SMARCTIC
Roadmap to Smart Arctic Specialization

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SMARCTIC in a nutshell

The objective of the SMARCTIC project is to formulate a future vision and a roadmap toward maintaining and further developing the Finnish Arctic expertise. The project will primarily evaluate how the principles of sustainable development and human well-being shall be realized in future natural resource exploitation projects and when taking advantage of new transportation routes. In order to respond to this concern, the project will examine the main research questions and, at the same time, evaluate the capacity for industrial renewal and assess new business potential.

The thematic areas (work packages) of the SMARCTIC project are as follows:

- Arctic context, including arctic competence and policy making
- Environmental informatics and mobile technology
- Smart logistics, transport and living environment
- Resource management and economics
- Human well-being in the North
- Road maps for arctic expertise
- Strategic initiatives and business opportunities

WP 3: Smart Logistics, Transport and Living Environment

The objective of WP3 (Smart Logistics, Transport and Living Environment) is to explore the impacts of opening northern frontiers on transport flows, communities and infrastructures, and to identify opportunities for related business concepts and services. The focus areas are accessibility, sustainability and growth. The driving vision for WP3 is to create a viable community in the North with adequate logistical conditions enabling accessible services as well as ecologically, socially and economically sustainable living environment.

Participants and distinct reports in WP3:

University of Oulu, Faculty of Science, Department of Geography:
Jarmo Rusanen, Virpi Keränen / Arctic Geographical Accessibility 66 pages.

University of Oulu, Faculty of Technology, Department of Architecture:

University of Oulu, Oulu Business School, Department of Marketing:
Jari Juga, Timo Pohjosenperä, Hanne Kettunen / Smart Arctic Logistics 64 pages.

Cover photo: Port of Oulu
(A) ARCTIC LOGISTICS REPOSITORY

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5. Statistical Overview: Northern Finland in Focus
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ARCTIC LOGISTICS REPOSITORY: SELECTED LITERATURE AND KEY FIGURES

1. POLICY PAPERS AND PARTNERSHIPS

This chapter presents some of the key strategy papers and documents related to the development of the Arctic Region.

1.1. Arctic Strategies (Arctic Council)

Arctic strategies have been outlined in the member countries of the Arctic Council, including (but not limited to) Sweden, Norway, Denmark, Iceland, Finland and Russia (see www.arctic-council.org). A summary of the strategy papers, mostly based on the Arctic Strategy paper of Sweden, is presented below. It should be noted that some countries (including Finland) are currently rewriting their arctic strategies.

Sweden: The purpose of the Government’s Strategy for the Arctic Region1 is to present Sweden’s relationship with the Arctic, together with the current priorities and future outlook for Sweden’s Arctic policy, proceeding from an international perspective. Further, it specifies how, and through which international cooperation bodies and bilateral channels, the Government should seek to achieve its objectives for the Arctic. Finally, it discusses the top priorities in the strategy’s three thematic areas: climate and the environment, economic development, and the human dimension. The strategy emphasizes that Sweden will work to ensure that the Arctic remains a region where security policy tensions are low. Sweden also wants to promote economically, socially and environmentally sustainable development throughout the Arctic region.

Norway: Development in the High North, including the Arctic, has been the Government’s highest foreign policy priority since 2005. The overarching objective is to gain greater knowledge, create more activity and have an increased presence in the north and to lay the foundations for sustainable economic and social development in the future. The Norwegian Government’s High North strategy was established in 2006. It was followed in 2009 by the report “New Building Blocks in the North” which identifies seven priority areas: 1) climate and the environment; 2) monitoring-emergency response-maritime safety in northern waters; 3) sustainable development of offshore petroleum and renewable marine resources; 4) onshore business development; 5) infrastructure; 6) sovereignty and cross-border cooperation; and 7) the culture and livelihoods of indigenous peoples. In the 2011 central government budget, a total of NOK 1.2 billion was set aside for initiatives in the High North, a significant portion of which was earmarked for research. Cooperation with Russia plays an important role in Norway’s Arctic policy. Norway is also promoting greater engagement in the Arctic by NATO and the Nordic Council of Ministers. The Norwegian Government intends to present an updated version of its strategy (“Towards the North”) shortly.

Denmark: Because Greenland and the Faroe Islands are also part of the Commonwealth of the Realm Denmark the country has a special position in the Arctic. Denmark’s Arctic strategy is based on the aims of supporting and strengthening development in Greenland and maintaining the position of the United Kingdom of Denmark as an important actor in the Arctic. To adapt to the changed conditions in the Arctic and because of its inextricable links with Greenland, Denmark has a special interest in promoting long-term, sustainable regional development within the framework of both Arctic cooperation and the activities of the Nordic Council of
Ministers. Special priority has been allocated to the following areas: energy and minerals; trade and tourism; shipping; education and research; and nature and the environment. Denmark intends to develop a new Arctic strategy during 2011.

**Iceland:** Arctic policy goal is to secure the country’s status as a coastal state in the Arctic region and safeguard its influence over developments and international decision-making based on legal, economic, ecological and geographical arguments. Iceland also wishes to “strengthen the Arctic Council as the main cooperative body on Arctic issues and press for decisions to be made within the Council.” EU membership for Iceland would provide the country with greater scope to assert its interests in Arctic cooperation bodies while giving the Union an even more palpable geographical presence in the region.

**Finland:** The position as an Arctic country in the Nordic region is very similar to Sweden’s. Neither country borders on the Arctic Ocean, both are EU Member States and both have indigenous Sámi populations. The Finnish Arctic strategy, established in 2010, defines the objectives for the country’s Arctic policy and describes ways of promoting it. The emphasis is on external relations, i.e. Finland’s relationship to the Arctic from an international perspective. The strategy deals with the region’s security, environment, economy, infrastructure, indigenous peoples, international institutions and the Arctic Policy of the European Union. Proposals for measures include improving transport communications, promoting exports, research and strengthening the Arctic Council. The strategy also proposes that Arctic Council summits be held on a regular basis and also includes proposals on how the Arctic Policy of the EU can be developed (e.g. giving the European Commission observer status in the Arctic Council and establishing the European Arctic Information Centre as part of the Arctic Centre at the University of Lapland in Rovaniemi). The Finnish Government has appointed a delegation for Arctic issues, which has a central role in the future development of the strategy. A revised arctic strategy was published by Finnish government in August 2013. The government motivated the revision by the growing importance of the arctic regions and a strong vision of Finland as an arctic country with special arctic competencies. Two main themes in the strategy are Finland’s role in promoting sustainable development and utilizing the economic potential of the arctic regions. Among the central industries where Finnish contribution to arctic development can be significant are mining, energy, offshore, cleantech and tourism. The vision laid down in the revised strategy sees Finland as an active arctic actor that reconciles the arctic environmental interests and global business opportunities through international collaboration.

**Russia:** Russia attaches considerable importance to the development of the Arctic, especially for security policy and economic reasons. A Russian strategy for the Arctic in 2008 clarifies the fundamental national interests in the Arctic. These are: 1) the Russian part of the Arctic shall serve as a strategic resource base to promote social and economic development, 2) the Arctic shall be an area of peace and cooperation, 3) the region’s ecosystem shall be protected, and 4) the Northeast Passage shall serve as a standard Russian shipping route. The strategy describes how these national interests are to be promoted from now until 2020. This includes gathering background information to support Russia’s view on how far the Russian continental shelf extends as well as measures to improve and expand the infrastructure for mining and transport. The Russian Arctic strategy ends by ascertaining that implementation of Russian government policy, as established in the strategy, means that Russia can preserve its role as a leading force in the Arctic.
1.2. Arctic Transport Policy

When it comes to transport and logistics, the emphasis in the arctic strategy papers is on general issues like sustainability, security and environmental issues, sea rescue and icebreaking. The strategy papers also emphasize the importance of free trade as a driver of economic development in the Arctic regions. Cooperation between the neighboring countries is also stressed as a precondition for developing long-term and relevant transport networks and solutions in the Barents Region. The importance of good transport connections and fluent border crossings are emphasized for the purposes of trade and industry as well as for tourism.

In the Finnish Arctic strategy paper, it is observed that a common strategic view on the goals of developing the transport system in Northern Finland and on the measures to be taken is needed at national level. Land and airline traffic infrastructure should be developed especially in the east-west direction. However, investments in cross-border infrastructure require that Russia, too, is prepared to develop its east-west transport networks. Russia’s transport strategy extending up to 2030 has no plans for opening new international links in the Barents Region. The Finnish strategy notes that the Northern Dimension Partnership on Transport and Logistics, when implemented, will create possibilities for extensive infrastructure projects between the EU, Northwest Russia and Norway.

According to the Finnish arctic strategy, the specific networks of importance in the Arctic include (see Figure):
- The Bothnian Corridor (now included in European Union’s Trans-European Transport Network, TEN)
- The Barents Link
- The Murmansk Link
- The Northern Lights Route
- The Arctic Ocean Corridor

A special mention in the Finnish arctic strategy is given to the expectations attached to the Northeast Passage (Northern Sea Route). However, some of the challenges of this route include difficult conditions, inadequate infrastructure, and the pricing policies (e.g. fairway dues and icebreaker services).
In Finland’s revised arctic strategy (2013) three objectives were laid down for the arctic transport system: 1) to create a basis for securing EU’s Arctic Sea connection; 2) to secure operational transport systems and border-crossing stations in the Arctic Region; and 3) to secure safe and sustainable maritime transport in the arctic regions. To achieve these goals, a long-term action and investment plan should be developed in the arctic region (e.g. joint Barents Transport Strategy).

In its Ministerial meeting in Kiruna, 15.5.2013, the Council agreed on the importance of a prosperous, safe and healthy Arctic environment and emphasized the need for strengthening the Council to meet new challenges and opportunities for cooperation in Arctic policy shaping and policy making. The meeting recognized the work related to Arctic Maritime and Aviation Transportation Infrastructure Initiatives and encouraged continued efforts to identify opportunities for complementary infrastructure development and use. (Arctic Council, Kiruna Declaration).

Source:
- Arctic Council, Ministerial Meeting Kiruna 15.5.2013

1.3. Steering Committee for the Barents Euro-Arctic Transport Area (BEATA)

Barents Euro-Arctic Council (BEAC) is the forum for intergovernmental and interregional cooperation in the Barents Region. BEAC was established in 1993 in order to "provide impetus to existing cooperation and consider new initiatives and proposals".

The need for co-operation on transport between the countries of the Barents Region was raised at a meeting of the Ministers for Transport of the Barents Euro-Arctic Council (BEAC), in Arkhangelsk in September 1996. The Barents Region was subsequently introduced into the EU transport cooperation as a Transport Area, decided at the third Pan-European Transport Conference in Helsinki in 1997. The BEATA co-operation was established and guidelines for its work drawn up at a meeting in Copenhagen in May 1998 between the Ministers for Transport from Finland, Norway, Russia and Sweden and representatives from the European Commission. A Steering Committee for the BEATA was set up. The main aim is to strengthen co-operation in order to create an efficient transport system in the Barents Region that integrates the different means of transport. The cooperation includes border crossing points, customs co-operation, maintenance and reconstruction as well as new projects to improve the infrastructure.

Among its activities, BEATA monitored the progress of the INTERREG III B project Sustainable Transport in the Barents Region (STBR) granted for the periods 2003-2005 and 2006-2007. It resulted in studies and plans covering the entire Barents Region in a coherent way. Compilations of national transport investment programs and a strengthened cooperation between decision makers, transport authorities and planners were also important aims of the project.

Under the Norwegian chairmanship of the Barents Euro-Arctic Council (2011-2013), an initiative has been taken to develop a Joint Barents Transport Plan (Vegvesen’s information dated 31.1.2013). An expert group consisting of members from Norway, Sweden, Finland and Russia will explore the transport needs and long-term infrastructure development plans, with special focus on border-crossing transport in the Barents Region.

In the Barents Summit 3-4.6.2013, in Kirkenes, the Barents Euro-Arctic Council, headed by the prime ministers, emphasized that economic and social development in the Barents Region requires
better transport connections, including further development of east-west transport networks and development of ports and marine terminals. The summit was encouraged by the work to draw up a Joint Barents Transport Plan, covering all transport modes and focusing on transport corridors between Russia, Finland, Sweden and Norway. In addition, the need for visa-free travel in the Barents Region was highlighted in the summit.

Sources:
- BEATA: [http://www.beac.st/?DeptID=8573](http://www.beac.st/?DeptID=8573)
- Joint Barents Transport Plan: [http://www.vegvesen.no/Om+Statens+vegvesen/Media/Nyhetsarkiv/Nasjonalt/426619.cms](http://www.vegvesen.no/Om+Statens+vegvesen/Media/Nyhetsarkiv/Nasjonalt/426619.cms)
- Barents Summit 2013: Kirkenes Declaration [http://www.regjeringen.no/upload/UD/Vedlegg/Nordomr%C3%A5dene/Barentssamarbeidet/Barents_Summit_Declaration_2013_1.pdf](http://www.regjeringen.no/upload/UD/Vedlegg/Nordomr%C3%A5dene/Barentssamarbeidet/Barents_Summit_Declaration_2013_1.pdf)

1.4. The Northern Dimension Policy

The *Northern Dimension Policy* was revised at the Northern Dimension Summit held in Helsinki on 24 November 2006. The new basic documents define the Northern Dimension as a common policy of the EU, Iceland, Norway and Russia where all partners are equal. The priority sectors of the Northern Dimension are economic cooperation; freedom, security, justice; external security; research, education, culture; the environment, nuclear safety, natural resources; social welfare and health care. The highest decision-making bodies of the Northern Dimension are the Foreign Ministers’ Meetings and the Senior Officials’ Meetings. Between these meetings, activities are coordinated by the Northern Dimension Steering Group made up of civil servants. Partnerships are a concrete way of putting the Northern Dimension policy into practice. They differ in nature and modes of operation, but they all strive to combine policy-making, the work of experts and practical-level project activities. The partnerships are based on open, equal and broad-based participation. In addition to the participating States, regional councils in the North and other international organisations and international financial institutions can take part in their activities.

The *Northern Dimension Partnership on Transport and Logistics (NDPTL)* comprises eleven countries, who in June 2010 entered into a binding agreement with the Nordic Investment Bank in Helsinki on the establishment of a small secretariat at the bank. The European Commission also takes a very active part in the NDPTL. The partnership is very much in its infancy but a number of studies have got under way. These include a forecast of anticipated traffic flows up to 2030 and a summary of the countries’ national priorities for transport infrastructure, especially regarding cross-border transport and logistics solutions. The aim is for this partnership to become a forum for cooperation that makes it easier for the participating countries to decide jointly on which projects and other measures they wish to invest in in order to increase the transport capacity in a cost-effective manner on both sides of their common national borders. The partnership can also be a forum for assessing desirable transport solutions in the Arctic, including shipping solutions.

Sources (Northern Dimension Partnership on Transport and Logistics):
- [http://www.nib.int/about_nib/cooperation/ndptl](http://www.nib.int/about_nib/cooperation/ndptl)
1.5. “Katse Pohjoiseen” (MEE 2013)

Finland’s Ministry of Employment and the Economy’s multidisciplinary working group’s report “Katse Pohjoiseen” (Look North) focuses on determined, long-term and co-ordinated development of Eastern and Northern Finland, on the basis of their special characteristics and strengths that have possibilities of bringing benefits to the economic development of the whole Finland. In practical terms, regional development measures require broad-based commitment and cooperation among various actors. The working group presents 36 proposals for follow-up measures and pilot projects; these are based on the outlines prepared by the group in the summer of 2012. It is vital for the future development of the whole country that investment be made in both conditions and expertise within Eastern and Northern Finland. Such conditions and expertise include:

- Arctic competence and development of tourism (especially sustainable tourism)
- Utilisation of the regions’ natural resources and increase in related expertise, alongside innovation- and development-related activities and education
- New possibilities for utilising wood and the related research, including bioenergy
- Taking environmental factors and sustainable development into account in all economic activities, and better reconciliation of nature-related values with other economic activity
- Development of world-class competence in key areas of expertise
- Development of diversified solutions, especially in energy production and service provision
- Harnessing of the potential to be found in Russia.

From the logistical point of view the report focuses on continued need to facilitate telecommuting and provide transport aid. The working group would improve telecommuting opportunities in the area by creating distance service points in tourist centres and increasing the tax deduction for working from one's own home. While the working group would continue to support payment of transport aid, it does not put forward other proposals for improving transport connections.

Source:
- Katse pohjoiseen (TEM 2/2013), together with the working-group outlines and the related background memorandum www.tem.fi/itajapohjoissuomi (in Finnish).

1.6. Foresight 2030

Once in each electoral period, the Government of Finland provides Parliament with Foresight Report on the long-term perspectives and options faced by society. In the Foresight 2030 (tulevaisuusselonteko) process, a separate foresight-insight work stage was included in the preparation of the foresight report, with the purpose of seeking new directions for Finland in a new way. A large number of experts participated in the related theme groups and a broad national debate was conducted on website and at regional events. The work resulted in six themes for the foresight report: 1) public administration as an enabler; 2) citizen’s well-being and inclusion; 3) working life in the future; 4) business regeneration; 5) a new geography for the North; 6) opportunities in the midst of scarcity.

The vision for the arctic theme (“A new geography for the North”) is that Finland will become a metropolis of arctic expertise that combines the exploitation of natural resources, logistics, natural values and good living in a sustainable way. Three inter-linked development directions are described under the arctic vision are as follows:
(1) **Sustainable utilisation of nature:** In 2030, Finland will be able to make sustainable use of the abundant natural resources of Northern Finland, such as minerals and forest. The needs of industry and tourism will be reconciled in land use, developing various livelihoods side by side. Reindeer herding will have retained its vitality as a business. New combinations between livelihoods will be sought, for instance disused mines will serve tourism and adventure travel. Sustainable mining technology could be converted into an export product. In addition, Finland could develop state-of-the-art reconciliation of natural resource management with reaping the benefits of various commercial activities.

(2) **A model country of Northern housing and living:** In 2030, Finland will be a model country of Northern housing and living, where the needs of different livelihoods will have been reconciled and these will be under development in parallel. Finland will also serve as a model country for harmonious co-existence with local traditional cultures and indigenous people in particular. Finland will be an individual, international and well-functioning Arctic region that attracts even new residents to live, study and work there. Mining and logistics may also lead to a need for housing and travel centres for staff, while simultaneously developing the region’s infrastructure.

(3) **The Arctic Sea Route and Europe’s Arctic Railway:** In 2030, Finland will be the Northern hub of European logistics. Melting of the polar ice cap will have opened a new sea route in the Arctic Ocean, shortening the transport distance to Asia. Finland will also have constructed a railway to the Arctic Ocean and a rail link across the Gulf of Finland to Europe. The new logistical position will serve the transport needs of industry and create demand for various services, as well as Arctic technology and competencies. Thanks to its active approach and Arctic cooperation, Finland will also benefit from the economic activity of Norway and Russia in the Polar Regions. Growth will be created from the combination of innovations, technological strengths and geographical position.

**Source:**

The logistics strategy for Northern Finland (Pohjois-Suomen logistiikkastrategia) was outlined by the Councils of Oulu Region, Lapland, Kainuu and Central Ostrobothnia in 2006. The strategy lays down the vision for logistics of Northern Finland in 2015 and presents specific objectives and an action plan how these objectives can be accomplished.

The vision for 2015 reads as follows: “Effective and efficient logistics enables business competitiveness in Northern Finland by mitigating the impacts of long transport distances and thin material flows.” The following goals are set accomplish this mission:

1) high-class logistics competence is available in Northern Finland;
2) technological solutions and real-time information is utilized efficiently;
3) advanced and versatile logistics services are available;
4) expedite connections exist between logistics nodes and the infrastructure supports fluent operations;
5) the position of Northern Finland in international logistics is strengthened.

More specific action plans are also listed to support the implementation of these high-level objectives. Included in the action plans is a priority list of infrastructure projects in Northern Finland which has, however, not materialized fully in the government’s infrastructure policy after the strategy was published.

Related strategy documents include the Logistics Strategy for the Oulu Region 2012-2016 (Oulun seudun logistiikkastrategia, 2012). The Logistics Strategy for Northern Finland is currently being updated.

Sources:
- Pohjois-Suomen logistiikkastrategia ja logistiikan kehittämisohjelma (2006)
  http://www.keski-pohjanmaa.fi/tiedostot/Pohjois-Suomen_logistiikkastrategia.pdf
- Oulun seudun logistiikkastrategia 2012-2016
  http://www.ouka.fi/c/document_library/get_file?uuid=6035f6ce-65e1-4d8f-b825-5c59a059e9be&groupId=173371

1.8. Government’s Transport Policy

Although Finnish Government’s transport policy does not specifically focus on arctic transport issues, there are certain aspects in the government’s policy papers that deserve to be mentioned.

Government’s Transport Policy Report (Liikennepolitiittinen selonteko, 2012) emphasizes the characteristics of Finnish transport system: distances are long and transport flows thin which makes the logistics costs of Finnish companies high in comparison to main competitors. As investment opportunities are limited, the resources will be increasingly directed to the maintenance and repair of existing infrastructure rather than new investments. Priority will be given to the core network and central corridors supporting the competitiveness of Finnish economy. It is also of interest that the administrative processes in transport policy planning will be more tightly integrated with regional planning to improve opportunities for closer cooperation and synergy impacts. Also, the report emphasizes the need to increase the sustainability and efficiency of the transport system with new technological solutions and ICT applications (Intelligent Strategy for Transport).
From the point of view of arctic transport and logistics, the Government’s Transport Policy Report specifically brings up the needs of the mining industry in Northern Finland. For this purpose, a special report has been prepared (see Chapter 3.2.) especially focusing on the railway transport connections in the northern regions. In addition, the report underlines the special challenge of winter maintenance, including the need for adequate icebreaking service in sea transport. As the information regarding the development of Northern Finland is scattered, the report proposes a joint vision to be prepared for the development of Northern Finland on the basis of the studies and views of the different ministries.

Another important policy paper from the Government is the Second Generation Intelligent Strategy for Transport (Toisen sukupolven älyliikennestrategia, 2013), which is a follow-up to the earlier work of 2009. In line with the principles of the Transport Policy Report, the intelligent transport strategy calls for new thinking no longer focusing on infrastructure investments only, but on the interplay of well-functioning infrastructure and real-time transport information. The key projects and focus areas mentioned in the intelligent strategy paper are generic and do not specifically deal with any specific conditions or regions (e.g. winter conditions, arctic regions). Naturally, many of the solutions and applications would be valuable in challenging arctic conditions (e.g. weather monitoring and situational awareness tools supporting transport planning, infrastructure maintenance, etc.), but also the challenges such as the limited market and user volumes are accentuated in the northern regions. Therefore, the intelligent transport solutions in the arctic regions might deserve a special attention.

Sources:
- Competitiveness and well-being through responsible transport. Government report on transport policy submitted to the Parliament of Finland 2012 (Liikennepoliittinen selonteko 2012)  
  http://www.lvm.fi/web/hanke/liikennepoliittinen-selonteko
- Towards a new transport policy: Intelligence in transport and wisdom in mobility. Finland’s second generation strategy for Intelligent Transport (Kansallinen älyliikenteen strategia 2013)  

1.9 Joint Barents Transport Plan

In light of the greater attention being paid to the High North, the Barents Euro-Arctic Transport Area (BEATA) steering committee took the initiative for a Joint Barents Transport Plan. An Expert Group were appointed in late winter 2013 to present a document to the steering committee by early autumn 2013. The Expert Group proposes the following joint objective for the four countries based on the national objectives: Russia, Finland, Sweden and Norway have the ambition to develop an efficient transport system in the Barents Region with good internal connectivity between the Barents countries and with good external links to world markets. The transport system should facilitate Barents regional development and create new opportunities for important industries. The transport system should be developed in a manner that safeguards the environment and improves safety and accessibility for all.

The Expert Group has defined 14 multimodal border-crossing transport corridors which are important from a Barents perspective (see Figure).
Figure: Transport corridors proposed in the Joint Barents Transport Plan

There are many challenges concerning transport in the Barents Region and there are many bottlenecks. Some of these are linked to:

- Low standard on sections of roads and railways
- Arctic winters and winter maintenance
- Lack of deep-water ports and fairways, especially in the Gulf of Bothnia and the White Sea
- Limited opening hours for customs clearance
- Different national regulations on total weights and lengths of vehicles
- Different railway gauges
- Lack of good flight connections east – west in the Barents Region

To tackle these challenges the Expert Group proposes some important measures for the future:

- Further work on harmonizing regulations on vehicle sizes
- Draw up good and if possible harmonized maintenance standards across the borders
- Main border-crossing roads should have an asphalted road width of minimum 8 metres
- More efficient administrative routines and customs clearance at borders and ports
- Development of key ports including good hinterland connections
- Consider feasibility study for new railway line between Nikel and Kirkenes with Russian gauge
- Consider feasibility study for new railway line between Svappavarra (Sweden) and across the border to Kolari (Finland)

It is emphasized in the Joint Barents Transport Plan that lacking east-west flight services is a major bottleneck for exchange of business and labor in the Barents Region. The Expert Group proposes further work to look at the possibility of subsidizing international flights in this area, to achieve a positive development for trade and industry. In addition, it is stressed that various infrastructure
financing instruments in the Barents region should be examined besides national budgets, including public private partnerships, international funding opportunities and road tolls. The Expert Group proposes that all border-crossing projects, or projects near to the border, be handled with extra awareness of the possibilities of cooperation on financing.

The follow-up of proposals of the Joint Barents Transport Plan is the responsibility of the Finnish Chair of Barents Euro-Arctic Transport Area from October 2013. The work should be coordinated with other important initiatives in the region. The Expert Group recommends that the preparation of a new version be considered under the Finnish chairmanship (autumn 2015), and subsequently a revised plan every four years as an input to national transport plans in the four countries.

Source:
2. ISSUES IN ARCTIC TRANSPORT AND LOGISTICS

This chapter presents selected topics and literature in the area of transport and logistics in the Northern Regions. Some of the topical issues include the Sulphur Directive, development of the Northern Sea Route, and the climate change issues. Also work in other networks and projects related to transport and logistics in the Arctic area are briefly examined.

2.1. Climate Change: Challenges and Opportunities

According to the Intergovernmental Panel on Climate Change (IPCC 2013), the warming of the climate system is unequivocal, many of the observed changes since the 1950’s are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. The satellite data of America’s National Snow and Ice Data Centre shows that the ice has shrunk far below the long-term average: since the 1970s the sea ice has retreated by around 12% each decade. In 2011 the summer minimum was 4.33 million square km — almost half the average for the 1960s.

Sea ice melting increases accessibility by sea which will benefit coastal communities, coastal resource-extraction operations, tourism, fishing, and shipping concerns. While nature will be in havoc, the climate change will bring oil, gas, water and other natural resources more accessible than before in the arctic areas. Many cities and ports in the arctic areas will grow and gain more influence.

Potential losers of the situation are smaller inland communities and their mostly indigenous people. Also inland mining and timber operations, and inland gas and oil drilling are potential losers. Global warming threatens the viability of an important network of roads that depend on freezing temperatures. Operating period on ice roads will shorten and transportation times will lengthen. Inland located remote communities which rely on winter roads may have to switch to air cargo services, which will increase living costs greatly.

The biggest problem of climate change in the Arctic is the thawing of permafrost – frozen soil – which again releases methane, a powerful greenhouse gas. Writing in the well-regarded Nature journal (25 July, 2013), three researchers Gail Whitman, Chris Hope and Peter Wadhams argued that the possible methane emissions caused by shrinking sea ice from just one area of the Arctic could come with a global price tag of 60 trillion dollars – the size of the world economy in 2012. The economic impact modelled was only for the methane existing on the East Siberian Arctic Shelf, and the total price of Arctic change is much higher, the authors warn. The research also explored the impact of a number of later, longer-lasting or smaller pulses of methane, and the authors write that, in all these cases, the economic cost for physical changes to the Arctic is “steep”, with developing nations bearing 80% of the cost through extreme weather, poorer health and damaged agriculture.

Sources:
- [http://www.ipcc.ch/index.htm](http://www.ipcc.ch/index.htm)
- [http://www.nature.com/nature/journal/v499/n7459/full/499401a.html](http://www.nature.com/nature/journal/v499/n7459/full/499401a.html)
2.2. Sulphur Directive

In 2012, EU parliament approved the so-called sulphur directive restricting the sulphur content of ship fuel to 0.1 percent in the waters off Finland. The Baltic Sea is classified as a Sulphur Emission Control Area (SECA) under the directive, which means stricter sulphur limits than for waters in southern Europe. The new limit for the Baltic Sea, set at a tenth of current levels, will come into force in 2015. In EU waters outside the Sulphur Emission Control Areas, a limit of 0.5 percent will apply from 2020.

The estimates regarding the increase of freight bill for Finnish industry vary. The Confederation of Finnish Industry (EK) estimated in 2012 that sea freights will increase by 30-50%, due to the poor availability of low-sulphur fuels. In monetary terms, the growth of the freight bill for Finnish industry is estimated by EK to be 600 million Euros. The Center for Maritime Studies, at the University of Turku, has estimated the increase to be between 200 million and 1.2 billion Euros.

In March 2013, the Ministry of Employment and Economy (TEM) published a list of measures that could be taken to alleviate the impacts of the sulphur directive for Finnish industry. The costs of these measures for Finnish society are estimated on an annual basis as follows:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Cost (million Euros/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- investment support for building new environmentally friendly ships</td>
<td>120</td>
</tr>
<tr>
<td>- investment support for sulphur scrubbers to old ships</td>
<td>135</td>
</tr>
<tr>
<td>- measures to promote the use of LNG</td>
<td>250</td>
</tr>
<tr>
<td>- refunding of annual vehicle tax for road transport companies</td>
<td>30-50</td>
</tr>
<tr>
<td>- renouncing the planned reductions of maritime transport subsidies</td>
<td>20</td>
</tr>
<tr>
<td>- reduction of fairway dues (lost revenues)</td>
<td>70-75</td>
</tr>
<tr>
<td>- operating subsidies to companies</td>
<td>1200-1800</td>
</tr>
<tr>
<td>- compensations for emission trading costs (depends on the price of emission rights)</td>
<td>140-280</td>
</tr>
</tbody>
</table>


It seems that at least part of the cost impact of the sulphur directive will most likely be transferred to the Finnish tax payer. It should also be noted that some of the measures suggested by the Ministry are not regionally differentiated; for instance, the refunding of vehicle tax for road transport companies would benefit companies in Southern Finland where road transport volumes are high, whereas the cost impacts of the sulphur directive are biggest for the heavy industry in the North because of the long sea legs to/from the northern ports.

Source:
- Rikkisääntelyyn sopeutuminen –työryhmän mietintö. TEM-raportteja 4/2013
  [http://www.tem.fi/?C=98033&s=2086&xmid=4992](http://www.tem.fi/?C=98033&s=2086&xmid=4992)

2.3. The Northern Sea Route

The Northern Sea Route is a route between the Atlantic and the Pacific. It goes through the Barents Sea, Kara Sea, Laptev Sea, East Siberian Sea and Chukchi Sea. The route shortens the transit time from Northern Europe’s main ports to North-East Asia. The climate change will lengthen the operating season on the route as ice caps get thinner – when this will happen is unclear, however.
Estimates regarding the time savings from Asian ports to Europe vary. According to Verny (2009) the sea transport distances and transport times between Shanghai and Rotterdam are as follows:

Table: Sea transport distances between Shanghai and Rotterdam

<table>
<thead>
<tr>
<th>Route</th>
<th>Distance</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Sea Route</td>
<td>7,700 nautical miles</td>
<td>18-20 days</td>
</tr>
<tr>
<td>Royal Road (via Suez Canal)</td>
<td>10,200 nautical miles</td>
<td>28-30 days</td>
</tr>
</tbody>
</table>

source: Verny, 2009

There are many problems related to the Northern Sea Route. Currently the problems are issues of functionality, physicality and politics. The arctic climate requires special ships to bear ice and icebreakers are needed to keep the route open, too. The navigable routes are currently too shallow for many ships and icebreakers also set limits for the width of the vessels. Ports in the Northern Sea Route would also require development for regular routes to be established.

Freight must be protected from freezing and services concerning up-to-date information about the weather, ice and transport should be offered continuously and reliably. Qualified employees are also needed and sea rescue should be organized as well. Russia’s icebreakers are old and would need new investments - in the upcoming years they can be the bottleneck of the whole route.

Bureaucracy is an issue, too. The permission for the Northern Sea Route usage must be applied four months beforehand. Also an eight-day queuing is needed during which the vessels ability to go through ice is measured. The time benefits of the Northern Sea Route are lost for bureaucracy. All these problems can be solved in time but actions on national and international level are needed - corporations can’t solve all problems by themselves.

According to Barents Observer, 46 vessels sailed through the Northern Sea Route in 2012, compared to 34 vessels in 2011 and only four in 2010. The total cargo transported on the Northern Sea Route in 2012 is 1,261,545 tons – a 53 percent increase from 2011 when 820,789 tons was shipped on the route. Arctic Logistics Information Office reports the following transport statistics on NSR in 2012:

Table: NSR Transit statistics for 2012

<table>
<thead>
<tr>
<th>Type of cargo</th>
<th>Number of vessels</th>
<th>Cargo volume, tons</th>
<th>Number of vessels, eastbound</th>
<th>Eastbound volume, tons</th>
<th>Number of vessels, westbound</th>
<th>Westbound volume, tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td>26</td>
<td>894,079</td>
<td>18</td>
<td>661,326</td>
<td>8</td>
<td>232,753</td>
</tr>
<tr>
<td>Bulk</td>
<td>6</td>
<td>359,201</td>
<td>4</td>
<td>262,263</td>
<td>2</td>
<td>96,938</td>
</tr>
<tr>
<td>Fish</td>
<td>1</td>
<td>8,265</td>
<td>1</td>
<td>8,265</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In ballast</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repositioning</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>1,261,545</td>
<td>22</td>
<td>923,589</td>
<td>11</td>
<td>337,956</td>
</tr>
</tbody>
</table>

Source: [http://www.arctic-lio.com/nsr_transits](http://www.arctic-lio.com/nsr_transits)

Petroleum products constitute the largest cargo group on the Northern Sea Route. The second largest cargo group is iron ore and coal. The first ever container vessel (19,000 ton vessel “Yong Sheng” of the Chinese Cosco Group) sailed on the Northern Sea Route in August-September 2013 on its way from a Chinese port to Amsterdam.

By comparison, it can be mentioned that there were 17,225 vessels sailing through the Suez Canal in 2012, transporting approximately 740 million tons or cargo, a volume that has doubled in one decade since 2002.
Another alternative to the sea transport is offered by the rail links between Asian and European cities. These include the Trans-Siberian Railway through Russia (“Eurasian Land Bridge”) and the Trans-Asian Railroad (“Iron Silk Road”) through Kazakhstan. On the Trans-Siberian route, the Beijing-Hamburg Container Express completed its first journey in just 15 days as it was introduced in January 2008. The Trans-Asian Route from Chongqing to Antwerp was opened in 2011 and is offered on a 5-days per week basis. One of the main users of this route, Hewlett-Packard, says that it has shipped over 4 million notebook computers from China to Europe in approximately two years when the service has been offered. In addition to shorter transport duration, the industry’s interest in the rail connection has increased because production in China is moving to inland locations such as Chongqing away from the coast where the wages have been growing quite rapidly.

The official website of the Northern Sea Route Administration (www.NSRA.ru) was opened on 15 April 2013. The website publishes information on administration contact details, rules of navigation, information of applications under review by the NSR Administration, information of the issues permits, information of refused Permit, information of organizations providing icebreaker support services in the Northern Sea Route water area, information of organizations providing ice pilotage services in the Northern Sea Route water area, vessels daily traffic reports, long-term ice forecast for 30 and 90 days, hydro-meteorological and ice conditions analysis and 72-hour forecast, and recommendations on communication. (Source: CHNL’s Arctic Logistic Information Office)

Sources:
- Arctic Logistics Information Office (http://www.arctic-lio.com/)
- Suez Canal authority (www.suezcanal.gov.eg)

2.4. Bothnian Green Logistics Corridor

On 19 October 2011, the European Commission put forward its proposal for new guidelines for the Trans-European Transport Network (TEN-T). The proposal contains targets for developing the Trans-European Transport Network, the definition of the network, and a proposal for a new TEN-T. In this proposal, the TEN-T is divided into a ‘comprehensive network’ and a ‘core network’. As for Finland, the former ‘priority projects’ - the Nordic Triangle, Motorways of the Sea and Rail Baltica and a new project, the Bothnian Corridor - are included in the core network. In July 2013, the European Commission made its proposal for financial support to the TEN-T projects. Among the 13 Finnish TEN-T projects, the Seinäjoki-Oulu railway project, as part of the Bothnian Corridor, will receive 12.8 million euros from the Commission, given that the proposition is accepted by the European Council and the Parliament.
To promote the achievement of TEN-T objectives, the Project *Bothnian Green Logistics Corridor* has been established by key actors in the Bothnian Sea region. The project consists of several work packages and aims to develop green transport solutions and business models for the Bothnia corridor and its connections. Freight traffic is expected to increase in the Bothnia Corridor and the industries involved will be mining industry (iron ore), pulp, paper, sawn timber, seafood industry. By 2050 the freight transports in Europe are expected to grow by 50 per cent. The increase will stretch the existing transportation system to its limits.

Bothnian Green Logistic Corridor project is taking different measures on how to integrate and further develop existing roads, railroads and sea transports to and from the north of Scandinavia. By examining the current situation from different perspectives, the project aims to identify weaknesses and predict future needs for the Bothnian Corridor.

Studies completed by the Bothnian Green Logistics Corridor Project (as per April 2013) include:

- Strategic transport nodes and links in the Baltic Sea Area
- Inventory of actors, transport volumes and infrastructure in the Bothnian Green Logistic Corridor
- Mining industry in Finland and Sweden – New boost for European industrial future
- Study of ports in Canada

It should be noted that there are also other ongoing and finished transport corridor projects in the Barents Region, such as the *Barents Link Corridor* (Narvik-Transsib/Kazakhstan), *Barents Transport Corridor* (Kemi-Murmansk) and the *Northern East-West Freight (N.E.W.) Corridor* (Far-East, Barents/Narvik, North America).

Sources:
- Bothnian Green Logistics Corridor Project [http://www.bothniangreen.se/](http://www.bothniangreen.se/)
- Barents Link Corridor (Narvik-Transsib/Kazakhstan) [http://www.barentslink.com/eng/publications.php](http://www.barentslink.com/eng/publications.php)
- Barents Transport Corridor (Kemi-Murmansk) [http://www.barents-transport.fi/BTC%20Kaikki/BTC_etusivu.htm](http://www.barents-transport.fi/BTC%20Kaikki/BTC_etusivu.htm)
2.5. Seaports in the Barents Region

In the Barents Logistics 2 project, a review of ports in the Bothnian Arc Region was conducted in 2012. The biggest ports in the area are Luleå in Sweden and Kokkola in Finland. Finnish ports offered far more regular routes than the Swedish ports.

Swedish ports are specialized in forest industry and bulk goods with each port focusing on either field. Also many of the Finnish ports get their biggest volumes from a certain industry. Many ports are located near a big factory or an industry which determines the specialization of the port.

Table: Ports in the Bothnian Arc Region in 2011

<table>
<thead>
<tr>
<th>Port</th>
<th>Max. Draught (m.)</th>
<th>Ships called port</th>
<th>Total Import (tons)</th>
<th>Total Export (tons)</th>
<th>Total traffic/port (tons)</th>
<th>Area of specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kokkola</td>
<td>13.0 m</td>
<td>615</td>
<td>2 049 917</td>
<td>5 298 078</td>
<td>7 347 955</td>
<td>Dry Bulk***</td>
</tr>
<tr>
<td>Kalajoki</td>
<td>8.5 m</td>
<td>122</td>
<td>1 225 511</td>
<td>232 659</td>
<td>355 170</td>
<td>Other goods**, forest products **</td>
</tr>
<tr>
<td>Rahe</td>
<td>10.0 m</td>
<td>629</td>
<td>4 208 599</td>
<td>781 451</td>
<td>4 990 050</td>
<td>Dry bulk*, metal products **</td>
</tr>
<tr>
<td>Oulu</td>
<td>10.0 m</td>
<td>514</td>
<td>1 440 449</td>
<td>1 347 814</td>
<td>2 788 313</td>
<td>Chemicals*, Paper products **</td>
</tr>
<tr>
<td>Kemi</td>
<td>10.0 m</td>
<td>420</td>
<td>587 892</td>
<td>1 067 054</td>
<td>1 654 946</td>
<td>Forest products*, paper products**</td>
</tr>
<tr>
<td>Tornio</td>
<td>9.0 m</td>
<td>406</td>
<td>1 207 241</td>
<td>770 480</td>
<td>1 977 721</td>
<td>Dry bulk*, Metal products**</td>
</tr>
<tr>
<td>Umeå</td>
<td>11.0 m</td>
<td>802</td>
<td>836 000</td>
<td>961 000</td>
<td>1 448 000</td>
<td>Forest products</td>
</tr>
<tr>
<td>Skellefteå</td>
<td>11.0 m</td>
<td>283</td>
<td>721 000</td>
<td>892 000</td>
<td>1 613 000</td>
<td>Dry Bulk</td>
</tr>
<tr>
<td>Piteå</td>
<td>12.5 m</td>
<td>304</td>
<td>722 000</td>
<td>715 000</td>
<td>1 437 000</td>
<td>Forest products</td>
</tr>
<tr>
<td>Luleå</td>
<td>12.5 m</td>
<td>630</td>
<td>2 865 000</td>
<td>6 114 000</td>
<td>8 979 000</td>
<td>Dry bulk</td>
</tr>
<tr>
<td>Kalix</td>
<td>5.7 m</td>
<td>80</td>
<td>80 000</td>
<td>140 000</td>
<td>220 000</td>
<td>(forest products)</td>
</tr>
</tbody>
</table>

Source: Lahtinen (2012)

According to a Norwegian study (Akvaplan-Niva 2012), the biggest ports in Northern Norway are Narvik and Hammerfest (17.6 million tons and 10.2 million tons of cargo volume in 2010, respectively). Also Mo i Rana, Tromsø and Hammerfest showed a cargo volume above one million tons in 2010. It can be noted that the sailing depths to the Norwegian ports is considerably higher (28 m) than those in the Bothnian Arc ports (13 m in Kokkola, 10 m in Oulu and Kemi).
Table: Navigation and traffic volumes in Northern ports of Norway in 2004 and 2010

<table>
<thead>
<tr>
<th>Ports</th>
<th>Sailing depth (m)</th>
<th>Anchoring</th>
<th>Access to space onshore</th>
<th>Traffic development (loaded/offloaded tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28</td>
<td>20</td>
<td></td>
<td>2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Changes %</td>
</tr>
<tr>
<td>Moljana</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>3,648,194</td>
</tr>
<tr>
<td>Bodø</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>661,157</td>
</tr>
<tr>
<td>Narvik</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>15,568,790</td>
</tr>
<tr>
<td>Harstad</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>473,169</td>
</tr>
<tr>
<td>Tromsø</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>767,082</td>
</tr>
<tr>
<td>Alta</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>701,000</td>
</tr>
<tr>
<td>Hammerfest</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>535,131</td>
</tr>
<tr>
<td>Honningsvåg</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>204,832</td>
</tr>
<tr>
<td>Kirkenes</td>
<td>+</td>
<td>+</td>
<td>Good</td>
<td>94,842</td>
</tr>
</tbody>
</table>

Source: Akvaplan-Niva, 2012

Cargo volumes in the Northern ports of Russia have grown in the last decade. Murmansk is the second biggest port in Russia (after St. Petersburg), its main transport flows including coal, oil, mineral fertilizers and iron ore. According to the Association of Commercial Sea Ports in Russia (www.setcorp.ru) the cargo volumes in 2012 for Murmansk and Archangelsk ports were 23.7 million tons (down 7.8% from 2011) and 5.2 million tons (up 20.9% from 2011), respectively.

Table: Cargo turnover in Northern ports of Russia 2003-2011

<table>
<thead>
<tr>
<th>Port</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Igarka</td>
<td>55.6</td>
<td>-</td>
<td>48.9</td>
<td>36.6</td>
<td>59.2</td>
<td>58.9</td>
<td>-</td>
<td>-</td>
<td>106.4</td>
</tr>
<tr>
<td>Dudinka</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>109.2</td>
</tr>
<tr>
<td>Varandey</td>
<td>-</td>
<td>59.0</td>
<td>50.1</td>
<td>57.6</td>
<td>190.0</td>
<td>738.0</td>
<td>751.0</td>
<td>401.0</td>
<td>613.0</td>
</tr>
<tr>
<td>Naryan-Mar</td>
<td>111.5</td>
<td>66.9</td>
<td>194.2</td>
<td>291.1</td>
<td>84.3</td>
<td>124.8</td>
<td>60.5</td>
<td>103.1</td>
<td>103.8</td>
</tr>
<tr>
<td>Mezen’</td>
<td>12.0</td>
<td>13.7</td>
<td>33.0</td>
<td>44.6</td>
<td>24.4</td>
<td>23.7</td>
<td>22.5</td>
<td>23.2</td>
<td>14.6</td>
</tr>
<tr>
<td>Arkhangelsk</td>
<td>312.4</td>
<td>550.3</td>
<td>649.8</td>
<td>535.2</td>
<td>530.6</td>
<td>468.0</td>
<td>325.6</td>
<td>366.7</td>
<td>426.4</td>
</tr>
<tr>
<td>Onega</td>
<td>783.6</td>
<td>231.5</td>
<td>100.3</td>
<td>104.3</td>
<td>100.6</td>
<td>108.7</td>
<td>73.7</td>
<td>65.3</td>
<td>71.1</td>
</tr>
<tr>
<td>Vitino</td>
<td>571.4</td>
<td>370.4</td>
<td>1625.7</td>
<td>4757.5</td>
<td>394.2</td>
<td>4393.5</td>
<td>4358.7</td>
<td>4376.1</td>
<td>4531.6</td>
</tr>
<tr>
<td>Kandalaksha</td>
<td>1020.0</td>
<td>342.2</td>
<td>339.1</td>
<td>247.9</td>
<td>654.8</td>
<td>963.1</td>
<td>1060.2</td>
<td>862.6</td>
<td>916.7</td>
</tr>
<tr>
<td>Murmansk</td>
<td>1483.7</td>
<td>2475.9</td>
<td>28170.6</td>
<td>26294.2</td>
<td>24609.3</td>
<td>24832.2</td>
<td>35276.2</td>
<td>32809.2</td>
<td>25687.4</td>
</tr>
<tr>
<td>Total</td>
<td>27062</td>
<td>34618</td>
<td>39580</td>
<td>39636</td>
<td>37364</td>
<td>41970</td>
<td>52553</td>
<td>50509</td>
<td>42376</td>
</tr>
</tbody>
</table>

Source: Akvaplan-Niva, 2012

Sources:

2.6. Murmansk Transport Hub

Murmansk is a port city and the administrative center of Murmansk Oblast, Russia, located in the extreme northwest part of Russia, on the Kola Bay, 12 kilometers from the Barents Sea on the northern shore of the Kola Peninsula. The population of Murmansk is 307,257 (2010) – down by almost 10 % from 2002 (336,137) and 34 % from 1989 (468,039). The population of the whole Murmansk Region is close to 800,000.
**The Murmansk Transport Hub** project aims at developing Murmansk as an international transport and logistics node. Along with the Shtokman gas project, the Murmansk Transport Hub project has involved great expectations as a driver of economic growth in the Murmansk Region. The main advantage of Murmansk is the non-freezing port located by the Arctic Sea and the Northern Sea Route. It has good rail and road connections and an airport outside the city of Murmansk.

The plan includes the development of the Western side of the Kola bay (new oil and coal terminals) as well as operations on the Eastern side (including new container terminal). A railway link across the Lavna River is needed to combine the two sides of the Kola bay. The anticipated volume of traffic through the Murmansk Transport Hub is expected to grow from 30 million tons in 2010 to 50-80 million tons in 2020. The plan has also been to establish a special economic zone in connection with the Murmansk Transport Hub (Russian Government’s decision in October 2010). The establishment of special port zones is intended to give significant tax and customs benefits and reduced administrative barriers to trade and business. In Murmansk, it is believed to give a boost to the development of the Murmansk Transport Hub and facilitate the Shtokman project.

The development plan of Murmansk Transport Hub consists of six stages (Olga Buch 6.11.2012):

1. Building of coal terminal
   - satisfaction of growing requirements of extractive companies in terminals for export of coal through Murmansk transport unit by means of building a complementary coal terminal (planned capacity: 20 million tons/year)
2. Building of oil and oil product terminal
   - satisfaction of growing requirement in terminals for export of oil products through Murmansk transport unit by means of building of up-to-date, ecological oil terminal on the West coast of the Kola bay (planned capacity: 35 million tons/years)
3. Building of container terminal
   - using of potential of Murmansk transport unit as container terminal in conditions of growth of turnover of containers in Russian Federation by means of building of up-to-date container terminal
4. Reconstruction of coal terminal
   - increase of effectiveness of terminal situated in second cargo district of Murmansk Commercial Port by using of modern technologies of transfer of coal (planned capacity: 9.4 million tons/year)
5. Building of logistic center
   - control and regulation of motor and railway traffic through Murmansk Transport Unit and concentration inside station Murmansk, creation of center of automated management of traffic
6. Building of storage and distribution zone
   - satisfaction of requirements of cargo-owners, transport companies and producers in special area, which will provide full spectrum of logistic and distributive services.

Recent news regarding the Murmansk Transport Hub have been somewhat mixed. According to Barents Observer (28.12.2012), the Russian Government decided in December 2012 to recall the decree on the establishment of the Murmansk Transport Hub, only a few months after the Shtokman project was shelved. The acquisition of the Murmansk Commercial Seaport by Eurochem and Siberian Coal Company, both owned by the Russian billionaire Andrey Melnichenko (Barentsobserver 18.12.2012), may have been one of the factors behind this development – the new owners focus on developing the existing port area. However, indications of growing interest by federal and commercial actors are emerging (Barentsobserver 15.2.2013; see also video by Federal
Department of Transport 29.3.2013). Rosneft recently announced its interest in the special economic zone (Barentsnova 4.4.2013). This state-owned oil company owns 15 percent of the management company administering the development of the Murmansk Transport Hub. Also the plans regarding the Belkomur railway project may have a positive impact on the development of the Murmansk Transport Hub (Barentsnova 28.3.2012).

Besides the Murmansk Transport Hub, the Russians have plans of developing the Liinakhamari Port on the Barents Sea. The port is planned for an annual capacity of 15 million tons of oil and 4 million tons of fertilizer. The fertilizer is produced in Apatit on the Kola Peninsula and can be transported to Pechenga by railroad. The port of Liinakhamari in the outlet of the Pechenga fjord has lain more or less idle since the Coast Guard moved its vessels out of the area a few years back. The fjord is used for salmon farming. (Barentsobserver 24.5.2012)

**Sources:**
- Murmansk Transport Hub back on Agenda. Barentsobserver 15.2.2013
- Tyukavin: Murmansk Transport Hub is Alive. Barentsnova 23.5.2013
  [http://barentsnova.com/node/2352](http://barentsnova.com/node/2352)
  [http://barentsnova.com/node/1851](http://barentsnova.com/node/1851)
- Rosneft to reside in Murmansk port economic zone. Barentsnova 4.4.2013
  [http://barentsnova.com/node/2291](http://barentsnova.com/node/2291)
- Complex development of the Murmansk Transport Hub (video by Russian Federation Department of Transport 29.3.2013) [http://www.youtube.com/watch?v=eZbg8m8ZFPo](http://www.youtube.com/watch?v=eZbg8m8ZFPo)

### 2.7. Kirkenes Port

Kirkenes Port is located on the northern end of the Arctic Corridor and is included in the national port development programme of Norway. It is an important node for passenger traffic and the end point of Hurtigruten: regular, all-year traffic operations between Bergen and Kirkenes. The port has ore transport (2.9 million tonnes), fish transport and service transport of oil and gas industry (total volume of other transport is 112,000 tonnes). The port has a deep-water channel and all-year ice-free transport services. It has also plans for developing unit load transport.

The port has close connections with the Tschudi Group, a shipping company that also owns a deep water berth, dry bulk silo and extensive storage space in the port of Kirkenes. The company is also involved in mining operations through the Sydvaranger Gruve AS, an iron mine close to Kirkenes that ships its products through the Port of Kirkenes.

The port of Kirkenes has plans to become a major cargo hub with the growing traffic in the Northern Sea Route. Plans have been made to connect the port with the rail network of Russia (Kirkenes havn og jernbanetilknytning, 2003). Plans have also been made to extend the railway line from Rovaniemi to Kirkenes (Arctic Railway 2010), an initiative that was met with some interest by
the Norwegian minister of transport, Marit Arnstadt, while speaking at a conference in Kirkenes in February 2013 (Barentsobserver 7.2.2013).

Sources:

2.8. Center for High North Logistics and the Arctis Database

*The Centre for High North Logistics* (CHNL, www.chnl.no) based in Kirkenes in North-Norway close to the Russian border, is an international, non-for-profit center with the main focus of collecting relevant information on maritime transport and logistics in the Arctic. To serve this purpose CHNL has developing a web-based database, ARCTIS (Arctic Resources & Transportation Information System), and has also established the Arctic Logistics Information Office (ARCLIO; www.arctic-lio.com) in Kirkenes and Murmansk, Russia. The office provides information on e.g. Northern Sea Route Administration, legislation and permits, ice pilot services, icebreaker assistance and tariffs, and transit statistics.

The *ARCTIS Database* is a gateway to know-how for businesses, governments, and the educational community on shipping, transportation infrastructure, logistics and non-living resources in the Arctic. The information topics in the database are shown below, but for many topics, the information collection is still in its infancy.

Information topics in the ARCTIS database (www.arctis-search.com):
- transportation research
- arctic energy and mineral resources
- marine transport and logistics
- arctic sea routes
- people, industries and institutions
- maps and charts
- arctic sea ice and climatology
- arctic policies and governance

Sources:
- Center for High-North Logistics http://www.arctic-lio.com/
- Arctis database http://www.arctis-search.com/

2.9. Fintrip – A Competence Network in Transport and Logistics

Fintrip (Finnish Transport Research and Innovation Partnership), a network established by the Ministry of Transport and Communications and Finnish Transport Agency for improving cooperation among researchers, users and funding organizations, organized a seminar on arctic opportunities on 21. November, 2012 in Helsinki.
The seminar included a workshop where research and business ideas were elaborated on selected topics. As a general observation, it looks like arctic knowledge and competences already exist in many areas and organizations, but national and international coordination is still lacking, and a closer dialogue is needed between business and public organizations. Concerted research and competence development actions should be undertaken to further promote arctic knowledge and business development. Some of the topics presented in the workshop are summarized below:

- **national and international cooperation**
  - introducing an arctic SHOK (strategic research/competence network) for concerted arctic research and competence development
  - contacts with Russia are of primary importance (political, environment, safety), but also Scandinavia and Canada
- **environment and climate change**
  - increasing preparedness for cross-border cooperation in arctic environmental/security in emergency situations
  - development of (international) environmental monitoring in arctic regions
- **infrastructure**
  - services and competence related to building for cold weather conditions must be strengthened
  - need for improved rail connections (Arctic Sea; connection to Tornio/Kemi region with European rail gauge)
- **security, sea transport, weather**
  - focus on crisis management, rescue and safety operations in arctic regions
  - services related to monitoring and management of arctic conditions (e.g. environment, ice and weather)
- **air transport**
  - airport construction and maintenance in cold regions (snow, ice, friction control etc)
  - Northern air traffic hub (Helsinki/St. Petersburg?)
- **new business opportunities**
  - commercialization of knowledge on weather and ice conditions, snow-how (hardware and solutions)
  - services, outfit, clothing etc. related to habitation and tourism in arctic regions
- **other**
  - role of LNG in transport
  - knowledge/study of winterworthiness requirements (materials, transport etc)

Source:
3. INDUSTRY AND INVESTMENTS IN THE HIGH NORTH

3.1. Business and Investments

Business prospects in the Arctic Region are positive. The most promising outlook is found in the mining industry, although there have also been setbacks recently (e.g. financial problems of Northland Resources and environmental problems of Talvivaara). Nevertheless, it has been estimated that the mining industry in Finland currently employs some 5000 persons and almost 6000 new employees will be needed during the next ten years (Kaleva 17.3.2013).

Key figures of the mining industry in Finland (source: Kaleva 17.3.2013)

- 12 metal mines and 30 mineral mines currently in operation
- a total turnover of almost 1.5 billion Euros in 2011
- direct employment 2700 plus 1900 employed by subcontractors
- prospecting activity close to 100 million Euros annually

Also tourism has experienced strong growth in the Northern Regions. Regional Council of Lapland (www.lapinliitto.fi) estimates that the number of registered overnights in Lapland (hotels, motels, cottages, etc.) has grown by almost 30 percent in one decade (from 1.86 million overnights in 2003 to 2.40 million in 2012. According to the estimates of the Tourism Research Institute (MTI), tourism created a total income of 550 million Euros in Lapland in 2011. Many of Lapland’s municipalities get almost half of their income from tourism (source: YLE kotimaa 15.4.2013).

According to the Lapland Chamber of Commerce, the planned investments in the Northern areas of Finland, Sweden, Norway and Russia (Murmansk and Arkhangelsk Regions) amount to an amazing 227 billion euros. More than 125 billion euros of these investments might be started by the end of the decade, according to the CEO Timo Rautajoki, based on the Lapland Chamber of Commerce survey in February 2012. The investments in the different business sectors are as follows:

Table: Investment plans for the decade in the High North according to Lapin Liitto

<table>
<thead>
<tr>
<th>Sector</th>
<th>Investment Plan (billion €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>industry</td>
<td>3.7</td>
</tr>
<tr>
<td>mining industry</td>
<td>18.5</td>
</tr>
<tr>
<td>oil and gas</td>
<td>35.3</td>
</tr>
<tr>
<td>nuclear energy</td>
<td>6.0</td>
</tr>
<tr>
<td>hydro energy</td>
<td>3.5</td>
</tr>
<tr>
<td>wind energy</td>
<td>22.9</td>
</tr>
<tr>
<td>electricity transfer grid network</td>
<td>3.6</td>
</tr>
<tr>
<td>trade</td>
<td>1.3</td>
</tr>
<tr>
<td>tourism</td>
<td>3.4</td>
</tr>
<tr>
<td>transport infrastructure</td>
<td>23.8</td>
</tr>
<tr>
<td>public investments</td>
<td>1.3</td>
</tr>
</tbody>
</table>


This list is quite optimistic – for instance the oil and gas project of Shtokman in Russia has been postponed, the nuclear power project in Pyhäjoki is uncertain, and the transport infrastructure project of Murmansk Transport Hub is struggling to find funding. However, many of the investments are in progress and new investment opportunities emerge (e.g. LNG terminals, bio-energy etc). In Sweden, the mining industry is investing strongly (including the relocation of
housing in Kiruna and Gällivare) and the energy investments in Norway (e.g. planned oil terminal in Veidnes and Kirkenes) have created a shortage of work force in the Northern Regions. In Kirkenes, for instance, the unemployment rate is 1.4 percent (HS 13.2.2013), which can be compared with the unemployment rate of 15 percent in Oulu (Kaleva 22.1.2013).

**Case: Mining in Sodankylä.**

Kevitsa is a copper and nickel mine in Sodankylä that started its operation in 2012. The mine is owned by the Canadian consortium First Quantum Minerals Ltd. The decision on opening the mine was taken in 2009 and construction work at the site started in June 2010. The estimated lifetime of the mine is 30 years or more. Pahtavaara is a gold mine, also in Sodankylä, and is owned by the Swedish Lappland Goldminers. The mine started operation in 2008.

The employment impacts of the two mines in Sodankylä are significant. The number of personnel at the two mines is close to 400 (Kevitsa 270, Pahtavaara 120). These figures can be compared with other big employers in the region: Sodankylä municipality 759, Finnish Defence Forces 388, and Metsähallitus 130. According to the Ruralia Institute of the Helsinki University, every person employed at the mines creates an additional 2.3 work places in the Sodankylä region.

The opening of the mines is also seen in construction activity. According to Helsingin Sanomat (26.3.2013), construction work in Lapland is currently concentrated to Sodankylä. There were 40 detached homes built in 2012 and in 2013 the figure is estimated to be 30-35. There are close to 100 people currently queuing for a rented apartment, while some years ago there were 200 empty apartments for rent. It can be mentioned that the mining company offers a financial support for home builders (12 000 euros of taxable support for a detached house); also other forms of help is given for example to find rented apartments.

**Sources:**
- Tuhansille tekijöille töitä, Kaleva 17.3.2013
- Pohjois-Norjasta loppuvat työntekijät, HS 13.2.2013
- Oulun työttömyys nousi 15 prosenttiin, Kaleva 22.1.2013
- Matkailun rahavirtoja selvitetty Lapissa. YLE kotimaa 15.4.2013.
- Arctic oil terminal signs land lease deal, Barentsobserver 16.1.2013
- Planning an oil terminal at Veidnes, Statoil press release 12.2.2013

### 3.2. Mining Industry and Infrastructure Needs

The mining industry is growing in the Arctic areas and strong expectations prevail for this trend to continue. In Finland, the Ministry of Trade and Industry published a mineral strategy in 2010 where the volume of mineral excavation in Finland is expected to grow to 70 million tonnes by 2020 from existing and new mining locations as shown below.

Mining industry growth involves considerable challenges for transport and infrastructure. An interim report on transport needs of the mining industry in the North (Kaivostoiminnan liikenteelliset tarpeet pohjoisessa –esiselvitys 2012) estimates that the production of mineral ore will multiply by the end of the decade in Northern Finland. The report gives base for planning how
the transport network should be developed in both short and long term and how the state and companies are required to participate in financing the routes.

At the beginning of 2012, Finland had approximately 50 active mines or quarries, 11 of which were mineral ore mines. The mines are situated mainly in Northern and Eastern Finland. Most of the mineral ore produced by the mines are processed into metals in Finland. The metal mines with the biggest transport volumes are the Elijärvi mine in Kemi, Pyhäsalmi mine in Pyhäjärvi and Talvivaara mine in Sotkamo. In addition, the transit transport of mining products from the Kostamus mine in Russia results in a significant amount of rail transport from Vartius to the Port of Kokkola. The products of mines producing industrial minerals are mostly processed in Finland. The most significant industrial mineral mines are the Siilinjärvi mine, Horsmanaho mine in Polvijärvi, Lahnaslampi mine in Sotkamo, Kinahmi mine in Nilsiä and Joutsenlampi mine in Lapinlahti.

Several new mines are planned to be established in Northern and Eastern Finland. These mines could multiply the current mining transport volumes. Two mines have been opened during 2012: the Kevitsa mine in Sodankylä and Kylylahti mine in Polvijärvi. Construction work is underway in the Elijärvi mine in order to double the production volume. In Talvivaara, production is planned to be expanded to Sotkamo. Other mines in planning significant with regard to transport volumes are the Hannukainen mine in Kolari, Sokli mine in Savukoski, Mustavaara mine in Taivalkoski/Posio, Äkäsjoensuu mine in Kolari, Suhanko mine in Ranua and Sakatti mine in Sodankylä.

If all the new mines in planning and the extension plans for existing mines are realised, the total transport volume of mining will increase by over seven million tonnes per year during this decade. In the northern neighbouring countries of Finland, several new mines are in planning. These mines would have a significant impact on the transport volumes during the next ten years. Measured in tonnes, the transport volumes of the mining industry are estimated to grow the most in Norrbotten, Sweden, and on the Kola Peninsula in Russia. In percentages, the growth is estimated to be greatest in Finnish Lapland and Västerbotten in Sweden.

Many infrastructure projects have been suggested to support the growth of the mining industry in Finland. Especially new railroad routes to the Arctic Sea have been investigated (Narvik, Skibotn, Kirkenes, Murmansk). However, a recent study commissioned by the Finnish Transport Agency (Kaivostoiminnan liikenteelliset tarpeet pohjoisessa, Ramboll 2013) concluded that the volumes will not be sufficient to justify new railroad investments and focus should be on developing existing connections through the ports in the Bothnian Arc area.

In addition to the mining industry, the most significant transport volumes currently result from the transport of metal and forest industries. Because of the current economic situation, the output of metal industry has been restricted. However, the demand is expected to increase along with the growth of China and India.

In future, the structural change in the forest industry is also likely to reduce the transport needs, but significant
changes are not expected in Northern Finland. Russia's entry into WTO is likely to reduce customs duties for timber exports and increase timber import from Russia. The use of timber as an energy source is predicted to double in Finland by 2020. The large investments in oil and gas in the Barents Region increase the need for international transport in the north. The demand for products of chemical industry is expected to grow especially along with the development of mining industry. The increase of fish transport from Northern Norway will increase the volume of road transport through Finland to Russia and Eastern Europe.

Tourism in the Barents Region is also expected to grow substantially. The greatest potential for tourism is created by foreign travellers, which will increase the demand for air travel in particular.

Sources:
- Kaivostoiminnan liikenteelliset tarpeet pohjoisessa
  http://www.kaivosliikenne.info/
  http://www.kaivosliikenne.info/transport_needs_web.pdf

3.3. National Infrastructure Plans

Norwegian Transport Plan 2014-2023

Norway’s government laid down its National Transport Plan for 2014-2023 on 12 April 2013. The plan is subjected to parliament hearing on 18 June 2013. In short, the plan represents a massive investment in simpler, quicker and safer transport systems nationwide. The following figures are mentioned in the government’s transport plan

Table: Planned spending in Norway’s national transport plan 2014-2023

<table>
<thead>
<tr>
<th></th>
<th>roads</th>
<th>railways</th>
<th>public transport, urban transport solutions</th>
<th>coastal transport schemes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>development of national road network</td>
<td>investments</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>operation and maintenance</td>
<td>operation and maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOK 292 billion (37.1 “-”-)</td>
<td>NOK 92 billion (11.7 “-”-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOK 105 billion (13.4 “-”-)</td>
<td>NOK 76 billion (9.7 “-”-)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

On a regional level, the National Transport Plan emphasizes the development of transport corridors, also including the development of cross-border corrections (e.g. railway link to Sweden from Narvik). The following estimates are given for government spending in the NTP for the Northern Regions for 2014-2023

Table: NTP spending in Northern Regions 2014-23 (NOK million)

<table>
<thead>
<tr>
<th></th>
<th>Region 7 (Trondheim-Bodo)</th>
<th>Region 8 (North of Bodo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>7,960 (1014 M€)</td>
<td>12,270 (1563 M€)</td>
</tr>
<tr>
<td>Rail</td>
<td>4,140 (527 M€)</td>
<td>1,615 (206 M€)</td>
</tr>
<tr>
<td>Coastal transport</td>
<td>574 (73 M€)</td>
<td>926 (118 M€)</td>
</tr>
</tbody>
</table>
The National Transport Plan specifically mentions BEATA (Barents Euro-Arctic Transport Area) and NDPTL (Northern Dimension Partnership for Transport and Logistics) and emphasizes the importance of cross-border coordination (Barents Transport Plan).

**Sweden’s Infrastructure Development Plan 2014-2025**

In Sweden, the Government has taken an active role to create jobs and boost long-term economic growth through infrastructure spending in the coming decade. The Government’s infrastructure development plan for 2014-2025 ("Investeringar för ett starkt och hållbart transportsystem", accepted by Swedish Parliament on 18.12.2012) proposes a total spend of 522 billion SEK (61 billion €) on state-owned transport infrastructure during the period 2014-2025. An additional 53 billion SEK (6 billion €) is obtained on infrastructure development from road user charges and road tolls. The following breakdown is mentioned in the government’s proposition:

Table: Investments in Swedish infrastructure development plan for 2014-2025

<table>
<thead>
<tr>
<th>Category</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railways</td>
<td>86 billion SEK (10.0 billion €)</td>
</tr>
<tr>
<td>Roads</td>
<td>155 billion SEK (18.1 billion €)</td>
</tr>
<tr>
<td>Development of transport systems</td>
<td>281 billion SEK (32.7 billion €)</td>
</tr>
</tbody>
</table>

With regard to regional infrastructure development needs, the plan specifically mentions the mining industry in the Northern parts of the country, particularly the railway line from Sweden to the port of Narvik ("Malmbanan") as well as the road connection between Pajala and Svappavaara.

The government’s plan will be followed up by an implementation plan in 2014 where individual projects will be presented for 2014-2025.

**Finland’s Transport Policy Report 2012-2020**

The Finnish Government submitted its transport policy report (Liikennepoliittinen selonteko) to Parliament on 12 April 2012, setting out policy lines for 2012-2022. Compared to the infrastructure plans of Norway and Sweden, the Finnish Transport Policy report is less specific about long-term infrastructure investments. The report outlines the general principles of transport planning and specifies an infrastructure development plan for the government period 2012-2015. In addition, a development plan is outlined for 2012-2020, but it is not clear to what extent the plan will bind the next governments’ infrastructure decisions.

Table: Government’s infrastructure development plan in Finland 2012-2022

| Infrastructure Development plan for 2012-2015 (total approx. 1,335 M€) |
|                                                                             |
| - three projects in Northern Finland, totalling 160 M€ (Ylivieska-Iisalmi-Kontiomäki rail improvement; Oulu-Kajaani road improvement; E4 improvement at Rovaniemi) |

Priority projects during 2016-2022 (total approx. 1,300 M€)

- all three priority projects in Southern Finland

Other projects during 2016-2022 (total approx 2,200 M€), including:

- approx. 900 M€ for 10 projects, of which two are in Northern Finland (Kemi-Oulu road; Kokkola seaway)
As a general observation, it can be noted that Finnish infrastructure policy is becoming more demand-oriented, i.e. investments are only made after a real need is observed – the mining industry infrastructure study serves as a good example (see above). In addition, more of infrastructure spending will be directed from new investments to maintenance and operations, and focus will be shifted to main routes in the infrastructure network. Lower-level infrastructure (local roads) will get lower priority – for instance, some of the bitumen roads in sparsely populated rural areas are already being converted to gravel roads.

**Russian Transport Strategy for 2030**

Russian Government’s Transport Strategy for 2030 can be found in the Internet in different versions (2008 and 2012). The most recent version from 2012 is a large document (325 pages) that lays down six main goals for the Russian Transport System:

- development of an efficient transport infrastructure in Russia;
- securing of quality and availability of freight transport/logistics services based on economic needs
- securing of quality and availability of general transport services based on social needs;
- integration of transport to the world and realization of the transit transport potential;
- improvement of the safety of the transport system;
- reduction of the environmental impacts of the transport system.

The strategy paper emphasizes the development of a freight terminal network and the creation of a competitive intermodal transport/logistics service market. The paper stresses the development of intelligent transport systems based on advanced information and communication technology and standards. There is also a mention about securing adequate transport services in the Arctic Region, Siberia and Far East, and other peripheral regions, also including the Arctic Sea Route.

Some of the numerical objectives laid down in the Russian Transport Strategy for Goal 2 include (change from 2010 to 2030):

- average speed of commercial road freight transport: 550 => 1100 km/day
- average speed of commercial rail freight transport: 240 => 320 km/day
- average speed of container transport on railways: 295 => 800 km/day
- average speed of container transport on Trans-Siberian Route: 1320 => 1700 km/day
- transport volume on Arctic Sea Route: 4.1 => 70 million tonnes
- volume of transport in extreme conditions (Far North): 91.6 => 188.2 million tonnes

The following measures related to the development of the Arctic Sea Route are mentioned in the Russian Transport Strategy:

- building of 3 nuclear-powered icebreakers (axel power 60 MW) by 2020
- building of 3 diesel-electric icebreakers (axel power 25 MW) by 2020
- building of 2 icebreakers with two steerable propellers (2*8 MW) by 2020
- building of LNG terminal in Teriberka region by 2020
- renovation of the port of Murmansk by 2020
- various infrastructure development measures by 2030, e.g. new coal port in Archangelsk (70 million tonnes) and new coal terminal in Murmansk/Lavna area (10 million tonnes)
Sources:


  [http://www.regeringen.se/sb/d/16531/a/201459](http://www.regeringen.se/sb/d/16531/a/201459)

- Kilpailukykyä ja hyvinvointia vastuullisella liikenteellä. Liikennepoliittinen selonteko 2012.  

4. DOING BUSINESS IN THE BARENTS REGION: FINDINGS FROM THE BARENTS LOGISTICS 2 PROJECT

Barents Logistics 2 project is competence development project funded by The Kolarctic ENPI CBC Programme of the European Union. Project partners from three countries (Finland, Sweden and Russia) are involved in various activities of the project. The main objective of the project is to develop logistics competencies and deepen educational cooperation between the universities and educational institutions together with public and business organizations in the Barents Region. The project has been initiated as a response to the growing needs of business and public organizations to advance logistics knowledge, competencies and skills.

Sources (available at www.barents-transport.fi):
- Atkova, I. (2013), "Analysis of the trade development strategy: the Murmansk region case”
- Finpro in Murmansk: Business opportunities in the Murmansk Region. Andrey Kletrov’s presentation in Barents Logistics 2 project seminar, Murmansk 10.4.2013

4.1. Logistics and Business in the Barents region

In the whole Barents region live around 5,5 million people of which 3,8 million in Russia. Population has decreased slowly and this trend is expected to continue. However, there are new businesses arising in the Barents region such as oil and gas production in addition to mining industry. New investments will mostly concern Russia and Norway but they will also have an impact on Finland’s and Sweden’s economy. (Heinonen, 2011)

Internationalization is important for the Barents region as the home markets are small in every country and growth potentials are limited (Heinonen, 2011). Cooperation between Barents regions countries can help companies to stay robust. In the future the largest cooperation possibilities will rise from big investments.

The restriction for internationalization in the north is the smallness of the markets. A subsidiary in Russia needs accurate calculations, it has to be profitable and risks have to be estimated well. The region is also sparsely populated and education level is partly low and long distances and cold conditions complicate working, too. E.g. mining companies have to take local branches into account as tourism in the north is highly dependent on pure nature. (Alila&Tuomela-Pyykkönen, 2012).

However, Barents region has also advantages - it is a safe region. Also, cooperation in the region doesn’t have to be just business; Murmansk and Northern Norway, for instance, have developed student exchange programmes.
**Case: Russia threatens with trade bans in the food industry**

Below are two examples of trade barriers in business with Russia. These incidents have been reported in public media.

In April 2013, Russia’s Federal Veterinary and Phytosanitary Monitoring Service (Rosselkhoznadzor) said they had discovered salmonella, roots of listeriosis, and live larva of threadworms in seafood imported from Norway. Rosselkhoznadzor threatened to stop fresh Norwegian fish delivery until Norway starts following the Russian legislation rules. This was not the first claim about the quality of Norwegian food. In 2012, the Russian sanitary service stopped fish products deliveries from 15 Norwegian companies, though it did not prevent Russia from becoming the biggest importer of the Norwegian seafood. In 2011 Russia imported about 300,000 tons of seafood or 10 percent of total Norwegian export while in 2012 Russia bought 104,000 tons of Norwegian salmon.

Similarly, in May 2013, Russian authorities said they were considering stopping potato import from EU. One of the exporters of Finnish potato to Russia, HZPC Sadokas estimates that the value of potato exports to Russia may well go up to €10 million per year. Quality problems are said to be the reason for the planned import ban to Russia, but the managing director of HZPC Sadokas, Jaakko Rahko, believes the real reason is Russia’s plan to protect its domestic production.

**Sources:**

### 4.2. Finland and Russia

Trade between Finland and Russia plays an important role in the economies of both countries. However, lack or insufficiency of relevant information concerning trading procedures in Russia, and in the Murmansk region in particular, frequently hinders the deployment of the existing business opportunities and makes the process of entering the regional market rather complicated demotivating perspective Finnish investors. Russia’s accession to WTO in December 2011 implies that trade relations between the two countries will be largely regulated by the WTO legal framework. Russia will be gradually integrated into the obligatory system and trade relations with Russia will become rule-oriented making Russia a more reliable trade partner. (Atkova 2013)

According to Andreeva and Heinonen the biggest barriers in logistics between northern Finland and North-Western Russia are bureaucracy in customs stations, poor conditions of infrastructure and lack of language skills and knowledge of the other culture. To increase trade between Finland and Russia in the north would require improvements in road networks and new, compatible information technology. (Andreeva & Heinonen, 2012).

In the beginning of export business language skills and knowledge of the target market are extremely important: it helps communication and managing customer relationships. Investments are also worth of making to data systems and trainings for their use. Electronic systems can reduce
bureaucracy, increase transparency and expedite transportation in logistics. (Andreeva & Heinonen, 2012).

Most of the large Finnish firms in Russia work in the fields on energy, metal, technology, construction, food, trade, mining industry and service. The most important thing for companies when deciding the location in Russia is market potential – it is independent from the size, field and internationalization modes of the company. Russians value quality in Finnish products and services and it should be used as a competence. In Barents region construction, transport and harbour projects are good business opportunities for Finns. (Heinonen, 2011)

The following examples are mentioned by Finpro as tangible examples for Finnish companies to do business in the Murmansk Region (Kletrov, 2013):

Table: Opportunities for doing business in the Murmansk Region

<table>
<thead>
<tr>
<th>Healthcare tourism</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facts:</strong></td>
<td><strong>How to benefit:</strong></td>
</tr>
<tr>
<td>• stable demand for quality medical treatment;</td>
<td>• active offering of medical and rehabilitation centers;</td>
</tr>
<tr>
<td>• middle and upper middle class prefer foreign clinics;</td>
<td>• active offering of combined tours (leisure and treatment);</td>
</tr>
<tr>
<td>• medical tourism is the next stage which will grow.</td>
<td>• cooperation with Murmansk private clinics.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facts:</strong></td>
<td><strong>How to benefit:</strong></td>
</tr>
<tr>
<td>• current education system is not trusted (low quality and expensive)</td>
<td>• active offering of education possibilities;</td>
</tr>
<tr>
<td>• “The blue dream”, goal to get children educated abroad</td>
<td>• offering of special trainings (for example, energy saving);</td>
</tr>
<tr>
<td>• foreign certificates and diplomas are in demand in business.</td>
<td>• cooperation with Murmansk educational centers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy efficiency</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facts:</strong></td>
<td><strong>How to benefit:</strong></td>
</tr>
<tr>
<td>• Russian companies must have developed energy-efficiency system by 2020;</td>
<td>• active offering of ready solutions in energy-efficiency;</td>
</tr>
<tr>
<td>• energy tariffs increase up to 5 times in 10 years from now;</td>
<td>• active offering of energy-saving construction solutions and materials;</td>
</tr>
<tr>
<td>• Russian Arctic area will be the most developed in energy saving.</td>
<td>• active offering of project management in energy-saving sector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Challenges in mining sector</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facts:</strong></td>
<td><strong>How to benefit:</strong></td>
</tr>
<tr>
<td>• alternative energy, energy saving solutions are at low utilization;</td>
<td>• active offering of energy solutions;</td>
</tr>
<tr>
<td>• professional level is low;</td>
<td>• active offering of trainings in mining technologies;</td>
</tr>
<tr>
<td>• mining process wastes are getting larger and almost not handled;</td>
<td>• project management in different sectors.</td>
</tr>
<tr>
<td>• technology transfer centers are practically not present.</td>
<td></td>
</tr>
</tbody>
</table>

Source: Finpro, Andrey Kletrov 10.4.2013
5. STATISTICAL OVERVIEW: NORTHERN FINLAND IN FOCUS

This chapter presents some of the key statistics especially in the Northern Regions of Finland. These statistics have been collected from various sources, such as Statistics Finland, Finnish Transport Agency and Ministry of Transport and Communications.

5.1. Economy and population

It can be seen that the three northern regions in Finland (Kainuu, North Ostrobothnia and Lapland) account for nearly one half of the land area of Finland whereas the region’s share of population and economic activity (measured by gross domestic product, GDP) is significantly lower.

Figure: Land area, population and GDP in Finland

When looking at the percentage shares of production value, the metal industry is strong in Northern Ostrobothnia and Lapland, whereas in Kainuu it is the mining and extractive industries that have taken the strongest position. It should be noted, however, that the three northern regions only account for approx. 12.2 % of total production value and 12.5 % of total value added in Finland. Moreover, the three regions only account for 10.4% of the total salaries and wages paid in Finnish industry.
5.2. Foreign trade

In terms of foreign trade value, the three northern regions of Finland (Kainuu, Northern Ostrobothnia and Lapland) accounted for approx. 9.2 % of Finland’s total exports and 6.5 % of total imports in the year 2011. Between 2010 and 2011, the exports from Lapland have grown by approx. 25 % while the exports from Northern Ostrobothnia have grown by approx. 21 %.

Figure: Exports and Imports in Northern Finland, 2011

5.3. Transport & Logistics

The well-known fact is that distances in the northern regions are long and population is sparse. This can be seen from the transport statistics of Finland: 15.5 % of total transport performance by road
(kilometers travelled) takes place in the three northern regions (Kainuu, Northern Ostrobothnia and Lapland). By contrast, 28% of the total highway network in Finland is situated in the three northern regions. It is the Oulu-Kemi road that stands out as a heavily trafficked road in Northern Finland.

**Table: Road transport in Northern Finland, 2011**

<table>
<thead>
<tr>
<th>Road transport (2011)</th>
<th>Transport performance (mill km/year)</th>
<th>Highway network (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kainuu &amp; North Ostrobothnia</td>
<td>3,909 (10.6%)</td>
<td>12,790 (16.4%)</td>
</tr>
<tr>
<td>Lapland</td>
<td>1,806 (4.9%)</td>
<td>9,085 (11.6%)</td>
</tr>
<tr>
<td>Finland total</td>
<td>36,740 (100%)</td>
<td>78,139 (100%)</td>
</tr>
</tbody>
</table>

Source: Liikennevirasto tietilasto

In *road freight transport*, the total transport volume in Finland amounted to approximately 313 million tons (23,770 million ton-kilometers) in 2011. The internal road transport in the three northern regions accounts for 12% of the total volume. For Kainuu and Northern Ostrobothnia, the outbound transport volume exceeds the inbound volume, whereas in Lapland the inbound transport volume is larger than the outbound volume.

**Table: Road freight statistics in Finland, 2011**

<table>
<thead>
<tr>
<th>Road freight transport volume (2011)</th>
<th>Internal (mill tons)</th>
<th>Inbound (mill tons)</th>
<th>Outbound (mill tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kainuu and North Ostrobothnia</td>
<td>24,787</td>
<td>3,384</td>
<td>4,844</td>
</tr>
<tr>
<td>Lapland</td>
<td>12,831</td>
<td>1,883</td>
<td>4,67</td>
</tr>
<tr>
<td>Finland total</td>
<td>312,921</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Liikennevirasto tietilasto

In *railway transport*, the total volume of freight transport in 2011 amounted to 34.8 million tons, or 9.4 billion ton-kilometers. The rail freight flows in Northern Finland are generally quite thin; however, there is a bulky freight flow of transit cargo from Vartius via Oulu to the Port of Kokkola, which is based on iron pellet transport from the Kostamuksha plant in Russia.

The volumes of *sea transport* in Northern Finland can be seen in port statistics below. Pietarsaari, Kokkola and Kalajoki actually belong to the Region of Central Ostrobothnia, but are included in the figure for comparison purposes. In terms of volume, Kokkola is the biggest of these ports, due to the transit traffic of iron pellets from Russia. Raade has a large import volume due to the iron ore transport to the steel mill. Overall, the ports in the three northern regions (Raade to Tornio) account for 9.3% of total export and 15.7% of total import of the sea ports in Finland (percentages indicated in the figure). The total container transport (measured in TEU, twenty-foot equivalent unit) in Northern Finnish ports accounts for 2.9% of the total container transport in Finland.
Logistics performance is evaluated regularly in the report “Finland State of Logistics”, produced regularly by the Turku School of Economics for the Ministry of Transport and Communications. An
international survey, “Logistics Performance Index” (LPI) by the World Bank, shows that Finland ranks high compared to its neighboring countries.

Figure: Logistics performance in different regions of Finland

<table>
<thead>
<tr>
<th>Region</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Finland</td>
<td>3.8</td>
</tr>
<tr>
<td>West Finland</td>
<td>3.6</td>
</tr>
<tr>
<td>East Finland</td>
<td>3.1</td>
</tr>
<tr>
<td>North Finland</td>
<td>3.3</td>
</tr>
</tbody>
</table>

World Logistics Performance Index (2012)

<table>
<thead>
<tr>
<th>Country (rank)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Finland</td>
<td>4.05</td>
</tr>
<tr>
<td>13. Sweden</td>
<td>3.85</td>
</tr>
<tr>
<td>22. Norway</td>
<td>3.68</td>
</tr>
<tr>
<td>95. Russia</td>
<td>2.58</td>
</tr>
</tbody>
</table>

Scale: 1 = very poor … 5 = very good


5.4. Border-crossing transport

Road freight transport between Finland to Russia grew strongly up till the year 2008, when the financial crisis hit the industry. Since 2009 the outbound freight traffic has started to grow again, while the inbound freight traffic from Russia has remained quite stable during the last years.

Figure: Development of freight transport between Finland and Russia 2004-2011.

Source: Finnish Customs

Compared to the total number of border-crossings in between Finland and Russia, the numbers in Northern Finland are modest. In 2012, less than 4000 border crossings of trucks were registered at the northern border stations of Kelloselkä (Salla) and Rajajooseppi. The total number of passenger car crossings exceeded 150,000 in 2012, but it should be noted that a considerable part of the traffic consists of tank tourism of Finnish drivers to Russian petrol stations nearby the border.
Comparing the figures of border crossings to/from Russia between Finland and Norway, it can be seen that the total number of Salla and Rajajooseppi exceeds the number of border crossings at Storskog in Norway. This is interesting, as there is a strong impression of active interaction between the Northern regions of Norway and Russia, and also a visa-free travel between the northern regions of the two countries. In reality, the Northern connections between Finland and Russia are more active than those between Norway and Russia.

Figure: Border crossigns at Storskog, Salla and Rajajooseppi 2007-2011

Source: Barents Borders: Delimitation and Internationalization. The Norwegian Barents Secretariat.
CASE OBSERVATORY

Three cases are presented in this section to illustrate the development and business opportunities related to arctic transport and logistics. The first case examines *arctic road and railroad infrastructure maintenance coping with the arctic conditions*. For many regions in Northern Finland, arctic conditions, decreasing population and transport volumes will entail severe challenges related to accessibility and service level in logistics. Also, in many cases problems with repair or maintenance can be critical because alternative routes and connections in sparsely populated regions are lacking. The second case is about *smart logistics in arctic port areas*. Arctic conditions are making sea transports very demanding. In this case we use Smartport concept in a general sense to describe the opportunities of port organizations to serve as intelligent nodes in transport corridors especially in the Arctic Regions. The third case gives a view at producing *health care related services in arctic conditions*. Finnish health care system is facing big challenges in growing costs and new service needs. Arctic conditions as long distances, low density and demanding climate are in many ways intensifying the challenges. One initiative to face these challenges is centralization that requires more attention into logistical systems that can bring benefits in saving costs and enhancing level of service. We take a look at one example: NordLab that is founded to produce laboratory services for five hospital districts in northern Finland.

Table: Interviewed organizations

<table>
<thead>
<tr>
<th>Date</th>
<th>Interviewed organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.3.</td>
<td>Ramboll Finland Oy</td>
</tr>
<tr>
<td>3.4.</td>
<td>Vähälä Yhtiöt</td>
</tr>
<tr>
<td>4.4.</td>
<td>City of Oulu (yhdyskunta- ja ympäristöpalvelut)</td>
</tr>
<tr>
<td>4.4.</td>
<td>Port of Oulu</td>
</tr>
<tr>
<td>5.4.</td>
<td>Merilinja Oy</td>
</tr>
<tr>
<td>12.4.</td>
<td>Pöyry CM</td>
</tr>
<tr>
<td>12.4. and 23.4.</td>
<td>Centre for Economic Development, Transport and the Environment (Ely Centre)</td>
</tr>
<tr>
<td>15.4.</td>
<td>YIT</td>
</tr>
<tr>
<td>17.4.</td>
<td>NordLab</td>
</tr>
<tr>
<td>18.4.</td>
<td>VTT</td>
</tr>
</tbody>
</table>

The case descriptions are based on interviews during the Smarctic project in spring 2013 (see table below). Due to budget limitations, all interviews were made in the Oulu region and the number of interviews was fairly limited. The choice of organizations and experts for the interviews was based on the judgment of the researchers and on tips obtained during the interviews from the experts. The interviews were made in a free, conversational manner. Before the interviews, a rudimentary list of discussion topics was sent to the interviewees for information. The discussions generally lasted 1.5 to 2 hours per interview. Additional information was collected from the Internet and other documentary sources from the case organizations.
6.1. MANAGEMENT OF ARCTIC TRANSPORT AND INFRASTRUCTURE

As indicated in the literature review and statistical appendix, the transport volumes in Northern Finland are quite small. There are a few main road and rail connections and the sea route that are vital for community and industry in Northern Finland (especially those belonging to the core network such as the Bothnian Corridor). In many peripheral regions the population and transport volumes are decreasing, and the resources for maintaining lower level roads are limited. For many regions in Northern Finland, this will entail severe challenges related to accessibility and service level in logistics. Also, in many cases problems with repair or maintenance can be critical because alternative routes and connections in sparsely populated regions are lacking.

Organization of infrastructure repair and maintenance

In the Northern District, there are currently 19 road maintenance contracts (Northern Ostrobothnia 11, Lapland 8). These are operated by four service providers: Destia (10), YIT (3), NCC (3) and Koillistie Määtä Oy (3). A typical duration of the maintenance contract is five years. The work is based on detailed technical instructions and standards, ranging from issues like winter maintenance standards to the management of roadside vegetation and prevention of invasive plants. The regional centers for economic development, transport and the environment (ELY) are responsible for organizing the tendering rounds for road maintenance contracts. It should be noted that Koillistie Määtä has been filed for bankruptcy in August 2008 which leaves the number of maintenance service partners to three.

In railway maintenance, the transport agency has outsourced the management of maintenance in the four districts (South, West, East, North) to private companies – currently, RR Management is in charge of the Southern District while Pöyry CM is responsible for the management of maintenance in the remaining three districts. The duties of the rail management companies (“rataisännöitsijät”) include: supervision of maintenance and construction operations; management-related licenses; land-use questions, and preparation of tendering rounds for rail maintenance. As in road maintenance, the work is governed by a set of instructions and standards published by the Finnish Transport Agency.

According to the interviewees, the contracting out of infrastructure maintenance has improved the efficiency and probably also the quality of rail and road maintenance. However, diminishing funding is seen as a problem and it is argued that the level of infrastructure is deteriorating for this reason. It is contended that rivalry in road maintenance is tight between the service providers. By contrast, in railway maintenance the number of service providers is rather limited because of the need for special equipment and competence. It might be asked how much pressure the private management companies can put on two state-owned service providers that dominate the market.

It seems that the tendency is for the infrastructure owners (Transport Agency/regional centers for economic development, transport and environment) to acquire total solutions that include infrastructure maintenance and also major repair operations. As an example, a recent contract awarded to NCC in the Koillismaa district includes the repair and maintenance of 1400 km of roads up to the year 2022. According to NCC, the contract includes asphalt renewal (100 km) and road widening (40 km) during 2013. Naturally, this means that only the big service providers can act as contract partners with the infrastructure owners. In turn, the big service providers use local service providers who take care of daily maintenance and smaller repair operations.
At the same time, the service providers are developing their capabilities to take over demanding maintenance and repair responsibilities. For example, YIT has established its own infrastructure service center (PANU) that coordinates maintenance and repair operations and disseminates up-to-date information to the local contractors. The service center also acts as situation awareness unit for its partners helping to monitor and forecast traffic and weather conditions and maneuver problem situations.

Destia, one of the biggest road construction and maintenance service providers in Finland, and Finnish Meteorological Institute have established a traffic weather center (Kelikeskus) that serves private (e.g. maintenance companies) and public organizations. Based on the weather and road monitoring data the center offers forecasts for timing of road maintenance operations such as de-icing and snow clearance. The service is available 24h/day all year round.

Finnish Transport Agency has its traffic management centers in four districts (Helsinki, Tampere, Turku, Oulu) where operators are on duty 24/7 (except in Oulu limited working hours) attending to the safety and fluency of traffic in all conditions. The traffic management centers act in close cooperation with regional authorities (city officials, the police, health care, rescue organizations). Among their duties, the transport management centers give announcements about incidents such as accidents, congestion, roadwork operations and special transports. According to a recent report (Transport Agency 49/2012), the duties and organization of traffic management centers are currently under review as an integrated traffic control operating system (T-LOIK) is being developed.

sources:
- http://www.yit.fi/yit_fi/infrapalvelut/Kunnossapito/palvelukeskus-panu
- http://ilmatieteenlaitos.fi/teiden-kunnossapito
- http://www.kelikeskus.fi/

Coping with the Arctic Conditions

Transport professionals both on infrastructure provider’s side and on logistics operators’ side considered winter conditions in Northern regions to be fairly manageable; transport professionals are used to cold weather, snow and darkness. Improved weather services give good opportunities for timing and planning of maintenance operations such as snow clearing and anti-icing measures. In fact, the arctic conditions bring some advantages for infrastructure service providers: in the summer time, when repair operations are carried out, work can easily be done in the night time because there is enough light all day round.

One specific problem in the hilly terrains of the high north is sheet ice which builds up on roads from the ditches. These are difficult to manage and often require costly excavator operations. In some places, electric warming cables have been installed to keep the ditches open. In the open landscapes of Lapland also snow drifting causes problems that may require 30-40% more snow-clearing operations compared to other regions. However, experienced maintenance companies can to some extent predict these problems and know how to calculate their costs impacts in contract negotiations.

Although exceptional weather conditions can nowadays be fairly accurately forecasted, it is not always possible to deal with them immediately because of capacity limitations or other reasons.
Also drivers who might not have any problems in stable winter conditions can be taken by surprise by exceptionally bad conditions. As an example, a snow storm on 6 March, 2013 led to a massive car crash on E4 in Oulu, causing one death and leaving 30 cars damaged. In this case, the maintenance can hardly be blamed: it was found afterwards from the service provider’s fleet tracking system that snow-clearing vehicles had passed the accident spot only 3-4 minutes before the accident. Other consequences of the accident could later be witnessed also from the traffic monitoring system of the City of Oulu. The camera recordings showed how bypassing traffic started increasing on the road network of the city, causing congestions even long after the traffic on E4 had been reopened after the accident. Even with improved capabilities for dealing with extreme situations, the human factor is still a major source of unpredictability in traffic. 

Climate change is seen as a potential problem that can cause unpredictability and increase the occurrence of extreme conditions also in northern regions. Snow storms, floods, heavy rainfalls and winds are problems that may cause difficulties for transport and logistics in the future. Although warning systems for emergency situations have been developed (e.g. national radio warnings), they should be more targeted regionally and offered to users through various channels. 

Transport information, telematics and situation awareness solutions

The role of information and communication technology (ICT) is growing in all fields of economic and social life. Also in transportation and logistics, the importance of ICT is well understood and clearly documented in various programs, strategies and initiatives. Some of the strategies and initiatives foster ambitious goals and visions; in a target state report of the Finnish Transport Agency, it is suggested that: “In 2017 traffic management has entered a new era. The vehicle and pedestrian traffic, the means of transport and the intelligent infrastructure produce accurate information about traffic and traffic conditions for extensive use. Traffic safety has significantly improved and accidents are prevented by means of anticipation and the application of systems intelligence. Real time traffic flow information and forecasts of the traffic flow and conditions in the next few hours are transmitted to drivers’ and passengers’ terminal devices. Travel and transport are as safe and smooth as possible in all weather conditions at all hours. The time of arrival at the destination is always known. Satellite positioning and advanced information systems for traffic management offer new opportunities for customer services and for reforming and further developing traffic charges and taxes. Congestion and the need for new investments in transport infrastructure have been reduced. The Finnish Transport Agency (FTA) and its partners facilitate this change by reforming the traffic management operating models and the information systems. The FTA ensures that the information is reliable, easy to use and available at all times.”

Although this vision may seem high-flying, it can be realistic, at least for professional users such as traffic management and maintenance organizations. High-quality information on traffic and weather conditions is available – although in many cases it has to be compiled from diverse sources – and professional users have the capabilities to utilize and disseminate it in appropriate form to those who need it. The maintenance service providers have their own traffic management centers with adequate technologies and resources. In addition, the Transport Agency’s aim to develop its traffic control and operating system (T-LOIK) should further enhance the simultaneous use of different operating systems, maintain the situational awareness and facilitate communication between authorities through a single interface.

There is, however, a lot of work to be done if this vision should be implemented to include also ordinary users (drivers, bikers, pedestrians). Even many logistics companies do not utilize situation awareness and telematics applications very much today. Discussions with a large logistics company
in Northern Finland revealed that information on exceptional conditions is mostly transferred orally from driver-to-driver on the road or via the company’s transport planners at the terminals. The regional weather information and forecast are shown at the terminals from Foreca’s website on a TV screen that also shows company-internal messages for the drivers. Foreca’s information is clear and concise, but lacks those elements that would make a road transport professional any better informed than an average driver in his/her car. Relevant information (exceptional conditions, traffic incidents, etc.) should be appropriately packaged, tailored and delivered to reach target groups especially among the heavy road users.

From an arctic transport and logistics perspective, suitable dissemination channels and sufficient targeting should be developed to deliver the information to the less-frequent users. The information should be easily accessible (within one-click reach) via the web or mobile devices. Today, various map and navigation applications are a commonplace for most web users (Google Maps is in fact the most-used smartphone app in the world, according to usage data collected by GlobalWebIndex. Among the world’s 969.49 million smartphone users, Google Maps was accessed by 54 % of smartphone users during the second quarter of 2013). Applications such as Google Maps are also getting some situation awareness information (e.g. traffic information and weather conditions), but especially in peripheral regions this information is still scanty.

Perhaps with the exception of marine ice information (such as the Baltic-Ice or Polarview portals) there aren’t any traffic information services clearly focusing on the arctic environment. Also, the visibility in general traffic information services about the arctic conditions tends to be quite limited. The question is, how much – and what kind – of arctic traffic information is needed. According to the interviews, a heavy information superstructure (e.g. telematics applications) in peripheral, sparsely populated regions is hardly justifiable. Nevertheless, it is important that applications and solutions are developed and experimented to help travelers and operators (logistics, infrastructure maintenance etc.) in difficult conditions, often in remote locations. Mobile applications, maybe utilizing open data sources and affordable platforms such as Google Maps, may be well suited for users in the arctic environment.

Some solutions and experiments deserve to be mentioned as good examples for possible future developments. Oulunliikenne.fi offers a collective information source for various user groups in the Oulu region. For car drivers, transport fluency information is obtained from various sources: sensors and monitoring devices of the Transport Agency and Regional Center for Economic Development, Transport and Enviroment as well as traffic control systems of the City of Oulu. A short-term forecast is given to describe the situation 30 minutes ahead of the current traffic situation. Information on weather and road conditions is obtained from road weather stations and roadside weather cameras. Parking information is obtained from parking houses and the navigation service is based on Google Maps. The service offers information about public transport schedules and routes (although real-time bus information is still lacking). An interesting application has been developed for cyclists and pedestrians to help route planning on the walking/cycling path network. When it comes to winter cycling, the route planning application offers an opportunity to prioritize routes based on winter maintenance classification.

An interesting experiment to improve the work and performance of road maintenance and repair has been developed by the Regional Center for Economic Development in Oulu. The Center wants to improve the road maintenance and repair work planning and control by using mobile devices such as smartphones, tablets etc. A solution has been developed using Google Maps and Google+ to rapidly disseminate information between the Center, its supervisors and regional contractors. Messages and digital photos can be easily transmitted and positioned on map to expedite the work.
In this way, road reparation requests are handled efficiently without any paperwork in this system. The solution has been received positively by the users and its use is being spread to other regions. Interestingly, this solution has similarities with the Rosyama service in Russia (https://rosyama.ru/) which helps the public inform the authorities about road repair needs.

![Image: An illustrative example of repair information over Google+(example provided by Markku Tervo, Center for Economic Development, Transport and Environment in Oulu)](image)

A specific problem that especially pertains to arctic regions is the lacking capability of traffic information services to cross national borders (Finland has three land borders in the Arctic area). As mentioned before, general route planning and navigation services such as Google Maps, ViaMichelin, Nokia’s Here, etc. generally do not have problems to tackle border crossings. However, services such as traffic and road weather information normally do not offer visibility across borders (even if fairly similar services exist in, for instance, Finland, Sweden and Norway). Public transport planning tools, such as the popular Matka.fi provided by the Finnish Transport Agency (www.matka.fi) cannot give suggestions for travelling from Oulu to Luleå. Perhaps one reason is that also direct bus and other public transport connections are lacking.

At the same time, it should be noted that in international transport and logistics the tools and aids that for instance truck drivers need do not have to be so sophisticated. The Norwegian Road Administration has compiled a handy pdf-document in ten languages (“Trucker’s Guide to Driving in Norway, presented by Donna Diesel”) with general information about driving in Norway but also more specific instructions about difficult winter conditions, e.g. convoys, attaching snow chains, etc. Although modern ICT technology has entered the cabins of trucks, a simple pdf-document (whether it is read on the screen of a tablet or paper) most likely can be made available to the driver who might be driving in tough Norwegian winter conditions for the first time in his/her life.

**Some concluding remarks**

There are particular conditions related to the management and maintenance of arctic transport and infrastructure including cold weather, darkness, snow and ice as well as long distances and sparse population. However, it seems that the people and organizations working in northern regions are fairly accustomed to these conditions and stable winter conditions are not considered to be too problematic. Exceptional conditions create more challenges and it is possible that they occur more frequently as climate change progresses.
The Finnish Transport Agency has largely outsourced the maintenance and repair operations to private organizations which has increased efficiency and possibly also the quality of operations. However, especially on the railway infrastructure repair and maintenance side the number of service companies is limited and the potential advantages of competition can soon get exhausted. Also limited infrastructure budgets cause problems and especially the maintenance and repair of lower level transport network has come under jeopardy in peripheral regions.

Traffic and weather information is readily available especially relating to the core transport network where traffic density is high. However, the information is still scattered in diverse systems and the interfaces are not standardized. The primary service providers have their own service centers that can utilize and disseminate various types of information, and thereby direct and control the work of the subcontractors in different regions. The Transport Agency has its own traffic management centers that produce and disseminate transport-related information through the traffic control and operating system. A number of transport-related internet portals can be found that compile traffic and circumstantial information from various sources.

Despite the existence of multiple data sources (including a lot of open data), it seems that “killer applications” delivering timely and relevant traffic and weather information for well-defined target groups are still missing. A small number of professional users have access to data that they can transform into situational awareness information while others contend with basic information such as current weather data and forecasts provided in the internet, radio, navigation tools, etc. Perhaps the next step in the development of traffic information systems could be to more clearly define the needs of different target groups and develop situational awareness solutions that can be tailored to these needs – if missing information is bad, so is also information overload.

From an arctic transport and logistics point of view, it is hardly feasible to build heavy information superstructure for monitoring and controlling traffic conditions outside the core corridors with high traffic density. However, innovative and affordable solutions should be encouraged for detecting and disseminating information on exceptional conditions and traffic incidents. Mobile applications and common information platforms can offer a good foundation for developing solutions in remote regions. Also vehicle-to-vehicle communication using ad hoc networks can offer new opportunities for improving situational awareness without heavy telematics investments.

The competence requirements in arctic transport and logistics are related with the building and maintenance of physical infrastructure as well as traffic and infrastructure management. Sufficient construction, repair and maintenance services are available in northern regions, but missing education in (infrastructure) construction is seen as a potential problem affecting the availability of competent personnel in near future. Traffic and maintenance management services are divided between private and public operators who run their own operation centers for traffic management. The roles of the different service providers are still in a formative stage and their work to meet the information needs of various user segments is still in its infancy. Although information services tend to get more and more centralized, it is important that traffic management services will be retained in the northern regions – the cooperation and synergies with e.g. police and rescue services should be further investigated. As financial resources on infrastructure development and maintenance are getting tighter and tighter, different actors must work seamlessly together in order to respond to emerging construction, repair and maintenance needs quickly and efficiently. Both technical and operational capabilities must be continuously developed to increase the agility and efficiency of the whole network of actors involved in the development, repair and maintenance activities.
The business opportunities related to traffic and infrastructure management in the arctic regions range from physical operations to management services and system development. For new entrants, the chances of becoming a contractor for Transport Agency can be limited, but opportunities for serving as a subcontractor to construction and maintenance companies are significantly better. Opportunities can also be found in the development of the systems and applications supporting the traffic and infrastructure management operations. The Transport Agency has its own plans and ambitions for developing a national traffic control and operating system, but innovations and experiments can also be made to develop the local business and information ecosystem for transport and infrastructure management. For instance, open data is now available from various public organizations that can open new opportunities for service providers to create user-friendly applications for selected target segments. Cross-border services in transport and infrastructure management are still an under-utilized opportunity that needs public as well as private business attention. New services and solutions are also needed for engaging the public in transport and infrastructure management – the needs of the transport system users must get heard.

Sources:
6.2. SMARTPORTS IN THE ARCTIC TRANSPORT NETWORK

The Smartport concept has been used in various contexts, including the research and education services of a university in Europe (Erasmus University & Rotterdam Port), or the process automation capabilities of a cargo handling solutions provider (Cargotec) in Finland. In this study, we use Smartport concept in a general sense to describe the opportunities of port organizations to serve as intelligent nodes in transport corridors especially in the Arctic Regions.

The Smartport Concept

There is a lot of technology used today in ports, such as access control systems, different kinds of identification technologies, gates working by phone calls, computers in cranes and trucks, radio-controlled ramps, electronic surveillance, and radio frequency identification (RFID) in containers. However, much of the technology is used also in other fields of business and transportation. Especially smaller ports do not have many specialized and tailored solutions in use. Technology can make the port smarter but by itself it cannot make the port smart.

Smart solutions and technology decrease manual work at ports. The key to success is in information - it should be accessible and easily found. In Smartports the information moves seamlessly and automatically between the vessel, shipping company and the port organizations. For example, the vehicles coming to the port would be automatically and electronically guided to the right place. Every human activity in the supply chain makes the process slower and prone to mistakes.

The Smartport should be efficient, environmental friendly and safe. Construction takes into account future needs and is environmentally sustainable. Trespass to the port area would be noticed immediately with the help of technology and tariff systems and billing would be automatic, too.

The Arctic Smartport

In winter there is snow and ice in the arctic areas and the weather is cold. Darkness brings another challenge for the workforce. The vessels calling the arctic ports should be ice strengthened. All these factors influence the activities in the arctic ports. However, transport professionals consider winter to be a normal circumstance – there will be snow, ice and darkness every winter and those who want to operate in the arctic areas just have to adjust to it.

All seasons require different equipment which costs money for companies but winter is definitely the hardest and longest season. First, extra ice on quays hinders the mooring of vessels and the ice needs to be either regularly removed or its formation needs to be prevented. For example in the Port of Oulu there is special equipment which blows air under the quay and the descending waves prevent the formation of ice. Second, snow and ice need to be removed from fields and the areas can be large. Third, all areas need to be lit up for safety reasons. Lightning especially can be a major cost item.

Besides hard weather traffic quantities are or can be a challenge for arctic ports. The lesser the traffic quantities, the more important becomes cost management. Smart solutions can save money, time and resources and make the best of the existing resources. Especially during the winter months, capacity management should be done in an integrated manner to minimize turnaround times of vessels and optimize the capacity utilization of port organizations. This may involve
improved cross-border coordination of transport resources such as icebreaking capacity, as has in fact already happened between Finland and Sweden in the Bothnian Arc region.

Arctic ports already have smart solutions but more could be also used and developed. Common data systems would benefit all parties and needed information could be found easily from the same place. Accessible information and sharing it involves also icebreaking which is needed in the arctic areas. According to our interviewees icebreaking should be better coordinated - lack of coordination leads to delays in transportation and changing variables are harder to take into account. Information for icebreaking should be gathered from vessels, icebreakers, and the Meteorological Institute. The resources in use should be optimized and the total system should be managed in a coordinated manner – benchmarking from industry and other transport modes can offer good examples.

Smartness can also stem from various smaller things. Smart buoys could measure information such as the thickness of ice and send alarms when their batteries are getting empty. Port lighting can be sensitive to the movement of people and vehicles and light level in unoccupied sectors can be reduced. Vehicles used in the port area could measure the condition of roads and inform others about the quantity of friction. Anticipation is the key word in many functions. The port authorities are late when people have to inform them for example to clean up the sand in the spring rime or to add the sanding in winter. Smartness would be to anticipate these needs and order them in advance. In this respect, the information needs in ports are largely similar to those in road maintenance.

**Ports as Nodes in Smart Corridors**

Ports are not isolated islands but serve as nodes in multimodal transport networks and corridors. They facilitate the movement of physical products (increasingly in containers) and nowadays also the transfer of information related to international transport and logistics management. For example, Portnet is an information system for port traffic that is maintained by Finnish Transport Agency and Finnish Customs. However, in a truly inter-operable transport network or corridor the information systems should be seen in a broader context linking transport technologies, logistical solutions and policies/regulations governing the transport environment (see figure).

Figure: Dimensions of Green Transport Corridors

![Dimensions of Green Transport Corridors](source: Bothnian Green Logistics Corridor, Task 3:1 Deliverable 1)

The inclusion of the Bothnian Corridor in the core network of the Trans-European Transport Network (TEN-T) offers an interesting opportunity for the Northern ports in Finland and Sweden. At the same time, the opening of the Arctic Sea Route will offer opportunities for strengthening the transport links between the Baltic Sea and the Barents Sea – perhaps also extending the TEN-T network towards the North.
One example of the smart corridor projects includes the Helsinki-St. Petersburg project (Fitsrus, see info box below). Similarly, the Bothnian Green Logistics Corridor (www.bothniangreen.se) project outlined methodologies on how to manage the Bothnian Corridor and its extensions. The best practices identified in these projects should be examined and their applicability in the Arctic context evaluated. The arctic ports can play a central role in the development of the smart and sustainable transport corridors in the Arctic Region.

**Fitsrus: Smart Corridor Project Helsinki-St. Petersburg**

The smart corridor project *Fitsrus: Helsinki-St Petersburg* aims at developing an intelligent transport corridor between the Regions of Oslo, Stockholm, Turku, Helsinki and St. Petersburg. The goal is to create more value of infrastructure investments by advancing innovative, ecological and intelligent services that drive new business development and economic growth. The project is motivated by growing passenger and freight transport to and from Russia and the increasing business potential related these transport flows.

The Fitsrus project harnesses intelligent services to enhance all transport modes and related services (road, rail, sea, terminals and border controls). Pilot services that have been proposed in the project include automated weather services, automated incident alert systems, real-time traffic and travel time information services, public transport information services and automated incident detection services. The leading idea is to develop and provide similar and interoperable services for corridor users, allowing them to utilize services with their own familiar devices and interfaces. A major element in this process is related to the utilisation of the open data principle, which enables the exporting and interoperability of services, as well as opening markets for competitive service procurement.

Elements of Smart Transport Corridor (based on Fitsrus project):

- better managed traffic
- no disturbances, no hinders in crossing
- better safety
- saved energy, less emissions
- continuity of services FI-RU
- new business, new jobs

The basis of the Fitsrus project was defined in the MoU signed by both Ministers of Transport in Moscow in September 2011, which also included a definition of the first four pilots.

**Sources:**

6.3. HEALTHCARE LOGISTICS - CASE LABORATORY SERVICES

Nordlab is an organisation founded by the five hospital districts of northern Finland to produce laboratory services primarily for the public health care system. The samples are taken in hospitals and in local health centres and then transported into bigger, partly specialized laboratories. This requires lots of transporting of sensitive samples in demanding arctic conditions. NordLab is predicted to expand to cover all the municipalities of northern Finland that covers almost half of Finland’s geographical area. Currently for example in Lapland only the biggest city Rovaniemi is a part of Nordlab. Nordlab’s clinical functions are mostly the already existing main laboratories of the five biggest hospitals (Kajaani, Kemi, Kokkola, Oulu and Rovaniemi) in the area of Oys Erva and some sample analysing is outsourced to southern-Finland and abroad. Currently only administrative functions are centered into Oulu headquarters. Nordlab is then managing a network of laboratories. In the beginning of 2013 NordLab has around 600 personnel and the total costs are around 63 000 000€. NordLab produces estimated 7,5 million laboratory analysis annually.

Operational advantage is reached primarily by optimizing the competencies of various laboratories. Same kinds of samples from bigger area are centralized into more specialized laboratories. The competencies are centralized into various bigger laboratories that help in recruiting valid personnel that is challenging in laboratories in peripheral areas. In service point of view the goal is that the end user (patient) can leave sample in nearby health centre without travelling into bigger hospital. Also the results would be quickly usable without end user having to see the processes behind the service. Only the sample is sent into bigger laboratory plausibly long way. Currently biggest
challenge in that process (despite lack of participant municipals) is the information system´s capability to serve results for the doctors taking care of the patients.

Logistics

By the management level NordLab is not seen primarily as a solution for logistical issues in laboratory services The main advantage NordLab brings is the optimization of the laboratory personnel and managing the core competencies of different laboratories in the area. Logistics is seen mostly as transports and therefore not as main function of Nordlab. Logistics is not mentioned in Nordlab plan of action, although the potential of reaching better service and lower costs by developing logistics is recognized. In near future Nordlab is hiring a consultant to plan logistical operations of Nordlab. According to the interview logistics isn´t seen any major challenge and not remarkably high part of the costs. Sometimes samples decay because of the errors in material flows, but only of acceptable extent. Transport costs are only few percentage of the total cost of and the quality of transports has not been rousing any key factor in total quality. By the interview it is understood that the logistical cost in wider scale are big part of the total cost although they aren’t not so easily recognized from the calculations.

Arctic conditions

Even though NordLab is handling very temperature sensitive goods in challenging environments are the arctic conditions not seen as special challenge. Nordlab need to serve also sparcely-populated areas but at the moment the distances are not a vast challenge as many municipals in the northern Finland haven’t already participated Nordlab. Situation might change if the municipals of the most northern Finland decide to take part of Nordlab network. Then distances from health center into laboratory can be over 500km:s plausibly in very arctic conditions. Most samples need to be stored and transported in temperature-controlled conditions, but regular insulated boxes (styrofoam) are in most cases enough to keep the temperature high enough. One challenge is also that some samples need various temperatures.

By the interview transportation of the laboratory samples does not require special competence if the packaging is done correctly. At the moment transportation is outsourced to companies such as Itella, Matkahuolto, Jetpack oy and taxies. These companies don’t cover the damages caused by the arctic conditions (freezing etc.), that requires more attention into packaging of the items.

Nordlab is a new organisation but its functions are mostly been existing for years or tens of years. Working in and with arctic conditions have been part of everyday life and probably therefore not seen as major challenge. In the printed strategy there is no mentions about cold conditions and the interview tells the same. Although arctic conditions are not seen as “a big thing” does not mean they are not taken care of. Maybe one reason for Nordlab is public health care system´s better ability to face one of the arctic challenges – to fulfil the service needs (and laws) of sparsely populated areas with long distances. This is done by centralization to optimize the use of laboratory personnel´s work which in low density areas means centralizing the activities from small separate units into bigger units that can serve larger areas.

Smart solutions in arctic laboratory network

At the moment laboratory supply chains are using smart solutions in only partly. One example mentioned is temperature monitoring in some transports that shows afterwards if the temperatures have been correct during transportation. There are already plausible solutions for keeping monitoring the temperatures in real time by the driver, but those are not already widely used.
Business opportunities

Nordlab is a non-profit organization (liikelaitos), which sets some limits into growing the business. Potential of growing internationally mostly in Barents region is seen, but the current yritysmuoto is not allowing that. Nordlab have interests into changing type of business entity into company (Oy), but currently that is legally not possible. New municipal law might change the situation.

Main conclusions

- Arctic conditions are part of everyday life and therefore not seen as a major challenge even though handling very sensitive goods in challenging conditions.
- Arctic competencies are in performing level jobs
- NordLab is an interesting example in seeking better services and lower costs by “centralizing” services supporting health care system.

Sources:

- NordLab Toiminta- ja taloussuunnitelma 2013-2015
- NordLab http://www.nordlab.fi/fi
- Interview 17.4.2013 CEO Rauno Luttinen, Economy- and administration manager Timo Kauppinen
- Risteli, Leila Tieto kulkee, kun bitti liikkuu – terveydenhuollossakin
6.4. CONCLUSIONS

Conclusions based on Case experiences (6.1.-6.4) are summarized in the following table.

Table: Current state, competence needs and opportunities from the three cases

<table>
<thead>
<tr>
<th>Development area</th>
<th>Current state and competence needs</th>
<th>Opportunities</th>
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<td><strong>Management of arctic transport &amp; infrastructure</strong></td>
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<tr>
<td>Infrastructure construction</td>
<td>Development of international project competence</td>
<td>Infra projects in Northern Sweden and Northern Norway, North-Western Russia is a question mark.</td>
</tr>
<tr>
<td>Infrastructure maintenance</td>
<td>Lean and agile operating models in infra maintenance</td>
<td>Intelligent solutions for infra maintenance (utilization of ICT in all operations).</td>
</tr>
<tr>
<td>ICT and traffic situation awareness</td>
<td>Situational awareness data is available but user-friendly applications are needed.</td>
<td>Utilization of open data sources, GIS, mobile applications.</td>
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<tr>
<td><strong>Smartports in the arctic transport networks</strong></td>
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<tr>
<td>Navigation in arctic conditions</td>
<td>Finland has expertise regarding navigation in ice conditions</td>
<td>Utilization of the expertise in international maritime transport and developing intelligent solutions.</td>
</tr>
<tr>
<td>Design/construction of arctic vessels.</td>
<td>Finland has expertise in design and construction of vessels for arctic conditions.</td>
<td>Growing demand in arctic maritime transport supported by intelligent solutions.</td>
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<td><strong>Healthcare logistics – Case laboratory services</strong></td>
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<tr>
<td>Domestic health care services</td>
<td>Current service covers health care districts in Northern Finland</td>
<td>Extension of service to domestically (Northern Finland, rest of Finland).</td>
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<td>Current law prevents growth to international markets.</td>
<td>Extension of laboratory services to the Barents Region (for special services also on wider international markets).</td>
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<tr>
<td>Supporting logistics system.</td>
<td>An all year pilot service for laboratory logistics soon available.</td>
<td>Development of intelligent logistics system and its extension to related support services in health care.</td>
</tr>
</tbody>
</table>
APPENDIX

Traffic information services and portals

- **Digitraffic** ([http://www.infotripla.fi/digitraffic/english/index.html](http://www.infotripla.fi/digitraffic/english/index.html)) offers real-time and historical information and data about the traffic on Finnish main roads. The service is provided by the Finnish Transport Agency, and it is addressed for organisations developing information services or working with traffic management and planning. Professional users of Finnish Transport Agency and Centres for Economic Development, Transport and the Environment are provided with a net application that can be used for traffic monitoring and creating various reports concerning real time or past traffic on certain road stretches. The data sources are the Travel Time System and the automatic measuring devices (LAM) of the Finnish Transport Agency, road weather stations, road surface pictures. In addition, the road traffic centers produce information about incidents, roadworks and frost heaves. The coverage of the service is limited to main roads mostly in Southern parts of Finland.

- **Finnish Transport Agency** ([www.liikennevirasto.fi](http://www.liikennevirasto.fi)) offers real-time information through its traffic service, including information on traffic disturbances, road weather and road conditions, and road works. The information is provided by regions (Metropolitan area, Southern Finland, Western Finland, Eastern Finland, Northern Ostrobothnia and Kainuu, and Lapland. As a special service, the Transport Agency provides a road weather forecast for the whole country, selected regions or specific roads sections (30-50 km in length). The road weather forecast is produced in cooperation with the Finnish Meteorological Institute and Karttakeskus.

- **V-traffic** ([www.v-traffic.com](http://www.v-traffic.com)) is a traffic information service offered by Mediamobile Nordic Ltd. Mediamobile is operational in Finland, Sweden, Norway, Denmark, Poland and France. Mediamobile Nordic produces and provides real-time information on traffic, weather conditions and disruptions affecting traffic. In the Northern regions, the information is quite sporadic – most information is concentrated to urban centres in Southern parts of Finland. The application is built on Google Maps.

- **Traffic Information Platform** ([www.forumvirium.fi/en/project-areas/smart-city/traffic-information-platform](http://www.forumvirium.fi/en/project-areas/smart-city/traffic-information-platform)) was started as a project in 2005 by Destia, Logica and Forum Virium for collecting and distributing real-time traffic information to service providers. The information can also be distributed through an organisation’s own service platform to mobile devices. The Traffic Information Platform contains a wide variety of traffic information, such as vehicle volumes, road weather and real-time data on traffic congestion and roadworks. The information is obtained from sensors and measuring devices, as well as additionally reported incident information from the authorities and ordinary road users. The service is now sold by Destia Traffic also to neighbouring countries.

- **LiikenneNyt** ([www.liikennenyt.fi](http://www.liikennenyt.fi)) is a traffic information service portal that contains a comprehensive line-up of online traffic services in a user-friendly “one-stop shop”. The first such porta is for the Tampere region. The user can personalize traffic information, specifying desired routes, public transport routes and stops, and personal smart travel cards. Information is available for all modes of transportation. LiikenneNyt is a multi-channel service, which is available as an online mobile service, and traffic flow information can also be selected as part of other service entities. The service is produced by Infotripla Oy, a company in Tampere specializing in the field of intelligent transport services.
- **Trafiken.nu** ([www.trafiken.nu](http://www.trafiken.nu)) is a Swedish service offering information that help users make intelligent travel choices regardless of transport mode (car, bicycle, public transport or a combination of those). The service includes information on public transport timetables and routes, current traffic speeds, any disruptions in public transport services, road works, accidents, road and weather conditions, cycle routes and maps, and parking facilities. The service has also launched a journey planner for Stockholm, making it possible to compare alternatives with public transport, car, bike and walk. Trafiken.nu is currently available in the regions of Stockholm, Kalmar/Öland, Gothenburg and Skåne.

- **Oulunliikenne** ([www.oulunliikenne.fi](http://www.oulunliikenne.fi)) is a traffic information service offered by the City of Oulu, Oulu Region and the Center for Economic Development, Transport and Environment of Northern Ostrobothnia. The service provides information for all modes of transport, including car use, public transport and bicycle use or walking. The service compiles traffic and weather information from various sources including the Transport Agency and the Technical services of the City of Oulu. The service is produced by Infotripla Oy.

- **Trafficineurope** ([www.trafficineurope.eu/](http://www.trafficineurope.eu/)) is a European traveler and traffic information service. The service offers links to national traffic information and travel planning services in different European countries.

- **Waze** ([www.waze.com](http://www.waze.com)) is claimed to be the world’s fastest-growing community-based traffic and navigation application. The application is currently available in the U.S. The idea is to connect drivers in the same region sharing real-time traffic and road information in order to save everyone’s driving time and gas bill on their daily commute. The goal is “to outsmart traffic and get everyone the best route to work and back, everyday.” This can be achieved by drivers sharing information about accidents, road hazards, traffic jams, etc. in real time. The maps in the system are community edited to make them more reliable. Moreover, the service also offers an opportunity for users to coordinate driving when, for instance, several people want to synchronize arrival times.

**Maritime information services**

- **Polar View** ([www.polarview.org](http://www.polarview.org)) offers integrated monitoring and forecasting services in the Polar Regions and mid latitude areas, affected by ice and snow. Polar View started as a project supported by the European Space Agency (ESA) and the European Commission, and was formally incorporated under the name Polar View Earth Observation Ltd. in the UK in 2011. The services include: Sea Ice Monitoring, Iceberg Monitoring, Ice Edge Monitoring, River Ice Monitoring, Lake Ice Monitoring, Glacier Monitoring and Snow Monitoring. The Finnish Meteorological Institute (FMI) and the Swedish Meteorological and Hydrological Institute (SMHI) belong to the Polar View Network and provide information to its service.

- **Baltice.org** ([http://portal.fma.fi/portal/page/portal/baltice](http://portal.fma.fi/portal/page/portal/baltice)) is a single access point to reliable and up to date information related to winter navigation in the Baltic Sea area. This site gathers information and instructions from icebreaking authorities from all the Baltic Sea countries. Information is available free of charge and meant for users of winter navigation information at the Baltic Sea. The aim of the site is to extend the knowledge of winter navigation and prevailing conditions in the area during ice season. Website is commissioned and financed by Baltic Icebreaking Management (BIM), which has members from all Baltic Sea countries, and co-financed by the European Commission through the programme for trans-European transport
network. The service is offered by Baltic Icebreaking Management, BIM, is an organisation with members from all Baltic Sea states.

- The Baltic Sea Portal (http://www.itameriportaali.fi/) provides current information about The Baltic Sea, the state of the Sea, the marine research activities and Protection of the Sea in Finnish, Swedish and English. The portal is maintained by the Finnish Environment Institute, the Finnish Meteorological Institute and the Ministry of Environment in Finland. Among others, the portal includes the “Baltic Sea Now” service with real-time information of the Baltic Sea level and wave height, about ice conditions in winter time and algae blooms in summer time. In addition, pages contain forecasts for example wave height and sea surface temperature. However, the main role of the portal is to provide more general information about the state of the Baltic Sea, especially its environment and ecosystems.

### Weather services

- **Finnish Meteorological Institute**, FMI ([www.ilmatieteenlaitos.fi](http://www.ilmatieteenlaitos.fi)) is a research and service agency under the Ministry of Transport and Communications providing information about the weather conditions above and around Finland for ensuring public safety. Among its services, FMI offers information about marine weather and the Baltic Sea, including weather forecasts for shipping, information on ice conditions, waves and wave heights, and wind conditions. Also commercial weather services are offered to shipping companies and maritime organizations over the internet and other information channels.

- **Swedish Meteorological and Hydrological Institute** ([www.smhi.se](http://www.smhi.se)) manages and develops information on weather, water and climate that provides knowledge and advanced decision-making data for public services, the private sector and the general public. As its Finnish counterpart, SMHI also offers maritime services, including both commercial and free information about sea weather, ice conditions, etc. One specific service offered by SMHI is the Onboard Routing tool, offering weather presentations of current and future weather conditions for up to 10 days and advanced route planning with general performance calculation in terms of speed, fuel consumption, estimated time of arrival and GPS interface for route import and position tracking.

- **Norwegian Meteorological Institute** ([www.met.no](http://www.met.no)) is the Norwegian governmental meteorological service provider. Of special interest is the oceanographic information including the monitoring and forecasting of sea ice for the Norwegian part of Arctic and the Norwegian coast. The institute is also producing daily global ice analysis based on data from meteorological satellites. The institute also runs a weather service ([www.yr.no](http://www.yr.no)) together with the Norwegian Broadcasting Corporation (NRK). A lot of the data on yr.no is free to use in applications and services.

- **Foreca** ([www.foreca.com](http://www.foreca.com)) is a commercial provider of weather data with offices in Helsinki, Stockholm and Moscow. Foreca offers consumer services, industrial services as well as consultancy and research services related to the weather and the atmosphere. As an example of services for industry, a tailored weather service for road maintenance companies and public organizations can be mentioned. Besides short- and long-term weather forecasts for selected geographical regions, the service includes real-time data on temperature, humidity, road conditions, etc. Also maritime weather services are offered, including wave and wind forecasts, rain, air pressure etc.