ARCTIC BUSINESS FORUM
YEARBOOK 2018

April 2018

Compiled and edited by Timo Rautajoki & Viivi Lakkapää
© Lapland Chamber of Commerce, 2018

Taitto ja painatus: Painatuskeskus Finland
ARCTIC COUNCIL MEMBER STATES

CANADA

USA

ARCTIC CIRCLE

GREENLAND / DENMARK

ICELAND
# TABLE OF CONTENTS

1. Foreword – State of the Arctic Business 2018 ........................................... 8  
2. Arctic Railway ............................................................................................. 12  
3. European High North Investments 2018–2025 ......................................... 27  
   3.1 Lapland .................................................................................................... 30  
      3.1.1 Top Investment Projects in Lapland 2018–2025 .......................... 35  
      3.1.2 Investments in Lapland 2018–2025 .............................................. 46  
   3.2 Oulu region ............................................................................................ 50  
      3.2.1 Top Investment Projects in Oulu Region 2018–2025 ................. 61  
      3.2.2 Investments in Oulu Region 2018–2025 ...................................... 72  
   3.3 Kainuu region ....................................................................................... 75  
      3.3.1 Top Investment Projects in Kainuu Region 2018–2025 ............. 78  
      3.3.2 Investments in Kainuu Region 2018–2025 ................................. 86  
   3.4 Norrbotten ............................................................................................ 88  
      3.4.1 Top Investment Projects in Norrbotten 2018–2025 ....................... 90  
      3.4.2 Investments in Norrbotten 2018–2025 ............................................ 94  
   3.5 Västerbotten .......................................................................................... 97  
      3.5.1 Top Investment Projects in Västerbotten 2018–2025 ..................... 100  
      3.5.2 Investments in Västerbotten 2018–2025 ....................................... 107  
   3.6 North of Norway .................................................................................. 109  
      3.6.1 Top Investment Projects in Northern Norway 2018–2025 ............. 117  
      3.6.2 Investments in Northern Norway 2018–2025 ............................. 128  
   3.7 Murmansk region ................................................................................. 132  
      3.7.1 Top Investment Projects in Murmansk Region 2018–2025 .......... 143  
      3.7.2 Investments in Murmansk Region 2018–2025 ............................ 156  
   3.8 Arkhangelsk region ............................................................................... 158  
      3.8.1 Top Investment Projects in Arkhangelsk Region 2018–2025 ......... 164  
      3.8.2 Investments in Arkhangels Region 2018–2025 ............................ 170  

References and sources of information ....................................................... 172  
Promoting business in the new north ........................................................ 173  
European high north investment potential 2018 ...................................... 174
FOREWORD –
State of the Arctic Business 2018

After many years, business is recovering in the European Arctic. This development has been visible in Lapland for a couple of years now, but in 2017 it looked like a new business boom. Official statistics in Finland have been showing that economic growth was the strongest in the northernmost region, Arctic Lapland. The turnover of companies in Lapland grew with 17% during the first quarter of the year and export of companies grew with almost 25%. This kind of increased business activity was creating new jobs and in the end of the year lack of skilled labor was one of the biggest obstacles of growth.

From the Lapland’s business fields tourism had the biggest boost in 2017 with 9% growth compared with previous year. Total amount of registered overnight stays was over 2,9 million. Overnight stays of international tourists was growing by 22% and the added value was 1,48 million, while domestics overnights were decreasing with 2% to 1,43 million. This means, that for the first-time, international tourists have majority in overnight stays in Lapland with 51%.

Almost same kind of growth happened in all branches of business in Lapland. Export was growing by 18% in 2017 up to 4,2 bn€. Only four other regions in Finland had bigger export than Lapland. In the last weeks of 2017 also mining industry started to announce mine expansions. Total value of all expansions in Lapland was almost 0,5 bn€ in the first weeks of 2018. Similar development has also started in other parts of Northern Finland. Oulu Region and Kainuu Region were also doing fine.

Recovering Arctic business is today different compared with last growth period about ten years ago. At that time, most of the investments and investment potential were offshore oil and gas projects. Today, Arctic oil production is not as popular as before and also not as profitable. Also, political tensions have grown after 2014 and the Ukraine crisis. However, Arctic cooperation continues almost at same level as before. Crisis has not so far had any effect on the work of Arctic Council, so that business is as usual.
Arctic Council hasn’t been active to develop business cooperation in the Arctic Region. Last decisions to activate business were made during the presidency of Canada in 2013–2015, when Arctic Economic council was founded and it started working. During present presidency of Finland, the priorities are environmental protection, connectivity, meteorological cooperation and education. Finland continues similar policy as USA in presidency of Arctic Council by bringing environmental protection back to the top of Arctic cooperation agenda.

Environmental organizations are more active now than before in the Arctic issues. Good example of this is the suing of the Norwegian government by climate activists like Greenpeace over the decision to open up areas of the Arctic Ocean for oil exploration. This has been seen as a move, that endangers the lives of existing and future generations.

According to the activists, Norwegian government has violated a constitutional environmental law, which guarantees citizens’ rights to a healthy environment. The law, known as Section 112, states: “Everyone has the right to an environment that safeguards their health and to nature, where production ability and diversity are preserved. Natural resources must be managed from a long-term and versatile consideration which also upholds this right for future generations.”

When fighting the case, Greenpeace has been relying on the findings of the Intergovernmental Panel on Climate Change. That states, that to meet the goals set out in the 2015 Paris accord, oil production must be put down, not escalated. The state rejects this argument, claiming, that all their preliminary assessments of the potential environmental impact have been conducted satisfactorily. However, Oslo District Court made decision in the beginning of January 2018, that the government acts in accordance with the law, when awarding new petroleum exploration licenses for the Barents Sea.

Simultaneously with the court process, Norway’s major oil company Statoil submitted in December 2017 the plan for development and operation for Johan Castberg oil field project with ENI and Petro as partners. Capital expenditures for Johan Castberg are estimated at some NOK 49 billion. Recoverable resources are estimated at 450–650 million barrels of oil equivalent. This makes the Johan Castberg project the biggest offshore oil and gas development to be given the go-ahead in 2017. First oil is scheduled for 2022.
Also, Government stated, that Norway’s future income from oil exploration will come from Arctic waters. However, the profitability of Arctic oil has become more crucial question than before. Statoil has also told, that the profitability limit is today in oil price less than USD35/bbl. This is a big change compared with the previous break even in oil price USD80/bbl and possible due to the strong development of oil production technology.

The investment potential in European Arctic Region is about the same as before, even though the total sum of planned investments in 2018 is 162 bn€ which is almost 40 bn€ less than in 2017. However, the positive business development can be seen in planned investments 2018–2025 with total value of 76,8 bn€, which is over 23 bn€ more than in 2017. The difference comes in planned investments, because after 2025, it seems, that there are less oil and gas projects than before. This seems also to be a global trend, but it doesn’t mean the end of the Arctic offshore. Only the planned projects seem to be more carefully selected, based on the use of modern Arctic technology to ensure the profitability of implementation.

Number one branch of business in 2018–2025 is transport infrastructure with total value of 18,5 bn€ compared with oil and gas 10,4 bn€ and wind power 10,8 bn€. Wind power has also been in problems with both public opinion and profitability. Probably in a couple of years, the amount of wind park projects also decreases.

Long debated and disputed Arctic Railway project moved ahead in the summer of 2017, when ministers of transport of Finland and Norway, Ms. Anne Berner and Mr. Ketil Solvik-Olsen decided to set up Finnish-Norwegian steering group to evaluate the possibilities to construct Arctic Railway between Lapland and Northern Norway. The report of the steering group was expected to be ready in the end of February 2018. On March 9th 2018, based on the report, the ministers announced, that the route of Arctic Railway is from Rovaniemi to Kirkenes and further research and evaluations are going to be made regarding this selected route.

Short summary of the Arctic Railway project follows this foreword in this yearbook with the official press release of Ministry of Transport and Communications of Finland and the vision and perspectives for an Arctic Railway by Kirkenes Näringshage, Sörvaranger utvikling and Finnmark Fylkeskommune from Norway.
This 2018 Arctic Business Forum Yearbook gives, as usual, an overview on the European High North investments and business development published in association with the Arctic Business Forum. The leading idea of this Forum is still to share information about the latest developments affecting business in the Arctic and discuss the actions to be taken in order to overcome the known and foreseen barriers of business and trade.

April 7\textsuperscript{th}, 2018 in Rovaniemi

Timo Rautajoki
President and CEO
Lapland Chamber of Commerce
Study on the Arctic rail line completed: Kirkenes routing to be examined further

The Ministry of Transport and Communications has decided that a railway routing to the Arctic Ocean via Oulu, Rovaniemi and Kirkenes is the one that will be examined further. The benefits of the route are that it would improve Finland’s logistical position, accessibility and security of supply. Of the two leading alternatives, the routing via Kirkenes was also less expensive.

“The Arctic railway is an important European project that would create a closer link between the northern, Arctic Europe and continental Europe. The connection would improve the conditions for many industries in northern areas. A working group will now start to further examine the routing to Kirkenes,” says Minister of Transport and Communications Anne Berner.
“We wish to continue the excellent Norwegian-Finnish collaboration and look forward to contribute to the working group exploring further options regarding the Artic railway route from Rovaniemi to Kirkenes (Kirkenes),” says Norway’s Minister of Transport and Communications Ketil Solvik-Olsen.

Last July the Finnish Ministry of Transport and Communications commissioned the Transport Agency to carry out a study on the Arctic rail line together with the Norwegian transport authorities. The Transport Agency assessed the implementation and financial feasibility of five different routing alternatives.

“All the alternatives are technically feasible. However, there was a lot of variation in terms of financial aspects and environmental impacts,” says Director Matti Levomäki from the Transport Agency.

The examined routing alternatives were Tornio-Narvik, Kolari-Narvik, Kolari-Tromsø, Rovaniemi-Kirkenes and Kemijärvi-Alakurtti-Murmansk. One alternative based on the use of High Capacity Transport vehicles was also examined.

The studies and a report of the results by the Transport Agency are available for downloading at the Agency’s website: www.liikennevirasto.fi.

What will the benefits of the Arctic railway be?

The Arctic railway would improve Finland’s logistical position and accessibility as well as promote connections with the whole of Europe. It would be an alternative transport route to be used in Finland’s imports and exports. The deep-water ports of the Arctic Ocean that are ice-free throughout the year would also open up a new connection to the Atlantic Ocean and Northeast Passage.

The studies estimate that transportation on the Arctic railway would mainly include minerals, fish products, raw wood and wood industry products. Potential material for transport are also natural resources of the Barents area and products to be transported in the future via the Northeast Passage.

The Tromsø and Kirkenes routings were found to include the highest number of potential passengers. Passenger transport volumes would mainly consist of tourist transport that is expected to continue throughout the year in the future.
The Arctic railway would also improve security of supply in Finland, because Finland would have access to an alternative route to the Baltic Sea.

How much would the rail line cost?

Cost estimates of the routings vary significantly. The estimates are affected by the length of the new line and requirements of the terrain, for example. The overall costs of the rail lines vary between EUR 0.7–7.4 billion. Investment costs to be incurred on the Finnish side would be from EUR 0.02 to 2.3 billion.

The overall costs of the routing via Kirkenes are estimated at around EUR 2.9 billion, if the line will go from Rovaniemi via Sodankylä to Kirkenes. The overall costs of the routing from Kemijärvi via Sodankylä to Kirkenes would be EUR 2.8 billion. The investment costs of the Kirkenes routing would be around EUR 2 billion on the Finnish side and around EUR 0.9 billion on the Norwegian side.

It is stated in the studies that assessing the socio-economic feasibility of the rail line alternatives is challenging. There is some uncertainty as to the transport potential, because one must look several decades ahead.

According to the transport volume estimate, none of the alternatives is socio-economically feasible. However, changes for example in the costs of different transport modes or in the region’s business and industry may significantly change the situation.

Were the effects on indigenous people and the environment considered?

The routing via Kirkenes will have impacts on the environment and economy as well as the industry and culture of the Sami. The studies describe the effects on reindeer husbandry and Sami people, but their extent was not assessed at this stage. These effects must be addressed in further studies.

Once further studies are commenced, guidelines for interaction with the Sami Parliament and the research work to be completed according to the Act on the Sami Parliament are to be agreed. An Akwé: Kon process in accordance with the United Nations Convention on Biological Diversity should be included in the work on the regional plan for Northern Lapland or carried out as a separate assignment. The purpose of the process is to examine the effects of the rail line and train transport on the Sami people and culture. In addition to the Sami Parliament, the question of the Kirkenes line will also be discussed with the Skolt village meeting.
In the course of the study, the Sami parliament and people were heard in Finland, Sweden and Norway. The meeting convened in accordance with section 9 of the Act on the Sami Parliament was held in Inari on 18 January 2018.

When planning the routing alternatives, the objective has been to take the valuable nature resorts of Northern Lapland into consideration. As the planning progresses, environmental impacts must be assessed in more detail. In connection with the actual project plan, an environmental impact assessment procedure will also be completed. The assessments will be complemented with field work and surveys.

What happens next?

Research work on the Arctic rail line will continue together with Norway. A joint working group will be appointed to determine the further stages and schedule of the work.

The group is to examine the key questions relating to the chosen routing, such as environmental issues, permit procedures, costs, and finance structure and model. The deadline for the group’s work is 31 December 2018.

Further studies on the routing will also be included in the work on regional plan for Northern Lapland.
(Source: lvm.fi)

**Perspectives for an Arctic railway: The Vision**

The vision for The Arctic Railway is to be able to offer an environmentally-friendly and faster transport alternative for goods between Northeast Asia and Northern Europe via Finland by utilisation of the Northern Sea Route (NSR) and development of Kirkenes as a hub port.

- As the first Western port on the route, Kirkenes would be a strategic hub in the north for liner traffic transporting containers to and from Asia
- The transport time through the Northern Sea Route is the fastest route from China with a railway link to Northern Europe via Kirkenes
- As the first Western port in the north with a railway link, Kirkenes would experience major employment effects in addition to wider economic effects in East Finnmark
This rail vision is based on the shortest travel time for containers from China to Northern Europe, and that the Port of Kirkenes would be the triggering factor for a railway line in a 2040 perspective. This route has the potential to be a new “maritime silk route in the north”.

The basis for the vision

This vision is based on 10% of the current combined international container trade from China, Taiwan, South Korea and Japan to the North European countries Germany, Denmark, Finland, Sweden and Norway using the Northern Sea Route (NSR) combined with transloading to a rail link in Kirkenes. This vision is based on container ships transporting 4,800 TEU (containers).

10% of the container traffic provides huge possibilities!

The basis of the vision whereby 10% of the current volume of goods is transported on this railway line would offer the following possibilities for the Port of Kirkenes with a rail link to Finland continuing to Scandinavia, the Baltic countries and Western Europe:

• 10 southbound goods trains per day from Kirkenes to Finland and on to other destinations
• 550,000 containers transloaded per year – or 37,000 containers per month – from Asia via the Port of Kirkenes during a 7.4-month navigation season, as well as the same number of containers (empty or with export cargo) on the return leg from Europe
• 400–600 people could gain direct employment in Kirkenes. Based on a 7.4-month navigation season on the NSR, a terminal port in Kirkenes must have equivalent or greater capacity than the Port of Gothenburg.
• The container traffic between Asia and Europe will be almost threefold in 2040, so even a share of 3–4% of the combined container imports from China, Taiwan, South Korea and Japan to Northern Europe would generate comprehensive activity at the Port of Kirkenes and on an Arctic railway to Rovaniemi.
• A 40% reduction of the sailing distance via the Northern Sea Route (NSR) compared to the current route through the Suez Canal between the northern part of Northern Europe (from Germany and northwards) and the Asian countries of China, Taiwan, South Korea and Japan
• A 20% reduction in fuel consumption compared to the route through the Suez Canal would generate climate effects.
The potential for goods transport linked to Russia, the Baltic countries and Poland.

An Arctic railway could also offer faster freight transport through direct access via Helsinki to the three Baltic countries and Poland, as well as to St. Petersburg in Russia.

- A reduction of 2–5 days through loading goods onto a train in Kirkenes compared to shipping via the NSR – the Baltic Sea
- 10% of the current flow of goods from China to the Baltic countries and Poland via Kirkenes could amount to an additional 37,000 TEU per year on an Arctic railway.
- The transportation of frozen fish and general cargo in containers from the far east of Russia to St. Petersburg and vice versa provide a significant cargo basis for an Arctic railway.

Other possibilities linked to tourism and commercial transport

There are no triggering factors, but rather secondary opportunities for a railway

- Tourism and the transportation of tourists between Rovaniemi and Kirkenes
- The potential for future exports from the Finnish mineral industry
- Export of seafood and white fish

Reduced transport time compared with the Suez Canal

Chinese calculations show that a container liner with a capacity of 4,800 TEU, low ice class and a 7.4- month navigation season via the NSR could be economically competitive with the Suez Canal.
This includes a significant time saving:

1. The sailing distance Shanghai – Hamburg via the Suez Canal is 12,277 nautical miles. At an average speed of 13 knots, it takes 39 days to complete this distance.
2. The sailing distance Shanghai – Kirkenes via the NSR is 6,517 nautical miles. At an average speed of 13 knots, it takes 21 days to navigate this distance.
3. The travel time on an Arctic railway Kirkenes – Hamburg via the new Helsinki – Tallinn railway tunnel would be roughly two days, and would also contribute to significantly faster to the growing markets of Estonia, Latvia, Lithuania and Poland, which are en route.
4. In principle, the current railway network between China and Europe via Russia makes possible a transportation time of 15 days between Shanghai and Hamburg. However, there are large bottlenecks on the Russian railway network due to busy traffic, particularly in the east of the country. A comprehensive movement of Chinese cargo to Europe from ship to rail would maintain or boost this problem even if the railway network is expanded.

Assumptions in a strategic perspective of 2040

This vision has a perspective of 2040, and is based on the following factors being realized:

- Climatic conditions linked to opening the Northern Sea Route beyond the current 6–7 months, and that the activity at the Port of Kirkenes is on an annual basis
- Political and commercial agreement concerning the use of the route and that emergency preparedness and security is satisfactory
- Financing and investment costs for the construction of a port in Kirkenes and a railway line to Rovaniemi
- The Norwegian Government has started the planning of a new large scale “Barents Harbor” in Kirkenes. This new harbor in Kirkenes, with all the complementary functions and assets, must be developed to serve the both the short and long-term logistic opportunities in the Barents Region in order to serve the purpose of the Arctic Railroad vision
- Construction of a railway tunnel to the Baltic region will be a decisive factor to achieve the efficient transportation of goods to Germany. If the tunnel is not constructed, 60% of the goods to Scandinavia would amount to the same trigger volume.
This vision document results from work initiated in collaboration by Sør-Varanger Utvikling AS, Kirkenes Næringshage AS and Finnmark County Council in the autumn of 2017. The background was an initiative from the Finnish Minister of Transport and Communications, Anne Berner, in May of the same year, of the wish to take a closer look at the possibility of building a 550 km Arctic railway from Rovaniemi to Kirkenes. This was endorsed in October of the same year by the Norwegian Minister of Transport and Communications, Ketil Solvik-Olsen, who instructed the Norwegian National Railway Administration to work on this in collaboration with the Finnish Transport Agency.

Concluding remarks

As the attention and progress around the different railroad solutions increases, we also notice that there are elements that have not been handled in our “vision document”, and that the content of this document might be too comprehensive to engage parts of the general public. Due to this, we have made some clarifications. It has been said that The Norden Sea Route (NSR) is too shallow, making this fairway uneconomical for container shipping.

However, studies done at Jiao Tong University in Shanghai illustrate models where vessels carrying 4800 TEU on NSR can compete with vessels carrying 15 000 TEU through the Suez Canal. You will find more about this in on p. 20–22 in the vision report. Another important aspect is that The Ministry of Transport and Communications has decided to study the possibilities of establishing a strategic port within the “Norwegian core network” in Kirkenes. The study is handled by The Norwegian Public Roads Administration (NPRA) (Statens Vegvesen).

NPRA started their work in the summer of 2017, and is planned to be finished within the autumn of 2018. The NPPRA is engaging relevant consultancy companies right now, and they are connecting the road E6 and including a railroad terminal into their planning work. Several national companies have shown interest in use and development of the port. The vision document has not emphasized that Finnish Lapland experience a rapid growing interest from Chinese business actors. This growing interest is especially tailored towards the energy - and - and tourist industry. In addition, the Finns are planning to open a direct flight between Beijing and Rovaniemi during the spring of 2019. As an example of the growing interest in Lapland, the Arctic Business Yearbook 2017 – produced by the Lapland Chamber of Commerce and Industry, expect the Chinese actors to invest more than 2 billion EUR (about 220 million USD) in their region during the next five years.
Lastly, we were informed that a consultancy company argues that the NSR is unfeasible for container shipping due to low temperatures in the fairway. After contacting one of the leading shipping companies in Norway, with strong international networks and partners, can we ensure that there is no evidence or reason to claim this. Shipping along cold areas has been done around the world for quite a long period. The shipping companies know how to handle this professionally, and they use thermos containers for the relevant cargo. In addition, it is important to highlight that the shipping company explains that a total of 5% of the freight demands thermo solutions (cold and warm), and if this becomes a major problem at the NRS they will find other ways for this particular freight.

Altogether, the railroad and the longtail effects and spin-offs will enable our region to handle a sustainable, innovative and effective future. Therefore, if our decision makers to look into the future - and really want to have a leading hand on the development of Arctic - our vision document clearly illustrates the possibilities of connecting Asia and Europe through Kirkenes and Finland.

Basis for the vision

The Northern Sea Route (NSR) The NSR represents a significant reduction of the sailing distance between Southeast Asia and Europe compared to the current traffic through the Suez Canal. This route would be particularly favourable between the northern part of Northern Europe (from Germany and northwards) and the Asian countries China, South Korea and Japan, and can reduce the travel time by around 40% and the fuel consumption by 20%.

Russia and China's view of the NSR

As the dominant economic superpower and trading nation, China has shown a steadily increasing interest in the development in the Arctic. To date, much of this has been connected to research, but China has also invested heavily in Russian industrial and logistics projects in Western Siberia and the Arctic part of European Russia.

China and maritime container traffic

Seven of the world’s largest container ports measured on throughput are in China. In 2015, these ports handled a total of 150 million containers. If one works on the basis that, as an alternative container route between Asia and Europe, the NSR could
have greatest economic significance on stretches that offer a major difference in sailing distance and sailing time compared to using the Suez Canal. Consequently, ports along the coast of Germany and northwards are of primary interest in an assessment of the potential flow of goods through the NSR via Kirkenes.

**Container ships through the NSR**

Russia and China both wish to utilise the NSR for container cargo based on new ship designs. In 2015, the Federal Agency for Maritime and River Transport in Russia (RosMorRechFlot) approved a concept for an ice-strengthened container ship with a capacity of 3,000 standard containers developed by the Ukrainian Marine Engineering Bureau. In the same year, Jiang Nan Shipyard in Shanghai carried out a feasibility study of Arc-class container ships, and developed a design that can transport 4,000 containers along the NSR.

The work is continuing, and the ongoing efforts will involve several test sailings via the NSR and through the Suez Canal, but individual calculations show, for instance, that the cargo costs for 4,800 containers via NSR is comparable with 15,000 containers via the Suez Canal if the navigation season via the NSR is extended to 222 days (7.4 months).

Beijing Transport Research Institute is also working on a model for good transport on the NSR. The profitability of this model is reliant on factors such as the availability of accurate ice forecasts for the NSR, enabling the most efficient utilisation of the navigation season. Consequently, China is lobbying for the financing and construction of meteorological stations in the European Arctic.

However, with rising temperatures in the Arctic, less ice and increasingly longer navigation seasons on the NSR, the use of smaller conventional container ships on this route is being assessed. Researchers at Jiao Tong University in Shanghai are currently working on two complex models for comparative scenarios to calculate the profitability of container transport on the NSR vs Suez. This involves the use of container ships with a capacity of 4,800 containers with a low ice class via the NSR and varying vessel sizes via Suez, which is also based on variations in the length of the navigation season via the NSR, variations in the price of fuel and the need for icebreaking assistance, etc.
Container cargo between China and the northern part of Northern Europe via the NSR

Hamburg is the largest European port for Chinese goods. In 2016, 11 million tonnes and 1.55 million containers from China (including Hong Kong) were imported here, while the equivalent exports were 8 million tonnes and 996,000 containers. By way of comparison, the combined turnover of international traffic at all Norwegian ports from China in 2016 was 617,000 containers.

Based on a unit conversion factor of 9.2 tonnes of goods per container, we have estimated that the combined imports by container in 2016 from China to Germany, Finland, Sweden, Denmark and Norway – which in terms of distance have a favourable location to the NSR – were 2.26 million units. This equates to 6,200 twenty-foot equivalent units (TEU) per day.

If 10% of China’s export to Germany, Finland, Sweden, Denmark and Norway in 2016 was shipped via the NSR to the Port of Kirkenes for transloading to southbound rail transportation, this would constitute 1,018 containers per day – or a vessel with 4,800 containers every fifth day – within a 222-day sailing window. This would require eight south-bound trains per day to keep pace with the unloading.

Empty containers and export cargo would also be returned to China to maintain the directional balance. This traffic alone would generate around 16 freight trains carrying 1,900–2,000 containers per day through the Port of Kirkenes and on the stretch Kirkenes – Rovaniemi for a period of 7–8 months per year.

Container cargo between other Asian countries and the northern part of Northern Europe via the NSR

If one also adds the combined imports from the three Southeast Asian counties Taiwan, South Korea and Japan, which in 2016 totalled 4.2 million tonnes, this provides an additional volume of 424,000 tonnes – or 20% of the Chinese cargo volume. This converts to 46,087 containers via the NSR to Kirkenes, or one transport ship every third week during the shipping season.

The combined cargo from South Korea, Japan and Taiwan via the NSR to Kirkenes would generate 9.6 calls. This means a call every third week in addition to the container traffic from China. This traffic has the potential to increase through extended navigation seasons owing to rising temperatures in the Arctic, and as the maritime container traffic between Asia and Europe is growing by 4–5% per year.
By making use of the new Baltic railway to Germany, it would also be possible to achieve significant time savings in the transportation of goods to and from the growing markets of Estonia, Latvia, Lithuania and Poland. Based on the current figures, 10% of the combined imports to this market from China via NSR would constitute 37,000 containers or one freight train every day during the navigation season.

Other markets

There is potential for further growth in cargo traffic growth via the Port of Kirkenes and an Arctic railway via the NSR from other Asian trading partners, other parts of Northern Europe and to/from ports on the east coast of USA and Canada.

The NSR for Russian container cargo

The NSR also represents a potential for liner traffic of Russian fish in freezer containers from the far east of Russia to Murmansk and St. Petersburg. There is the potential for 137,000 containers per season or one sailing every second week. Such liner traffic can represent a cargo basis between the ports of Murmansk and Kirkenes.

The NSR as a prerequisite for an Arctic railway with Kirkenes as the hub

An Arctic railway from Rovaniemi to Kirkenes with a hub port on the Barents Sea would be reliant on liner traffic with containers to and from Asia through the Northern Sea Route (NSR) to generate a regular and sufficient flow of goods for a high proportion of the year.

Based on current figures, 10% of the combined exports by container from China, Taiwan, South Korea and Japan to the northern European countries of Germany, Denmark, Finland, Sweden and Norway would constitute 275,000 containers per year. This could generate more than 37,000 containers per month via the Port of Kirkenes during the 7.4 month-long navigation season. This would in turn generate 296 southbound goods trains with a length of 750 m per month – or approximately 10 such trains per day.

During a 7.4 month-long navigation season along the NSR, a terminal port in Kirkenes must have equivalent or greater capacity than the Port of Gothenburg. It could directly employ 600 or more people.
This vision document is based on 10% of the goods volume and container traffic between the countries concerned in 2016. However, with an expectation of strong growth in the container traffic between Southeast Asia and Europe, the suggested volume via the NSR would constitute just 3–4% of the combined container trade in 2040.

The basis for an Arctic railway

If an Arctic railway is going to be economically sustainable, it must have traffic that provides year-round activity at the railway line’s hub. Beyond the traffic via the NSR, which would be a cornerstone of the operation, there would be a need for other traffic in the period the NSR is closed to traffic.

In the longer term, the mining, timber and bio industries in Finnish Lapland may form an important element for year-round operation of an Arctic railway. The mineral potential is significant, while extensive development work with the production of biofuels is also underway.

In Finnmark County, the transport of farmed salmon and fish from the Barents Sea also represents a potential. The annual production of farmed salmon currently equates to 3,420 articulated lorries – or about 40 complete trains. The central freezer warehouse in Kirkenes receives between 14,000 and 18,000 tonnes of frozen fish annually, which equates to between 1,522 and 1,956 containers – or 10–15 complete trains. However, the potential for transport on the railway line is significantly greater, as a total of 131,000 tonnes of fish were landed in Finnmark County in 2016.

Furthermore, 50,000 tonnes of waste are transported annually by road from Finnmark County to Southern Norway or Sweden for processing. This amounts to 4,100–4,200 tonnes per month, which can be converted into around three complete train.

In 2017, the tourism industry in Finnish Lapland had 2.3 million guest nights, of which 1 million were foreign nationals. By the end of October 2017, the tourism industry in Finnmark County had 611,000 guest nights, of which 242,000 were foreign nationals.
The significance for the development of the Port of Kirkenes

A conservative estimate of goods, which includes return cargo for directional balance, shows that the Port of Kirkenes could receive an annual throughput of 550,000 containers linked to traffic via the NSR.

This is nearly three times the throughput at the Port of Oslo, which is Norway’s largest container port with 207,000 units in 2016. However, the volume amounts to 70% of the container traffic at the Port of Gothenburg, which is Scandinavia’s largest port.

For Kirkenes, we are talking about a container season of about 7.5 months, which gives a throughput of 74,000 containers per month. In comparison, the two other ports operate year-round and have an average monthly throughput of 17,250 containers (Oslo) and 66,500 containers (Gothenburg).

One can gain an indication of the scope by looking at the organisation of the ports of Oslo and Gothenburg. The Port of Oslo serves as a landlord and has an administration numbering around 100 employees. These cover staff functions and four departments: traffic, property, technical and urban development. The port functions as a landlord for all commercial activities in the port: terminals, railways, shipping agents, etc. Gothenburg port is organised in a similar manner, with 120 employees in the administration.

Neither Oslo nor Gothenburg may be compared directly with Kirkenes as both are also major cruise and passenger ports with almost 6 million travellers per year, and both offer a broad range of services. An economic impact report of the Port of Oslo indicates that it generates 3,000 jobs. However, we have comparable figures from the operation of Møller-Maersk’s APM Terminals at the Port of Gothenburg, which handles the container traffic there. The terminal has 440 employees, serving three container ships at the port daily and loading/unloading an average of more than 2,328 containers. They also load/unload 14 trains with 890 containers, in addition to 1,664 containers arriving/departing by articulated lorry.

For Kirkenes, port activity on such a scale would be significantly larger than the mining activity in the town up to the end of 2015, measured in terms of both direct employment and social impact.
Stricter environmental requirements for shipping in the Arctic

Requirements relating to the ban on heavy fuel oils in the Arctic will have an impact on shipping via the NSR. However, such fuel regulations currently applicable already have a major significance on shipping in the Baltic Sea and North Sea, forcing modifications and eventually other mechanical and fuel solutions for new ships. As such, it will not specifically affect future traffic on the NSR, but rather suggests that in the future all global shipping will have a stronger environmental profile.

The NSR vs the Suez Canal

The current low fuel prices and increased capacity on the Suez Canal have contributed to reducing the maritime industry’s interest in the NSR. However, these conditions may change through improved conditions, e.g. rising fuel prices, better emergency preparedness and a longer navigation season owing to climate change which has led to thinner ice and a longer ice-free season.

A warmer Arctic

A warmer Arctic can create to more favourable conditions for shipping by keeping the entire NSR open for an extended season and perhaps it may be ice-free as early as 2030. However, rising temperatures in the Arctic may lead to unfavourable developments such as significantly more drift ice and more unstable and volatile weather conditions, which combine to making the route more challenging to navigate.
## European High North Investments 2018–2025 (M€)

<table>
<thead>
<tr>
<th>Category</th>
<th>Lapland</th>
<th>Oulu Region</th>
<th>Kainuu</th>
<th>Norrbotten</th>
<th>Västerbotten</th>
<th>N Norway</th>
<th>Murmansk</th>
<th>Arkhangelsk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>2065</td>
<td>650</td>
<td>993</td>
<td>540</td>
<td>4006</td>
<td>380</td>
<td>1600</td>
<td>175</td>
<td>10409</td>
</tr>
<tr>
<td>Mining industry</td>
<td>1030</td>
<td>0</td>
<td>240</td>
<td>200</td>
<td>0</td>
<td>420</td>
<td>815</td>
<td>1050</td>
<td>3755</td>
</tr>
<tr>
<td>Oil and gas</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10400</td>
<td>0</td>
<td>0</td>
<td>10400</td>
</tr>
<tr>
<td>Hydro power</td>
<td>190</td>
<td>350</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>425</td>
<td>0</td>
<td>0</td>
<td>965</td>
</tr>
<tr>
<td>Wind Power</td>
<td>576</td>
<td>3000</td>
<td>780</td>
<td>800</td>
<td>1740</td>
<td>3950</td>
<td>0</td>
<td>0</td>
<td>10846</td>
</tr>
<tr>
<td>Nuclear power</td>
<td>0</td>
<td>7000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7000</td>
</tr>
<tr>
<td>Bio power</td>
<td>0</td>
<td>410</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>700</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Energy transfer</td>
<td>600</td>
<td>150</td>
<td>0</td>
<td>270</td>
<td>100</td>
<td>2670</td>
<td>0</td>
<td>0</td>
<td>3790</td>
</tr>
<tr>
<td>Trade</td>
<td>100</td>
<td>655</td>
<td>0</td>
<td>220</td>
<td>0</td>
<td>630</td>
<td>0</td>
<td>0</td>
<td>1605</td>
</tr>
<tr>
<td>Tourism</td>
<td>2122</td>
<td>300</td>
<td>180</td>
<td>70</td>
<td>80</td>
<td>200</td>
<td>0</td>
<td>0</td>
<td>2952</td>
</tr>
<tr>
<td>Transport infrastructure</td>
<td>1122</td>
<td>716</td>
<td>0</td>
<td>2471</td>
<td>1840</td>
<td>4240</td>
<td>3650</td>
<td>4500</td>
<td>18539</td>
</tr>
<tr>
<td>Public investments</td>
<td>200</td>
<td>500</td>
<td>135</td>
<td>60</td>
<td>40</td>
<td>4270</td>
<td>0</td>
<td>0</td>
<td>5205</td>
</tr>
<tr>
<td></td>
<td>8005</td>
<td>13731</td>
<td>2328</td>
<td>4631</td>
<td>7806</td>
<td>27585</td>
<td>6065</td>
<td>6425</td>
<td>76576</td>
</tr>
<tr>
<td>Region</td>
<td>2017</td>
<td>2020</td>
<td>2025</td>
<td>2030</td>
<td>2040</td>
<td>2050</td>
<td>2060</td>
<td>2070</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Arctic</td>
<td>0</td>
<td>0</td>
<td>1000</td>
<td>2000</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N Norway</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Oulu R</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Norrbotten</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Lappland</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Murmansk</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Västerbotten</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Kainuu R</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Oil and gas</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mining industry</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Trade</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Nuclear power</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Tourism</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Transport infrastucture</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Public investments</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

European High North Investments after 2025 (M€)
## European High North Investment Potential 2018 (M€)

<table>
<thead>
<tr>
<th>Region</th>
<th>2018–25</th>
<th>After 2025</th>
<th>Total:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lapland</td>
<td>8005</td>
<td>8019</td>
<td>16024</td>
</tr>
<tr>
<td>Oulu Region</td>
<td>13731</td>
<td>5155</td>
<td>18886</td>
</tr>
<tr>
<td>Kainuu Region</td>
<td>2328</td>
<td>416</td>
<td>2744</td>
</tr>
<tr>
<td>Norrbotten</td>
<td>4631</td>
<td>12620</td>
<td>17251</td>
</tr>
<tr>
<td>Västerbotten</td>
<td>7806</td>
<td>2390</td>
<td>10196</td>
</tr>
<tr>
<td>North Norway</td>
<td>27585</td>
<td>32500</td>
<td>60085</td>
</tr>
<tr>
<td>Murmansk Region</td>
<td>6065</td>
<td>17470</td>
<td>23535</td>
</tr>
<tr>
<td>Arkhangelsk Region</td>
<td>6675</td>
<td>6600</td>
<td>13275</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>76826</strong></td>
<td><strong>85170</strong></td>
<td><strong>161996</strong></td>
</tr>
</tbody>
</table>
3.1 LAPLAND

ARCTIC OCEAN

- Airport
- Harbour
- Railway

Locations:
- Narvik
- Nordkapp
- Hammerfest
- Tromsø
- Alta
- Vadsø
- Enontekiö
- Ivalo
- Kirkenes
- Severomorsk
- Murmansk
- Monchegorsk
- Apatity
- Bobø
- Kittilä
- Rovaniemi
- Kemi
- Kuusamo
- Belomorsk
- Arkhangelsk
- Severodvinsk
- Luleå
- Umeå
- Oulu
- Kajaani
- Finland
- Russia
- Norway
- Sweden
- Finland
- Russia
- Norway
- Sweden
Lapland is the northernmost county of Finland with about 183,000 inhabitants. About 4,500 of inhabitants are indigenous Sami people. The total area of the county is 99,000 km², which equals to 30% of the whole of Finland. Lapland is sharing borders with Sweden, Norway and Russia, altogether 1,642 km. There are two international border crossings to Russia, six to Sweden and six to Norway.

The six subregions of Kemi-Tornio, East Lapland, the Valley of Tornio, Northern Lapland, the Region of Rovaniemi and Fell Lapland form the region of Lapland.

Rovaniemi is the administrative capital of Lapland with appr. 60,900 inhabitants. The other cities in Lapland are Kemi appr. 22,300 inhabitants, Tornio appr. 22,500 inhabitants and Kemijärvi appr. 8,100 inhabitants.

Business in Lapland

Clean nature and abundant natural resources provide a unique, solid foundation for the business sector in Lapland. The cornerstones of the region’s economy are forest industry, metal industry, mining industry, forestry and tourism. The energy sector, too, will play an increasingly important role in the economy in future.

Economic uncertainty caused by global financial crisis and continuing poor demand in export industry has reflected in the economic development of Lapland. The decline in international demand has had a negative impact especially in the export industry and building sector. Economic growth of Lapland has, however, been more positive than the national level growth. The strong growth in tourism and mining industry have affected also to other branches of business, like trade and business to business services.

The total turnover of the all companies in Lapland has climbed 4% over the year 2008 level, when the financial crisis started. The export from Lapland has reached also the level of 2008. Business to Business services have made biggest growth compared with the 2008 level. Growth is more than 15%. Other growing branches of business are transport and logistics (growth 14%), tourism (growth 13%) and trade (growth 12%). Industry is still about 6% behind the year 2008 level with building and construction (-4%). Compared with other Finnish regions the development of Lapland has been almost unique.
Key economic figures of Lapland:

- Population 182,800
- Jobs 73,300
- Total amount of companies 10,400
- Total turnover of all companies 10 bln. €
- Value of industrial export 3.291 bln. € (No. 7 of regions in Finland)

Industry is the most important branch of business in Lapland. Total turnover of industry is 4.7 bln€ and it has about 8,000 employees. Number two business is trade with turnover of more than 2 bln€ and over 6,000 employees. Building sector is number three with 800 m€ turnover and over 4000 employees. Then is transport and logistics with 500 m€ turnover and almost 4000 employees. Tourism is next with 400 m€ turnover and 3,700 employees. Mining is smaller with 300 m€ turnover and 1,200 employees, but after recent openings of two mines and one mine expansion the numbers were rapidly rising until raw material demand decreased and price level fell down.

The industrial strategy of Lapland provides guidelines for securing industrial growth and internationalization, developing the operating environment and targeting public aid measures. The strategy assesses development prospects in the industrial sector over a long-time span until 2030 and sets short and medium term objectives for promoting growth.

The prospects for development in Lapland

This page summarizes the current situation and development prospects of Lapland’s business environment by 2025.

Changes in the livelihood structure of Lapland have been great. In industry, the share of service business as an employer has grown. Also, in the change in public sector service production, the share of private service providers continues to grow, so new jobs are mainly created for companies. In 2016, Lapland’s net sales declined and net sales of all other industries grew and the total number of personnel fell slightly. Lapland has a strong export-driven large industry that enables growth in other businesses as well. Growing sectors include mining and industry, tourism and services. In the short term, there are many uncertainties in economic development. In the longer term, towards the year 2025, Lapland’s business and economy are expected to develop favorably, owing to the positive outlook for both Lapland and neighboring areas.
The continuous and rapid change in the international economy, as well as the demands for innovation and competence still pose challenges for the operations, growth and internationalization of Lapland’s businesses. The importance of natural raw materials will increase with the creation of new SMEs. Partnerships globally, especially with the northern best partners, in innovation, subcontracting and subcontracting, production, sales and marketing, as well as financing and capitalization play a decisive role in the development of business competitiveness. Lapland companies have gained new business opportunities for international markets, for example, Asia. The US market also shows some signs of growth. Especially as a tourist destination Lapland’s attractiveness is growing.

Increasing labor demand is reflected in the decline in unemployment in Lapland. Stronger than the number of employed people, this is also reflected in the development of the employment rate. As a result of the positive development prospects of the business sector and the elimination of labor, labor demand is expected to continue to be brisk, with a positive reflection on the employment and unemployment trends in the next few years and in the longer term towards the year 2025.

Functionality of the labor market and availability of skilled labor

Problems with the functioning of the labor market appear as recruitment problems and labor supply problems. On the other hand, in some professions, there is considerable oversupply in Lapland. The skills requirements of the workforce have changed and job seekers’ knowledge does not always meet the requirements of the workplace. Increasing labor demand, structural changes in the labor market, and changing and expanding knowledge needs will increase the challenges for labor supply.

The economic potential of the area, such as energy resources and potential new routes to open up, emphasize its strategic importance. The transition of the global economy to Asia will change the status of the region. Increasing interest in more and more countries is growing in the Arctic region’s opportunities and the growing importance of the region. Lapland’s advanced intelligent specialization strategy, Arctic Smartness, has been noted in the European Commission and in other European regions, and as a result, interest in the region has increased considerably. A new type of networking provides opportunities to participate more actively in international project consortia and thereby increase European funding for development projects in the region.
Population decline has continued in Lapland in recent years, with the exception of a few individual municipalities. The 187,000 target for the 2017 Lapland Treaty requires strong growth in business life. The number of foreign-based people has increased annually, but the share of other countries is clearly lower. The number of people over the age of 65 will increase by just under one fifth by 2020.

Younger age groups are clearly more educated than older age groups and the educational level of the population continues to rise. The level of education of immigrants will in future affect the average level of education. It is a worrying fact that only about 17% of people aged 20–24 are still in school, only 17.9% of men in Lapland and 15.2% of women. Particular attention should be paid to the acquisition of training for men.

In some respects, the health status and social welfare of the population in Lapland are worse than in the whole country. However, there is positive development in the economic situation of young and families with children. Health and social well-being are influenced by many factors, exclusion. To reduce welfare and health inequalities, it is important that, for example, social and health services are equally accessible and accessible to all and that efforts are made to promote preventative services and the promotion of wellbeing and health.

Increasing immigration is a chance and a challenge for Lapland. The number of working-age population will increase and the dependency ratio will improve as entrants will be integrated and employed. Immigrants enliven and diversify their business life and bring new innovations and internationality. It is important to invest in smooth reception, high-quality integration, education and employment services and an open atmosphere to make newcomers become permanent Lappish people. Responding to the challenges of integration requires closer cooperation between the authorities, the organization field and the business community.

University of Lapland carries out a joint Lapland University Program Innovation Program 2014–2020 in its research and development activities. During the current funding period, the internationalization of research and development activities at Lapland universities will be strengthened and the importance of funding from outside the region will be emphasized. Cooperation between the different R & D actors in the region will be further intensified.
Lapland’s transport system largely corresponds to the present needs of the region, but long distances increase the logistics costs. The deterioration of the road may impair the precision of transport. Possible realization of bio-economics projects in Kemi and Kemijärvi require improvement of the road condition. New rail links are needed for the needs of mining and tourism. The opening of the northeastern fairway for international maritime transport is prepared by examining the location of the Arctic Ocean. Aging and concentration of the population and the reduction of funding will reduce public transport links, especially in rural areas, but access to airport and railway stations is to be arranged.

3.1.1 Top Investments Projects in Lapland 2018–2025

1. Boreal Bioref Oy, Kemijärvi biorefinery

The total value of the biorefinery investment is EUR 950 million, with a repayment period of less than ten years. According to the current timetable, the investment decision is set to be made by the beginning of 2018, and the refinery is intended to be constructed during 2018–19. The refinery is envisaged to start operations in early 2020.

Prior to construction, the following will need to have been completed during 2017:
- detailed technical designs;
- environmental and water permits;
- building permits;
- procurement documents;
- agreements;
- EIA (Environmental Impact Assessment);
- chemical permits; and
- REACH permits.
Pre-existing infrastructure, functional logistics

The groundwork for the refinery is solid:
- Local and regional plans are being prepared for a new production plant in the area. An electrified railway line will reach the industrial area, and a new timber terminal will be located on site.
- The water supply is guaranteed. The longest river in Finland, Kemijoki, flows past the refinery.
- The harbours in Lapland remain open around the year.
- Passenger rail transport is functional, with a direct rail connection in modern sleeping cars from Kemijärvi to Helsinki.
- The closest airport is located in Rovaniemi, less than an hour’s drive from Kemijärvi.

Competitive know-how guarantees success

In 2012, the combined turnover of Finnish cleantech companies grew 15%, while globally, the industry grew less than 10%. Finland’s share of the GDP of the entire world is around 0.4%, but its share of the cleantech market is over 1%. In a comparison by the Eco Innovation Observatory, Finland is the best eco innovation country of the EU member states.

Wood supply is plentiful and close by

For this reason, the production is reliable and cost-effective.
- The number of trees in Lapland has increased by a factor of 1.5 and growth by a factor of 1.9 compared with the 1970s.
- 13 million cubic meters of wood grow annually in Lapland. The biorefinery will need around 2.8 million cubic meters.
- In total, the sawmill and glulam plant located in the same industrial area and the other sawmills in the vicinity produce wood chips suitable for use as raw material in the biorefinery to the amount of over 500,000 loose cubic meters.
A demand-centric production strategy

The bio-refinery produces both a flexible and steady flow of basic pulp products in high demand and an attractive arrange of innovative special products.

The single-line bio-refinery produces three different kinds of cellulose: bleach kraft softwood pulp, dissolving pulp and microcrystalline cellulose (MCC). Their individual production process can be flexibly adjusted in line with prevailing product demand, thus enabling the biorefinery to maximise production yields.

Alignment with the government’s long-term growth priorities

The government has selected bio-economy as a key foundation for Finland’s long-term success by 2025. In line with this strategy, the Finnish state is supportive of the bio-refinery project in Kemijärvi.

An ethical investment

Investing in the bio-refinery will promote the sustainable development and use of new technologies.

- The wood raw materials are produced in a sustainable and regulated manner. The designed production capacity and wood sourcing carefully take into account nature conservation and sustainable development, the interests of the forest owners and the traditional livelihood in the region, reindeer husbandry.
- It reduces the need to harvest timber from valuable old forests. The bio-refinery brings younger forests into more efficient use. This also enables the profitable harvesting of timber from such areas.
- Significant synergies with the regional saw industry, as it provides a reliable and efficient use of the excess wood chips.
- Works under the BAT principle and saves natural resources through circular economy. Refines waste into biogas that can be used, for example, in the raw material transports for the refinery.
Kemijärvi is a suitable location for a bio-refinery for several reasons:

- **Pre-existing infrastructure, functional logistics.** There are industrial activities in the area, and the site is to be designated for a production plant in the local plan. The facilities will also benefit from an on-site timber terminal and an electrified railway line.
- **Gauranteed water supply.** The longest river in Finland, Kemijoki, flows past the refinery.
- **Wood supply is plentiful and close by.** Only four million cubic meters of the annual growth of Lapland’s forests (13 million $\text{m}^3$/year) are utilized. The bio-refinery needs 2.8 million $\text{m}^3$/year. In total, the sawmill and glulam plant located in the same industrial area and other sawmills produce by-products suitable for use as raw material in the biorefinery to the amount of over 500,000 m$^3$ per year.
- **Availability of competence and partners.** Kemijärvi has a strong industrial tradition. Thanks to the former pulp mill and a vigorous wood refining industry, a competent workforce is available, and there is a pre-existing network of companies in the area, for example in wood sourcing.

**Adhering to BAT principles minimises the environmental impact**

At the Kemijärvi biorefinery, outdated technologies have been replaced with cleantech solutions, that follow BAT principles (Best Available Technology). This enables industrial production with a minimal environmental footprint. This contributes to reducing the overall pressures on our natural resources.

**Circular economy saves natural resources**

The refinery operates within a circular economy and everything that is possible to recycle is done so, either within the refinery’s own production process, or through external partners.

In addition to traditional bleached softwood kraft pulp, the single-line bio-refinery is also designed to produce other top-grade products, such as dissolving pulp and sugars from side streams. These sugars can ultimately be used to replace fossil plastics and cotton in an environmentally friendly and renewable manner. However, the production of these materials also consumes a great deal of water, and this is why the water conservation and management aspects of the operations need to be highly prioritized. Whilst, a fully closed water circulation process is not yet possible, the exhaust water will be treated using the latest know-how in environmental technologies, which put the bio-refinery in a class of its own in terms of water management.
In the spirit of recycling, the biorefinery also refines its waste and sludge into valuable products. Wastes is refined into biogas, which, for example, can be used in raw material logistics to the bio-refinery, etc. The sludge is converted into soil conditioner that can be applied in the more actively managed regional forests.

Finally, the production processes are also more than self-sufficient in terms of energy, as it produces substantially more electricity and heat than it requires. This surplus energy is converted into electricity, that is sold to the regional grid.

500,000 tons of bio-materials and bio-chemicals per year. Thanks to the single-line production design of the envisaged bio-refinery, the output mix of products can be flexibly adjusted to appropriately reflect market demand conditions at any given point in time.

As such, the bio-refinery will manufacture both basic established products, that are in high demand, as well as more innovative and higher margin specialist products. These products include:

**Traditional products**
- Dissolving pulp
- Long fibre market pulp
- Electricity

**Innovative products**
- Microcrystalline cellulose, MCC
- C5- and C6 sugars
- Pine oil and turpentine
- Bioenergy
- Soil improvement substances

Natural and sustainable yield enhancements from our forests

**Forests require thinning**

The annual growth in Lapland is 13 million cubic meters, and this growth trend continues to increase. Today, more than half of this growth remains unutilized. In the future, we face the danger of losing large amounts of timber, as forests in Lapland grow ever denser.
In forests that have been let to grow too dense, the trees don’t gain sufficient width and their crowns remain reduced in size. In the result, the total green mass of such forest will never reach their potential. The vitality and resilience of such forests gradually weakens, resulting in trees that grow and gain bulk more slowly than in well managed forests.

Thanks to the envisaged biorefinery, thinning wood finds its user. Annually, the biorefinery will utilize 2.8 million cubic meters of thinning wood and wood chips as raw material.

**Increased forest diversity**

The biorefinery uses local, sustainably produced pine as its raw material. The pine is thinned from young forests. This encourages bio-diversity in the forests, where trees of different ages and species grow side-by-side. This avoids fields of pines, and as a result there is a natural forest scenery.

An actively managed and thinned forest also binds more carbon, thanks to its higher grow rate.

**Reduces the need to cut old forests**

Timber is felled from mature forests, because it has not proven profitable to utilize fiberwood stands marked for cutting. The bio-refinery is able to take these stands marked for cutting into use. At the same time as fiberwood is harvested from these stands for the biorefinery, timber can also be harvested for e.g. regional saw mills. This avoids the harvesting of only mature forests.

**More lichen stands for reindeer**

The biorefinery’s wood harvesting methods favors lichen pastures:

- Moves timber harvesting to young thinning stands. Forests growing mature tree lichen are saved.
- In barren lichen-growing boreal forests, thinning increases the amount of light, which in turn, enhances lichen growth. The surface area of lichen-growing ground increases, thereby producing greater overall yields.
EPC Contract

In conjunction with the Chinese presidential visit to Finland, China CAMC Engineering Co., Ltd. (CAMCE) and Boreal Bioref Oy have signed a mutually binding EPC contract (engineering, procurement, construction).

In conjunction with the Chinese presidential visit to Finland, China CAMC Engineering Co., Ltd. (CAMCE) and Boreal Bioref Oy signed a mutually binding EPC contract (engineering, procurement, construction). In accordance with the EPC contract, CAMCE will assume responsibility for delivering a turn-key solution for the envisaged biorefinery. The agreement represents a material mutual commitment to each other, as well as to the realization of the biorefinery investment.

Furthermore, Boreal Bioref and CAMCE have agreed that CAMCE shall become a shareholder in Boreal Bioref Ltd. According to the shareholders’ agreement, Boreal Bioref will retain a majority control until the preconditions of the works in the EPC contract are met. The agreed seed-, or bridge financing ensures the seamless continuation of the planning works. The investment related agreement has also been signed by Silvi Industries AB, which is CAMCE’s partner company.

A third agreement has been signed by CAMCE, Boreal Bioref and the China Development Bank (CDB). The agreement covers the financing of the biorefinery in Kemijärvi and the agreement sets out the targets of the parties with respect to the financing of the investment and its associated arrangements.

Boreal Bioref Oy (“Boreal Bioref”) has completed the preparatory work on which the investment decision for the 500 000 tons biorefinery planned to Kemijärvi can be made. Technical design, comprehensive feasibility study and significant commercial wood procurement agreements have been completed.

The Shenyang Investment Management Co., Ltd., Shenying International Holding Co., Ltd. (jointly owned by ShanYing), and Boreal Bioref, have signed a detailed investment target agreement that Shanying will become majority shareholder in Boreal Bioref Oy, pulp and other organic products buyer and operational partner.

Boreal Bioref has been negotiating with Shanying since November 2017 and the companies have organized mutual consultation, visits and production visits both in Kemijärvi and in China. Negotiations have been conducted in close cooperation with
Boreal Bioref’s strategic partner and EPC provider China CAMC Engineering Co., Ltd. (“CAMCE”). CAMCE and Boreal Bioref are pleased to welcome both Shenying as a biorefinery project, and the companies are now working closely together to meet the timetable goal and start building construction work.

The planned majority ownership of Shanying Boreal Bioref will be made after the completion of binding agreements with the combination of both direct and indirect share ownership, alongside CAMCE. In addition to the Kemijärvi bioreaction project, CAMCE and Shanying will continue to explore the development potential of other cooperative companies around the world.

The construction of a building site requires a positive environmental permit decision and all permits granted by all financing agreements and the related Chinese authorities. According to the plan, construction works will commence in the summer of this year and, according to schedule, the biorefinery will be completed by the end of 2020. Boreal Bioref submitted an environmental permit application to the Regional Authority of Northern Finland (PsAVI) at the end of August 2017. The city council of Kemijärvi approved the town plan for the industrial area on March 5, 2018. Shanying is a major international paper company and the third largest domestic paper and board producer. The company mainly focuses on the production of kraft paper, board, high quality corrugated paper, offset papers and other paper grades. Listed Shanghai’s Shanying roots are in East China, but their activity has grown in recent years in the provinces of Central and South China. In addition to China, the company also owns companies, Europe, USA, Japan and the Nordic countries. The company has long and active relationships with the Finnish pulp and paper machine industry and by the end of last year Shanying acquired the Swedish Nordic Paper company, which is the leading manufacturer of specialty pulp paper. Today, Shanying’s annual output is over three million tons of paper and one billion square feet of board and board.

Boreal Bioref is a Finnish bio-economics company that designs and builds a modern biorefinery for Kemijärvi. The company’s production is extensive, including cellulose, slurry, microcrystalline cellulose, tall oil, ethanol, bioenergy (electricity and heat), biogas, soil improvers and wood-based sugars (C5 and C6). The company uses 2.8 million cubic meters of wood annually, of which about 0.4 million cubic meters of chips are delivered from sawmills located in the area. The annual production volume is 500,000 tons. China is Finland’s largest export partner for market pulp and cooperation with Shanying ensures Boreal Bioref’s successful entry into this important pulp market.
2. Lapland Hotels Oy Rovaniemi Valionranta

Lapland Hotels Oy is planning to construct the Rovaniemi congress center in three stages. In the Valionranta area, a 250-room hotel, a wellness spa area and outdoor recreation areas such as an open-air swimming pool would be made. Construction begins one year after the city plan has been confirmed.

In the second phase, congress facilities and 50–100 holiday apartments will be built and residential construction will begin. The next phase begins 2–3 years after the first phase is completed. In the third phase, 0–50 holiday apartments will be built and residential construction will continue. The third stage begins 2–3 years after the completion of the previous phase.

The Rovaniemi City Council unanimously approved the application of Lapland Hotels on Monday to combine the southern and northern formula area of Valionranta. In the northern layout area, residential dwellings resulting from the town plan will be handed over to Lapland Hotels, when the building permit for a hotel or part of a hotel containing approximately one thousand people has been legally valid.

Lapland Hotels plans to build a riverside hotel, apartment complex, congress center and apartments. The project is to be implemented in three phases. Firstly, a 250–350 room hotel and a wellness spa area would be built, including outdoor areas with an open-air swimming pool. In the second phase, congress facilities would be implemented and a housing estates and housing would be initiated. In the third phase, the apartment complex and housing construction would continue.

The town plan for Valionranta is planned to be completed and the city council will be treated after about one year (Source: Lapin Kansa)

3. Mine expansion projects in Lapland

Outokumpu Oy Kemi Mine

Outokumpu’s site in Tornio is the most integrated stainless steel mill in the world: the same production site includes melt shop, hot rolling mill, cold rolling mill and even ferrochrome smelter as the source of one of the essential raw materials, chromium. The most significant raw material is recycled steel, and the recycled content in the ready-made products is in average more than 80 %. The production site has its own harbor from which products are delivered to the markets and raw materials delivered to the site.
Tornio site covers more than 600 hectares and employs some 2,150 stainless steel professionals. In addition, some 300 people employed by subcontractors and business partners work daily in the production site. Kemi mine is located close to the Tornio stainless steel mill. The mine guarantees access to the most important raw material of stainless steel, chromium that makes steel stainless, for long in the future. Kemi mine produces chromite concentrate and raw material for the ferrochrome works in nearby Tornio.

Proved mineral reserves of the mine total approximately 33 million tons and after studies in 2012, the quantity of mineral resources, estimated to a depth of one kilometer, totals now some 105 million tons.

Outokumpu has awarded Pöyry with the detail engineering, project and site services assignment for the expansion project of the Kemi mine. In this €250 million investment, Outokumpu's Kemi mine will be deepened from the current 500 m level to 1,000 m to ensure continued ore supply for the future. The investment enables Outokumpu to maintain the current level of chromite production capacity of about 2.7 Mt per year also in the coming decades.

The assignment includes all basic and detailed engineering services for process, mechanical, layout, civil, structural, process electrification, ICT, automation, instrumentation, HVAC, ventilation and building electrification design disciplines as well as rock mechanics and rock engineering. Procurement support, project management and control services, site supervision and commissioning support are also included in the scope. The project is being carried out between 2017 and 2020.

**Agnico Eagle Kittilä Mine**

Mining company Agnico Eagle Finland announced an expansion investment at its Kittilä gold mine of approximately 160 million euros. A 1,044-meter-deep shaft will be built in the mine. At the same time, the processing plant's processing capacity will be raised from the current 1.6 million tons per annum to 2.0 million tons per annum.

The project is expected to start in the spring this year, will be phased in over four years and is expected to result in a 50,000 to 70,000-ounce annual increase in gold production at reduced operating costs beginning in 2021.
The mine’s proven and probable mineral reserves total 26.9 million tons of ore grading 4.64 g/t gold, containing approximately 4.1 million ounces of gold. According to the current estimates, the mine will continue its operations till 2034.

**Boliden Kevitsa Mine**

The Kevitsa open-pit mine in northern Finland was acquired by Boliden in June 2016. The operation, which comprises a mine and a concentrator, went into operation in 2012. The ore concentrates are supplied to our own smelting plant in Harjavalta and to external customers. The Kevitsa deposit – first discovered in 1987 – is one of the largest ever mineral discoveries in Finland. Currently, Kevitsa has 380 employees, who work together with around 200 contractors.

Boliden has decided to expand the Kevitsa copper-nickel mine and Harjavalta copper-nickel smelter. In total, EUR 125 m will be invested until 2020. Boliden invests EUR 80 m in increasing production at Kevitsa from 7.5 to 9.5 M tons per year from 2021. The investment includes a new autogenous mill and peripheral equipment, and a new mill building. The investments will be commenced in 2018 and full production will be achieved in the first quarter of 2021.

"Now that the integration of Kevitsa has been completed, it’s time to take the next step. We have substantial Mineral Resources and high grades, but the concentrator’s grinding capacity is limiting production. Today’s decision is an important step towards maximizing the value of Kevitsa," says Mikael Staffas, President Boliden Mines.
### 3.1.2 Investments in Lapland 2018–2025

#### Industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kemi-Tornio region industry maintenance projects 30 m€/year</td>
<td>210 m€</td>
</tr>
<tr>
<td>Kaidi Finland Oy, Kemi bio fuel plant</td>
<td>900 m€</td>
</tr>
<tr>
<td>Boreal Bioref Oy, Kemijärvi biorefinery</td>
<td>950 m€</td>
</tr>
<tr>
<td>Rakennusvarma Oy, Kemi, wood panel factory</td>
<td>5 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>2.065 bn€</td>
</tr>
</tbody>
</table>

#### Mining industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospecting and exploration 60 m€/year</td>
<td>420 m€</td>
</tr>
<tr>
<td>Outokumpu Oyj, Kemi chromium mine expansion</td>
<td>250 m€</td>
</tr>
<tr>
<td>Agnico Eagle Oy Kittilä gold mine expansion</td>
<td>160 m€</td>
</tr>
<tr>
<td>Boliden Kevitsa mine expansion</td>
<td>80 m€</td>
</tr>
<tr>
<td>Boliden Kevitsa, new buildings</td>
<td>50 m€</td>
</tr>
<tr>
<td>Boliden Kevitsa, tailings storing</td>
<td>20 m€</td>
</tr>
<tr>
<td>Rupert Resources Pahtavaara gold mine reopening</td>
<td>50 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>1.030 bn€</td>
</tr>
</tbody>
</table>

#### Hydro Power

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kemijoki Oy, Sierilä power plant</td>
<td>130 m€</td>
</tr>
<tr>
<td>Kemijoki river salmon ladder projects</td>
<td>60 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>190 m€</td>
</tr>
</tbody>
</table>

#### Wind power

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salla wind park projects</td>
<td>48 m€</td>
</tr>
<tr>
<td>Kemijärvi wind parks</td>
<td>90 m€</td>
</tr>
<tr>
<td>Posio wind parks</td>
<td>144 m€</td>
</tr>
<tr>
<td>Pello wind projects</td>
<td>102 m€</td>
</tr>
<tr>
<td>Ylitornio projects</td>
<td>90 m€</td>
</tr>
<tr>
<td>Tervola projects</td>
<td>60 m€</td>
</tr>
<tr>
<td>Rovaniemi Kuusiselkä wind park</td>
<td>42 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>576 m€</td>
</tr>
</tbody>
</table>
### Energy transfer networks

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyhäselkä-Keminmaa, connection to Sweden</td>
<td>200 m€</td>
</tr>
<tr>
<td>Lapland – Finnmark new grid line</td>
<td>400 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>600 m€</strong></td>
</tr>
</tbody>
</table>

### Trade investments

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rovaniemi Southern Center</td>
<td>50 m€</td>
</tr>
<tr>
<td>Kemi-Tornio projects</td>
<td>50 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>100 m€</strong></td>
</tr>
</tbody>
</table>

### Tourism

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kakslauttanen Arctic Resort Oy, Utsjoki</td>
<td>30 m€</td>
</tr>
<tr>
<td>Mustaparta Grand Hotel, Tornio</td>
<td>15 m€</td>
</tr>
<tr>
<td>Merihoivi, Kemi</td>
<td>40 m€</td>
</tr>
<tr>
<td>Lapland Hotels Oy, Rovaniemen Valionranta 1–2</td>
<td>100 m€</td>
</tr>
<tr>
<td>Senaatti kiinteistöt Oy, Rovaniemi hotel</td>
<td>25 m€</td>
</tr>
<tr>
<td>Lapland Hotels Oy, Pallas</td>
<td>20 m€</td>
</tr>
<tr>
<td>Santa´s Hotels, Rovaniemi, expansion</td>
<td>30 m€</td>
</tr>
<tr>
<td>City Hotel Rovaniemi, expansion</td>
<td>10 m€</td>
</tr>
<tr>
<td>Levi Summit/Panorama expansion</td>
<td>250 m€</td>
</tr>
<tr>
<td>Laatumaa/Ylläs new resort</td>
<td>600 m€</td>
</tr>
<tr>
<td>Saariselkä resort expansion plan</td>
<td>400 m€</td>
</tr>
<tr>
<td>Christmas Land, Rovaniemi</td>
<td>100 m€</td>
</tr>
<tr>
<td>Hansaman Hotels Oy, Rovaniemi and Saariselkä</td>
<td>80 m€</td>
</tr>
<tr>
<td>Noitatunturi Oy, Pyhätunturi</td>
<td>20 m€</td>
</tr>
<tr>
<td>Toranda Kalevala Park, Tornio</td>
<td>10 m€</td>
</tr>
<tr>
<td>Nordic Choice Hotel, Tornio</td>
<td>20 m€</td>
</tr>
<tr>
<td>Santa Park Cave hotel</td>
<td>12 m€</td>
</tr>
<tr>
<td>Permanent Snow Castle, Kemi</td>
<td>10 m€</td>
</tr>
<tr>
<td>Small hotel etc projects 50 m€/year</td>
<td>350 m€</td>
</tr>
<tr>
<td><strong>Yhteensä:</strong></td>
<td><strong>2.122 mrd€</strong></td>
</tr>
</tbody>
</table>
### Transport infrastructure

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT 4 Kemi-Pohjois-li</td>
<td>91</td>
</tr>
<tr>
<td>VT 4 Rovaniemi southern highway</td>
<td>50</td>
</tr>
<tr>
<td>Kemi Ajos deep sea port</td>
<td>30</td>
</tr>
<tr>
<td>Laurila-Tornio railway electrification</td>
<td>20</td>
</tr>
<tr>
<td>Sevetti road reconstruction</td>
<td>15</td>
</tr>
<tr>
<td>Nellim road reconstruction</td>
<td>10</td>
</tr>
<tr>
<td>Kolari-Kilpisjärvi road reconstruction</td>
<td>160</td>
</tr>
<tr>
<td>Rovaniemi – Sodankylä railway</td>
<td>325</td>
</tr>
<tr>
<td>Kemijärvi bio product plant roads etc</td>
<td>210</td>
</tr>
<tr>
<td>Kaidi project roads, Kemi</td>
<td>81</td>
</tr>
<tr>
<td>Arctic Railway Rovaniemi–Kirkenes planning</td>
<td>50</td>
</tr>
<tr>
<td>Rovaniemi Airport expansion</td>
<td>50</td>
</tr>
<tr>
<td>Other Lapland airport expansions</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1122 m€</strong></td>
</tr>
</tbody>
</table>

### Public investments

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lapland Central Hospital expansion</td>
<td>150</td>
</tr>
<tr>
<td>Other public, swimming halls, etc</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>200 m€</strong></td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>8.005 bn€</strong></td>
</tr>
</tbody>
</table>

### Investments after 2025

#### Mining industry

<table>
<thead>
<tr>
<th>Company Description</th>
<th>Cost (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yara Suomi Oy, Sokli mine, Savukoski</td>
<td>1,0</td>
</tr>
<tr>
<td>CD Capital, Suhanko platinum mine, Ranua</td>
<td>1,5</td>
</tr>
<tr>
<td>Anglo American/AA Sakatti Oy, Sakatti nickel mine, Sodankylä</td>
<td>1,5</td>
</tr>
<tr>
<td>Mawson Resources, Rompas gold mine, Ylitornio</td>
<td>500</td>
</tr>
<tr>
<td>Hannukainen Mining Oy, iron mine, Kolari</td>
<td>600</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>5.100 bn€</strong></td>
</tr>
</tbody>
</table>
### Energy/wind power

| Lapland projects | 204 m€ |

### Transport infrastructure

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Amount (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arctic Railway Rovaniemi – Kirkenes, Finnish side</td>
<td>2,0 bn€</td>
</tr>
<tr>
<td>Tornio – Kolari railway reconstruction</td>
<td>255 m€</td>
</tr>
<tr>
<td>VT4 Rovaniemi – Sodankylä road</td>
<td>160 m€</td>
</tr>
<tr>
<td>Road connections to Norway, Palojoensuu/Sevetti</td>
<td>140 m€</td>
</tr>
<tr>
<td>Mining roads, Suhanko/Sokli</td>
<td>160 m€</td>
</tr>
</tbody>
</table>

**Total:** 2.715 bn€

**All total after 2025:** 8.019 bn€

### Lapland Investment potential

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018–2025</td>
<td>8.005 bn€</td>
</tr>
<tr>
<td>After 2025</td>
<td>8.019 bn€</td>
</tr>
</tbody>
</table>

**Total:** 16.024 bn€
3.2 OULU REGION
The Oulu region is the metropolitan area of Northern Finland and the largest urban centre in the northernmost regions of Scandinavia. The city is not only the fastest growing region in the Nordics during the last 20 years, but also has one of the youngest populations in Europe.

The Finnish region of Oulu (in this article the Oulu region refers to ‘Northern Ostrobothnia’) extends across Finland from the Gulf of Bothnia coast to the Russian border and has an area of 37 000 km² and is about equal in size to the whole of Netherlands.

The Oulu region is a growing region that has a population of about 247 000 people (4,5% of the Finnish population). The population is well educated and Oulu has the youngest population in Europe (median age 34,7, 2016).

The total population of Northern Ostrobothnia is 411 150 (2016). Five surrounding municipalities joined Oulu in the beginning of year 2013 and the population of the city is now about 200 450 (2016).

The Oulu Province belongs to a sub-arctic climate. The City of Oulu has a moderate climate due to its maritime location. At the latitude of Oulu, the average monthly temperatures range from -11°C in January to 16°C in July. The mean temperature in January is -16°C in the northeast of the area. Oulu is ideally situated at the junction of the main roads and railways of Northern Finland. Oulu Airport is the second largest airport (1 million travellers) in Finland, and the Port of Oulu is the largest port for unitized cargo transport on the Bay of Bothnia. Oulu is also a potential site for data centres and a possible fibre optic cable connection could be opened from Europe to Asia via Oulu to the north.

Business in Oulu Region

The Oulu region is an internationally recognized centre of technology and expertise where conscious efforts have been made to develop ideal ecosystems for new technology and practical cooperation between training, research and private enterprises.

Oulu has a total of about 17 000 high tech jobs. In addition to the information and communication technology (especially radio technology), the Oulu region is also well known for Cleantech and medical technology.
The few more densely populated centres in the area have significant industrial facilities specialized in forest, steel, chemical, construction and food industries.

Oulu is surrounded by some major Northern European investments (worth more than 100 billion euros). Being the biggest city and the most significant logistics hub in Northern Scandinavia, Oulu provides an excellent location for the companies working for major projects.

The City of Oulu has been ranked twice among the TOP 7 finalists of the smartest community in the world survey (ICF 2012, 2013). Oulu was also rated as one of the best innovation and technology cities (FORTUNE and CNBC 2012) and one the most promising start-up entrepreneurship cities (CNN 2012).

**BusinessOulu and OIA**

BusinessOulu is a business hub and development organization of the City of Oulu. The main mission is to be a driver of business transition and a partner in business growth by supporting enterprises and strengthening their competitiveness in global markets. Together with its partners, BusinessOulu offers comprehensive services to companies operating in ICT, Cleantech, Industry, Life Science, Trade & Service, Travel & Logistics and Creative Industry sectors.

**Internationalization and investments in services**

BusinessOulu offers a number of services for the companies planning to go international and companies willing to invest in Oulu or relocate themselves in Oulu. Oulu promotes strong cooperation between arctic cities and between the public and private sector.

BusinessOulu assists companies in the different stages of internationalization: in compiling internationalization plans, planning and securing funding, and utilizing international networks in finding new business opportunities.

BusinessOulu has extensive international networks and cooperation partners both globally and in the nearby markets: Sweden, Norway, Turkey, USA, Canada, Germany, Russia, Kazakhstan and Japan, to name a few. In total, Oulu has a cooperation relationship with 16 partner cities on four continents. One important part of BusinessOulu operation is the activities that take place in the target countries.
The City of Oulu and several companies and research institutions have been working closely together with San Jose, the biggest city in Silicon Valley, since the beginning of 21st century. For several years now, Oulu and the Cities of Sendai and Fujisawa in Japan have worked closely together. The newest launch in Japan is the cooperation agreement between Oulu and the area of Kanagawa.

A very important part of internationalization for Oulu is the nearby cooperation area of the Nordic Countries and Russia. In the nearby northern regions, Oulu’s network includes Boden, Luleå and Umeå in Sweden, Alta in Norway, and Arkhangelsk and Petrozavodsk in Russia. BusinessOulu has also close collaboration between the companies in Finland, Norway and Sweden through the opening of Finnish Business Hub (Suomi-talo) concept in Tromsø and Gällivare.

Among others, significant targets include:

- Mining and construction projects in Northern Sweden
- Energy and construction projects in Northern Norway and Northwest Russia
- Energy, construction and mining projects in Northern Finland and the improvement of their prerequisites
- The logistics corridors of Barents Region: railway, road and shipping routes and flight connections
- Rail and road links from the Atlantic and the Polar Ocean with Central and Southern Europe under development
- Shortest airway to Northern America and Northern Asia from Europe
- A possible fibre optic cable connection from Europe to Asia via Oulu to the north

In the near future, significant investments concerning energy, construction and mining, for example, are expected to take place in Northern Finland and the Barents area. The internationalization project of the company network aims to support the companies in order to improve their opportunities of gaining access to major national and international projects.

Oulu Innovation Alliance (OIA) is a unique collaboration, which integrates top know-how of printed intelligence, wellness technology, wireless technology, Cleantech and 3D internet. It connects research institutions, businesses and public sector organizations. OIA generates cutting-edge global business from research, development and innovation projects and ventures. Oulu Innovation Alliance has renewed its strategy heading for the period 2016–2020.
The Oulu ecosystem has established itself as a hotbed of wireless technologies. The area offers an excellent opportunity to participate in developing future technologies. Oulu – the Capital of Northern Scandinavia – has a foundation of more than 40 years of technological success stories. Today, Oulu is an even stronger R&D community of several global companies. Oulu is the best place in the world for developing hi-tech-based products from an idea into a complete product for the global market and for companies and consumer-clients to use. A significant number of international corporations relocated to Oulu during the last 18 months before 2016.

Over the past couple of years, the ICT ecosystem in Oulu has diversified considerably. Oulu provides an exceptionally wide and versatile selection of shared R&D environments and living labs to develop solutions further and test their functionality in real environments. Today it is complemented by clusters producing finance, health tech and automotive solutions. In the coming years, Oulu focuses on strengthening its leading role in areas like IoT, Automotive, FinTech, Health & Wellness, Wearables, Industrial Internet, and Green ICT and Gaming sectors. One example of the advanced local ecosystems is the decision to be one of the first constructors of 5G test networks in Oulu. In 2015, VTT Technical Research Centre of Finland opened a network for all enterprises, and the University of Oulu set up a public 5G network for researchers, companies and students. Future products and service innovations can be developed in an open test environment. High-tech ICT leverage from a long-term asset, the HILLA programme, focuses on doubling Oulu’s 2 billion hi-tech exports.

All in all, the Oulu ecosystem offers more than 10 testing labs for all kinds of company needs. With its developing infrastructure, Oulu and its surrounding regions form an excellent urban living lab. This enables development of products and services in a real-life environment with end users.

Oulu offers multiple open innovation arenas. Active promotion of the health ecosystem is managed by OuluHealth, which has formed a strong network between the city’s key players in life science and health-related fields. As an example, the OYS Test Lab is a brand new test environment for specialised health care products and services in the heart of its provider, Oulu University Hospital.
Internet root IXP FICIX3 together with a mirror of the DNS root server J means that IP traffic between different ISPs could be exchanged directly in Oulu. FICIX3 makes Oulu a potential site for data centres and opens a possible fibre optic cable connection from Europe to Asia via Oulu to the north.

Being the fastest growing city in Finland and the Nordics, Oulu is an international city full of opportunities. At the moment there are major business and development projects in the Oulu region and the confidence in Oulu’s growth is stronger than ever.

Basic Industry

Large investments in Northern Finland and nearby regions are the growth engine of basic industry in Oulu. The most significant investments are intended for energy production and construction industry. Traditionally, the strong fields of industry in the Oulu region are forest, metal and chemical industries, wood processing and food industry. Large integrated pulp and paper mills operate in Oulu. There is a big steel mill in the nearby city of Raahe. Furthermore, the region is a leading production area for log houses and prefabricated homes.

The extensive network of education and services together with the efficient logistical connections support the growth of the industrial sector. A significant share of the industrial production in Oulu is exported. Technological competence and educational institutions in the Oulu region offer numerous opportunities for creation of new solutions and innovations for the future.

Key figures of the basic industry in Oulu:
• turnover of over € 4.8 billion
• approximately 11 100 employees

Cleantech

Environmental technology, i.e. Cleantech, is one of the most rapidly growing industries on a global scale. The fast growth in the Cleantech sector is due to factors such as decreasing natural resources, shortage of water, climate change, as well as legislation and international agreements. Oulu has selected Cleantech as one of the most important areas to focus on. There are extensive investment plans concerning Cleantech such as renewable energy production in Northern Europe. Cleantech products from Oulu are utilized all over the world and the success of Oulu Cleantech is supported by strong local ICT expertise.
The strongest Cleantech competences in Oulu are:
- Renewable energy
- Smart energy solutions
- Resource efficiency
- Emission control

In addition to companies, the University of Oulu and the Oulu University of Applied Sciences invest heavily in R&D work for Cleantech.

Creative Industry

The diversity of the creative industries in Oulu ranges from architectural services and communications sector to design and adventure services. During the last few years online, mobile and SaaS services have started to emerge as new branches. Oulu is also one of the central clusters of the Finnish game industry.

The creative industries offer new opportunities, perspectives and inspiration for other business sectors and the community around them. Some top international events are also organized in Oulu, such as the widely known Air Guitar World Championships.

Key figures of the creative industries in Oulu:
- Over 1,000 companies
- Turnover of approximately EUR 200 million
- Approx. 2,000 employees
- About 100 new companies annually

Life Science in Oulu

The life science business and infrastructure are growing steadily in Oulu. There are about 540 companies in the health, wellness, bio, e-health and medical technology industries, and at least 240 of them are hi-tech companies. They all offer world-class expertise, address varied global needs and aim at expanding to international markets, with an export turnover increasing by 32% in the past six years. The total revenue in this sector amounts to around EUR 700 million. In Oulu, there is world-class competence in the next generation technologies and the emerging bio-economy. Information and Communications Technology (ICT) expertise is utilized, for example, in the development of life science applications, such as wireless biosensors and med-tech devices.
Additionally, the city boasts a unique OuluHealth ecosystem, which aims at accelerating innovation, delivering sustainable services to health companies, and providing better solutions for the citizens. Located in Kontinkangas, OuluHealth is a multifaceted network of universities, public organizations like the Oulu University Hospital, the VTT Technical Research Centre, and various health-tech entrepreneurs as well as biopharmaceutical companies.

The OuluHealth ecosystem includes a one-of-a-kind, test- and development environment for products and procedures. Equipped with cutting edge pilot facilities of OuluHealth Labs, it is composed of the following partners: the City of Oulu, Oulu University Hospital and Oulu University of Applied Sciences. This innovative environment enables companies and service providers in the healthcare sector to develop their products or services under authentic conditions and with genuine users. In this way innovations are tested through the entire service chain, from private homes all the way to health centers and hospitals.

The ecosystem’s active promotion is managed by the organization OuluHealth, which has formed a strong network between the city’s key players in life science and health related sectors. It represents a physical meeting place for the entire ecosystem. The campus already houses more than a hundred organizations, including Oulu University Hospital, Oulu City Hospital, Oulu University Faculty of Medicine, Oulu University of Applied Sciences and a large number of companies. This competence cluster of Kontinkangas currently employs more than 8,000 people and more investments are being planned for it. One of the ecosystem’s stakeholders, Oulu University Hospital, for example, has decided to invest 500 million euros over the next 20 years.

Oulu has been leading an innovation boom in the health, wellness and the bio sectors. Examples of highly successful products in the life science sector include: the world’s leading brand of heart rate monitors, the world’s first production method for recombinant collagen, products for faster development and scaling of biotech production processes, selection of diagnostic tests and real-time online methods for improving food safety at point of production in food processing plants.

The city of Oulu is widely recognised as an innovative leader in the field of medical technology. Together with its ecosystem, Oulu is shaping the future by supporting innovations, creating new business opportunities and providing a unique environment for the health-tech businesses.
Trade, Services and Travel

The new underground car park Kivisydän (Stone Heart) stimulates investments and attracts new trade enterprises to Oulu city centre. The increase in population and purchasing power combined with an active economic development creates a sustainable platform for the development of services and trade in the city. The current investment plans in the city centre are valued at a couple of hundred million euros during the next decade.

Oulu is the 5th largest travel destination in Finland and the percentage of leisure travellers has already reached 60%. The city attracts tourists with the selection of shopping and services as well as its lively display of culture and events. A stone’s throw away from the city centre there is the Nallikari area, which is particularly well known as a summer destination among international visitors. The new city plan enables investments of more than 100 million euros in hotels, along with a holiday village and amusement park in the Nallikari area. Other investments concerning the travel sector are targeted to Kuusamo, Syöte, Rokua Geopark, and Kalajoki.

Transport

Oulu’s location, right in the middle of Northern Europe’s developing market and its active business life, is excellent. Traffic and transport to and from Oulu works efficiently. The city is the most significant logistics hub in the Northern Scandinavia. Oulu is a junction for road, railway, sea and air transport.

Oulu Airport is the second busiest in Finland. This recently expanded and completely renewed airport serves one million passengers annually. The regular domestic and international flights of several airlines connect Oulu with the rest of the world. A direct flight to Helsinki (Finnair, Norwegian) takes only 50 minutes. Arctic Airlink operates the route Oulu-Luleå-Tromsø since January 2015, connecting these three northern university cities by 10 flights per week. Altogether, Oulu Airport offers 15-20 flights daily and over 100 flights per week.
The Port of Oulu is one of the leading ports on the Bothnian Bay, and 500–600 ships visit Oulu annually. The port has regular connections to all over Europe. The annual amount of cargo shipped through Oulu is between 3 and 3.6 million tonnes. The most significant export product is paper, and the main import products are fuel and raw materials for the forest industry. The Port of Oulu is open all year round, and it is the biggest port in Northern Finland in terms of the amount of containers and unit traffic. The Port of Oulu includes three separate harbour areas: Vihreäsaari oil and bulk docks, Nuottasaari docks and Oritkari docks. Next to the Port of Oulu there is a northern multimodal transport centre, which serves the logistics centres of the Oulu region as well as road, railway and sea transportation.

Education and Research

Oulu is a research hub with a capital R: the local Technical Research Centre of Finland (VTT) is Northern Europe’s largest organization involved in applied research. Research is also conducted at the University of Oulu, Oulu University of Applied Sciences and numerous research institutions, such as Finnish Food Safety Authority Evira, the Finnish Geodetic Institute (FGI), MTT Agrifood Research Finland, the Natural Resources Institute Finland LUKE, the Finnish Game and Fisheries Research Institute (FGFRI), and the Finnish Environment Institute SYKE. The educational offering is further complemented by vocational institutions and private education providers.

Oulu University

The University of Oulu is an international science university which creates innovations for the future, wellness, and knowledge through research and education.

Innovation is about seeking, utilizing and applying new knowledge. The University of Oulu researches people and culture in a changing living environment, as well as opportunities that new technology provides for improving the well-being of people and the environment. The University of Oulu is a multidisciplinary expert in Northernness.

Founded in 1958, the research and education community is 16 000 students and 3 000 employees strong, and one of the biggest and most multidisciplinary universities in Finland. The ten faculties, the many departments and the specialized research units of the University of Oulu create the foundation for multi-scientific research, innovation and training of experts for demanding professional tasks.
The University of Oulu conducts scientific basic research in over 70 branches of science. Open-minded combining of technical sciences, natural sciences and human sciences creates a unique foundation for new multidisciplinary research knowledge, innovation and education. The research areas of strength include four focus areas and four development areas.

Focus areas:
• Biosciences and health
• Information technology
• Cultural identity and interaction
• Environment, natural resources and materials;

Development areas:
• Business and economy
• Steel research
• Research-based teacher education
• Mining and mineral field

The research organizations of the focus and development areas are typically multidisciplinary, and they encourage researchers to make new scientific initiatives and discoveries. The University of Oulu conducts research in close cooperation with sector research institutions and corporations. Acting in the international scientific network is the foundation of renewal.

Oulu University of Applied Sciences

Oulu University of Applied Sciences has more than 30 programmes in which theory and practice are in balance. The university has an active role in research, both internationally and regionally. Oulu University of Applied Sciences works in close cooperation with regional business life. (Source: BusinessOulu)
3.2.1 Top Investment Projects in Oulu Region 2018–2025

1. Fennovoima Oy Nuclear Power Plant

Fennovoima was established for a number of reasons. While the owners have a clear vision and objective to receive reasonable- and stable-priced electricity, the Hanhikivi 1 project also serves the bigger picture not only from a national point of view, but also from the EU’s point of view.

Almost 20 % of Finland’s electricity consumption has been covered with imports in recent years. Finland is one of the few EU countries structurally dependent on the electricity import. This strong dependency weakens Finland’s current account, employment and security of supply. Finnish Energy organisation has assessed that Finland will lose several thousand megawatts of electricity production capacity by the year 2030, so new energy investments are needed.

The benefits of decreased electricity imports, improved current account and increased household purchasing power are approximately half a billion euros a year for the Finnish national economy.

Domestic investments to Fennovoima’s project go up to approximately 2 billion euros. This means a substantial boost to the economy in Northern Finland in particular. The economic impact can also be felt outside the power plant area, as the demand for services grows.

Fennovoima requires no subsidies. The Hanhikivi 1 project is a market-based private investment and Finland does not grant state aid to nuclear power. Furthermore, Fennovoima is a non-profit co-operative: the owners will receive electricity at costprice in proportion to their ownership share. This is called as the Mankala-principle.

The operating life of the Hanhikivi 1 power plant is 60 years. Fennovoima will sell all the electricity it produces at cost to its owners in proportion to their shareholdings. When the power plant starts producing electricity, the price of electricity is estimated to cost 50 euros per MWh at a maximum. This price includes e.g. the operating costs of the plant, fuel, nuclear waste management, financing costs and Fennovoima’s organisational costs.
There are a number of ways by which Fennovoima’s Hanhikivi 1 project supports the EU objectives:

• By reducing energy imports and improving Finland’s energy self-sufficiency, Fennovoima also strengthens power generation within the EU: electricity for European consumers will be produced inside the EU according to EU standards.
• Fennovoima’s promotes the diversification of energy sources of the EU: also, the fuel supplier can be tendered globally after the initial operational phase.

The investment stimulates Europe’s economy, generates jobs, and facilitates climate protection.

Nuclear energy is CO\textsubscript{2} free i.e. it produces no carbon dioxide emissions. It is therefore the choice of a climate friend. Finland is committed to cutting its carbon dioxide emissions as a part of the prevention of climate change. Nuclear power is one part of the energy solution aiming to reach these emissions goals.

A nuclear power plant produces a great deal of energy with a small area and low life-span emissions. The Intergovernmental Panel on Climate Change, working under the auspices of the UN, defines nuclear power as one part of the solution for controlling climate change.

The nuclear power plant is a major investment, the effects of which extend to the whole of Finland and the national economy. The building of new nuclear power gives birth to significant additional investments not only within the energy sector and construction but also capital goods-producing industries.

According to the research of the VTT Technical Research Centre of Finland (2014), the Hanhikivi 1 nuclear power plant investment of Fennovoima will increase nearly one per cent domestic investments in the 2020’s and the gross domestic product more than 0.25 per cent. Nearly half of the growth of the gross domestic product is related to increased investment throughout the 2020’s.

**Effects on employment**

The investments related to the project will increase employment, especially in the construction industry. The effect on employment growth will be about one third of the additional domestic product growth. The growth of industrial investment in the 2020’s is subject to sectors manufacturing capital goods. Other export industry investments will start to grow by the 2030’s.
Effects on the purchasing power of households

The additional income, which is created from the investments, will increase the purchasing power of households and stimulate consumer demand. The purchasing power of households will also be improved as the price of the energy will rise more moderately than without the construction of new nuclear power. The moderate energy price development is very important for Finland, because it improves the competitiveness of the whole country. The growth of the purchasing power of households will increase investments with the fields of trade and of private services in the 2020’s.

If measured in Euros, the reduction in energy import, the improvement of the current account balance and the growth of the household purchasing power would benefit the national economy about half a billion Euros every year.

In the model calculations of the VTT Technical Research Centre of Finland, the basic estimate on the electricity demand was based on the basic scenario of the 2013 Energy and Climate Strategy of Finland, which takes into account, inter alia, the short-term economic forecasts.

Fennovoima project is a billion-class investment

The construction of the Hanhikivi 1 nuclear power plant is a 1.8–2.7 billion domestic investment. According to the estimates of Pöyry Finland, the employment effects of the power plant construction are 24 000–36 000 person-years in Finland, if the domestic content is 45 per cent. The nuclear power plant is at the most built by about 4000 people, and during the operation phase, the power plant directly employs 400–500 people.

Fennovoima will build its nuclear power plant Hanhikivi 1 (FH1) to produce electricity for its owners at production cost price. The plant will be built in Pyhäjoki in Northern Finland.

Fennovoima and RAOS Project, subsidiary of Rusatom Energy International, have a plant supply contract for the Hanhikivi 1 nuclear power plant. According to the schedule agreed with Rosatom, Hanhikivi 1 plant will produce electricity in 2024. The plant site on the coastal municipality of Pyhäjoki is located in Northern Ostrobothnia on the shore of the Baltic Sea. The name of the plant comes from Hanhikivi peninsula where the site is located in.
Hanhikivi 1 will have a third-generation evolutionary pressurized water reactor based on Russian VVER plants, which were developed by OKB Gidropress, a ROSATOM subsidiary.

First VVER units were built already before 1970s, and good operational experiences have been gained in Finland as well. Fortum has operated two VVER-440 units in Loviisa for several decades now with good operational and safety records.

The main performances, reliability and safe operation of reactor incorporated into the design, are proved by the VVER-type NPP operating experience. The reference units for Hanhikivi 1 are now under construction in Russia in Sosnovy Bor (Leningrad 1 and 2). Within the past 25 years, 20 VVER plants have been taken into operation.

Development of the plant type has been done with export market in mind, along with the Russian domestic market so applicable international legislation has been taken into account in the plant design. The plant can also be built to fulfill the Finnish requirements, such as the YVL guides by the Radiation and Nuclear Safety Authority Finland (STUK).

The plant produces 3200 MW of thermal power and has horizontal steam generators which is typical for VVER plants. Operational lifetime of the plant is 60 years. For further information see International Atomic Energy Agency IAEA and Rosatom websites.

### Main Design Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated reactor core thermal power</td>
<td>3200 MW</td>
</tr>
<tr>
<td>Thermal efficiency</td>
<td>~37%</td>
</tr>
<tr>
<td>Electric power</td>
<td>1200 MW</td>
</tr>
<tr>
<td>Primary circuit pressure</td>
<td>162 bar</td>
</tr>
<tr>
<td>Number of fuel assemblies</td>
<td>163</td>
</tr>
<tr>
<td>Number of control rods</td>
<td>121</td>
</tr>
<tr>
<td>Primary circuit loops / Steam generators</td>
<td>4</td>
</tr>
<tr>
<td>Rated core coolant flow rate</td>
<td>85 600 m³/h</td>
</tr>
</tbody>
</table>
GE Steam Power Systems will deliver Hanhikivi 1 unit’s turbine generator set. The set consists of a high-pressure turbine, intermediate pressure turbine, three low pressure turbines and a generator, which is on the same shaft as the turbines.

Technical Parameters

- The turbine-generator is based on Alstom’s technology: turbine is based on Arabelle technology and generator is Gigatop 4 technology.
- Overall length almost 80 meters
- The whole turbine-generator weights almost 2500 tons (high and intermediate pressure turbines weight about 450 tons and three low pressure turbines and the generator weight about 500–600 tons each)
- The length of the low-pressure turbine’s last stage blades is about 1.8 meters and the span almost 6 meters
- The turbine-generator shaft will rotate 1500 rpm
- The capacity is 1200 megawatts and the plant will produce altogether about 10 TWh per year. This is over twice of the electricity consumption of Helsinki, the capital of Finland, and covers about 13 % of Finland’s electricity needs.

The turbine-generator will be manufactured in France. GE Steam Power Systems is a well-known and experienced supplier that bought Alstom’s energy business in 2015. Alstom’s steam turbine-generators with Arabelle (turbine) and Gigatop 4 (generator) technologies have been delivered to a number of nuclear power plants all over the world.

Operating Principle of a Steam Turbine Generator

The turbine generator is a conventional part of a power plant so to say – it is used to convert the steam generated in the reactor island into electricity to be distributed to the national grid.

In practice, almost dry steam from the reactor unit is piped to the turbines. This heat energy makes the turbines rotate and the generator – which is on the same shaft as the turbines – converts the kinetic energy of the turbines into electricity. Turbine generators are found in all condensing power plants, even if the steam is generated differently, for example, by burning coal.
Fennovoima’s nuclear power plant will be supplied by RAOS Project Oy, which is a part of Rosatom, the Russian State Nuclear Energy Corporation.

Fennovoima and Rusatom Energy International (formerly Rusatom Overseas) signed a supply contract in December 2013 for the Hanhikivi 1 nuclear power plant to be constructed in Pyhäjoki. The administration of the plant supply contract is managed by RAOS Project Oy, the Finnish subsidiary of Rusatom Energy International. Furthermore, Rusatom Energy International is a subsidiary of Rosatom. It was established in 2011 to advance Rosatom’s international sales of nuclear technology. Rosatom has 70 years of experience in the nuclear power industry.

Rosatom is a company owned by the Russian state. It consists of 340 different organizations and has more than 256,000 employees. It is the only existing organization in the nuclear industry, that can offer and produce all the services and products for the whole nuclear power life cycle from start to finish.

In addition, Rosatom possesses strong nuclear technology expertise related e.g. to medicine, radiation technology, nuclear-powered icebreakers and research reactors. Rosatom has more than 70 years of experience in nuclear power and the company is currently constructing more than 40 power plants both in Russia and abroad. Over the past 25 years, 20 units equipped with the VVER technology have been commissioned – Fennovoima’s Hanhikivi 1 plant is also based on the same technology.

Current plants in construction or in planning stage:

<table>
<thead>
<tr>
<th>Outside Russia (34 in total)</th>
<th>In Russia (8 in total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland: 1 unit</td>
<td>Novovoronesh NPP: unit 7</td>
</tr>
<tr>
<td>Hungary: 2 units</td>
<td>Leningrad NPP-II: units 1 and 2</td>
</tr>
<tr>
<td>Belorussia: 2 units</td>
<td>Baltic NPP: units 1 and 2</td>
</tr>
<tr>
<td>Armenia: 1 unit</td>
<td>Rostov NPP: unit 4</td>
</tr>
<tr>
<td>Turkey: 4 units</td>
<td>Kursk NPP–II: units 1 and 2</td>
</tr>
<tr>
<td>Bangladesh: 2 units</td>
<td></td>
</tr>
<tr>
<td>Egypt: 4 units</td>
<td></td>
</tr>
<tr>
<td>Jordan: 2 units</td>
<td></td>
</tr>
<tr>
<td>China: 2 units</td>
<td></td>
</tr>
<tr>
<td>India: 4 units</td>
<td></td>
</tr>
<tr>
<td>Iran: 8 units</td>
<td></td>
</tr>
<tr>
<td>Nigeria: 2 units</td>
<td></td>
</tr>
</tbody>
</table>

More information on Rosatom’s global activities can be found on their website.
Subcontracting network for the project is currently being built

The main contracts for the project have been signed with Titan-2 and the Atomenergomash, Atomproekt and Gidropress companies. All main contractors have plenty of experience in Rosatom’s nuclear power projects. The assembly of the subcontracting network is currently underway.

Contact plant supplier RAOS Project

Nuclear power plant’s construction is a complex project, which can be roughly divided into two: 1) preparing and building the nuclear power plant itself and 2) building other necessary buildings in the area.

Before each new stage, thorough and careful plans and assessments are carried out; planning is a key factor to a successful construction phase.

Infrastructure Works

Fennovoima’s nuclear power plant will be built onto a greenfield site. Therefore, the works have begun with preparing the site, e.g. cutting down trees, bringing electricity and municipal engineering to the area, as well as, building and strengthening roads.

When the site has been prepared, the excavation works for the cooling water tunnels and excavation for buildings begin. The rock material from the excavation works will be used in the plant area as much as possible. The infrastructure works will last some 2–3 years.

Buildings

Building the actual nuclear power plant can start after the construction license has been granted. The nuclear power plant will contain reactor, turbine, safeguards and fuel buildings, as well as, many auxiliary buildings. In addition to the nuclear power plant, several other buildings will be built in the area, e.g. offices, storehouses, as well as, an accommodation area for some 1000 workers.
Fennovoima's Hanhikivi 1 nuclear power plant will be built in Northern Finland in Pyhäjoki. The site is located on Hanhikivi peninsula which also gives the name to the plant.

The coastal municipality of Pyhäjoki is located in Northern Ostrobothnia on the shore of the Baltic Sea. Pyhäjoki has some 3400 residents. It is a part of the Raahe region that also includes Raahe, Vihanti and Siikajoki.

Altogether the region has some 35 000 residents. Finland’s 6th biggest city, Oulu, is about 100 kilometers north from Pyhäjoki. The Oulu region has over 200 000 residents.

There is ample information available to companies, that wish to be involved in the project. In addition to Fennovoima, information is provided by the municipalities of the Pyhäjoki region, entrepreneur organizations, and company development organizations. Furthermore, Fennovoima assists the plant supplier, RAOS Project, and the main contractor, Titan-2, in their cooperation with Finnish companies.

The contracts relating to the Hanhikivi 1 project are well suited for Finnish companies. Fennovoima’s training building in the Hanhikivi headland, built on contract by Rakennusliike Sorvoja Oy from Oulainen and completed in 2016, provides a good example in this respect. Currently, Sorvoja is under contract to build a main gate building for Fennovoima.

Extensive earthwork has been and will be carried out in the area prior to the construction of the actual power plant, with many small companies involved in the effort. More work opportunities are available in the fields of hydraulic construction work, dredging, and environmental monitoring.

**Focus on Documentation**

The special characteristics of the Hanhikivi 1 project include detailed advance planning, authority inspections, and careful documentation of the work phases. All work phases must be traceable and reviewable for up to several years afterwards, so that the safety and quality of the product under any conditions can be ensured.
Fennovoima will contract out the construction of various auxiliary buildings in the Hanhikivi headland. Furthermore, Fennovoima is responsible for the electrification of the plant site and the construction of the associated public utility services. The majority of the infrastructural construction projects will be implemented between 2015 and 2018.

The plant supplier, RAOS Project, is responsible for all operations relating to the design, licensing, construction, and commissioning of the power plant, as well as associated project management. The plant supplier has selected the Russian Titan-2 as its main contractor. The main contractor bids out most of the contracts relating to the site.

Fennovoima and Titan-2 are collecting the contact information of contractors and service providers interested in cooperation in their electronic registers. For any company, the first step towards participation in the Hanhikivi 1 project is to register in both the Fennovoima database and the Titan-2 database.

2. Ferrovan Oy vanadium plant

Ferrovan Oy is a private Finnish company that plans to start vanadium production in the metal product factory to be built at the Raahe port area. The metal processing plant will handle vanadium-rich raw material from SSAB’s steel production in Finland and Sweden. At the production stage, the plant offers over 100 permanent jobs.

The main products of the Metal Products Factory will be ferrovanadine and crude steel. Ferrovanadine is used as an alloy for the production of high strength steel grades. Raw material, for example, uses the foundry industry as its raw material. Most of the world’s vanadium production goes to the steel industry. Vanadium steel is very strong and light. Vanadium steel is used especially in the construction industry, airplane structures and tool manufacturing. Vanadium is also used as a catalyst in the chemical industry and in the future increasingly in the battery and battery industries.

Ferrovan Oy (MKOy) has completed a financing arrangement, that will finalize the profitability study of the Raahe Vanadium Plant in the next nine months. The financing arrangement was attended by Osuuskunta PPO, Tesi and the current main owners of MKOy Tamares Mining Holding B.V., Akkerman Exploration B.V. and Ilmarinen Mutual Pension Insurance Company. The vanadium plant utilizes recyclable melts from steel mills.
The goal of MKOy is to build an vanadium plant in Raahe harbor, which utilizes recyclable steel cores as its raw material. MKOy’s main product will be ferrovanadine, commonly used in steel industry as an alloy to increase steel strength, hardness and corrosion resistance. Steel reinforced with vanadium is used, among other things, construction and aviation industry.

In the MKOy production process, vanadium and iron are recovered from the steel core. At the same time, a slurry is created which can be used, for example, in the building industry or the cement industry. An innovative and cost-effective process will vigorously implement the goals of the rotary economy.

MKOy has entered into a long-term contract whereby SSAB supplies the raw material needed by the vanadium plant from its steel mills in Finland and Sweden. The goal is to launch production 2020.

The construction of a vanadium plant is scheduled to commence at the beginning of 2018. The estimated construction time for this investment of approximately € 240 million, is two years. MKOy has selected the French BNP Paribas as the main organizer of the investment financing, which has a strong experience in arranging the corresponding loan finance packages.

3. Oulun Energia Oy, new power plant

In Oulu, a new 215 megawatt biomass plant produces electricity and district heating. The power plant has received an environmental permit in December 2017. The decision on the EUR 200 million investment was made on 4 January 2018.

The new biomass power plant will be built near the Laanila industrial site in the vicinity of the eco-power plant. Planning has taken into account that future biorefineries or other industries can be integrated around the biomass power plant. The investment also opens up new opportunities for the bio-economy.

The plant’s design will start in January 2018 and the construction will begin in June 2018. The power plant will be completed in November 2020 and will be replaced by the Toppila 1 plant unit leaving production this summer. Bioenergy is clearly better than its energy efficiency and emissions compared to Toppila 1, which has produced electricity and district heat since 1977, which no longer meets the environmental requirements of the 2020s. The Toppila 2 power plant unit, which was completed in 1995, will continue to produce energy at the end of its life cycle, estimated until the year 2035.
Key Facts

- Location Laanila industrial area in Oulu
- Environmental Permit 12/2017
- Investment Decree 01/2018
- The building permit will be applied for in spring 2018 and the construction will begin on 06/2018
- The power plant will be completed in 11/2020
- Fuel capacity 215 megawatts, electric power 70 megawatts, district heating power 175 megawatts
- Produces electricity and district heat and possibly also process steam for the industry
- A multifuel power plant that can utilize various fuel compositions, including recycled fuel
- Life expectancy about 40 years
- Cost estimate EUR 200 million
- of main equipment
- the boiler plant Valmet Technologies Oy
- flue gas cleaning Valmet Technologies Oy
- turbine plant Siemens limited liability company
- Fixed Fuel Receiving, Storage and Conveyor System Raumaster Oy
- Pöyry Finland Oy has been selected as design consultant
- The share of renewable energy will increase considerably

The new bio-power plant will be able to meet our target of carbon neutral energy production by 2050. Technically, the power plant is designed so that the plant boiler can utilize versatile fuel compositions and their relationships can be easily changed. The technology does not limit the use of wood, for example, in old Toppila 1.

The bioenergy plant will increase our share of renewable energy considerably with its production efficiency and the share of renewable fuel. Our goal is that the power plant will use about 70 percent of its fuel as fuel. The remainder is the recycled fuel from the rotary economy and the security of the security of supply. The use of peat is gradually diminishing and completely eliminates our fuel mix in the 2040s. By 2050, our total energy production is completely carbon neutral. The Laanila bioenergy plant has received an environmental permit in December 2017.
### 3.2.2 Investments in the Oulu Region 2018–2025

#### Industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Centers and Cloud Services, Oulu</td>
<td>400</td>
</tr>
<tr>
<td>Mustavaara Oy vanadium plant, Raahe</td>
<td>250</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>650 m€</strong></td>
</tr>
</tbody>
</table>

#### Hydro Power

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyhäsalmi pump power plant</td>
<td>350</td>
</tr>
</tbody>
</table>

#### Wind Power

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All wind park projects in the region</td>
<td>3.0 bn€</td>
</tr>
</tbody>
</table>

#### Nuclear Power

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fennovoima Oy Nuclear Power Plant, Pyhäjoki</td>
<td>7.0 bn€</td>
</tr>
</tbody>
</table>

#### Bio Power

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oulun Energia Oy, new power plant, bio fuel technology</td>
<td>250</td>
</tr>
<tr>
<td>Scanships Oy, biofuel plant, Sievi</td>
<td>110</td>
</tr>
<tr>
<td>Kanteleen Voima Oy, biorefinery, Haapavesi</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>410 m€</strong></td>
</tr>
</tbody>
</table>

#### Energy Transfer Networks

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fingrid Oy</td>
<td>150</td>
</tr>
</tbody>
</table>

#### Trade

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zatelliitti Shopping Center expansion, Kempele</td>
<td>235</td>
</tr>
<tr>
<td>Raksila Super Market Block, Oulu</td>
<td>115</td>
</tr>
<tr>
<td>Raksila Station Zone project, Oulu</td>
<td>225</td>
</tr>
<tr>
<td>Raahenportti Mall, Raahe</td>
<td>80</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>655 m€</strong></td>
</tr>
</tbody>
</table>
### Tourism

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruka East investments, Kuusamo</td>
<td>150 m€</td>
</tr>
<tr>
<td>Nallikari Tourism Center expansions, hotel and theme parks</td>
<td>100 m€</td>
</tr>
<tr>
<td>Oulu City Market place hotel</td>
<td>30 m€</td>
</tr>
<tr>
<td>Oulu Airport Hotel</td>
<td>20 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>300 m€</strong></td>
</tr>
</tbody>
</table>

### Transport infrastructure

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT 4 Oulu – Kuivaniemi</td>
<td>91 m€</td>
</tr>
<tr>
<td>Ylivieska-Kokkola railway double track</td>
<td>310 m€</td>
</tr>
<tr>
<td>Ylivieska – Vartius railway electrification, Oulu Region part</td>
<td>148 m€</td>
</tr>
<tr>
<td>Oulu and Ylivieska railway yards</td>
<td>46 m€</td>
</tr>
<tr>
<td>Hailuoto bridge</td>
<td>76 m€</td>
</tr>
<tr>
<td>Oulu Deepsea port</td>
<td>30 m€</td>
</tr>
<tr>
<td>Oulu Port Logistics Center</td>
<td>15 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>716 m€</strong></td>
</tr>
</tbody>
</table>

### Public investments

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oulu University hospital</td>
<td>500 m€</td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>13.381</strong></td>
</tr>
</tbody>
</table>

### Investments after 2025

#### Energy/wind power

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional projects</td>
<td>3.750 m€</td>
</tr>
</tbody>
</table>

#### Trade

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linnakallio center, Kempele</td>
<td>300 m€</td>
</tr>
<tr>
<td>Oulu hypermarkets</td>
<td>100 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>400 m€</strong></td>
</tr>
</tbody>
</table>
### Tourism

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalajoki Holiday Marina resort</td>
<td>200</td>
</tr>
<tr>
<td>Other projects (Nallikari, Oulu, Ruka)</td>
<td>450</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>650</strong></td>
</tr>
</tbody>
</table>

### Transport infrastructure

<table>
<thead>
<tr>
<th>Highway</th>
<th>Cost (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT 4 Oulu – Jyväskylä highway</td>
<td>160</td>
</tr>
<tr>
<td>VT 8 Oulu – Vaasa highway</td>
<td>130</td>
</tr>
<tr>
<td>VT 22 Oulu – Kajaani highway</td>
<td>65</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>355</strong></td>
</tr>
</tbody>
</table>

**All total after 2025:** 5.155 bn€

### Oulu Region Investment potential

<table>
<thead>
<tr>
<th>Period</th>
<th>Cost (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018–2025</td>
<td>13.731</td>
</tr>
<tr>
<td>after 2025</td>
<td>5.155</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>18.886</strong></td>
</tr>
</tbody>
</table>
3.3 KAINUU REGION
Kainuu is located in the Oulu province and it borders the regions of Northern Ostrobotnia, North Karelia and Northern Savonia. In the East it also borders Russia. The region consists of eight municipalities and two cities. The administrative capital is Kajaani. Municipalities of Kainuu: Hyrynsalmi, Kuhmo, Kajaani, Paltamo, Puolanka, Ristijärvi, Sotkamo, Suomussalmi, Vaala and Vuolijoki.

The total population of the region is 84 350, Kajaani being the biggest city with nearly 38 000 inhabitants. Land area is 24 452 km2 and population density 3.51 km2.

The town of Kajaani was founded by Count Per Brahe in 1651. The River Kajaaninjoki and the ruins of the historical Kajaani Castle are situated in heart of the town. Kajaani Castle celebrated its 400th anniversary in 2004.

The turnover of companies within the technology industry of Finland has continued its growth during 2006. The same trend exists in the region of Kainuu. Currently there are more than 2,300 people employed in the regions ICT and metal industries.

The future outlook for Kainuu is now better than for years. There are planned investments in the industry and the service sector worth up to two billion euros. If implemented, the investments would bring up to 3,800 new jobs in the region. Estimates about the future investments have been documented in the regional development picture submitted to the Ministry of Economic Affairs and the Employment. The ministry has gathered views from all 18 provinces.

- Kainuu has become a positive area though its structural change. Sure, we still have a problem of long-term unemployment and marginalization, but at the same time, labor supply in the region has become more difficult, says Pentti Malinen, the provincial council. According to Malinen, there are positive problems on the desktop more than ever before during his provincial leadership. The future is based on traditional core industry of the region, but the new trend is, that all these sectors are facing investment opportunities. - If the planned investments happen, we need big changes both in education and in migration, says Malinen and refers to the labor demand.

For example, 270 employees of a potential KaiCell biorefinery do not get directly from the current schooling system. - It requires recruiting from the labor market and further training, Malinen says. In addition to the new investments, Kainuu is also expected to grow in the area of already existing industry. For example, Kuhmo Woodpolis Wood Products Industry will have 50-70 new jobs by 2020 and a 70–100 million increase in net sales. The leading wood expertise of Kuhmo, is Tuupala’s wooden school, which is being introduced this year.
In its picture of the Ministry of Economic Affairs and Employment, the Regional Council of Kainuu links the tourism industry, the technology industry, the bioeconomy and the sustainable mining industry to the core of their business. The objective is that Kainuu’s regional economy will continue to grow faster compared to the whole country’s rate and exports will grow. According to the statistics published by Statistics Finland in December, Kainuu was in the peak of economic growth and employment growth in 2016. The problem is, however, structural unemployment and a low level of workforce. Kainuu’s lower rate of employment is characterized by a high proportion of working-age pensioners; 13 percent of people aged 18–64 are retired.

The Regional Council of Kainuu describes the supply of second-level education to be versatile. Special thanks are given to the high schools, which have focused on specific field. For example, in the field of metal and wood products industry, they are seen less attractive, which causes a problem. - The labor market in the region is attracted by well-trained students and the Kajaani University of Applied Sciences (KAMK) has a strong postgraduate position. KAMK’s strategic areas of expertise are well supported by Kainuu’s smart specialization, as it turns out from the picture submitted to the Ministry of Economic Affairs and the Employment report.

The main routes for access to Kainuu are the connection to Kajaani, highway 5 and road 78 and Savo. According to the Ministry of Economic Affairs and the Employment report, the aim is to connect the Savo track along the Taivalkoski track to Lapland and the Arctic Ocean. Despite the positive direction, challenges are enough, especially in demographic development. At the end of 2016 there were 74,803 inhabitants in Kainuu, of whom only slightly more than half lived in Kajaani. Between 2010 and 2015, in sparsely populated rural areas, the population decreased by 20% (5,712 people).

The total population of Kainuu has decreased by 4.5 per cent (3,379) at the same time. The demographic challenge is to slow down the decline in the population by 2020 and turn the population up by 2030. The limit of 75,000 inhabitants should be reached in 2035. To be able to achieve this, it will require the rise of province’s attractiveness as a place of residence and study, as well as an investment objective. New inhabitants in Kainuu is needed elsewhere from Finland and also abroad. The inhabitants of Kainuu feel, that they are happier than average Finns, but at the same time health inequalities are increasing. The majority of the population does just fine, but the problems of anxiety are being prolonged and deepened. The morbidity is still higher than the national average rate. The challenge is also the clarification of the provincial image. According to a recent image survey, Kainuu has generally a positive image, but the province is poorly known. Kainuu’s innovativeness and know-how are not sufficiently visible.
3.3.1 Top Investment Projects in Kainuu Region 2018–2025

1. Kaicell Fibers biorefinery

KaiCell Fibers’ biorefinery investment is about 900 million euros. The company’s goal is to produce around half million tonnes of chemical pulp per year. Nearly a quarter of the production is used for further processing. KaiCell Fibers’ aim is to sell market pulp 323,000 tonnes for the paper, tissue and cardboard industry.

The company’s own downstream product is ecological textile fiber Arbron™. The estimated production volume of textile fiber is about 100,000 tonnes per year. In addition to the main products, the company sells by-products to partners who develop bioproducts at the Paltamo mill site in the upcoming BioFutureFactory™.

The goal is that
- **2019** Investment decision to be made
- **2021** Factory to be in use

The vast amount of forest resources in Kainuu provide a wide range of opportunities for further processing of bioproducts. Bioproducts can be used to replace non-renewable natural resources in the world where the population is growing, the climate is warming and consumption limits are coming.

Sustainably grown wood should be further processed locally as long as possible. This is the basis of our biorefinery. Sustainable use and good management of forests will also ensure the annual growth of forests in Kainuu in the future.

Our biorefinery manufactures pulp and, on its basis, other highly refined products such as Arbron™ for textile raw material. We also seek new partners to develop more innovations.

The share of new bioproducts in our biorefinery production will increase significantly. The highly refined products marketed by various industries in the international market also provide a solid foundation for

Wooden material will be bought from liable suppliers. The wood comes from sustainable managed local forests. Over 90% of the local forests are certified. Biorefinery is using mainly pulp wood coming from thinning. Thinning is an important part in well-maintained and sustainably growing forest. Besides, there are plenty of sawmill chips available in Kainuu, which also makes it a suitable site for the biorefinery.
The annual forest growth in Kainuu is 6.9 million m$^3$. The actual annual harvesting has been on the level of 3.2 million m$^3$. Vast majority of the woods in the local forest are suitable for the biorefinery.

The biorefinery will be built in Paltamowith being surrounded by enrich forest resources. The location ensures optimal logistics, reasonable transport distance and low transport emissions. The average transport distance is about 100 km. Unlike in the early time, the pulp wood has been transported elsewhere for processing in Finland.

Kaicell Fibers’ wood procurement will be certified. The third party auditing will ensure that we develop the procurement sustainably and continually.

2. Taivaljärvi Silver Mine

Sotkamo Silver consists of the parent company, Sotkamo Silver AB, with one wholly owned subsidiary in Finland: Sotkamo Silver Oy. Sotkamo Silver develops silver, gold and zinc deposits in the Nordic region. The Company has completed the Definitive Feasibility Study for Silver Mine project and is working on project financing issues.

In addition, there are two gold deposits, Harnäs which is a former small scale gold mining site in Sweden, and Hopevuori gold occurrence in Finland. There are no resource estimates available for these deposits.

Sotkamo Silver’s headquarter is located in Stockholm, Sweden. A local office in Oulu and a field office in Sotkamo, Finland.

Approximately 15 million euros have been spent on exploration of the Taivaljärvi Silver Mine Project; it was originally discovered in 1980 by university researchers, who identified several silver-lead-zinc-gold anomalous glacial boulders one kilometre down in the ice from outlined mineralisation.

Kajaani Oy, a Finnish exploration company, followed up these initial boulder indications by percussion drilling, bedrock-moraine interface sampling and a small boulder rock chip sampling program. Results from the percussion drilling led to the identification of the sub-crop mineralisation. Followed-up diamond drilling intersected mineralisation in 1981.
Further work by Kajaani, which consisted of mapping, geochemical till sampling and the completion of several geophysical studies, resulted in the definition of silver-lead-zinc-gold mineralisation of over a 400 by 100 metre surface area, to a depth of approximately 500 metres, with a strike length of nearly 550 metres. The quantity of mineralized rock in this area was estimated to be approximately 10 million tonnes.

In 1986, Kajaani entered into an agreement with Outokumpu Oy, resulting in the formation of the 50:50 Taivalhopea Joint Venture in 1988. The objective of the joint venture was to develop underground access to the identified mineralisation and to investigate the further potential of the Taivaljärvi Silver Mine Project.

In 1991, Outokumpu Oy conducted a feasibility study to the exploitation of the Taivaljärvi Silver Mine Project. Metallurgical tests were completed as a part of the feasibility study. The tests generally demonstrated that the mineralisation was amenable to concentration with standard floatation techniques. Outokumpu Oy concluded at that time that due to weak metal prices, development of the Project was not financially feasible.

Combined 526 drill holes of about 58,500 metres have been drilled on the Silver Mine Project and its immediate surrounding area, with the completion of over 8,500 assays for silver, zinc, lead and gold on samples collected from the area. Selected results include 721 grams of silver, 1.2 grams of gold, 0.4% zinc and 0.6% lead per ton over 7.8 metres, 1.531 grams of silver, 1.0 grams of gold, 1.8% zinc and 0.5% lead per tonne over 8.1 metres and 575 grams of silver, 1.7 grams of gold, 1.9% zinc and 1.6% lead over 4.1 metres.

Sotkamo Silver has continued the exploration and development of the Silver Mine Project inclusive completion of an environmental baseline study of the Project area in 2006 and preparation of a first NI-43-101 compliant resource in May 2007. Environment licence was granted 2013. The first measured and indicated resources were estimated at 1.2 million tons grading 153 grams of silver, 0.9% zinc and 0.5% lead per ton, with inferred resources of 617,000 tons grading 130 grams of silver, 0.8% zinc and 0.4% lead per tons. The historical average gold grade was 0.7 grams of gold per ton.

Sotkamo Silver has during 2014 received the latest independent estimate of the mineral resources for Silver Mine deposit. Total measured and indicated resources were 6 million tons grading 83.4 grams of silver/ton, and inferred resources of 1.3 million tons grading 75.5 grams of silver equivalents/ton.
Other work has included preparation of a proposed mine plan based on the assumption that approximately 3.3 million ton which are financially viable ore. Outotec (Finland) Oyj has reviewed the mining section inclusive mine planning and ore reserve estimates for the updated Bankable Feasibility Study. The updated ore reserves are based on information both from completed Bankable Feasibility Study and information from Sotkamo Silver.

The financing package of the construction of Silver Mine has been finalised and convertibles allocated. The Board of Directors of the Company has resolved, based on the authorisation granted by the Annual General Meeting on 15th March 2018, to allocate convertibles of in total a nominal amount of about €5 million, divided between a maximum of 102 convertibles, each with a par value of €50,002. A full conversion could increase the company’s share capital with 15,210,194.44 Swedish crowns. Allocated convertibles shall be paid at latest on 4thApril 2018. The Board of Directors shall be entitled to extend the payment period. The financing package of the Silver Mine has now been finalised with these convertibles.

The financing of Silver Mine project and the Group liquid assets of about €46 million consists of following parts:

• €13 million 4-year secured bond issued by Sotkamo Silver Oy
• €4 million directed share issue issued by Sotkamo Silver AB
• €5 million 4.5-year convertible bond issued by Sotkamo Silver AB
• €2 million government grant to Sotkamo Silver Oy.
• €6 million loan from the Finnish Funding Agency for Innovation to Sotkamo Silver Oy
• €16 million liquid assets of the Group as of 31stDecember 2017.

As the financing has now been finalised, the Board of Directors made today a resolution to build Silver Mine. The works are now proceeding with full speed towards production start-up as planned in early 2019.

3. Terrafame Oy projects

Terrafame Ltd is a multi-metal company producing nickel, zinc, cobalt and copper at its mine and metals production plant located in Sotkamo, Finland. Our aim is to conduct environmentally sustainable, safe and profitable operations.
According to the web pages of the Company:

Our mission is to build a sustainable world through high-quality metal products. To accomplish our mission we will take full advantage of our unique assets – extensive mineral resources and the bioleaching method. All our operations are based on Terrafame’s three cornerstones: safety, efficiency and commitment. Our vision is to be a multi-metal company among our top peers, measured by cost-efficiency. Thanks to the bioheapleaching method, Terrafame provides high-quality and low carbon footprint products to global markets.

To reach our vision, we have set a clear strategic roadmap. We aim to mine and crush annually 18 million tons of ore. Our strategic initiatives also include securing a minimum leaching yield of 70% and the efficient extraction of nickel, cobalt, zinc, and copper.

We aim to set an example in occupational and environmental safety. Here, an important role is played by maximized uptime and efficiency of operations.

We are committed to all aspects of good governance in our business operations. In addition to laws and regulations, we are guided by the cornerstones of our operations – safety, efficiency and commitment – as well as our operating principles.

Terrafame’s decision-making complies with the Articles of Association, the Finnish Limited Liability Companies Act and other legislation in force. We also comply with the Finnish Corporate Governance Code where applicable.

Terrafame’s objective is environmentally sustainable, safe and economically viable mining operations.

The amount of ore mined has been in line with targets; the bioleaching process, which is vital for the successful ramp-up of the mine, has worked as expected and the utilisation rate of the metals production plant has been high. Terrafame has increased production volumes of nickel and zinc as the ramp-up has proceeded. In October 2016 the production took a big leap forward as the second production line of the metals recovery plant went into operation.
In 2016, the net sales of Terrafame Ltd. from metal product deliveries were EUR 100.8 million. Regardless of the price development of metals, mine operations incur costs that are heavily front-loaded.

Terrafame employs approximately 685 skilled professionals. In addition, 681 employees from excavation contractors and other partner companies work at the mine regularly. The work community is young and our average age is approximately 40 years.

Terrafame team consists of a variety of experts from different occupational groups. The development of their professional skills is an important part of our business. We provide our employees with new opportunities to develop their skills through both education and career and job rotation.

Approximately 80 % of our employees and the majority of our contractors live in the Kainuu region. Indeed, many of them have moved to the region after being hired by Terrafame. In addition to Kainuu, some Terrafame employees live in, for example, Northern Savonia and Northern Ostrobothnia.

The safety of our personnel is one of the cornerstones of our operations. In 2016, we managed to reduce the frequency of accidents leading to absences from work (LTIF) to level 8.4. Our permanent goal is zero (0) accidents. In addition, we aim to reduce the partner companies’ accident frequency.

All our operations are guided by safety principles: we anticipate and manage safety in all situations, from the planning of work to actual implementation. We pay attention not only to ourselves, but also to our co-workers and subcontractors. Our managers hold a key position in implementing the safety culture. The Management Team and the department representatives participate in regular “safety tours” at the site. Regular meetings are held also with our contractors in terms of safety issues.

For new recruits, we emphasize the importance of working safety from the day they arrive at the mine. This means a comprehensive safety orientation training for all people working at the area.

At Terrafame we have two golden rules, which are followed at all circumstances:
• Work will be performed safely, or it will not be performed at all
• There is always time to do things safely, carefully and by the book
Safety-related incentives such as Safety Reward further motivate our personnel to operate safely. For Safety Reward, all our employees are divided into three “trophy groups” based on their department. If the group manages to work for one month without a single accident leading to absence, all employees in the group receive a monetary award.

As an additional incentive, an extra sum is added to the safety bonus, if there have been no accidents leading to absence during an annual quarter.

We continue to develop the incentive systems together with the representatives of personnel groups.

Multi-metal company Terrafame Ltd. has decided to apply the Finnish government for a permit to recover uranium, in accordance with the Finnish Nuclear Energy Act (990/1987). Terrafame intends to submit the permit application in the weeks to come. If the government grants the permit, Terrafame estimates that uranium recovery could commence towards the end of 2019.

In Terrafame’s production process, natural uranium is also leached from the ore, alongside other metals, but the uranium is not currently being recovered. The uranium concentrations in the ore mined by Terrafame are low. However, it would be possible to recover sufficient amount of uranium for commercial purposes, using modern methods.

The uranium in Terrafame’s production process and products does not cause radiation hazards to people or the environment as the radiation properties are equal to natural uranium present in the rock. The amount of radiation would not vary with starting uranium recovery.

Terrafame’s plant area includes a uranium recovery plant, into which 75 million euros have been invested in the past. If the company starts uranium recovery, the plant would require an investment of 10 million euros from Terrafame.

After Terrafame has submitted its permit application, the Ministry of Employment and Economic Affairs will request statements on the application from the municipality of Sotkamo, the town of Kajaani and their neighbouring municipalities, and several other parties. Private persons and communities will also have a chance to be heard during the processing of the application.
In addition to the government’s permission, starting uranium recovery requires approval from the Radiation and Nuclear Safety Authority, a uranium sales permit from the Ministry for Foreign Affairs, as well as a permit from the European Atomic Energy Community (Euratom) to transport uranium abroad for processing. Terrafame already has the chemical permit from the Finnish Safety and Chemicals Agency (Tukes) as well as the environmental permit granted in 2014.

Terrafame is beginning preparations for the Environmental Impact Assessment (EIA) of the battery chemicals plant it is planning to establish. Before the EIA procedure, a preliminary consultation will be organised between the key authorities and Terrafame. Involving stakeholders in the assessment work is also an essential part of the EIA procedure, which is why the company has convened an EIA monitoring group.

In the first phase of the EIA procedure, an EIA programme will be prepared for the battery chemicals plant, detailing the project and its options and describing the current state of the environment related to the project. In addition, the programme stage will include a proposal on the environmental impacts to be assessed and a plan on how the effects will be investigated.

In the second phase, an EIA report on the battery chemicals plant will be prepared, describing the results of the assessment specified in the programme phase and evaluating the feasibility of the EIA project. The EIA will end with a reasoned conclusion provided by the coordinating authority.

As in the past, Terrafame has invited the company’s key stakeholders, such as representatives of the relevant authorities, municipalities, neighbours, entrepreneurs and the local district nature conservation organisation to participate in the monitoring group. The purpose of the group is to promote the flow and exchange of information between the various parties.

In November 2017, Terrafame announced its plan to invest in the production of battery chemicals for electric car batteries. At the same time, the company announced that it had negotiated private financing of USD 200 million for the planning and construction of the plant. Terrafame aims to make an investment decision on the battery chemicals plant in the first half of 2018, when detailed plans and estimates have been completed.
### 3.3.2  Investments in Kainuu Region 2018–2025

#### Industry

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>KaiCELL Fibres, bioproduct plant, Paltamo</td>
<td>900 m€</td>
</tr>
<tr>
<td>ST1/North European Biotech Oy expansion</td>
<td>60 m€</td>
</tr>
<tr>
<td>Data Center Kajaani</td>
<td>33 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>993 m€</strong></td>
</tr>
</tbody>
</table>

#### Mining industry

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrafame Oy, Sotkamo, uranium, cobalt and battery production</td>
<td>185 m€</td>
</tr>
<tr>
<td>Sotkamo Silver Oy, Taivaljärvi silver mine</td>
<td>55 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>240 m€</strong></td>
</tr>
</tbody>
</table>

#### Wind Power

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyrynsalmi wind parks</td>
<td>150 m€</td>
</tr>
<tr>
<td>Vaala wind park</td>
<td>198 m€</td>
</tr>
<tr>
<td>Paltamo wind park</td>
<td>132 m€</td>
</tr>
<tr>
<td>Kajaani wind parks</td>
<td>300 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>780 m€</strong></td>
</tr>
</tbody>
</table>

#### Tourism

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vuokatti East resort, Sotkamo</td>
<td>120 m€</td>
</tr>
<tr>
<td>Other tourism projects</td>
<td>60 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>180 m€</strong></td>
</tr>
</tbody>
</table>

#### Public investments

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central hospital, Kajaani</td>
<td>135 m€</td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>2.328 bn€</strong></td>
</tr>
</tbody>
</table>
## Investments after 2025

<table>
<thead>
<tr>
<th>Mining industry</th>
<th>$200 m€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otanmäki mine reopening</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy/wind power</th>
<th>$66 m€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional projects</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport infrastructure</th>
<th>$150 m€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional railroad and road projects</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total</th>
<th>$416 m€</th>
</tr>
</thead>
</table>

## Kainuu Region Investment Potential

<table>
<thead>
<tr>
<th>2018–2025</th>
<th>$2.328 bn€</th>
</tr>
</thead>
<tbody>
<tr>
<td>after 2025</td>
<td>$416 m€</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2.744 bn€</strong></td>
</tr>
</tbody>
</table>
3.4 NORRBOTTEN
Norrbotten County (Norrbottens län) is a county in the North of Sweden. It borders to Västerbotten County and the Gulf of Bothnia. It also borders the counties of Nordland and Troms in Norway, and Lapland Province in Finland.

Norrbotten has some 249 436 inhabitants, which represents three per cent of Sweden’s population. There were people in this part of the country as far back as the Stone Age, 9 000 years ago. Reindeer husbandry and the Sami culture are couple of thousand years old.

The mountain area in Norrbotten, which is part of the Scandinavian mountain chain, is a near 100 km wide zone running from North to South. All of Sweden’s mountains above 1800 meters are located in this area. Many of them are in the Sarek area and the Kebnekaise mountains, which are the two most extensive high mountain regions.

The county railway network, both in a north-south direction and to Finland and further on eastwards is a vital link, both for goods traffic and passenger traffic. The Ore Railway between Luleå and Narvik in Northern Norway is one of the country’s most important goods routes. Half Sweden’s tonnage of railway freight is transported from Kiruna to Riksgränsen and on to Narvik in Norway.

In Norrbotten County there are five airports with scheduled flights: Luleå Airport, the fifth busiest in Sweden, Arvidsjaur, Gällivare, Kiruna and Pajala. The county is crossed by a national road network, which links to Norway and Finland.

The roads in Norrbotten are important also to link together this vast county. Nine per cent of Sweden’s road network is in Norrbotten County, a region where the rate of car ownership is among the highest in Sweden.

The harbour in Luleå is Sweden’s leading bulk goods terminal. An effective ice-breaker service enables the ports of Piteå and Luleå to remain open all year round for the intensive shipping. The harbour in Kalix also has year-round shipping, although on a smaller scale than Luleå and Piteå.

Luleå University of Technology is Scandinavia’s northernmost technical university, with world-class research and education The university today has more than 19,000 students, 1,700 employees, and an annual turnover of more than 1,600 million SEK. (Source: Facts about Norrbotten, Länstyrelsen I Norrbottens Län)
The position in Norrbotten is still strong, but the picture varies between the industries. The construction sector signals a significantly weaker position than other sectors, and also compared to other Nordic countries. Retail and service companies, instead, strengthened their assessments to a level close to a very strong position. Manufacturing industry also indicates that it is close to a very strong position, despite the fact that the industry declines relatively sharply from the record position stated in the previous survey.

Manufacturing companies reported above all more negative estimates of the size of the finished warehouse compared with the previous measurement. However, despite a slight weakening, the size of the order book is still positive. The expectations of production volumes are still positive although they have weakened slightly since the last measurement. The relatively negative opinion of the construction sector is due to weak assessments of the order book and the continuing problems of finding skilled labor. Both the private service industries and the retail sector thus indicate a strengthened position. The merchants are particularly positive about the volume of sales developed in the previous period, while the position of service companies is primarily driven by positive expectations of demand in the future.

Source: http://www.norrlandsfonden.se/media/50041/norrlandsbarometern_2017_nr3.pdf

3.4.1 Top investment project is Norrbotten

1. Facebook Data Center 3

The Node Pole, a major data center development located in the industrial north of Sweden, has been acquired by local energy companies Vattenfall and Skellefteå Kraft.

Financial terms of the deal were not disclosed. The region hosts several data centers, including Facebook’s facility in Luleå and Hydro66 colocation site in Boden. It has ample space and power available for future projects.

The new owners will continue developing the Node Pole as a data center hub. The news comes ahead of the long-expected changes to the pricing of electricity for data centers, expected to be announced by the Swedish parliament in December.
The Node Pole is located just 50 miles away from the Arctic Circle. It benefits from cheap, 100 percent renewable electricity derived from hydroelectric dams on the Lule River, where the grid hasn’t had a blackout since 1979.

The entire development is being acquired by Vattenfall and Skellefteå Kraft – the former is Sweden’s largest utility company that’s already providing electricity to both Hydro66 and Facebook.

According to the Node Pole, the partners will continue developing the data center campus, but will make it a part of an even larger plan – establishing Sweden as the first choice in Europe for all kinds of industries in need of stable, long-term access to cheap and sustainable energy.

The company says that Sweden currently has around 1,400MW of spare power capacity.

The deal is subject to government approval, expected before the end of the year Facebook opened some years ago its first data center in Lulea, Sweden. The company says the 27,000 square meter (290,000 square foot) data center may be its most efficient and sustainable to date. It’s the first server farm on a multi-building campus in Lulea, and will be powered by hydro electricity and filled with the “vanity free” server and storage hardware from the Open Compute Project. Here’s a look inside the Facebook Lulea data center.

Pinnacle Sweden, Facebook’s real estate company in Sweden, wants to build a third server hall on Porsön, not far outside Luleå. An application for building permits has been submitted. Next, the Environment and Building Committee is expected to raise the application on Tuesday. The proposal from the government’s officials is that the building permit is to be granted. According to local newspaper, the new server hall will be 380 meters long with a total area of over 31,000 square meters.

2. Malmö porten project, Luleå deep sea port

Due to demands for improved safety, capacity and environment through sulfur and nitrogen restrictions (Seca and Neca), increasing demand for ore and mineral transport and a heavily loaded ore runway, it is clear what needs to be done, Luleå Hamn AB has to be bigger.
Through an expansion, Luleå Hamn AB enables a greater socio-economic gain, as Luleå is an important node for transport from the mine to the customer. Luleå Hamn AB, a so-called TEN-Core port (a port of particular importance for the trans-European transport network), thereby also receives 50 percent EU financial support for an investigation and environmental impact assessment of the project.

Through the project, Luleå Hamn AB will have increased efficiency, less environmental impact, be able to catch larger vessels than today by increasing the depth to the Baltic Sea max, 15 meters. The need for icebreaking and tugs should be reduced, allowing vessels with a maximum load of approximately 200,000 tonnes to be able to arrive in Luleå and the possibilities for ships to reach the port in wintertime should be improved by 13.5 meters deep and 80,000 ships tons.

This will be possible for Luleå Hamn AB through a deepening and widening of the route in Bottenviken and the quark where about 20 million cubic meters of material will be excavated, of which a small part of this will be used for the construction of a new dock in Luleå Harbor.

Project Malimporten

Today, Luleå Hamn AB has:
• a maximum depth of 10.9 meters
• 600–700 calls per year
• 8–9 million tons of goods per year
• max 55,000 tons on the vessels
• a turnover of approximately SEK 100 million

By 2020, when the project is completed, Luleå Hamn AB expects to hold:
• new deep cages
• a new ham part
• a connection to Malmöbanan
• max 200,000 tons on the vessels
• an increased loading and storage capacity
3. Kaunis iron reopening Pajala mine

After a long process with many challenges, the design for a new start has begun. In a so-called "private placement" together with Carnegie Bank and about 80 Swedish contractors, necessary capital has been taken.

Kaunis Iron is a newly established company with the intention of launching the iron ore mine in Pajala with new owners and a strong local commitment. Due to strong demand, a sustainable and competitive product and world-class operating facilities, the target is set for an annual production equivalent to two million tonnes of finished product. Our unique iron ore concentrate, which has already been shown to be strongly demanded by the world’s steelworks, has a clear market place with its favorable environmental benefits.

The reason for the decision is the conviction that the business will be profitable, investors and stakeholders agree.

The plan is for production to start in the summer of 2018. The target is set for an annual production corresponding to two million tons of finished product. It's about half as much as the target was from the former operator.

There have been views on the environmental impact of the business. Among other things, the impact on the groundwater level of the marsh where the deposit is located. “Yes, mining has environmental impact, so it is of course. It must always be weighed in when making an overall assessment, but there are also strong reasons why it is worth it. Jobs and a living countryside weigh heavily in the second wave bowl. Today, it is a must and obvious to look at all sustainability aspects, socially, economically and environmentally. Even though we must respect each other’s roles, we want to be an active part of Pajala’s community building, “says Åsa Allan, location manager at Kaunis Iron.

Per-Erik Lindvall, one of the driving people in the project, has a solid background from the mining industry with 10 years in Boliden and 26 years in LKAB in various senior positions. Per-Erik is a famous profile in the mining industry. He is the one who, together with among other site manager Åsa Allan, will build the team for the operation of the mine in Kaunisvaara. Åsa is a geologist in primary and doctorate 2007 in oreology at Luleå University of Technology. After a time as a consultant, she was recruited as senior geologist to Pajala mine in 2012. After building up the geology part, she eventually became mining manager before the mine closed. Before Kaunis Iron, he knocked on the door for two years as a communchef in Pajala.
- So this just feels fantastic. I know what it means to the municipality, and I know that there is a great support for the mine in the region. I also know that together we will succeed with what we take care of. Now it’s the first focus on recruitment, we expect that more than 300 people will be needed in the business. We know there is a strong interest, we are receiving very positive reactions from the Norwegians already. A large part of the need will be resolved through partnerships with key suppliers, and some will be employed by the company, says Åsa Allan, location manager at Kaunis Iron.

Ultimately, it is about the unique product that has already been shown to be strongly demanded by the world’s steelworks. “We know that our product, with very favorable environmental benefits, has a clear market place. It is no secret that countries like China have major environmental challenges while having a great need for steel. This has led to premium raw materials with higher iron content. Something that gives our product from Kaunisvaara a head start, ”said Per-Erik Lindvall, board member of Kaunis Iron.

The company has also decided to solve the transport in the same way as before. This means that it will resume the delivery of iron ore from the harbor in Narvik.

The fact that Narvik becomes the port of discharge is specifically confirmed by the company.

There will be talk of an annual production of two million tons.

3.4.2 Investments in Norrbotten 2018–2025

<table>
<thead>
<tr>
<th>Industry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook Data Center 3, Luleå</td>
<td>400 m€</td>
</tr>
<tr>
<td>Arctic Arc, Arjeplog, Cold climate testing indoors track</td>
<td>100 m€</td>
</tr>
<tr>
<td>Canaan Creative Data Center, Boden</td>
<td>20 m€</td>
</tr>
<tr>
<td>SCA Munksund, Piteå, expansion white-top kraftliner</td>
<td>20 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>540 m€</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mining Industry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaunis Iron AB, Pajala, Kaunisvaara mine reopening</td>
<td>200 m€</td>
</tr>
<tr>
<td><strong>Wind Power</strong></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>General Electric/Green Investment Group, Piteå, Markbygden ETT</td>
<td>800 m€</td>
</tr>
</tbody>
</table>

**Energy Transfer Networks**

| Vattenfallen elnät Norrbotten-network | 270 m€ |

**Trade**

| Kiruna Shopping center | 100 m€ |
| Barents Center, Haparanda | 120 m€ |
| **Total:** | **220 m€** |

**Tourism**

| Clarion Sense, Luleå, expansion | 15 m€ |
| Scandic, Luleå, expansion | 20 m€ |
| Kiruna, New hotel | 30 m€ |
| Small tourism investments | 15 m€ |
| **Total:** | **70 m€** |

**Transport infrastructure**

| E 10 Luleå – Kiruna | 180 m€ |
| E 4 Salmis – Haparanda | 16 m€ |
| Railway Luleå – Rilksgänsen, ERTMS signal system | 265 m€ |
| Luleå Railway station new tracks | 60 m€ |
| Malmbanan, Kiruna – Riksgränsen, railway stations | 30 m€ |
| Luleå Sea port, Malmöporten, deepening of the fairway | 320 m€ |
| Norrbotniabanan Skellefteå – Luleå | 1.6 bn€ |
| **Total:** | **2.471 bn€** |

**Public investments**

| “Mögtesplatser för alla”- project, Luleå | 40 m€ |
| Other public investments | 20 m€ |
| **Total:** | **60 m€** |
| **All total:** | **4.631 bn€** |
Investments after 2025

**Mining industry**
- Hannans Reward, Rakkurijoki iron mine: 1.0 bn€
- Hannans Reward, Lannavaara iron mine: 1.0 bn€
- Hannans Reward, Pahtohavare gold-copper mine: 0.5 bn€
- Jokkmokk Ironm Mines AB, Kallak iron mine: 1.0 bn€
- Boliden AB, Laver copper mine: 1.3 bn€
- LKAB Kiruna, next projects up to 2030: 1.9 bn€
**Total:** 6.7 bn€

**Energy/Wind power**
- Markbygden, finalizing, Piteå: 4.0 bn€

**Tourism**
- Space Port Sweden, Kiruna: 220 m€

**Transport infrastructure**
- Kiruna – Narvik railway double track, Swedish side: 1.3 bn€
- Pajala – Svappavaara railway: 400 m€
**Total:** 1.7 bn€

**All total:** 12.620 bn€

**Norrbotten Investment Potential**

<table>
<thead>
<tr>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018–2025</td>
<td>4.631 bn€</td>
</tr>
<tr>
<td>After 2025</td>
<td>12.620 bn€</td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>17.251 bn€</strong></td>
</tr>
</tbody>
</table>
3.5 VÄSTERBOTTEN
The county had the second strongest position in Norrland. As in the rest of the counties, the manufacturing industry and the construction sector Net Economic Indices. The construction sector was pleased with how the building developed and the size of the order book.

Manufacturing industry was above all Positive to the size of the order book and in their expectations of production volumes ahead. Retail and private service industries still made stable positive position estimates. Service companies were especially positive in their expectations on demand in the future.

The mood situation in the county turned down the last measurement, and Västerbotten showed that as a single county a weakening position. The biggest explanation for this was that the manufacturing industry signaled a heavily weakened position from a previously very strong position.

Industrial companies signaled a significantly weaker position as a result of strongly weakened expectations of production volumes in the future. This net figure was at a level far below the average for the past few years. Other net assets were, in principle, in line with the previous quarter. Retail sales instead strengthened their position assessment and the confidence indicator is now in line with other Norrland after having slowed somewhat for over a year’s time. The merchants were significantly more positive both in terms of outcomes and in their expectations of sales.

The position in the construction sector is still very strong with positive assessments of the order book. Builders are also still positive in their view of how the number of employees will develop. At the same time, companies also indicate access to skilled labor as the main obstacle to continued growth. Private service industries weakened slightly somewhat compared with the previous survey, but the situation is still stronger than normal.

Västerbotten has a population of around 210 000 where 80% live along the coast and the remaining live in the sparsely populated interior and mountain areas. One can say that 70% of the population is concentrated to 20% of the total area. The population in the interior is concentrated to the chief city in each municipality and it has decreased significantly over the past 20 years. In sharp contrast, Umeå has been one of the most dynamic cities in Sweden with a population growth of 27% during the period of 1980–97. The other coastal municipalities have decreased in population.
Västerbotten is a productive region with strong and diverse business sectors. It is at the forefront of R&D, has abundant natural resources and is an attractive location as a gateway to Northern Scandinavia and the Barents region. Companies locating in Västerbotten benefit from a strong entrepreneurial tradition, competitive costs for personnel, operations and facilities, an excellent infrastructure and a reliable, well-educated work force. The region offers readily available land and premises at affordable costs. Companies establishing businesses in Västerbotten may also apply for financial and employment incentives from the government.

Västerbotten has experienced one of the highest GDP growth-rate of all Swedish provinces for the last six years, with an increase of 48% compared to the national average of 40%. A strong industrial culture, based on forestry, mining and pulp and paper, is making way for new high-tech industries, creative companies and a high-productivity manufacturing and processing sector. Since the region hosts most of Sweden’s energy resources, there is also an active development of eco-friendly power and heating solutions. Västerbotten has a collaborative spirit with many established networks and consortiums, business incubators and cross border research and development.

The region has three universities, Umeå University, including the world known Umeå Institute of Design, Luleå University of Technology and the Swedish University of Agricultural Sciences. The universities all offer inspiring environments for students, researchers and scientists, whom are world leaders in many fields. The region’s universities are constantly evolving and improving through regional, national and international cooperation with trade and industry, research institutes and authorities.

The region’s well-developed infrastructure with seven airports, deep sea ports, railroad communications, trucking service and an excellent road network with three European highways make it easy to travel and carry freight. Västerbotten also has a world-renowned development of both mobile and fiber-based broadband, and an extensive GSM and 3G network coverage. For example, Umeå has the fastest broadband connection in Europe. (Source: Västerbotten Investment Agency)
3.5.1 Top investment projects in Västerbotten 2018–2025

1. Northvolt Battery factory

Northvolt has announced a partnership with the two Swedish municipalities Skellefteå and Västerås for the establishment of Europe's largest lithium-ion battery manufacturing plant.

After an initial assessment of eight Swedish and two Finnish municipalities, Northvolt narrowed its choice down to Västerås and Skellefteå. The company has since decided to base activities in both towns, with the factory in Skellefteå and the main research and development operations in Västerås.

Peter Carlsson, founder and CEO of Northvolt, said: "Europe is rapidly moving towards electrification. Sweden has a unique position to establish large-scale battery production to support this transition with its clean and affordable energy, proximity to raw materials, and a strong industrial tradition deep in its DNA."

Skellefteå, about 770km by road from Stockholm, is part of a raw material and mining cluster in the north of Sweden and has a long history of process manufacturing and recycling. It will be the location of Northvolt’s first large-scale lithium-ion battery factory and will serve as the main production site, which includes active material preparation, cell assembly and recycling.

The construction of the factory is scheduled to begin during the second half of 2018. By the end of the March 2020, it will produce 8 GWh worth of battery capacity a year. Once completed in 2023, it will produce 32 GWh a year and employ 2,000–2,500 people.

Meanwhile, Västerås, a little over 100km drive from Stockholm, is home to a number of multinational companies including ABB, which has a strong engineering and R&D competence in electrification and process optimisation.

The Västerås facility will include a demonstration line, which will be used to qualify and industrialize products and processes. The operation there will employ 300–400 people. Construction of the demonstration line in Västerås will begin next year and should be completed in 2019.
Electric vehicle battery development has been gathering pace in Europe. Samsung SDI is building a $365m plant in Hungary with an annual capacity of 50,000 batteries for the EV market in Europe. Meanwhile, Daimler recently began construction of a second lithium-ion battery factory in Kamenz, south-east Germany, with an investment of $544m.

Northvolt has found a new backer for setting up a battery cell production pilot plant. The Swedish Energy Agency will support the demonstration line, Northvolt Labs, in Västerås with a grant of SEK 146m. The new line precedes a planned Swedish Gigafactory.

Northvolt has been hedging plans to set up a Gigafactory in Sweden for some time. The idea has now got official backing as the Swedish Energy Agency today announced it will support the establishment of Northvolt’s first pilot line with 15 million euros.

In Kronen that makes 146 millions for the so-called Northvolt Labs. In addition to the demonstration line the new demonstrator facility will also include a research lab, will be used to qualify and industrialise products and processes together with Northvolt’s partners and customers such as Scania for example.

Northvolt’s new research centre is supposed to bring 300 to 400 jobs to Västerås and is located not far from ABB’s headquarters. Both companies signed a partnership recently.

The launch of Northvolt Labs is a key step towards the establishment of Northvolt’s large-scale lithium-ion battery factory in Skellefteå, Sweden, which will serve as the main production site and include active material preparation, cell assembly, recycling and auxiliaries once it is completed.

The plans for a Swedish Gigafactory had first been made public in October 2017, when the Swedish company that is led by former Tesla manager Peter Carlsson, had completed its search for a location to build up its battery cell production facility. Construction works in Skellefteå are to commence in the second half of 2018. Two years later, the plant shall open with jobs for 2,000 to 2,500 employees and an initial production volume of 8 GWh per year that is to climb up to 32 GWh by 2023.

For the initial pilot plant that precedes production, Scania as well as ABB are backing Northvolt’s initiative financially. Scania and wind energy giant Vestas will spend 10 million euros each while ABB offered initial support of an undisclosed amount.
The new grant through the Swedish government should bring the pilot plant up to speed. The Swedish Energy Agency will release its 15 million euros between now and 2023. The grant corresponds to around 20% of the supportive costs required.

Around 100 people will initially be employed at the pilot plant, excluding those in R&D. Northvolt wants to combine research with mass-scale battery production and commercialisation. A further 2,500 jobs are expected to be created at the actual production site in Skellefteå in the future.

The Board of Directors of the European Investment Bank (EIB) has approved a loan request from Northvolt AB. The financing, a facility of up to EUR 52.5 million, is projected to be supported by InnovFin – EU Finance for Innovators’s Energy Demonstration Projects facility, with the financial backing of the European Union under Horizon 2020 Financial Instruments.

2. Norrbotniabanaban railway project

Norrbotniabanaban is a planned coastal railway between Umeå and Luleå, which allows for several positive social development effects. For Sweden as a whole and the region. At the moment, a planning work is being carried out for the various sections of the project.

The Norrbotten railway will primarily strengthen freight traffic in the country, but also enable passenger traffic between the north coast cities. The positive effects are great; Transport costs for freight traffic can be reduced by about 30%, and travel times for passenger traffic can be halved, enabling job shifts in a better way than today.

The Norrbotten County Bank is expected to create conditions for sustainable social development, increased competitiveness for business and positive regional development that benefits the entire country. The new railway is expected to generate major climate and environmental benefits as a whole. For example, emissions of carbon dioxide are estimated to decrease by approximately 80,000 tons per year.

Current state

All railroad investigations are complete. The Swedish Transport Administration is now working on drawing up railway plans for the Umeå-Skellefteå route and plans for construction start Umeå-Dåva 2018.
The route Umeå-Skellefteå is included in the proposal for a national transport plan submitted by the Swedish Transport Administration to the Government 31 August 2017.

Short facts

TRACK LAYOUT
• 27 miles Umeå-Luleå

COST
• According to the Swedish Transport Agency’s 2015 estimation, the cost is 30 billion (+ - 4) in price level 2015.

BENEFITS
• Reduced shipping costs by 30%.
• The maximum train weights of the day are 1,000-1,100 tonnes, on the Norrbotten railway they can be increased to 1,600 tonnes.
• Halftime travel times make the labor markets widen and we manage the skills supply.
• Increased capacity on the railways.
• Robust rail system in the north with the possibility of diversion to other electrified tracks in traffic disturbances.
• Distances decrease by 7–11 miles in many important freight relations.
• Connects the Botnia Banana, Malmbanan, Stambanan, Haparanda Banana and Finnish Railways.
• Become a link between Europe and the Barents region’s rich assets; ores, minerals, forests, oil and gas.

Financing

Financing can, among other things, be obtained from the EU when the Norrbotten bank is identified as part of the European network, core network. Norrbotten Bay is then eligible according to the following levels:
• For planning up to 50% of the cost can be obtained.
• For construction work up to 30% of the cost can be obtained.

The Norrbotten Bay will mean the biggest structural changes in more than 100 years in northern and western Botswana. The EU, with its Member States, has decided that the European Railway Network will be completed by 2030.
The long distances between municipalities will be bridged by fast and efficient traffic, but more importantly, business can maintain competitiveness by making it available through reliable and sufficient transport capacity.

With short connections to existing transport corridors, the Norrbotten Railway creates international and national proximity. In addition to railway capacity there is a great need for the right skills. There are three good universities, attractive places and a strong business community and lower unemployment than the rest of the world. But the long distances do not always make it up. Skellefteå, which lies between the three universities, has lower university education than the two university cities, which is linked to the long commute distances. The same applies to employment commuting, where we work in northern and western Finland, shorter distances than in the rest of Sweden, as the distances between municipal centers are too long. In the long run, the long distances have given a strong gender-divided labor market where women are found in health and administration and the men in manufacturing and industry. It will be a vulnerable labor market, while at the same time the work on gender equality will be at low risk.

The basic industry in the north has clearly identified that in the short and medium term, capacity increase and the creation of a modern coastal railway, Norrbotten Bay, is still necessary for the development of a large scale and environmentally friendly base industry in northern Norway, northern Sweden and northern Finland. In a slightly longer term, a northern east / western rail link.

Norrbotniaban AB

In the Swedish Transport Administration’s climate scenario there are three distinct areas in the country with significant capacity problems: the Malmö region, the Gothenburg area and northern Sweden. It is not possible to calculate the exact benefits for each part. What is clear, however, is that NBB solves most of the problems in northern Sweden (for the north-south row). Without the course, we will not even come close.

The Norrbotten Railway is a central part of the Swedish and European transport system and opens a northern entrance to Sweden with short connections to existing transport corridors that together create an international and national proximity. Halved travel times, increased rail capacity, double track function along with the mainland through Upper Norrland and reduced CO2 emissions, we are well prepared for Norrbotten railway and what it will carry for the region, Sweden and the EU.
Container start-up for Umeå-Davatill 2018

Early construction work between Doha and Skevefteå, self-completed rail plans and building documents 2020/2021 are of particular importance.

The wage billing of the building and the funding requirement is solved in its entirety. It is therefore important that the state and regional negotiations begin as soon as possible.


The open-air facility-built-in motorway shaft direct connection to the building is completed to Skellefteå so that the entire track can be completed in the near future until 2030.

The importance of planning plans will continue to be reinforced by the fact that the designated rail corridors lie as a dead hand over large areas and prevent exploitation and investment in the municipality. A suspended plan also prevents rational construction of the entire route and makes it impossible to get out early benefits of the track. Overall, it is likely to prolong the entire project as a whole.

IHaparanda- Torneå möts svensk och finsk järnväg och ären femetected railway nodes in the TEN-T investigation. Unfortunately, the different trace widths make transhipment, omaxing, and gauge shift to overcome the obstacles to freight transport in the east-west direction. This feature must be ensured.

Norrbotniabanan AB

3. Agnico Eagle, Barsele gold mine

Barsele is located in northern Sweden, 500 km southwest of our Kittila mine in northern Finland. Barsele includes two types of mineralization: intrusive-hosted gold as well as gold-rich volcanogenic massive sulphide (VMS).

Barsele contains intrusive-hosted gold mineralization in the Central, Avan and Skirasen zones, which appears to be similar to the Goldex deposit. The property also hosts gold-rich polymetallic VMS mineralization in the Norra Zone. Gold is generally associated with arsenopyrite and low base metal content, but also occurs as native
metal locally. Since mid-2015, we have conducted trenching, structural mapping and drilling, compiled geophysical data, carried out downhole geophysical surveys, and conducted hyperspectral diamond core scanning, environmental studies and community relations work. The project has an initial inferred mineral resource (the Company's 55% portion) estimated at 661,000 ounces gold (11.9 million tonnes grading 1.72 g/t) as of December 31, 2016. This estimate can be subdivided into open pit inferred mineral resources of 133,000 ounces gold (4.1 million tonnes grading 1.02 g/t) and an underground inferred mineral resource of 528,000 ounces gold (7.9 million tonnes grading 2.08 g/t).

Project update

- Drilling from January through July 2017 totaled 28,511 metres (56 holes).
- The owners plan to spend approximately $8.8 million on exploration in 2017 (on a 100% basis) with a focus on expanding the mineral resources along strike and at depth, testing the gap between the Central and Avan zones, and investigating certain VMS targets.
- Recent high-grade gold intersections demonstrate that the area between the Central and Avan zones is mineralized. New shallow intersections in the Avan Zone and deep intersections in the Skiråsen Zone indicate that the system is open to the northwest and southeast as well as at depth. The currently known mineralized system extends approximately 3.0 kilometres along strike and is recognized from surface to approximately 700 metres depth locally. This is an increase of approximately 400 metres strike length, mainly to the northwest.
- The plan for the remainder of the year is to continue expansion and infill drilling on the Avan, Central and Skiråsen zones, and to drill-test regional targets. Additional trenching is planned at the Central Zone as well as regional basal till sampling.

Geology

The Barsele deposit is located at the intersection of the Skellefte and Gold Line metallogenic trends. The project area covers a sequence of metasedimentary and metavolcanic (Härnö formation) rocks of the Proterozoic Svecofennian system.

The district shows strong potential for gold and base metal mineralization and ore structures. There is an important spatial relationship between the major north-south-trending high strain zones and gold deposits in the area. All economically important deposits in the region are located on the same type and age of structures. The orogenic gold deposits are related to the same structure as the Barsele prospect.
Mineralization

The Avan, Central and Skiråsen zones extend over a strike length of 2.6 km from surface to at least 580 metres depth, within a highly fractured granodiorite. There are two types of mineralization in the Central Zone. Low- to moderate-grade orogenic or mesothermal intrusive-hosted gold is associated with networks of thin tourmaline-quartz and quartz-calcite-arsenopyrite veinlets. High-grade gold-silver-lead-zinc mineralization is hosted by syntectonic quartz-sulphide veins, with grades up to 50 g/t gold or higher. The other style of mineralization at Barsele is referred to as “Skellefte-type mineralization”, found in the Norra Zone. It comprises gold-rich VMS mineralization, similar to the Company’s LaRonde deposit in Quebec.

3.5.2 Investments in Västerbotten 2018–2025

<table>
<thead>
<tr>
<th>Industry</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sawmills in Västerbotten, SCA Vilhelmina, Renholmen</td>
<td>6 m€</td>
</tr>
<tr>
<td>Northvolt Battery Factory, Skellefteå</td>
<td>4 bn€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>4.006 bn€</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wind power</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vattenfall Blakliden, Fäboberget</td>
<td>540 m€</td>
</tr>
<tr>
<td>GHG Wind Parks, Vilhelmina, Storuman</td>
<td>1.2 bn€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1.740 m€</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy Transfer Networks</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vattenfall Västerbotten</td>
<td>100 m€</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tourism</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemavan vision 2025</td>
<td>50 m€</td>
</tr>
<tr>
<td>Skellefteå hotel</td>
<td>30 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>80 m€</strong></td>
</tr>
</tbody>
</table>
## Transport infrastructure

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost (bn €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norrbottniabanaban railway Umeå -Skellefteå</td>
<td>1.460</td>
</tr>
<tr>
<td>Inlandslänken project, railway Västerbotten</td>
<td>0.040</td>
</tr>
<tr>
<td>Västerbotten region transportplan investements</td>
<td>0.100</td>
</tr>
<tr>
<td>Umeå road projects E4/E12</td>
<td>0.110</td>
</tr>
<tr>
<td>E4 projects before 2020</td>
<td>0.040</td>
</tr>
<tr>
<td>Other railway projects, junctions</td>
<td>0.090</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1.840</strong></td>
</tr>
</tbody>
</table>

## Public investments

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost (bn €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skellefteå Culture Center</td>
<td>0.040</td>
</tr>
<tr>
<td><strong>Total all:</strong></td>
<td><strong>7.806</strong></td>
</tr>
</tbody>
</table>

## Investments after 2025

### Mining industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost (bn €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archelon, Rönnbäcken nickel mine</td>
<td>1.000</td>
</tr>
<tr>
<td>Agnico Eagle, Barsele gold mine</td>
<td>0.300</td>
</tr>
<tr>
<td>Dragon Mining, Fäboliden gold mine</td>
<td>0.200</td>
</tr>
<tr>
<td>Tertiary Mining, Storuman fluorspar mine</td>
<td>0.040</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1.540</strong></td>
</tr>
</tbody>
</table>

### Transport infrastructure

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Cost (bn €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLC railway Storuman – Mo i Rana, Swedish side</td>
<td>0.850</td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>2.390</strong></td>
</tr>
</tbody>
</table>

## Västerbotten Investment Potential

<table>
<thead>
<tr>
<th>Period</th>
<th>Cost (bn €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018–2025</td>
<td>7.806</td>
</tr>
<tr>
<td>After 2025</td>
<td>2.390</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>10.196</strong></td>
</tr>
</tbody>
</table>
The Norwegian High North consists of three counties: Finnmark, Troms and Nordland. Population of Finnmark is 75,207 and the total land area is 48,618 square kilometres. Most of the population live along the coast. However, the indigenous people (Sami), about 10% of the population - have a special status with its institutions and live mainly in the inland. 5% of the population in Finnmark is of recent foreign origin and mainly from Russia and Finland. The Sami people constitute the majority in Finnmark’s interior parts, while the fjord areas have been ethnically mixed for a long time. The Finnic Kven residents of Finnmark are largely descendants of Finnish immigrants who arrived in the area during the 19th century or before from Finland, suffering from famine and war.

68°–70° North, Troms is a county in North Norway bordering Finnmark to the northeast and Nordland in the southwest. To the south is Norrbotten Län in Sweden and further southeast is a shorter border with Lapland Province in Finland. To the west is the Norwegian Sea (Atlantic Ocean). The entire county is located North of the Arctic Circle. The Gulf Stream running up the cost gives the county a temperate climate. Area is 25,877 square kilometres.

Troms county has a total of around 161,771 inhabitants. Major cities and municipalities are Tromsø (72,066), Harstad (24,291), Lenvik (11,345), Målselv (6,599) and Balsfjord (5,502). More than third of the county’s population lives in the City of Tromsø. In Troms, three different cultures meet: Norwegian, Sami and Kven cultures. Approximately 10% of the population is of Sami heredity.

Nordland is located along the northwestern coast of the Scandinavian peninsula and extends about 500 km from Nord-Trøndelag to Troms. From the county border in the North to the southern border the distance is about 600 kilometers. At the narrowest the county is only 6 kilometers wide from the coast to the Swedish border. Area is 38,456 square kilometers.

Population in Nordland is 240,527 which of 50,000 reside in Bodø and 18,509 in Narvik cities. Nordland has population of about 3000 Sami people, of whom 8% are engaged in reindeer herding. (Source: Finnmark.no, Hammerfet Kommune, Kirkenes närigshage)
The consumption of northern Norway households has been reduced since the end of 2016. The impressive sales increase in retail trade from 2015 and 2016 is now normalized and is at the same level nationally. Household income increased more in northern Norway than in the rest of the country during the period 2013-2015. In 2016, they increased by 7.8 per cent (measured through tax revenues to the municipalities), and then somewhat lower than on a national basis.

Throughout the recession, employment growth was higher in northern Norway than nationally, but now the potential for further growth is less. It is simply too few people to take off, while unemployment cannot be much lower. With such pressure in the labor market, wages are expected to increase significantly in those parts of the economy, where growth in wages is primarily governed locally.

Housing prices are falling in Norway. September was the sixth consecutive month in a row, but the annual growth rate is still very positive. In Northern Norway as a whole, inflation has slowed sharply, and Tromsø and Bodø are experiencing a fall in prices. There is reason to expect a reduction of up to 5 per cent in northern Norway before prices stabilize from the second half of 2018. The price drop will probably not be as strong in the north as in the south.

Expectations of higher wage growth mean, that households in the region believe in solid consumer growth in 2018, approximately this is in line with the rest of the country.

Investments

Investment growth in northern Norway was strong in 2016 and continued into 2017, primarily due to the high start-up of new housing projects. A number of projects are running far into 2018, but according to Norway’s statistic, the construction industry's building orders are not the way as they have been. With a fall in the house prices, we must expect, that housing investment will go further down also in northern Norway.

In the construction industry, where road construction and other infrastructure control the activities, the situation is not as bad. Here the investments are in the making, and an ambitious national transport plan ensures that growth continues at the same level in the next few years.
In Nordland, several water and wind power developments are being planned. Energy companies Fortum and Nordkraft have entered into major agreements for further wind power in the Ofoten and Vesterålen, and Eolus Vind Norge AS has been licensed to construct Øyfjellet wind power plant at Mosjøen. Thus, the investments in both water and wind power will help to increase the total investment figures in the next few years.

The supplier industry in northern Norway is still struggling, but according to the analysis of “Levert”, better times are expected next year. In the oil and gas sector, it is actively working with development solutions for the Johan Castberg field in the Barents Sea. Nevertheless, there is a chance, that the major projects to the north will affect also to the investments on the rural side, especially before 2020.

It is primarily foreseeable profitability, that controls the companies’ investment plans. According to Norway Bank’s regional network, the companies in Northern Norway expect a slight growth in investment. Overall, investment growth should therefore be expected to decline from last year’s high level till 2 percent for the next year. Falling house prices will affect in the investment growth in the coming years, but investments in power supply and oil industry will dampen the slowdown. KB expects growth to be 2 percent also in 2019.

Export

North-Norwegian exporters benefit from favorable price developments on their goods. The value of North-Norwegian exports was 9 percent higher in the first eight months of the year than in the same period last year. This is mostly about good price development and less about volume growth. Overall, KB (Konjunktbarometer) believes in a North-Norwegian export growth of 2.5 per cent this year, measured at constant prices. Exporters will experience greater demand from Europe, but without better capacity, volumes cannot increase significantly. With a stronger Norwegian krone in the future, we can expect growth to decrease to about 2 percent. Why the slowdown does not get bigger, is due to the optimistic expectations of the tourism industry.
Seafood

The value of seafood exports from northern Norway increased by 22.5 per cent in 2016. In the first 8 months of the year, growth has continued, but only by 6 per cent. The industry still benefits from high prices for farmed salmon and fresh whitefish, but the price trend for salmon points downwards.

In the north, the seafood industry is struggling to increase the volumes. This applies especially to the farming, but also to coastal and deep sea fishing, which have had zero growth in deliveries to North Norway fishery in 2016. Until October this year, there has been a volume increase of 8 per cent for the country as a whole. There are special fish of blue whiting, herring and sandeel that demand is rising up, but the demand for pollock has also been good. There is a reason to believe, that the volume growth has been good also for Northern Norway’s fishermen.

Within farming, there is no growth to track. In 2016, there was zero growth in the production of salmon and trout in Northern Norway, and for the country as a whole, production in the first 40 weeks of the year has also been unchanged from the same comparison period in 2016.

The need to fight salmon lice limits the prospects for increased production. The lice problem has contributed to the end of the license allocations, but the Directorate of Fisheries opened to apply for development permits in November 2015. Of the nearly 40 applications for development permits, only five have been given the license for an allocation. Two of these are in northern Norway. Nordlaks Oppdrett AS has received 10 permits with a total production volume of 7800 tons for its offshore concept at Havfarm. The volume corresponds to 3 per cent of what was produced in Nordland in 2016, and is the largest allocation of development licenses. The new technologies with closed plants and underwater cages are still at the testing stage.

By 2019, we cannot expect a particular change in the seafood volumes from northern Norway. Seafood prices are likely to stay on a high level for a few years, but not at the levels they have had in recent years. Both the price of whitefish and redfish have shown a weaker development in recent times. At the same time, somewhat higher economic growth, both in Europe and globally, will push prices up. Thus, it is likely that the value of the seafood export might also experience zero growth in 2019.
Tourism

Tourism industry in Northern Norway is growing rapidly. Expect in 2013, when there was a slight downturn. The number of overnight stays has risen by way over 10 percent each year. This is even higher number compared to the national basis. In 2016, the number of overnight stays increased by 21 per cent for foreigners. Last year’s growth in northern Norway was nothing but impressive and ended 11 percentage points higher than on a national basis. Growth for 2017 does not look as strong for northern Norway. In the first eight months of the year, the number of overnight stays increased by 2.5 per cent, compared with the same period last year.

Especially in Troms, growth is strong, with 3 times as many overnight stays as 10 years ago. The boom in tourism is largely attributable to the increased winter tourism and experiences with the northern lights. The high growth in Troms indicates a great potential also in Nordland and Finnmark. Lofoten has gotten a lot of attention internationally, but also nearby areas like Vesterålen and Steigen, have great opportunities for growth. With a new and better airport in Mo i Rana, Helgeland will also be able to prepare for a solid increase in the number of visitors in the years to come.

Better times in the global economy, and especially in Europe, speak for this trend to continue. The tourism industry is, however, very sensitive to price changes. A stronger Norwegian currency and increased VAT, which are reported in the Government Budget for 2018, may have an impact on the industry. This Year’s weak growth indicates, that the inflow will slow down in the coming years. Limited availability and expensive airfares also indicate that the demand for North Norwegian tourism services will not grow at the same rate as before. Nevertheless, KB expects an annual increase in North Norwegian tourism exports by up to 5 percent in the next few years, but that growth will decline. Norwegian tourists’ consumption growth in the north will be way below half of this.

Metals

Northern Norway exported metals, chemical products and processed goods to almost NOK 12 billion in 2016. The export has decreased from the previous year, due to a fall in export goods prices, average decreasing rate 8 percent. The fact that Chinese suppliers have come to the market are pushing down profitability.
According to Index Nordland, metal producers are on their capacity limit, and as the industry is growing, investment must increase as well. Signs of reduced profitability are not the best starting point for increasing investment, but several new projects are still in the start-up phase. In Narvik, the construction of a steel plant is being considered, and in Glomfjord work is being done to establish a magnesium plant. Elkem’s acquisition of Fesil Rana Metall can offer new opportunities, and Glencore Manganese in Mo i Rana has invested in a new technology, that increases their capacity. In addition, Statistics from Norway may report a small increase in the number of employees in the metal industry in northern Norway.

In summary, this indicates that industry capacity will increase over the next few years, and KB estimates a 2 per cent increase per year over the next 2 years, where almost all exports are exported.

Growth prospects of other industries

Mineral industry

The mineral industry’s contribution to the North-Norwegian economy has been on a declining front in recent years. Employment figures for 2016 show a decline of 3 percent. But there are also some optimistic news on this field as well.

In 2016, Elkem received approval for quartz recovery in Nasafjell in Rana municipality. Nasafjell is considered to be one of Northern Europe’s largest and most important quarters, estimated to be 10 times larger than other known instances in Norway. Elkem is considering using a part of this quarter for the production of silicon products at Elkem Salten in Sørfold. The company is now working to associate the necessary infrastructure with the field and estimates a start-up of production no earlier than 2020.

One year after the bankruptcy in Sydvaranger Mine, the mines are opened again. After several months of maintenance of the equipment in the mine, owner Felix Tschudi announces that the company is now rebooting with limited operation.

According to the IMF, world prices for aluminum and iron ore will remain in the same level for a while. Global investment in renewable energy can nevertheless increase the demand for northern Norwegian minerals.
Public sector

The state budget for 2018 contains several good news for northern Norway. The Government proposes reintroducing the differentiated employer’s fee for transport and energy companies. We will build roads for 3.1 billion in the region, and a new center for ocean and arctic issues has been proposed to be created in Tromsø. The government also announces efforts to increase the presence of the defense in the north, with the establishment of a company at the Garrison in southern Varanger, the acquisition of combat air defense to the army and the start of building Evenes as the base for maritime patrol aircraft and operation base for F-35 combat aircraft. The government also proposes to remove the municipalities’ ability to impose property taxes on so-called “work and use”. It opens, among other things, to the foreign data companies a possibility once again correct their approach to safe access to affordable power and water cooling for large-scale data centers.

Growth in public consumption was relatively weak in 2016. This year growth is increasing, but with a re-elected bourgeois government, KB believes a reduction in regional transfers to the country. The sector still accounts for a significant proportion of North-Norwegian employees, and by 2016 employment growth was still higher than in the private sector. Low population growth and opportunities for reduction in government transfers may lead to the public sector becoming less important in northern Norway in the future. KB believes in 2.5 percent growth in public consumption this year and 2 percent in the coming years. This is lower than the national growth.

Employment, unemployment figures and demographics

Demand for labor has long been high in northern Norway. Employment growth was close to 1 percent in 2016, when it was almost 0.2 nationwide. Unemployment in the north has been lower than in the country as a whole, and has fallen throughout the years 2016 and 2017. This year the national unemployment rates have also improved.

At the same time, population growth in northern Norway is weak. Since unemployment is very low, the weak population growth makes it difficult to keep employment growth up. KB therefore believes that employment growth in the region will fall to 0.5 percent per year in the coming years. Lack of labor puts clear constraints on further economic growth. (Source: http://kbnn.no/artikkel/skiftende-skydekke-nordnorsk-okonomi)
1. Johan Castberg Oil field

Capital expenditures for Johan Castberg are estimated to be at some NOK 49 billion. Recoverable resources are estimated to be at 450 – 650 million barrels of oil equivalent. This makes the Johan Castberg project the biggest offshore oil and gas development to be given the go-ahead in 2017. First oil is scheduled for 2022.

“Johan Castberg has brought challenges. The project was not commercially viable due to the high capital expenditures of more than NOK 100 billion and a break-even oil price of more than USD 80 per barrel. We have been working hard together with our suppliers and partners, changing the concept and finding new solutions in order to realise the development. Today we are delivering a solid PDO for a field with halved capital expenditures, and which will be profitable at oil prices of less than USD 35 per barrel,” EVP Margareth Øvrum says.

“Johan Castberg will be the sixth project to come on stream in Northern Norway. The field will be a backbone of the further development of the oil and gas industry in the North. Infrastructure will also be built in a new area on the Norwegian continent. We know from experience, that this will create new development opportunities,” says Arne Sigve Nylund, Statoil’s executive vice president for Development and Production Norway.

The Johan Castberg field will have a supply and helicopter base in Hammerfest and an operations organization in Harstad. The costs of operating the field are estimated to be at some NOK 1.15 billion per year. This will represent about 1700 man-years nationwide, some 500 of which will be located in Northern Norway. This includes both direct and indirect effects.

Parallel with the submission of the PDO, Statoil is signing a contract both for the Johan Castberg subsea system, and engineering and procurement management, both with Aker Solutions AS. The contracts have a total value about NOK 4 billion.

Johan Castberg is a big subsea development, and this contract includes 30 wells, 10 subsea templates and two satellite structures. “We are pleased to see that Norwegian suppliers again demonstrate their competitiveness and will play a key role in the development of Johan Castberg. The jobs generated nationwide during the development are estimated at almost 47 000 man-years,” Øvrum says.
Statoil, on behalf of the partners in the Snorre licence, is also signing a letter of intent (LoI) with FMC Kongsberg Subsea AS for the subsea system for Snorre Expansion Project (SEP). The LoI is worth slightly less than NOK 2 billion and includes 6 subsea templates and subsea production equipment for a total of 24 wells.

The Johan Castberg partnership consists of Statoil (operator 50%), Eni (30%) and Petoro (20%). The Johan Castberg licence will also spend more time investigating the possibility of realizing a stand-alone oil terminal on Veidnes. An onshore terminal could also be an alternative in combination with offshore oil offloading. However, there are significant differences in costs between a concept based on bringing the oil to shore in a pipeline and a concept based on offshore oil offloading. Statoil and its partners will therefore continue to work to optimize opportunities in the area and the timing of project activities. An investment decision on a possible terminal will be made in 2019.

Johan Castberg is a breakthrough in unexplored areas, where we must interact with other interests, such as the fisheries. At the same time, this is a development, which will have ripple effects including an impact on technology and expertise building in the supplier industry—particularly in the north.

Statoil has also made contract with Kvaerner regarding Johan Castberg topsides. The contract includes the construction and installation of the topside structure for the floating production, storage and offloading vessel (FPSO) to be located on the Johan Castberg field in the Barents Sea. The contract has a total value of about NOK 3.8 billion. The development work will take place at several yards along the Norwegian coast.

“This is one of the large pieces of the Johan Castberg puzzle, and is a key component of the FPSO. The contract includes building a total of ten modules, a flare boom and a central pipe rack. The international competition for the contract has been tough, and we look forward to working closely with Kværner in the years to come. Norwegian suppliers have again demonstrated their competitiveness,” says Torger Rød, Statoil’s senior vice president for project development.
Work along the coast

Kværner will utilise a number of yards along the Norwegian coast for the construction work. Yards in Sandnessjøen, Verdal, Stord and Egersund will all be used. The construction work is scheduled to last until 2021, followed by a complex assembly period. In this period, the topside structure will be installed on the hull and connected to the turret. First oil from the field is scheduled for the first half of 2022.

“The Johan Castberg development will generate substantial spinoffs for Norwegian supply industry in the years ahead. The field is also essential to the further development of industry in Northern Norway, and we are pleased that this contract will help increase activities in the north,” says Pål Eitrheim, Statoil’s chief procurement officer.

Johan Castberg will be the sixth project on stream in Northern Norway. The field has been important to the further development of the oil and gas industry in the north. Thanks to Johan Castberg infrastructure that will be developed in a new area of the NCS.

Capital expenditures for the Johan Castberg project are estimated at some NOK 49 billion (capex numbers in nominal terms based on fixed currency) and the jobs generated nationwide during the development are estimated at slightly less than 47,000 man-years.

The field will be producing oil for more than 30 years, and substantial spinoffs will be generated in the long production phase. Castberg will create considerable activities for Norwegian supply companies and generate ripple effects in Northern Norway. Recoverable resources are estimated at 450 – 650 million barrels of oil equivalent.

Statoil sanctioned projects worth NOK 90 billion in 2017 on the NCS. Norwegian suppliers have secured 70 % of the contracts related to these projects so far. The contact is subject to government approval of the plan for development and operation (PDO).

Statoil is signing a letter of intent with Sembcorp Marine Rigs & Floaters Pte. Ltd in Singapore for the construction of the hull and integrated living quarters for the floating production, storage and offloading (FPSO) vessel that will be located on the Johan Castberg field in the Barents Sea.
The contract will be signed at the final investment decision scheduled before Christmas.

Covering engineering, procurement and construction the contract has a value of NOK 4 billion.

The contract, which was won through international competitive bidding, marks an important milestone for the progress of the Castberg project. There were no Norwegian bids for the contract.

“We will be working closely with Sembcorp Marine to ensure safe and efficient delivery based on our requirements for HSE, quality, time and cost. The remaining procurement work will be progressed in parallel with this,” says Statoil’s chief procurement officer, Pål Eitrheim.

The construction of the hull is the most time-critical delivery for the completion of the Johan Castberg project for the scheduled start-up in 2022. The contract will have a separate cancellation clause linked to the approval of the plan for development and operation (PDO).

“Johan Castberg is the next major field development in Norway and important to future infrastructure in the Barents Sea. Analyses from Agenda Kaupang show, that the project will generate some 47,000 man-years of employment in Norway from 2018-2022,” says Torger Rød, Statoil’s senior vice president for project development.

2. Lundin Petroleum projects in the Barents Sea

Lundin Petroleum is a Swedish independent oil and gas company with a proven track record of finding, developing and producing oil and gas resources.

Norway is the principal area of operation for Lundin Petroleum. With estimated gross reserves in the range of 2.1 and 3.1 billion barrels of oil, the giant Johan Sverdrup discovery is the largest find on the NCS since the mid-eighties.

Norway is Lundin Petroleum’s principal area of operation with 2P reserves of 726.3 MMboe. Average net production from the Norwegian assets for 2017 amounted to 81.6 Mboepd.
Johan Sverdrup development

In September 2010 an exploration well on the Avaldsnes prospect in PL501, located 25 km east of the Edvard Grieg field, resulted in a giant oil discovery. A further large discovery was made on the same structure in the neighbouring PL265 on the Aldous Major South prospect. In early 2012, the Avaldsnes/Aldous discovery was renamed as Johan Sverdrup.

An extensive appraisal program was completed in 2014 and the PDO was submitted in February 2015.

The PDO for Phase 1 of the development was given final approval by the Norwegian Ministry of Petroleum and Energy in August 2015. Phase 1 of the development consists of four bridge linked platforms as well as three subsea installations. The gross capital expenditure for Phase 1 is estimated at NOK 88 billion (nominal, operators latest estimate), which includes oil and gas export pipelines, development wells as well as power supply from shore. Phase 1 production is scheduled to come on stream in late 2019 with a gross plateau rate of up to 440,000 barrels of oil per day.

Lundin Petroleum has a 22.60 percent working interest in the Johan Sverdrup field.

Edvard Grieg field

Edvard Grieg came on stream at the end of 2015, quickly achieving stable operations, and during 2016–2017 new wells were progressively brought online with production levels reaching gross maximum facilities capacity of 100,000 boepd towards the year end.

The Edvard Grieg prospect in licence PL338 was successfully drilled as an oil discovery in late 2007. Following appraisal program, a plan for development and operation (PDO) for the Edvard Grieg field was given final approval in June 2012. The gross capital cost of the Edvard Grieg field development is estimated at NOK 26 billion and it includes platform, pipelines and development wells.

Lundin Petroleum was assigned a unitized interest in the Ivar Aasen field located north of the Edvard Grieg field in 2014. Lundin Petroleum has a net ownership in Ivar Aasen of 1.385 percent. Production from Ivar Aasen, which commenced in December 2016, is exported via the Edvard Grieg platform.
Other production

The Alvheim field came onstream in 2008 and consists of the Kameleon, Boa, Kneler, Kameleon Øst and the Viper/Kobra hydrocarbon deposits."

The Volund field is located to the south of Alvheim and is a sub-sea tieback to the Alvheim FPSO. The field came on stream in 2010. In addition, the Viper/Kobra accumulation is a subsea tieback to the Volund subsea facility with first oil achieved in December 2016.

The Brynhild field (PL148) produced first oil in December 2014 and is Lundin Norway’s first field development as an operator.

Production from the Bøyla field in PL340, commenced in January 2015. The field is a subsea tie-back to the Alvheim FPSO.

Exploration

A significant oil and gas discovery was made in 2014 on the Alta prospect in the Barents Sea. The find is located close to the Gohta discovery situated on the Loppa High. Alta will be further appraised during 2017.

Lundin Petroleum has an active ongoing exploration/appraisal program in Norway. A total of ten exploration/appraisal wells are scheduled to be drilled in 2017, which will be concentrated in two core areas, namely the Utsira High in the North Sea and the southern Barents Sea.

Gohta oil and gas discovery is located in production licence PL492 of the Barents Sea, Norway, at a water depth of 342m. The site is operated by Lundin Petroleum subsidiary Lundin Norway, and lies approximately 35km north of the Snøhvit field. The field is jointly owned by Lundin (40 %), Det norske oljeselskap (40%) and Norwegian Energy Company (20%). Lundin plans to develop Gohta along with the Alta discovery, which is located 20km to the north-east. The company is currently performing appraisal activities at both sites.
Gohta was discovered via the drilling of the 7120/1-3 wildcat well by the Transocean Arctic semi-submersible drilling rig in September 2013. The well was drilled to target the Triassic sandstone (Snadd formation) and Permian carbonate (Røye formation) reservoirs. The Middle Triassic reservoir rocks (Kobbe formation) were the secondary target. The well was drilled to a vertical depth of 2,515m, and encountered a 75m oil column and a 25m gas / condensate cap in the Permian carbonate reservoir. The Triassic reservoir quality was as expected, albeit filled with water. Oil-water contact occurred at a depth of 2,365m below mean sea level.

Discovery of Gohta confirmed the presence of recoverable oil and gas in the Permian sandstones in the Norwegian part of the Barents Sea for the first time. A drill stem test (DST) was conducted to establish the flow properties of the prospect. The test achieved a maximum production rate of 683 standard cubic meters (Sm³) of oil and 22,230Sm³ of associated gas a day. The gas to oil ratio in the well was 190Sm³/Sm³.

Gohta is part of the Loppa High area of the Barents Sea, which is a proven hydrocarbon zone with a number of gas and oil fields such as the Goliath field. The reservoir is a four-way dip closure containing porous Permian sandstones of the Tempelfjorden Group. The field is estimated to contain reserves between 111 and 232 million barrels of oil equivalent.

Gohta is being appraised through the drilling of two appraisal wells. Well 7120/1-4 S was drilled in July 2014 approximately 5.3km north-west of the discovery well, using the Island Innovator drilling rig.

The primary purpose of drilling the appraisal well was to test the extent of the Permian sandstones reservoir and establish the oil-water and gas-oil contacts in the western part of the prospect. The well was drilled to a vertical depth of 2,520m and encountered 10m of upper Permian sandstones. Two DSTs were performed at the well, with the 10m conglomerate producing at the rate of 700,000Sm³ of gas a day. Drilling of the second appraisal well named 7120/1-5 commenced in March 2017. The Leiv Eiriksson semi-submersible rig is drilling the well with an aim to delineate the north-eastern part of the prospect.

The well will also establish a calibration point for drilling of a horizontal well, in order to perform an extended well test currently scheduled for next year. Lundin is planning to develop the Gohta field along with the Alta discovery.
The operator is currently appraising the two fields and carrying out pre-development activities. The field development concept will be finalized upon completion of the appraisal. The preliminary field development concept for the Gohta / Alta fields includes a standalone floating production, storage and offloading (FPSO) unit along with the subsea installations.

Lundin Petroleum has downgraded contingent resources at its Gohta and Alta oil discoveries in the southern Barents Sea offshore Norway to 115–390 MMboe combined.

In Gohta’s case, the reduction is due to results from an appraisal well drilled last year, while for Alta, the change follows a review of all wells on the field completed in 2016 and 2017. Later this year the company plans an extended well test at Alta with a view to reducing reservoir uncertainty and providing the basis for development studies.

Overall, consultant ERCE estimated Lundin’s 2P (proved plus probable net reserves) at 726 MMboe at the end of last year, with 3P (proved/probable/possible) net reserves of 895 MMboe.

At the Edvard Grieg field in the Norwegian North Sea, Lundin’s main producing asset, 2P reserves rose to 274 MMboe, up 51 MMboe from the end-2016 estimate, excluding production.

The increase was based on drilling results and production performance to date, which suggest more oil in-place and a greater proportion in a higher recovery sands as compared to the lower quality conglomerate reservoir.

Lundin has identified further contingent resources in the form of infill drilling opportunities.

Lundin Petroleum AB (Lundin Petroleum) is pleased to announce, that its wholly owned subsidiary Lundin Norway AS (Lundin Norway) has successfully completed the drilling and production testing of Alta appraisal well 7220/11-4 (Alta-4) located in PL609 in the southern Barents Sea.
The Alta-4 well was located approximately 2 km south of the original Alta discovery well 7220/11-1 and approximately 2.5 km north of the previous appraisal well 7220/11-3. The main objectives of the well were to further appraise the Alta discovery and to provide a calibration point for the drilling of a horizontal well for a possible extended well test that is being planned for 2018.

The well encountered a gross hydrocarbon column of 48 metres, comprising 4 metres of gas and 44 metres of oil in a sequence of Permian-Triassic clastic carbonate sediments. Extensive data acquisition and sampling was carried out in the reservoir, including conventional coring and fluid sampling. Pressure data show the same fluid contacts and gradients as observed in previous wells drilled on the Alta discovery, confirming good communication across the large Alta structure.

A production test was performed in the oil zone, producing at a stabilized rate of 6,050 barrels of oil per day with low pressure drawdown and constrained by rig testing facilities. The production test confirmed very good reservoir properties and good lateral continuity within the Permian-Triassic clastic reservoirs.

A geological sidetrack will now be drilled approximately 900 meters north of the Alta-4 well to assist with placement of a horizontal well for an extended well test, that is planned for the next year.

Alex Schneiter, CEO and President of Lundin Petroleum comments: “I am pleased with the good well results from Alta-4, which confirms very good reservoir properties, communication across the large Alta structure and excellent production rates. We will now proceed to plan a possible extended well test for 2018, which is the next step in moving the significant Alta discovery towards development.”

The well was drilled using the semi-submersible drilling rig Leiv Eiriksson which following completion of the Alta-4 sidetrack well will proceed to drill the Børselv prospect, also located in PL609.

Lundin Norway is the operator of PL609 with a 40 percent working interest. The partners are DEA Norge AS and Idemitsu Petroleum Norge AS with 30 percent working interest each.
3. ASA Nussir Kvalsund mine

Nussir ASA engages in the exploration and mining of copper in Kvalsund. Its assets comprise of copper deposits with silver, gold, and platinum as bi-products. Nussir ASA was incorporated in 1985 and is based in Tønsberg, Norway.

Kvalsund is a municipality in the county of Finnmark, located in Northern Norway. Kvalsund is situated between the natural gas-rich town of Hammerfest and Alta, the biggest city in Finnmark. The Nussir Field was discovered in the late 1970’s and is the biggest copper deposit ever found in Norway.

Further exploration of its ore has yielded valuable amounts of gold, silver, platinum and palladium in addition to its significant copper deposits. Nussir ASA owns 100 % interest in this project’s exploration and mining rights.

There are deep-sea, ice-free port; a major highway; high-voltage power lines; and a developing industrial zone already in place. These primary infrastructures offer excellent complements to an integrated operation for the company.

Nussir, with its sustainable mining initiative, is committed not only to the viable harnessing of the rich deposits in the mine, but also to the minimal intrusion in our host community’s way of life. We take our social responsibility seriously and this is done by engaging local folks in regular fora, prioritizing the human resources in the region and by respecting the nature around it. Because of these, the local authorities and residents in the area are in unison as they welcome the Nussir Project.

Government of Norway has been positive with the permitting process regarding Kvalsund mine. However, the mine has also strong opposition especially against permit to dump waste waters to Barents Sea in Repparfjor. The disputed decision will open up for the dumping of two million tons of mining wastes per year in the Reppar Fjord, an environmentally vulnerable area in the country’s northernmost region of Finnmark.

Minister of Climate and Environment Vidar Helgesen argues, that is all safe and sound. «It is environmentally justifiable to give the permission», he underlines, and adds that the environmental consequences of the mining project have been carefully reviewed, a press release from the ministry says.
The disposal area for dumping covers about 8 square km of waters. The wastes from the nearby Nussir copper mine are believed to have a significant impact on environment in the area.

Minister Helgesen argues that the project will create 150 new local jobs and that copper is a metal much needed by the electric car industry. Environmentalists, however, say that the decision is a major blow both to the nature and to the government’s green reputation.

«The government is giving us a dead fjord for Christmas», leader of Friends of the Earth Norway, Silje Ask Lundberg says in a press release. She calls the project «one of the most environmentally hostile industrial projects in Norwegian history» and underlines, that the decision is made in contradiction with experts’ advice. «The dumping of mining slag will kill all life on the sea bottom in the disposal area», she underlines.

Also, Sami authorities have expressed strong opposition to the project. In a statement made early this year, the Sami Council said, that the Nussir mining will have «very extensive and negative consequences for fisheries, reindeer herders and the environment». «This is an economical and environmental high-risk project, where they play with the local society», Council representative Silje Karine Muotka says.

From before, Norwegian authorities have allowed mining companies to dump wastes to sea also in Kirkenes, the mining town located near to the border to Russia. Norway is one of only three countries in the world which allow dumping of mining wastes to sea. The Nussir field was discovered in the late 1970s and is the biggest copper deposit ever found in Norway. The field is located in Kvalsund, a municipality on the Barents Sea coast. The project is 100 percent owned by company Nussir ASA.

Estimates of the amount of ore in this deposit is continuously being updated as analytical results from ongoing exploration activities become available. The latest mineral resource estimation is from July 2014. Based on core drilling and other studies the latest JORC estimation gives

- 5.8 million tons of indicated resources and
- 60.2 million tons of inferred resources, giving a total of
- 66 million tons of copper ore.
The deposit has an average grade of 1.15 % and payable amounts of silver and gold.

It is expected, that future core drilling in the central area and in the depth, will result in increased tonnage. The Nussir ore thickness is normally between 3 to 6 meters.

### 3.6.2 Investments in Northern Norway 2018–2025

#### NORTH NORWAY 2018–2025

<table>
<thead>
<tr>
<th>Industry</th>
<th>Fishing industry investments</th>
<th>Other industry</th>
<th>Total:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other industry</td>
<td></td>
<td></td>
<td>170 m€</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td></td>
<td>380 m€</td>
</tr>
</tbody>
</table>

#### Oil and gas

<table>
<thead>
<tr>
<th>Company</th>
<th>Investment in m€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statoil AS, Johan Castberg Oil Field</td>
<td>5.2 bn €</td>
</tr>
<tr>
<td>Statoil AS, Veidnes Oil Terminal</td>
<td>312 m€</td>
</tr>
<tr>
<td>Lundin Petroleum, Alta/Gohta Oil Field</td>
<td>3.1 bn€</td>
</tr>
<tr>
<td>Oil and Gas exploration Barents Sea 5 yrs</td>
<td>1.8 bn€</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
</tr>
</tbody>
</table>

#### Mining industry

<table>
<thead>
<tr>
<th>Company</th>
<th>Investment in m€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nussir ASA, Kvalsund copper mine</td>
<td>350 m€</td>
</tr>
<tr>
<td>Kirkenes Gruva, reopening</td>
<td>70 m€</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
</tr>
</tbody>
</table>

#### Oil and gas

<table>
<thead>
<tr>
<th>Company</th>
<th>Investment in m€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statoil AS, Johan Castberg Oil Field</td>
<td>5.2 bn €</td>
</tr>
<tr>
<td>Statoil AS, Veidnes Oil Terminal</td>
<td>312 m€</td>
</tr>
<tr>
<td>Lundin Petroleum, Alta/Gohta Oil Field</td>
<td>3.1 bn€</td>
</tr>
<tr>
<td>Oil and Gas exploration Barents Sea 5 yrs</td>
<td>1.8 bn€</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
</tr>
</tbody>
</table>

128
<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategory</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro power</td>
<td>North Norway projects</td>
<td>425 m€</td>
</tr>
<tr>
<td>Wind power</td>
<td>Finnmark projects</td>
<td>1.47 bn€</td>
</tr>
<tr>
<td></td>
<td>Troms projects</td>
<td>1.27 bn€</td>
</tr>
<tr>
<td></td>
<td>Nordland projects</td>
<td>1.21 bn€</td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>3.95 bn€</td>
</tr>
<tr>
<td>Energy transfer networks</td>
<td>East Finnmark network</td>
<td>1.67 bn€</td>
</tr>
<tr>
<td></td>
<td>Nordland-Hammerfest network</td>
<td>1.0 bn€</td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>2.67 bn€</td>
</tr>
<tr>
<td>Trade</td>
<td>Shopping centers Troms</td>
<td>400 m€</td>
</tr>
<tr>
<td></td>
<td>Shopping centers Finnmark</td>
<td>30 m€</td>
</tr>
<tr>
<td></td>
<td>Shopping centers Nordland</td>
<td>200 m€</td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>630 m€</td>
</tr>
<tr>
<td>Tourism</td>
<td>Målselv Fjellandsby ski center</td>
<td>100 m€</td>
</tr>
<tr>
<td></td>
<td>Other hotel and resort projects</td>
<td>100 m€</td>
</tr>
<tr>
<td></td>
<td>Total:</td>
<td>200 m€</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Transport infrastructure</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodø new airport</td>
<td>520 m€</td>
</tr>
<tr>
<td>Mo i Rana new airport</td>
<td>153 m€</td>
</tr>
<tr>
<td>Tromsø airport new terminal</td>
<td>31 m€</td>
</tr>
<tr>
<td>Kirkenes airport runway extension</td>
<td>10 m€</td>
</tr>
<tr>
<td>Lakselv airport terminal extension</td>
<td>5 m€</td>
</tr>
<tr>
<td>Evenes airport new terminal</td>
<td>8 m€</td>
</tr>
<tr>
<td>Hammerfest Grøtnes new airport</td>
<td>300 m€</td>
</tr>
<tr>
<td>Lofoten Gimsøy new airport</td>
<td>150 m€</td>
</tr>
<tr>
<td>Roads, Corridor 8, E6, E8, E10</td>
<td>2.77 bn€</td>
</tr>
<tr>
<td>Railway, Nordland</td>
<td>87.7 m€</td>
</tr>
<tr>
<td>Fishing ports, terminals</td>
<td>208 m€</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>4.24 bn€</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Public investments</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals, schools, etc</td>
<td>4.27 bn€</td>
</tr>
<tr>
<td><strong>Total all:</strong></td>
<td><strong>27.585 bn€</strong></td>
</tr>
</tbody>
</table>

**Investments after 2025**

**Industry**

<table>
<thead>
<tr>
<th>Fishing industry investments</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>500 m€</td>
</tr>
</tbody>
</table>

**Oil and gas**

<table>
<thead>
<tr>
<th>Barents sea projects</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22.3 bn€</td>
</tr>
</tbody>
</table>

**Energy/Wind power**

<table>
<thead>
<tr>
<th>All wind park projects</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.0 bn€</td>
</tr>
</tbody>
</table>

**Trade**

<table>
<thead>
<tr>
<th>All projects</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0 bn€</td>
</tr>
</tbody>
</table>

**Tourism**

<table>
<thead>
<tr>
<th>Projects after 2025</th>
<th>€</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>400 m€</td>
</tr>
</tbody>
</table>
### Transport infrastructure

| Railway projects, Narvik, Mo I Rana | 2.3 bn€ |

### Public investments

<table>
<thead>
<tr>
<th>Schools, hospitals, etc</th>
<th>3.0 bn€</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All total:</strong></td>
<td><strong>32.500 bn€</strong></td>
</tr>
</tbody>
</table>

### North Norway Investment Potential

<table>
<thead>
<tr>
<th>2018–2025</th>
<th>27.585 bn€</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 2025</td>
<td>32.500 bn€</td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>60.085 bn€</strong></td>
</tr>
</tbody>
</table>
Murmansk Region is situated in the North-West of European Russia and it is one of the strategic areas of the country in the North-Western Federal District. The Region borders with the Republic of Karelia in the south-west and with Finland and Norway in the west and north-west. The Murmansk Region is one of the few Russian regions to share the border with the European Union and NATO countries.

The strategic importance of the Murmansk Region is based on enormous raw material resources and also military political importance. The Region is the base for Northern Navy ensuring defence capacity of the northern frontier. Headquarters of the Navy is located in Severomorsk about 20 km north of Murmansk.

Murmansk port is open all year round and it is the biggest Russian port situated to the north of the Arctic Circle. The products of Kola Peninsula mining industry is shipped to the world market from Murmansk. Nuclear icebreakers have ensured year-round Arctic navigation.

The Region occupies an important geopolitical position in relation to regions with a developed industry connected to it with land, sea and air routes. The location close to the border, significant exporting capabilities and available transport links establish good conditions for enhanced cooperation with other countries. The Murmansk Region is an active member of the international Barents Euro-Arctic cooperation.

As of early 2012, the Region includes 12 urban okrugs (Murmansk is the regional capital), 5 municipal districts and 23 settlements, 13 of them urban and 10 of them rural.

Population of the Region has decreased in 20 years from 1.2 million inhabitants to less than 800,000 inhabitants. People have moved back to their home regions or to cities like St. Petersburg and Moscow. The population density is 5.4 / sq. km. Population has concentrated in cities where live almost 93% of the inhabitants. Rural areas have only 7% of population. Nationalities are (2002): Russians are the majority in Murmansk Region with 85%, Ukrainians 6.4% and other nationalities 8.4% are minority. Sami people are living in Lovozero area and total population of Sami is less than 2000 people.

The total amount of inhabitants in the Murmansk Region was in 2012 787,900. The biggest towns are Murmansk (305,000 inhabitants), Apatity (59,200 inhabitants), Severomorsk (50,000 inhabitants) and Monchegorsk (44,600 inhabitants).
Business community

Mining industry is the backbone of Kola Peninsula economy. In the Murmansk Region, there are over 60 large deposits of various raw minerals where 30 types of useful minerals are extracted. Most deposits of the minerals are of national significance, and of international significance as far as apatite, nepheline and cyanide ores and rare metals are concerned.

The economic specialisation of the region includes extraction and processing of ferrous and nonferrous metal ores, industrial production of copper, nickel, cobalt, semi-fabricated precious metals products, primary aluminium and apatite concentrate that is a raw product for phosphate fertilisers.

The share of the Kola land of the total Russian production is 45% in nickel, 11% iron-ore concentrate and 7% of refined copper. The Region is the only producer of apatite, nepheline and baddeleyite concentrates (100% are produced in the Murmansk Region).

Main industrial companies

JSC “Kolskaya GMK” is a single complex for extraction of sulphide copper and JSC ores and production of precious metals. Company is a division of Norilsk Nickel located in the Murmansk Region. Most important mines of Kola GMK are in Zapoljarnyi, Pechenga area and smelters in Nikel and in Monchegorsk which is the headquarters of the company.

JSC “Apatit” extracts and processes apatite and nepheline ores of the Khibiny deposits which are part of the largest and richest deposits in the world as well as the basis of phosphorous raw materials in Russia. JSC Apatit is part of Fosagro company.

JSC “SZFK (North West Phosphorous Company)” is new industrial company in the Murmansk Region. It opened the first mine in Rutshij Olenij near the town of Kirovsk two years ago. The company belongs to Akron group JSC “Kovdorsky GOK” develops the Kovdor deposit and produces iron-ore, apatite and baddeleyite concentrates. It is part of EuroChem company. Kovdor is near Finnish border and the company has been interested about the Sokli mine deposit on Finnish side only 54 km from the town of Kovdor.
JSC “Olkon” extracts banded iron formations and sells high-quality iron-ore concentrate. It is a part of Severstal company which is the second biggest steel company in the world.

“KAZ-RUSAL”, a branch of United Company RUSAL, the biggest aluminium company in the world. KAZ smelts aluminium from aluminium oxide delivered there. The smelter and the plant are in the town of Kandalaksha.

The major production facilities were built decades ago, and the enterprises currently aim at deep-level mining and underground mineral extraction which requires upgrading and expanding the mining industrial infrastructure.

Abstract of Gov. Marina Kovtun’s Speech “State of the Murmansk region”

If you try to describe the outgoing year in one phrase, you can do it this way: The Murmansk region lived on the same agenda with the country.

All the goals that we set for ourselves, all the projects that are planned and already being implemented in our region, all the initiatives that we broadcast “upward” - all of them are aimed at the benefit of Russia as a whole, and none of them is limited to a narrow “Little place” interest.

We more than ever clearly feel that Murmansk is Russia’s outpost in the Arctic. Including thanks to a clear “feedback” with the federal center. And this feeling became our compass, which allowed us to pave the way for stability and progressive development of the region.

We actively participate in the adjustment of the draft law “On the Arctic zone of the Russian Federation”, in stimulating changes in federal legislation in the interests of the inhabitants of all Russian “secrets” without exception. More on this I will go further.

The Murmansk region became one of the eight regions of Russia and the only Arctic entity where growth was observed at once for all indicators of economic development: investment, construction, industrial and agricultural production, retail trade, consumption of paid services.

Industrial production in the region grew by almost 14%. Output in metallurgy and ship repair increased 1.2 times, in the extractive industry - by 10%.
Investments in fixed assets and construction increased 1.2 times, the volume of cargo handling by our ports increased 1.7 times, the catch of aquatic biological resources 11%, and agriculture showed growth of more than 5%.

On the stable situation in the labor market, the level of registered unemployment declined to 1.4%.

Although not much, but there was a growth in retail trade, consumption of paid services by the population.

Inflation in comparison with the last year has slowed almost twice, to record low values: for 10 months of the current year - 102.4% by December of last year.

The average accrued salary has grown in nominal by almost 4%. At the end of the year, we expect its growth in real terms by 1.3%.

At a safe level, we keep the deficit and the debt burden of the regional budget (respectively, 2.6% and 38.4% of the total annual revenue). This allows us to remain in a group of regions with a high quality of regional finance management.

The most significant contribution to positive economic dynamics is still made by our industrial giants - PhosAgro, Norilsk Nickel, EuroChem and Rosenergoatom Concern, as well as transport and fisheries complexes.

The next step is the closure and reclamation of old municipal landfills.

Municipalities, by ensuring the development of projects for the reclamation of their landfills, will be able to rely on subsidies for design. For the next three years, the budget provides for more than 20 million rubles annually. The availability of project documentation will enable us to obtain federal support for the eradication of landfills.

We first started cleaning the Kola Bay from the sunken and sunken property. We started with the cleaning of the Retinskaya bay. The plan of further works is supported by the Ministry of Natural Resources of Russia.

I note that our industrial enterprises show high ecological responsibility.
For example, the company Norilsk Nickel not only significantly reduced emissions, but also opened a new modern visit-center of the Pasvik Reserve. The international status of the reserve allows the visit-center to become an important dialogue platform for the development of cooperation with the border areas of neighboring countries.

The company “Fosagro” this year launched a complex of unique equipment for the processing of used tires and railway sleepers. Installation works for the needs of the region. the utilization of industrial wastes is a problem for all mining enterprises.

Ecology, like nature itself, has no boundaries. It is not for nothing that the protection of the environment is the key direction of our international cooperation.

This year, with the participation of the Government of the region, the most important stage of a unique international project for the rehabilitation of one of the region’s largest radiation-hazardous facilities - the former coastal base in Andreeva Bay - was completed. This project will go down in history as a vivid example of international cooperation. In its implementation, hundreds of specialists from 7 countries were employed.

To provide the northerners with a decent quality of life, we need a strong, efficient economy that is stable to external market forces.

We had high hopes for federal measures to stimulate the social and economic development of the Arctic zone of Russia. Actively joined the process of lawmaking and the formation of support zones of development.

But the measures announced today in the current version of the bill “On the Development of the Arctic Zone of Russia” and the state program “Social and Economic Development of the Arctic Zone of the Russian Federation” are not sufficient to ensure high-quality economic growth in the macroregion.

Despite this, we do not intend to retreat from our ambitious goal of establishing the region as a strategic center of the Arctic zone of Russia.

Already today the region becomes a point of attraction of the newest technologies.

We are forming a unique high-tech cluster for the construction of offshore hydrocarbon production and processing facilities in the Arctic, analogous to which in Russia at present
We are forming a unique high-tech cluster for the construction of offshore hydrocarbon production and processing facilities in the Arctic, with no analogs at present in Russia. Large-scale projects on the development of transport and energy infrastructure are being implemented, icebreaking and fishing fleets are being updated.

To the active phase of the Center for the construction of large-tonnage offshore structures in Belokamenka, a subsidiary of NOVATEK starts. Entry of the first stage of the shipyard is expected in the summer-autumn of 2019.

On the margins of the St. Petersburg International Economic Forum, a memorandum of understanding was signed between the regional government, the Ministry of Industry and Trade of Russia and NOVATEK on concluding a special investment contract in 2018.

It will give the investor guarantees of stability and unchanging conditions for the project, its unconditional support at all levels of government - from municipal to federal. At the same time, for the region it is a documentary assignment of the investor’s obligations to implement the project on time and in agreed volumes. Think about it - it’s more than 10 thousand jobs and tens of billions of rubles of investments.

The NOVATEK project was an example of well-coordinated work of authorities at all levels. I want to express my gratitude to the Regional Office of Rosreestr, the administration of the Kola district, to the executive authorities of the region who took an active part in solving the issues of providing the Kola shipyard with land plots, as well as in preparing the permission of the Government of the Russian Federation to create artificial land plots in the water area of the Kola Bay.

A significant contribution to the common cause belongs to the deputies of the Murmansk Regional Duma, which provided for this year the prompt adoption of the necessary legislative acts of the Murmansk region.

Rosneft took the first practical steps to implement the project to create a coastal base for offshore projects on the basis of the 82 SRZ in Roslyakovo. A scheme for planning the location of production facilities has been developed, the main technological parameters of the facility have been determined, and work is under way to conclude lease agreements for land plots. Taking into account the scale of the project, the land will be provided to the company without bidding.

Maintenance of these projects remains one of the priority tasks for the Government of the region.
We consistently try to provide investors with the most attractive terms.

In addition to the already proven tax incentives and other preferences, from this year we reduced the regional income tax rate to 10% for participants of regional investment projects, as well as organizations that have concluded special investment contracts with the participation of the Russian Federation. Previously, the tax rate on profits to the regional budget could be reduced only to 13.5%. At the same time, companies that have concluded a special investment contract can claim both our and the federal tax support. In the North-West Federal District, only two regions have introduced such support measures.

This year we came up with yet another initiative - to include in the taxable at a discount rate the composition of assets of assets created within two years before filing an application for state support. This will reduce the financial burden in the investment phase of the projects being implemented. Deputies of the regional Duma supported us, and this norm will work already on January 1 next year.

The issue of assessing the effectiveness of tax incentives and, in general, the flexibility of our tax policy, we pay great attention. We have been conducting this work for several years, ahead of the federal center, which now only determines the main approaches to assessing tax benefits.

The government of the Murmansk region will have to work hard to adjust our assessment system to federal requirements. Similar work should be carried out by local governments in the field of local tax incentives.

A favorable investment climate is not only benefits and preferences, but also high quality of the business environment.

We consistently reduce the time for passing administrative procedures.

This year, 4 times (up to 9 days) reduced the period of preparation of the boundary and technical plans, 2 times (up to 15 days), the issuance of the town-planning plan. For 7 days (up to 17 days), the deadline for approving the scheme of the location of the land plot on the cadastral plan of the territory, for 2 days (up to 5 days), the time for issuing a building permit.
Expanded opportunities for the passage of these procedures: multifunctional centers, regional and municipal portals of public services, “personal cabinets.” All services can be obtained electronically.

In addition, this year, according to such indicators as “the number of procedures for registering ownership rights” and “the share of small and medium-sized businesses in public procurement,” the region received some of the highest ratings in the country.

According to the results of the research of the Center for Strategic Research, our innovation on the transfer of “small volume” purchases to the electronic trading platform is recognized as one of the best regional practices in the procurement system. I note that the site has been running for two years.

Now about the support of small and medium-sized businesses.

Over 66 million rubles have been allocated from the budget for this year. Of this amount, 130 preferential microloans, 15 grants for the creation of own business, 15 targeted subsidies, and 15 guarantees were granted, which allowed raising more than 140 million rubles of credit resources.

We expand the access of entrepreneurs to state support.

Since this year, 7 services of the “Federal Corporation for the Development of Small and Medium-Sized Enterprises” are provided in all MFCs of the region.

New credit products have been introduced for agricultural producers and agricultural cooperatives, for settlements under leasing agreements and for organizations engaged in tourism. Entrepreneurs have already received 10 microloans for a total of 8.5 million rubles.

By the end of the year, we expect an increase in the share of employed in small and medium-sized businesses to 19% of the number of working northerners, or up to 71 thousand people.

The task for the next year is to increase employment in this area. To do this, we plan to expand the line of credit products, as well as implement the federal educational project for the development of women’s entrepreneurship “Mama-entrepreneur.”
One can not fail to mention another federal, this time the priority program embodied in the region, “Monocity”.

During this year, all 7 management teams of mono-cities were trained within it, the main streets were arranged, in most of the municipalities “entrance groups” of polyclinics were repaired.

Significant progress is in creating new jobs in single-industry towns - in total they are more than 2 thousand. And 417 of them are registered entrepreneurs for the first time.

All of the above is the beginning of a big forward movement. I want to thank the heads of single-sector municipalities for their active involvement in this work.

And one more important point. We entered the first twenty regions where a decision was made to create a territory for outrunning socio-economic development in single-industry towns. Today we already have two TOSER residents - pioneers are the Production Association “Complex” and the company “Nitro Siberia Zapolyarye”. I thank the administration of Kirovsk for the work done.

Now the Kirovsk administration needs to provide maximum support to those who entered TOSER and potential residents, and from the Ministry of Industry and Enterprise Development and the “Development Corporation of the Murmansk region” - attracting new investors.

Further - about tourism.

The tourist flow to the region this year is estimated to exceed 330 thousand people. Interest in the Murmansk region is growing. We attribute this to both the development of infrastructure and the increased availability of transport, especially the tourist “pearls” of our region.

This year, the reconstruction of the road interchange at the entrance to Kirovsk was completed, on which federal co-financing was attracted. All the roads in Teriberka have been asphalted, capital repair of the Umba-Varzuga subsoil road has been started to transfer it to a hard surface.

Next year, the regional priority project “Master Plan for the Development of Teriberka” will be continued.
A new experience for us will be the participation of the region in the association of cultural and tourist development “Silver Necklace”. 11 regional routes are included in the project registry.

We associate great hopes with the development of Arctic sea tourism. Next year, companies have already put up for sale 10 cruises with a visit to the port of Murmansk.

Tour products with TT Travel are being worked on for inclusion in the sales line. Interest to the region in the development of cruise tourism was shown by representatives of the INFLOT company who took part in the activities of the tourist site “Made in the Arctic” in the framework of the Murmansk International Business Week.

Work continues with the Norwegian company “Hurtigrutten”, with which the possibilities of calling vessels to the port of Murmansk in 2019 are discussed.

I instruct the Ministry of Industry and Enterprise Development to develop coastal tourist programs, taking into account the 72-hour visa-free entry for ferry passengers.

### 3.7.1 Top investment projects in Murmansk Region 2018–2025

1. **Novatek ship building plant**

The major owner in Yamal LNG-project RAO Novatek signed a Memorandum of Understanding regarding a special investment contract with the Ministry of industry and trade and the Murmansk Region Government in June 2017. According to the Memorandum, the parties intend to sign a tripartite special investment contract on creating a center for the construction of large-scale offshore structures in Belokamenka, located in Murmansk region.

Construction is now under way for a giant new dockyard near the port of Murmansk, Russia. The new greenfield facility – to be called Kola Shipyards – will be used to build the process equipment for a second LNG plant near Novatek’s Yamal LNG, a liquefaction terminal at the Port of Sabetta. According to Novatek, the new shipyard will also be capable of building ferro-concrete platforms, production topsides for Arctic offshore projects and other large structures.
Yamal LNG started in December and Novatek is already pushing ahead with plans for the second LNG plant, which will be called “Arctic LNG-2.” Unlike its predecessor, which was assembled from large process modules built overseas and shipped to the site on heavy-lift module carrier ships, its construction will be largely completed in Russia. Arctic LNG 2 - project will be developed in Gydan, on the wide-stretched lands along the right banks of the Ob Gulf.

To lay the groundwork for this undertaking, Novatek is investing hundreds of millions in Kola Shipyards. The yard will feature two docks measuring 400 meters long by 16 meters deep, and contractors will use the excavated soil to build four artificial islands.

The Kola Yard will be instrumental in building so-called gravity-based structures (GBS), which can be towed to the shallow Arctic waters and used as production platforms. As much as three million tons of rocks and soils have already been removed from the construction site in Murmansk. Construction works on site started in August 2017. Novatek is engaged in a comprehensive project cooperation with foreign companies. Among them are Technip, Linde, FMC Technologies and Saipem. In production Kola Yard has about 4000 new jobs.

The Arctic LNG 2 is to be ready for production by early 2023. It will be based on three project trains each with a production capacity of 6,1 million tons. Natural gas resources are based on the nearby Salmanovskoye and Geofizicheskoye fields, and possibly also field like the Gydanskoye, East-Tambey and North-Ob. The project’s Front End Engineering Design (FEED) is reportedly to be ready by late 2018 and a final investment decision taken before the end of 2019. With the Arctic LNG 2, Novatek will boost its annual production of LNG to more than 34 million tons. That liquified natural gas will all be shipped out through Northern Sea Route, some of it eastwards to Asian buyers.

2. Norilsk Nickel and other mining and industrial projects

Norilsk Nickel is the most important industrial company in the Murmansk Region. Kola Mining and Metallurgical Company is the subsidiary of Nornickel in Kola Peninsula. On 26 January 2018, the Governor’s Economic Council held an extended meeting in Murmansk that focused on Nornickel’s preliminary 2017 results and plans for the current year. The meeting was chaired by Marina Kovtun, the Governor of the Murmansk Region, and attended by government officials, members of the Murmansk Regional Duma, and representatives of local business and scientific communities.
Elena Bezdenezhnykh, the Company’s Vice President, was the one to present on behalf of Nornickel.

Local authorities pay close attention to Nornickel, as it is one of the principal taxpayers and employers in the Kola Peninsula. For 2017, the Company is expected to contribute over RUB 8.3 bn in tax and non-tax payments to the region’s consolidated budget.

At present, Kola MMC (part of the Nornickel Group) is the world’s largest nickel refining facility. This was made possible through the Company’s investments in the upgrade and refurbishment of its production and logistics capacities worth some RUB 25 bn. In addition, this is the only site in the country, that produces electrolytic cobalt.

The Company’s operations are a major driver of the region’s social and economic development. It runs a number of investment projects in the Murmansk Region that span, among others, the social and environmental domains. For the Murmansk Region’s budget, these projects result in a positive effect of over RUB 1 bn annually.

In March 2017, Nornickel and the local government signed a cooperation agreement to carry out the Year of the Environment initiatives. The Company undertook to complete the largest environmental investment project in the region (disposal of salt effluent from nickel refining operations) that costs around RUB 1.7 bn, and provided RUB 7.65 m for the arrangement of nature trails, security and development of ecotourism in the nature park of the Rybachy and Sredny Peninsulas.

Elena Bezdenezhnykh emphasized Nornickel’s commitment to proceed with the environmental program. In particular, the Company plans to introduce environmentally-friendly production technologies at Kola MMC sites, that will enable the smelting shop to halve its emissions after 2019.

Marina Kovtun expressed her gratitude to Nornickel, a reliable contributor to the region’s social and economic development, which proposed holding the meeting. “This meeting is notable not only thanks to the report of Nornickel’s top manager, but also because it is a catalyst for a dialogue that I hope.
Also, the tank-house of Kola MMC (Nornickel’s subsidiary) has seen the launch of new electrolysis cells as part of Stage 1 of the investment project to introduce a more effective electro winning technology. This will phase out smelting of nickel anodes and involve the use of nickel powder produced in tube furnaces as the feedstock for saleable metals instead. The electrolytic nickel production in new tanks involves the use of insoluble anodes with the lifetime of about five years. In addition, the tanks boast a larger capacity in terms of the number of placed anodes. There is no need for cell cleaning, and the process ensures zero losses of both precious and non-ferrous metals.

The new technology will enable the Company to cut operating costs, drive down metal losses in the production process and improve the quality of products. The project has a special focus on mitigating the environmental impact. Electro winning removes the anode electric furnace from the Company’s nickel production chain, thus reducing air emissions of Sulphur dioxide and nickel-containing dust. The new tanks have already produced their first finished metal products.

In total, 476 electrolysis cells in the tank-house will see a phased transition to the electro winning technology. Nornickel’s committed investment to upgrade the nickel production at Kola MMC exceeds RUB 20 bn (300 m€).

The company is completing the container yard upgrade at the Monchegorsk site looking to significantly boost the speed of cargo handling. Nornickel has invested RUB 100 m (1.5 m€) into the project.

The container yard serves for handling and shipping end products such as nickel and copper to consumers and also for taking delivery of bulky cargoes — mainly production equipment ordered by the Company. On top of that, it offers customs clearance and features a custom approved warehouse.

The upgrade is mainly driven by a greater nickel output at the Monchegorsk site as part of Nornickel’s development strategy. Over the past two years, the production of end products that can be shipped in containers only has increased by over 30%, while the speed of container cargo processing remained unchanged due to the technological constraints.

Currently, the container yard can handle five flatcars all at once. To increase the throughput, the Company decided to expand the rail cars’ receiving area by adding over 3,000 sq m covered with concrete to the container yard territory.
Following the upgrade, the facility will be able to handle loading and unloading of 20 flatcars at the same time. This will not only significantly cut cargo processing time, but also reduce the usage of switchers, which move the flatcars around, by four times.

The container yard will also be equipped with a utility room connected to water supply and sewerage systems to improve the working conditions for the staff.

Furthermore, Kola MMC has embarked on the first stage of the railroad construction at its Monchegorsk site to address an increase in metal production.

According to the refining flowchart, the railway transport is used to deliver feedstock (converter matte from Nikel and Norilsk) to the site, transport semi-products obtained at different production stages among the shops, and ship end-products to consumers.

In 2013, Nornickel adopted a new development strategy aimed at minimizing the Company’s environmental impact and reducing operating expenses. In line with these goals, the Company reconfigured its production capacities to maximize cost advantages from their operation. The reconfiguration includes production upgrade.

Norils Nickel has also developed its terminal in the Port of Murmansk. Nornickel's Murmansk Transport Division (MTD) has implemented Solvo. TOS, an automated process control system for the transshipment terminal. It ensures efficient management of container cargo transshipping and vehicles handling processes. In 2017, modernization of the transshipment terminal was completed, increasing MTD’s capacity up to 1.5 mt of container cargo per year.

Deployment of the automated production process control system significantly improves the terminal’s overall performance. The software and hardware system enables the dockworkers to manage the fleet of handling equipment and machinery, monitor performance in real time and plan for automatic container cargo processing in a centralized way. This enables MTD to minimize excessive operations and streamline the use of machinery and human resources.

In the near future, the terminal intends to deploy an automated process control system for general cargo. Nornickel does not only own the terminal, but also acts as a stevedore, a ship owner, a cargo owner and a railway operator with its own rolling stock. MTD also has a large fleet of various lifting machines: portal cranes, fork lift loaders and rubber-tired gantry cranes.
Kovdorskijj GOK, OAO mines and produces apatite and baddeleyite concentrates, and iron ores. The company sells its products in Russia, Czech Republic, Slovakia, Poland, Japan, the United States, and Europe. The company was founded in 1962 and is based in Kovdor, Russia. Kovdorskijj GOK, OAO operates as a subsidiary of Open Joint Stock Company Mineral and Chemical Company EuroChem.

Kovdorsky GOK plans to invest more than RUB 24.6 billion in development by 2021. The investment program calls for increasing the amount of ore processing by 15.7% to 22 million tons per year by expanding the existing Zhelezny open-pit mine. The lower horizon of mining operations will drop from minus 230 meters to 650 meters by 2050, at which point Kovdorsky GOK will begin underground mining of the deposit. The investment program reserves RUB 10.108 billion to 2022 for replacement of equipment such as transport facilities, drilling rigs, excavators, loaders and other equipment. The company plans to invest RUB 4.264 billion in increasing the volume of ore processing.

Acron Group founded the joint-stock company North-Western Phosphorous Company (NWPC) in 2005, to create a new phosphate raw material base in Murmansk region. The Group’s investment program is focused on developing a phosphate deposit to supply its downstream facilities with raw materials required for phosphorous-containing fertilizers.

In October 2006, NWPC won a tender held by the Russian Federal Subsoil Resources Management Agency and, in November of the same year, obtained a license to develop the Oleniy Ruchey and Partomchorr apatite-nepheline ore deposits.

In 2007–2008, Giproruda Engineering Institute (St. Petersburg) completed the design for a mine at the Oleniy Ruchey apatite-nepheline ore deposit, and the design was approved by Glavgosekspertiza of Russia in September 2008.

NWPC started construction of the mine infrastructure in late 2008. In 2012, NWPC completed Phase I of the mine construction, performed commissioning and start-up at the beneficiation plant and produced the first tons of apatite concentrate.
Since June 2013, NWPC has provided Acron Group’s Russian facilities with phosphate raw materials and shipped apatite concentrate to third-party consumers.

- Reserves: 43.3 million tons P2O5 (A1+B+C1 as of 1 January 2015)
- In the end of 2012, the Oleniy Ruchey mine started regular shipments of apatite concentrate to the Group’s production facilities in Russia.
- Mine capacity: up to 2 million tons of apatite concentrate (upon commissioning of Stage 2). Based on integrated apatite-nepheline ore processing, pilot facilities to process nepheline concentrate and extract rare-earth elements (lanthanum, cerium and neodymium oxides) will be built up. Currently, such pilot operations are being built at Acron’s Veliky Novgorod site.
- Total project investments will be approximately USD 1 billion.

Key Stages

**2006–2008:** Preparing design documents for the Oleniy Ruchey mine and obtaining an approval of the state expert review board.

**2009–2012:** Building mining and processing facilities, an open pit and infrastructure. Apatite concentrate production was launched in late 2012.

**2015:** Increasing the mine capacity to 100 ktpm (1.1 mn tpa).

**2014–2018:** Expanding the mine capacity by building Stage 2 of the filtration and drying shop, silo warehouse for apatite and nepheline concentrate, rail line from the mine site to Titan station (roughly 39 kilometres). Commissioning of the underground mine.

North-Western Phosphorous Company has installed an underground mine positioning system that enables it to monitor the location of personnel and equipment in real time.

This system provides automated control in such fields as workplace safety, personnel and production monitoring, and expansion and development of the workflow supervision network. Supervisors receive alerts about system component failures and information that allows them to analyse the movement of equipment and workers and view reports.
When coupled with Wi-Fi data transfer, the mine positioning system delivers highly precise coordinate positioning, which, unlike the sectoral positioning used by most similar facilities, displays the precise location of a moving object within the system’s coverage area. The equipment on which the system runs is manufactured by Australian MST, which has vast expertise in the development of underground safety systems.

Mine shift supervisors have specially designed rugged tablet PCs from which they can control production processes and access other information from inside the mine. Personnel can make internal and external calls via rugged cell phones through the positioning system. These cell phones have an advanced feature – they can be used as radio sets, reducing blind areas and providing better oversight of the production process in the underground mine environment.

Currently, NWPC has set up tracking for more than 200 persons and items. All purchased equipment and new personnel members are given positioning tags. The Company is increasing the number of signal receiving and data transmitting points as the mine expands.

NWPC plans to expand the availability of transmitting and receiving units in 2018; the Company will lay additional fiber-optic cable routes to cover blind areas and new openings. NWPC also plans to begin transmitting information on fuel and oil consumption by underground mine machinery.

North-Western Phosphorous Company will no longer use trucks to deliver apatite concentrate to Titan rail station. Following the commissioning of a new 50-km section of track connecting the mine with Aikuven station, trains will now carry product to buyers directly from the Oleniy Ruchey mine site. The year-long, large-scale project to build the railroad and infrastructure cost the Company RUB 4.7 billion.

Apatite concentrate will be loaded into rail cars at a new loading terminal, consisting of three conveyor galleries, transshipping and loading facilities. The automated terminal is equipped with a modern electric power supply system, rail car scales and an automatic dosing system.

The two conveyor lines that feed apatite concentrate for loading are equipped with a spill-gathering system to prevent possible losses during product transportation and to maximize the terminal’s efficiency.
3. Murmansk Transport Hub

The Murmansk Region has a special strategic status for Russia. Geographical location defined the Kola Peninsula as a priority element in ensuring the geopolitical interests of Russia in the north of Europe and the Arctic. Its non-freezing deep-water the Kola Bay became the main base of the Northern Fleet, and Murmansk sea port became the center of industrial fishing in the Barents Sea and the North Atlantic, and the starting point of the Arctic.

Today, Murmansk is the only port in European Russia with an open access to major oceanic routes. Port of Murmansk has direct access to the Northern Sea Route, that links the Atlantic to the Pacific through the arctic waters and provides access to natural resources of the Far North, Siberia and the Far East.

The Murmansk Region located at the junction of transnational routes and having reliable sea, railway, road and air links with industrial Russian regions can surely be called a northern gateway of Russia.

The main port of the region is the sea port of Murmansk located in the Kola Bay. It is also the key port of the Arctic Basin in terms of transporting goods to the High North and far abroad.

The port of Murmansk has all the necessary infrastructure for receiving, servicing and repairing vessels. It is a base for the Russian shipping companies, the emergency and rescue fleet and the unique nuclear icebreakers fleet providing pilotage along the Northern Sea Route.

The Murmansk seaport is among ten biggest Russian ports in terms of cargo transshipment, and is the only Russian port capable of receiving vessels of up to 300 thousand tones deadweight any time of the year due to non-freezing deep water area of Kola Bay.

Cargoes being transshipped in the port of Murmansk include general cargoes, liquid cargoes as well as containers, fish and fish products. Total cargo turnover in 2017 was 51.29 million tones.
Liquid cargoes prevail in the overall amount of transshipped goods. Prevailing among the dry goods coal is handled in terminals of PJSC Murmansk Commercial Seaport, the biggest stevedore company of the Murmansk region. The company also successfully handles apatite and iron-ore concentrates, non-ferrous metals, manganese ore, containers and other cargoes.

The port of Kandalaksha is located in the southern part of the Kola Peninsula in the water area of Kandalaksha Bay. The port of Kandalaksha specializes in transshipment of bulk and general cargoes. Total cargo turnover in 2017 was 1.69 thousand tones.

The project of Complex development of the Murmansk transport hub is the main transport infrastructure development project in the region. The project is being implemented within the state program Development of the Russian transport system (till 2018 - federal targeted program Development of the Russian transport system (2010 – 2020)) with the aim of increasing competitiveness and further development of the regional transport infrastructure.

Once the project implementation is fulfilled, a year-round deep-water marine hub will be created for handling of container and liquid cargoes, as well as, transshipment of coal and mineral fertilizers. It will be integrated into the North–South international transport corridor.

The project aims at development of the water area of Kola Bay, sea, railway and road transport infrastructure as well as logistics and warehouse infrastructure.

The project implies construction of a new railway and a cargo terminals on the western shore of Kola Bay. It is planned to reconstruct the existing coal terminal and construct a container terminal, a logistics center and a distribution zone on the eastern shore of Kola Bay.

The project is being implemented on a basis of public-private partnership. The state funds the construction of an auxiliary utility infrastructure for investment projects to be implemented by private investors. The project, when implemented, will increase the Murmansk port cargo turnover up to 70 million tones.

The Northern Sea Route is the backbone of the Russian Arctic transport system. It ensures economic integration of the Arctic territories both with other parts of Russia and with foreign countries, provides access to major hydrocarbons deposits and marine bio resources of the Arctic zone as well as to other strategic raw materials.
The powerful nuclear icebreakers fleet enables usage of the Northern Sea Route for transnational transit between the countries of North-West Europe and the Asia-Pacific region (Japan, China) and the USA and Canada and its integration into the global transport system as an independent Eurasian transport corridor with year-round transport of export cargoes. Currently new icebreakers of 22220 project are being constructed.

JSC Murmansk Shipping Company has a unique experience of shipping in northern latitudes. It is the biggest shipping company taking up the main share of cargo freight under the Russian flag in the Russian Arctic sector.

Murmansk transport branch of PJSC MMC Norilsk Nickel has successfully implemented a project on building a series of reinforced ice-class vessels for transporting cargoes along the Northern Sea Route without icebreaker pilotage which contributed to efficient handling of cargoes of Norilsk Nickel. It has its own fleet to ensure year-round regular transport connection between the seaports of Dudinka, Murmansk, Archangelsk, Rotterdam and Hamburg.

The general railway transport is a key element of the regional transport system. It takes up a considerable share in the transportation of passenger and goods. Total length of railway network in the Murmansk region is about 870 kilometers. Automobile transport plays an important role in passenger transport connections between the Murmansk region and the central parts of Russia. The length of federal, regional and local public roads in the Murmansk region is over 3.5 thousand km.

There are three international automobiles border checkpoints in the Murmansk region: Borisoglebsk, Lotta and Salla. Due to the increased traffic, there is a number of projects for the modernization of the international border checkpoints and roads renovation to be funded, in part, by international cross-border cooperation programs.

Considering that the Murmansk region is remote from the central parts of Russia, air transport is of particular importance in passenger transportation. There are two airports on the Kola peninsula providing services for passenger transportation, handling of aircrafts, luggage, post and cargoes: international one in Murmansk and one in Apatity (with passenger traffic in 2017 of 846 thousand people and 59 thousand people correspondingly). The border checkpoint enables the airport of Murmansk to provide international flights.
In order to develop necessary infrastructure, for receiving and servicing cruise ships and ferries, they are creating a regular ferry link with Norway and while increasing the number of foreign cruise vessels entering the port, pier of the Murmansk seaport was reconstructed in 2015 and passenger terminal was renovated in 2016. It is planned to provide the passenger terminal with border checkpoint.

Project Initiator:

Limited Liability Company “Sea Commercial Port “Lavna”

Address: 183038, Murmansk, Portoviy Passage, 25

Tel/fax: 8 (8152) 48-08-90

Brief description, goals and objectives of the project:

In order to improve the competitiveness in the market of port services and expanding of the scope of services for transshipment of various cargoes in the seaport of Murmansk, the project contemplates the building of a coal terminal of LLC “Sea Commercial Port “Lavna” with the capacity of 18 million tons. The project is included in Federal Target Program “Development of transport system of Russia (2010–2020)”, subprogram “Development of export of transport services.” To perform building works on the project, railway building on the western shore of the Kola Bay should be started. (2014).

Project cycle:

• up to 2014 – front-end engineering design, elaboration of design documentation;
• 2014–2016 – building;
• 2017 – building and commissioning of I terminal queue (turnover of 6 million tons)
• in 2018 – building, commissioning of II terminal queue (turnover of 12 million tons)
• after 2018 – building commissioning of III terminal queue (turnover of 18 million tons).


Current status of the project: A positive conclusion of RF State Expert Evaluation Department on project documentation, it is necessary to start railway building on the western shore of the Kola Bay.
Total investment: 76,605 billion rub.

Sources of financing:
• the federal budget – 62,136 billion rub.;
• equity capital – 14,469 billion rub.

Expected results of the project:
• preservation and development of human resources of the Murmansk region (project involves the creation of about 1,000 jobs);
• promoting business and investment activity in Murmansk region;
• strengthening of the competitive advantages of the transport system of the Russian Federation;
• a significant increase of export and transit potential of Russia.

According to TASS the Organization of the Murmansk Transport Hub (MTH) continues as planned, and its infrastructures will be formed by late 2019, press service of the regional government said on Monday after a meeting chaired by governor in Murmansk.

“As for the MTH project, it continues,” the press service quoted Governor Marina Kovtun. “Prime Minister Dmitry Medvedev stressed the project’s strategic importance and ordered to finalize it before 2020. thus, all the infrastructures, including the energy and railway, should be formed by late 2019.”

Construction of the Lavna coal terminal on the Kola Bay is a part of the program and it is included in the federal program for development of the Russian transport infrastructures. The coal reloading complex with the capacity of 18 million tons a year, a 46-km railroad, which is under construction, will be built on the basis of the public-private partnership. The coal terminal construction’s investor is the Lavna trade sea port.

A new 330-kv power station (“Murmanskaya”) will be built for new facilities and for better energy supplies of the existing consumers. The implementation term for this project is 2019.

A governmental meeting on development of the Russian North-West’s transport infrastructures, chaired by President Vladimir Putin, discussed the Murmansk Transport Hub on August 16. The president ordered undertaking exhaustive measures to implement the project in due time. The meeting’s members specified the project’s financial and economic model, the list of facilities, and the list of participants.
### 3.7.2 Murmansk Investments 2018–2025

**Murmansk Region 2018–2025**

#### Industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norilsk Nickel, Kola Nickel Refinery upgrade, Monchegorsk</td>
<td>300</td>
</tr>
<tr>
<td>Novatek/Yamal LNG2, ship building plant, Belokamenka, Murmansk</td>
<td>800</td>
</tr>
<tr>
<td>Rosneft Supply Base, Rosljakov, Murmansk</td>
<td>400</td>
</tr>
<tr>
<td>Fishing industry investments</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1.6 bn€</strong></td>
</tr>
</tbody>
</table>

#### Mining industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSC SZFK/Akron, mine expansion, Olenyj Ruchej</td>
<td>625</td>
</tr>
<tr>
<td>JSC Kovdorsky GOK, modernization projects</td>
<td>190</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>815 m€</strong></td>
</tr>
</tbody>
</table>

#### Transport infrastructure

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (m€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murmansk Transport Hub</td>
<td>3.0 bn€</td>
</tr>
<tr>
<td>Railway Vykhodnoi – Lavna</td>
<td>400</td>
</tr>
<tr>
<td>Murmansk Railway and Bus Stations</td>
<td>75</td>
</tr>
<tr>
<td>Murmansk port cruiser terminal</td>
<td>125</td>
</tr>
<tr>
<td>Murmansk Airport expansion</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>3.650 bn€</strong></td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>6.065 bn€</strong></td>
</tr>
</tbody>
</table>

**Investments after 2025**

#### Industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norilsk Nickel, Monchegorsk new refinery</td>
<td>1.0</td>
</tr>
<tr>
<td>Rosatom/Norilsk Nickel, Stainless steel mill, Monchegorsk</td>
<td>1.0</td>
</tr>
<tr>
<td>Monchegorsk industry park</td>
<td>150</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>2.150 bn€</strong></td>
</tr>
</tbody>
</table>
### Mining industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OAO Pana/Barrick Fedorova Tundra platinium mine</td>
<td>1.0</td>
</tr>
<tr>
<td>SZFK/JSC Akron, processing plant, mine expansion</td>
<td>1.0</td>
</tr>
<tr>
<td>Norilsk Nickel, Gremyakha, titanium mine</td>
<td>600</td>
</tr>
<tr>
<td>Norilsk Nickel, Vuruchavench, copper-nickel mine</td>
<td>600</td>
</tr>
<tr>
<td>Norilsk Nickel, Sopcheozerskoje chromium mine</td>
<td>500</td>
</tr>
<tr>
<td>Arcmineral Service MC, Afrikanda titanium mine</td>
<td>500</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>4.2</strong></td>
</tr>
</tbody>
</table>

### Oil and gas

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSJ Sintez Petroleum, oil refinery, Murmansk</td>
<td>800</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>9.320</strong></td>
</tr>
</tbody>
</table>

### Energy

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAES-2, Rosatom, 2 reactors, Polarnye Zori</td>
<td>8.0</td>
</tr>
<tr>
<td>JSC Rusgidro, tidal power plant</td>
<td>200</td>
</tr>
<tr>
<td>TGK-1 Kola hydro power plants upgrade</td>
<td>800</td>
</tr>
<tr>
<td>Windlife-Energy BV, Tumanny wind park</td>
<td>320</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>9.320</strong></td>
</tr>
</tbody>
</table>

### Public investments

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional heating system</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>All total:</strong></td>
<td><strong>17.740</strong></td>
</tr>
</tbody>
</table>

### Murmansk Region Investment Potential

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment (bn€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018–2025</td>
<td>6.065</td>
</tr>
<tr>
<td>After 2025</td>
<td>17.470</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>23.535</strong></td>
</tr>
</tbody>
</table>
Arkhangelsk Region belongs to the northern part of North West Russia. It has 3000 km coast by the White Sea, Barents Sea and Kara Sea. The region includes the Nenets autonomous district, the Novaya Zemlya and the Franz Josef Archipelago. Total area of the region is 410,700 square kilometers.

Population in Arkhangelsk region is 1,230,000 which is 0.8% of Russia’s population. The population density is 2.2 per sq. km. and 74% of the inhabitants live in cities and 26% live in rural areas. City of Arkhangelsk is the capital of the region and it has 356,000 inhabitants. Other bigger cities are Severodvinsk in the neighborhood of Arkhangelsk with 192,000 inhabitants, Kotlas with 60,500 inhabitants, Novodvinsk with 40,600 inhabitants, Koryazhma with 39,600 inhabitants and Onega with 21,300 inhabitants.

Industrial production

Industry is the key factor of Arkhangelsk Region economy. Main branches of business are forest industry and machine building industry. The Arkhangelsk region ranks eighth in Russia and second in the North-western Federal District in the volume of forest resources. Total square of commercial forests is 22 mln. hectares, timber reserves — 2.8 billions m3. Timber reserves of the Arkhangelsk region are recognized to be of high quality. Total forest reserves include 82% of coniferous forests and 18% — deciduous forests. Available cutting area is 48% of the total forest area.

The region produces 30% of Russia’s exported sawn material and 25% of paper and cellulose exports. Forestry, wood processing and pulp & paper are very important sectors of the economy—contributing over 40% to the regional production volume. Woodcutting in 2002 totaled 8 million cubic meters (80 million cubic feet), but 23 million cubic meters can potentially be cut. According to regional administration, there are over 200 wood cutting enterprises in the region and some 30 wood processing companies. According to expert estimates, regional enterprises produce 1.5-2 million cubic meters of sawn timber, plywood, glued blanks, fireproof plywood slabs and other wood products, approximately half of volume being exported. There are also furniture manufactures. One of the most successful is Aquatechnika.
An impediment to increased production is poor road infrastructure, especially bad access to forests. Modernization and productivity enhancement on existing sawmills are the priorities for development of logging and wood processing sectors. Active processing and trading companies include Arkhangelsk Plywood Plant, Dvinosplav JSC, Primorsky Sawmill, Onega Sawmills, Solombala Sawing and Woodworking Combine, Timber Mill N3 and Timbex.

The three pulp & paper manufacturing facilities in the region are Kotlas (part of St. Petersburg-based Ilim Group), Arkhangelsk (part of Titan holding), and Solombala mills. In average, their output totals 728,000 tons of pulp, 320,000 tons of paper and 674,000 tons of cardboard. The mills have their own logging capabilities and cut a significant share of needed timber themselves. For example, Kotlas pulp & paper mill has 16 logging companies, which are using Timberjack logging machines. Products include sulfate pulp, cardboard, coniferous sulfite bleached cellulose, offset printing and bag paper, Kraftliner, foliage sulfate bleached cellulose etc. Arkhangelsk pulp & paper mill is part of Titan Holding with nearly 25,000 employees. Titan produces 35% of Russia’s cardboard. Its logging companies cut two million cub meters of timber every year (25% of logging in the region).

A strong machine-building industry has developed in the Arkhangelsk region and it is specialized in shipbuilding. Shipbuilding is an important part of the regional economics because of high competence and unique production assets. The largest enterprises of this sector are «Sevmash» and «Zvezdochka» which create near 90% of proceeds of the sector.

These companies are constructing and repairing nuclear and diesel submarines, oil and gas platforms, ship vessels and others. The unique Russian center for construction, repairing and utilization of nuclear power submarines was founded here. The enterprises have facilities and technologies for construction of oil and gas platforms and necessary unique competence for implementation of the project of construction of floating nuclear thermal power station.

There is an infrastructure for preparation of specialists for machine-building sector. Today in Arkhangelsk region there are two higher educational establishments which train such specialists: Arkhangelsk State Technical University and Sevmashvtuz which is a branch of the St.-Petersburg Marine Technical University.
Sevmash has build an offshore ice-resistant platform for “Prirazlomnaya” oil field in the Pechora Sea. The total cost of the project was $1 billion. Sevmash is also a contractor of several oil companies to manufacture sea shelf platforms for oil and gas development in Sakhalin. Zvezdochka has a contract from the Finnish shipbuilding company, Azipod, to supply screw propellers for civil ships. The company is also Norway’s contractor to build bearing structures for tidal electrical power stations. Zvezdochka has experience in designing and manufacturing of floating bridge piers, pontoons, pontoon bridges of different length, ships, fishing trawlers, jack-up drilling rigs for exploration and exploitation of oil and gas offshore wells in the Russian Arctic. However, attraction of investment is difficult due to the fact that the enterprise is still government property and is engaged in Russian military programs. (Source: Arkhangelsk Region Government, Economic and Investment potential)

Arkhangelsk aims to be the international capital of the Arctic

The governor of Arkhangelsk Region, Mr. Igor Orlov has been very active during last years to develop the Arctic cooperation. He even nominated Arkhangelsk to the international capital of the Arctic in one of the numerous press conferences before “The Arctic: Territory of Dialogue”-forum in March 2017. According to Governor Orlov the main argument for this nomination was the fact, that the most important Arctic Forum of Russian Federation will after 2017 be held in Arkhangelsk every second year on a regular basis.

City of Arkhangelsk had also a plan to build a big new exhibition center, where these Arctic Forums could be organized in the coming years. This project got speed in the beginning of July 2017, when the construction of the exhibition center “Nord Expo” began in Arkhangelsk.

The center will be built in the district of Varavino-Factoria, in the area of Papanina Street. The total area of the object will exceed 2.6 thousand square meters. The site is selected taking into account the principle of the best logistic accessibility. “Nord-Expo” will be located in the place of the major traffic intersection - at the intersection of the Okruzhnaya motorway and the road leading from the motor bridge from the M8 highway. This project is being implemented by Nord Expo Ltd, which is part of the Axel group of companies. The planned volume of investments is 340 million rubles (5 m€).
Arkhangelsk has also other significant Arctic connections. The administration of Northern Sea Route has two offices, one in Moscow and one in Arkhangelsk. The office in Arkhangelsk handles practical tasks connected to the route. Arctic transport connected to Northern Sea Route is also main part of the interests of Arkhangelsk Region in the Arctic Business.

**Cooperation with China**

Chinese companies play significant role in the Arctic strategies of Arkhangelsk Region. First contacts with Chinese investors have been with Huadian Corporation, which in November 2014 signed an agreement regarding CHPP-energy projects in Arkhangelsk and Severodvinsk with Russian energy company TGK-2. This was also very important agreement in Russian-Chinese business cooperation, because both presidents Vladimir Putin and Xi Jinping were present in signing ceremony.

Next step to a closer economic cooperation between Arkhangelsk and China happened in the end of 2015 when Poly International Holding Company told, that they are ready to invest in the two key projects of the Region, the Belkomur and Arkhangelsk deep sea port.

Governor Igor Orlov told to TASS in December 2017, that China is a key partner of Arkhangelsk Region in implementation of big projects in the Arctic. Also, President Vladimir Putin said at the annual news conference in December 2017, that China had entered the biggest Russian projects including the Arctic, and that the Chinese counterparts have demonstrated their interest to the Northern Sea Route project.

**Start of the next Arctic Forum**

The organizing committee of the Fifth “The Arctic: Territory of Dialogue”-international forum had first meeting in Arkhangelsk in March 15, 2018. The first meeting started the detailed discussion that will focus on preparing for and holding the fifth forum in 2019. The Organizing Committee had on agenda practical matters like the importance of preparing the city infrastructure and upgrading the local hotels and transport network in Arkhangelsk.
3.8.1 Top investment projects in Arkhangelsk Region

1. The Belkomur

In the 20th century Russian rail ways development was based on a latitudinal approach (West-East connection). This has led to a situation now, where there is a lack of meridional railways. This has led to a shortage of convenient communications between raw and industrial regions of the country and existence of dead-end industrial centers. A shortage of communications has been in the North for a long time. Railway construction in a planned Belkomur location began together with establishing Northern Coal and Metallurgy Industry in the middle of the 1930s. In 1944 railway Kotlas-Vorkuta connected Pechora Coal Basin and Cherepovets metallurgical works. Rail road construction continued in Polar Russia further, but due to a mass amnesty of the main work force GULAG prisoners, it was stopped in 1953–1954.

The project came into life again in the 1990s. Belkomur had to integrate economically the Northern regions - Perm and Kirov regions, the Republic of Komi and Komi-Perm Autonomous District. In 1995, a large scale meridional project was proposed - a railway connecting Arkhangelsk, Syktyvkar, Kudymkar and Perm with the name Belkomur (White Sea-Komi-Urals).

The General Rail Ways Scheme Development for Russian European North (1994) was the basis of the project, it contained necessary technical and economic grounds. The General Scheme was considered and supported by Komi Government, Arkhangelsk and Perm regional administrations, Komi-Perm Autonomous District.

To implement the project in September 1996, there were established a company project in Syktyvkar called Interregional JSC Belkomur. Main shareholders for the project were the Russian Federation and its subjects as the Republic of Komi, Arkhangelsk region, Komi-Perm Autonomous region, Perm region and a number of large enterprises of those regions. Institutes Lengiprotrans and Uralgiprotrans with participation of Giprotrans TEI began to develop the project.

In the beginning of 1998, JSC Belkomur began to construct a Northern link of the new railway from opposite directions simultaneously: from Arkhangelsk region, from Karpogory to Sharda 22.2 km by Sevtransstroy as a contractor and from the Republic of Komi Ertom-Vendinga 17.85 km by JSC Pechorskoye Stroitelstvo as a contractor. JSC Komistroymost built 290 m long bridge over the Vashka river.

For the Southern link, Syktyvkar-Perm a feasibility study was made and positive expertise was received.
In 2015, Chinese Poly International Holding Company expressed their interest to join as an investor in the Belkomur project. The project is linked with the plans on creation of a deep-water area at the Arkhangelsk seaport. Negotiations with Poly Group on this project are also in progress, but this project features less elaboration so far. Investments needed for creation of a deep-water area at Arkhangelsk seaport are estimated at RUB 120–150 bln.

The project includes a construction of a new railway (1252 km), including a new construction of 795 km, the rest is reconstruction and modernizing of the existing lines. Belkomur consists of 2 parts: Northern and Southern. The first one crosses Arkhangelsk region and the Republic of Komi, the second one crosses the Republic of Komi from Syktyvkar to Perm region.

The Belkomur project (White Sea - Komi - Ural) involves the construction of the railway Arkhangelsk - Syktyvkar - Solikamsk (Perm) to the length of 1161 kilometers, working as the logistical basis for an integrated industrial and infrastructural development of the regions of the European North of Russia. Construction and reconstruction of the railway transport infrastructure within Belkomur project will help to develop economic potential of the Republic of Komi, the Perm Region, the Arkhangelsk and Murmansk regions and establish business relationships with PRC organizations and companies. The Republic of Komi, the Arkhangelsk Region and the Perm Region are the project initiators and major Belkomur shareholders.

The first trains may run on the Belkomur railway (White Sea-Komi-Urals) already in 2023. The Belkomur project is a new railway route, which will connect industrially developed regions in Siberia and the Urals with ports in Russia’s North and North-West. The project will add to effective development of the Arctic projects and will form the international railway route across Russia between Russia’s European North and China, thus cutting by 800 km the transportation distance for deliveries from Siberia and the Urals.

The prospects for the Belkomur project implementation have been discussed at an extended meeting of the Federation Council’s committee for economic policy. The project will be launched in time if a concession agreement on the railway construction is signed by the beginning of 2018, Viktor Novozhilov, the chairman of the Arkhangelsk regional legislature, told TASS after the meeting.
Chinese company, Poly International Holding Co. earlier confirmed plans to invest up to $5.5 bln into the project. The concession agreement is expected to be drafted and submitted to the Russian government already in 2017.

“The project’s implementation requires reconstructing and building of hundreds of kilometers of railroads. The project will boost the development of key economic clusters, including chemical, timber, transport, shipbuilding, construction, fuel and energy, mining and seafood processing industries,” Novozhilov said. “More than 45,000 new jobs will be created. If the concession agreement with the investor is signed by the start of the next year, the first trains will run on the railway already in 2023.” He added that Russian senators had supported the railway construction.

Alexei Alsufiev, the first deputy governor of the Arkhangelsk region, told TASS that the 2016 strategic audit of the Belkomur project had confirmed its macroeconomic efficiency. “This efficiency grows, if we regard the Belkomur project in dynamic connection with all the major infrastructure projects in the region, that are being or will be implemented in the near future. I am talking about the Murmansk transport hub, the Northern latitudinal railway and the Arkhangelsk seaport,” Alsufiev said.

Belkomur will increase the effectiveness of more than 100 companies, and another 40 enterprises will get opportunities for development. The project is also expected to suspend the outflow of workforce from Russia’s northern territories.

As for the Arkhangelsk region, in particular, it will be able to produce additional 4 mln cubic meters of timber annually, to increase the mining of bauxite ore and diamonds and will contribute into the development of lead and zinc deposit on the Novaya Zemlya archipelago.

The Perm Territory has a minimum share in this project (some 9.5 %), but Belkomur will give this region additional possibilities to develop timber industry and increase production of limestone and other building materials. The new railway will resolve the problem of transportation from the Solikamsk basin of up to 10 mln tons of potassium fertilizers annually.

Belkomur will allow the Komi Republic to increase timber production and will help the development of major deposits of bauxite and titanium ores. “The region and our east-oriented projects can be potentially linked to Belkomur,” said Nikolai Gerasimov, deputy head of the Komi government. “I am talking about the development of oil production and construction of gas industry and mining enterprises.” He said that
the republic was always seeking the implementation of this project. “The projects not only links regions, north and south, Europe and Asia, but also creates prospects for remote areas. The position of the Komi Republic is simple and standard - we want this project to be implemented and to start working for the development of our region,” the official added.

At the regional level, the Belkomur project will boost the industrial and social-economic development in Komi, Perm, Arkhangelsk, Murmansk and other adjusting areas. As the route is implemented, another 39 investment projects will develop further the North-Western part of Russia, attracting more than 720 billion rubles (almost $13 billion) in private investments, and offering 28,000 new jobs.

The new railway’s annual capacity will be 35 million tons. Coal, mineral fertilizers, oil, timber, ores, construction materials, containers will be taken to the backbone ports of the Northern Sea Routes: to the ports of Murmansk, Arkhangelsk, Belomorsk, and later on also to Sabetta. The extra-budgetary funding of the railway construction will exceed 260 billion rubles ($4.5 billion). As the exploitation term (26 years) expires, the Belkomur railway will be transferred for further use to the Russian Federation.

2. Arkhangelsk Deep Sea Port

The Arkhangelsk deep-water port is a potential backbone infrastructure of the Northern Sea Route. Across the White Sea the port has a direct access to the ocean, thus granting independence of navigation from whatever political conditions. Construction of the port is a part of the Russian transport strategy to 2030. The new port will offer a more attractive alternative route for exported and imported goods to Europe, North America, the Asia-Pacific region (first of all China), and will offer an independent exist for large vessels into the World Ocean.

Construction of a new deep-water port in Arkhangelsk is connected with the Belkomur railway project to cut transportation distance for cargoes from the Urals and Siberia by 800 km. The new deep-water hub will be suitable for year-round handling of large capacity vessels and will be situated 55 kilometers (34 miles) north from Arkhangelsk near Mudyug Island, in the northern part of the Sukhoye Morje Bay (Dvina Gulf in the White Sea).
Arkhangelsk is an oldest commercial sea port in Russia and the western terminus of the Northern Sea Route. It currently features a multifunctional commercial harbor for transshipment of general cargo, including pulp, cardboard, metals, sawn timber, containers, heavy equipment and bulk cargo.

It is also a principal base for oil and gas developments on the Arctic shelf including those in the Barents and the Kara Seas. Shipbuilding and repair are also important, and the port is the base for a fishing fleet. The region is also Russia’s main satellite launching area.

Throughput at the expanded port is anticipated to be capable of berthing vessels up to 100,000 dwt and of handling around 30 million tons of cargo by 2030. The port is part of Russia’s Transport Strategy for the period to 2030. It is anticipated to offer an alternative and more attractive route for cargo flows to and from Europe, North America and China. Arctic Transport and Industry Hub “Arkhangelsk” JSC was established in May 2016 to manage the project, and a development agreement was signed with Poly International Holding in China last week.

3. Pavlovskoje lead-zinc mine

New geological surveys of the Pavlovsky deposit reveals a 26 percent increase in ore resources. The total resource potential is now upgraded to 47 million tons, TASSreports.

License holder and operator ARMZ Uranium Holding (JSC Atomredmetzoloto), a subsidiary of state-owned nuclear power giant Rosatom, intends to develop infrastructure, a processing plant, as well as housing facilities for 450 workers on site, company CEO Yuri Murashko says.

Parts of the production is planned to be shipped to the world markets through the Northern Sea Route, according to the company. Annual production amount is set to 2,5 million tons of ore.

The deposit was discovered in 2001 and the project’s mine is reported to come into production in year 2019, according to Barents Observer. The Pavlovsky deposit includes a 12-square km area located about 16 km from the coast. The project’s port will allow vessels with a deadweight of up 8000 ton to dock.
Novaya Zemlya is a closed military area strictly controlled by the Russian Armed Forces. Between 1973 and 1975, the southern island of Novaya Zemlya was used for larger underground nuclear tests. Of the seven detonations that took place in the area, several ventilated radioactive gases to the atmosphere, because the explosions were not deep enough in the ground.

Pavlovskoye Lead and Zinc Deposit is one of the largest deposits in Russia. Its reserves are estimated to be at 47.7 million tons of ore (2.49 million tons of zinc, 549,000 tons of lead and 1,194 tons of silver). First Mining Company JSC (JSC PGRK, an affiliated company of Uranium Holding ARMZ/Atomredmetzoloto JSC which is part of ROSATOM) plans to build a mining enterprise with a capacity of up to 3.5 million tons of ore per year on Novaya Zemlya.

At the International Arctic Forum “Arctic: Territory of Dialogue” on March 30, 2017, ROSATOM and Arkhangelsk Region signed an agreement on the cooperation in the comprehensive development of the Arctic Zone of the Russian Federation.

The document was signed by ROSATOM Director General Alexey Likhachev and Arkhangelsk Region Governor Igor Orlov.

The agreement provides for the parties’ cooperation to secure sustainable social and economic development of Arkhangelsk Region through creation of prerequisites for attracting investments and implementation of the mining project of ROSATOM dealing with Pavlovskoye Lead and Zinc Deposit (on the Yuzhniy Island of the Novaya Zemlya Archipelago, Arkhangelsk Region) and the project of construction of the deep-water area of Arkhangelsk Sea Port.

The key areas of the cooperation will include the development of the transportation infrastructure of Arkhangelsk Region, in particular, inclusion of the marine terminal on the Yuzhniy Island of the Novaya Zemlya Archipelago (including the deep-water area) into the boundaries of Arkhangelsk Sea Port. Also, the agreement provides for development of the logistic support, including assistance in round-the-year navigation for uninterruptible and ecologically safe navigation of ships to the Yuzhniy Island of the Novaya Zemlya Archipelago, Arkhangelsk Region.
### 3.8.2 Investments in Arkhangelsk Region 2018–2025

#### Industry

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkhangelsk Pulp and Paper Mill board plant reconstruction</td>
<td>175 m€</td>
</tr>
</tbody>
</table>

#### Mining industry

<table>
<thead>
<tr>
<th>Mining Company</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSC Atomredmetxoloto, Poavlovskoje lead-zinc mine</td>
<td>1.0 bn €</td>
</tr>
<tr>
<td>Omya Group, Plesetsk limestone mine</td>
<td>50 m€</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.050 bn €</strong></td>
</tr>
</tbody>
</table>

#### Bio energy

<table>
<thead>
<tr>
<th>Bio Energy Project</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huadian/TGK-2, CHPP plant, Arkhangelsk</td>
<td>350 m€</td>
</tr>
<tr>
<td>Huadian/TGK-2, CHPP plant, Severodvinsk</td>
<td>350 m€</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>700 m€</strong></td>
</tr>
</tbody>
</table>

#### Transport infrastructure

<table>
<thead>
<tr>
<th>Infrastructure Project</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belkomur-project start, Poly Group</td>
<td>3.8 bn €</td>
</tr>
<tr>
<td>Sever Deep Sea Port, Arkhangelsk</td>
<td>700 m€</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.5 bn €</strong></td>
</tr>
<tr>
<td><strong>All total</strong></td>
<td><strong>6.425 bn €</strong></td>
</tr>
</tbody>
</table>

#### Investments after 2025

<table>
<thead>
<tr>
<th>Infrastructure Project</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poly Group, Belkomur railway project finalizing</td>
<td>6.3 bn €</td>
</tr>
<tr>
<td>JSC RZD Railway terminal and logistics center, Arkhangelsk</td>
<td>300 m€</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6.600 bn €</strong></td>
</tr>
</tbody>
</table>

Arkhangelsk Region Investment Potential

<table>
<thead>
<tr>
<th>Period</th>
<th>Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018–2025</td>
<td>6.425 bn €</td>
</tr>
<tr>
<td>After 202</td>
<td>6.600 bn €</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13.025 bn €</strong></td>
</tr>
</tbody>
</table>
REFERENCES AND SOURCES OF INFORMATION

Arkhangelsk Region:
en.dvinainvest.ru

Murmansk Region:
Ministry of Economic Development of Murmansk Region

North of Norway:
Konjunkturbarometeret Nord

North of Sweden:
NHO Norrbotten
Invest in Norrbotten
Västerbotten Investment Agency

Kainuu Region:
Invest in Kainuu

Oulu Region:
BusinessOulu
Oulu Chamber of Commerce

Lapland:
Lapland Chamber of Commerce
PROMOTING BUSINESS IN THE NEW NORTH

Lapland Chamber of Commerce (est. 1939) mission is to create success in the North.

Representing views and opinions of trade and industry the Chamber is working on better business environment, offering business related services and building networks in order to maintain and enhance business competitiveness.

International cooperation and networking plays an active role of the Chamber activities in the European High North, forgetting not the worldwide context.

Members of the Chamber include a variety of companies from big industrial companies to SME’s from different industries and branches of business, municipalities and other business related services.

We are open for cooperation and see that each new contact is a chance of new business opportunities. Please don’t hesitate to contact us for more information.

LAPLAND CHAMBER OF COMMERCE
www.lapland.chamber.fi
www.arcticbusinessforum.com
EUROPEAN HIGH NORTH INVESTMENT POTENTIAL 2018 (2018–2025)

- **LAPLAND**
  - 2018–2025 – 8.005 BN€

- **NORTHERN NORWAY**
  - 2018–2025 – 27.585 BN€

- **NORRBOTTEN**
  - 2018–2025 – 4.631 BN€

- **OULU REGION**

- **VÄSTERBOTTEN**
  - 2018–2025 – 7.806 BN€

- **KAINUU REGION**
  - 2018–2025 – 2.328 BN€

NORWAY

FINLAND

SWEDEN