

## COMPETING SOLUTIONS

The Western Arctic Railway competes with two other transportation solutions based on railways:

1. A new railway between Rovaniemi in Finland and Kirkenes in Norway, with a link between Kolari and Sodankylä (The Eastern Arctic Railway).
2. A new railway between Kolari in Finland and Svappavaara in Sweden, which can be connected to the railway to Narvik in Norway (The Ore Railway).

The current transportation pattern by rail in Finland is mainly between the major cities and to / from ports in the Baltic Sea. Both products and markets for the Finnish industry have adapted to this type of transport solution, and public and private companies have invested in infrastructure according to this pattern.

A rail between Kolari and Kirkenes gives a transport length of about 510 km to the port. There is also a longer sailing distance for ships to Kirkenes, between 360 and 500 km, depending on destination. We have not calculated the investment costs for the railway to Kirkenes, but the distance indicates that it is significantly more expensive than The Western Arctic Railway. The cost of operating the trains will increase according to the distance. The combination of shorter transport distances both on land and sea, clearly favors of The Western Arctic Railway.

A rail between Kolari and Svappevaara gives a transport length of about 340 km to the port of Narvik. But the sailing distance for ships to Narvik is between 110 and 370 km shorter, depending on destination. We have calculated the investment cost for the line to Narvik on the basis of previous reports. The investment is less than half of The Western Arctic Railway. The cost of train operations will be somewhat larger, but easily justified by the shorter sailing distance. For the ore transport from Kolari / Pajala to the Atlantic Ocean, a rail to Narvik results in lower costs than The Western Arctic Railway.

But there are some conditions in favor of The Western Arctic Railway:

- It will be technically integrated (rail gauges) in the Finnish / Russian railway network and can thus serve other freight flows more effectively than a Swedish / Norwegian railway solution between the mines in Kolari and Narvik.
- It will provide supplemental transportation capacity. Available capacity of Narvik is dependent on the volume produced by LKAB in Kiruna, Sweden, and the possibility for increased capacity on existing lines.
- It allows increased commercial development in the north of Finland and the north of Norway.



# THE WESTERN ARCTIC RAILWAY

Kolari - Muonio - Kilpisjärvi - Skibotn

RAMBOLL

TORNEDALSRADET  
TORNIONLAARSON NEUVOSTO

INTERREG  
IV A NORD



## INTRODUCTION TO THE WESTERN ARCTIC RAILWAY

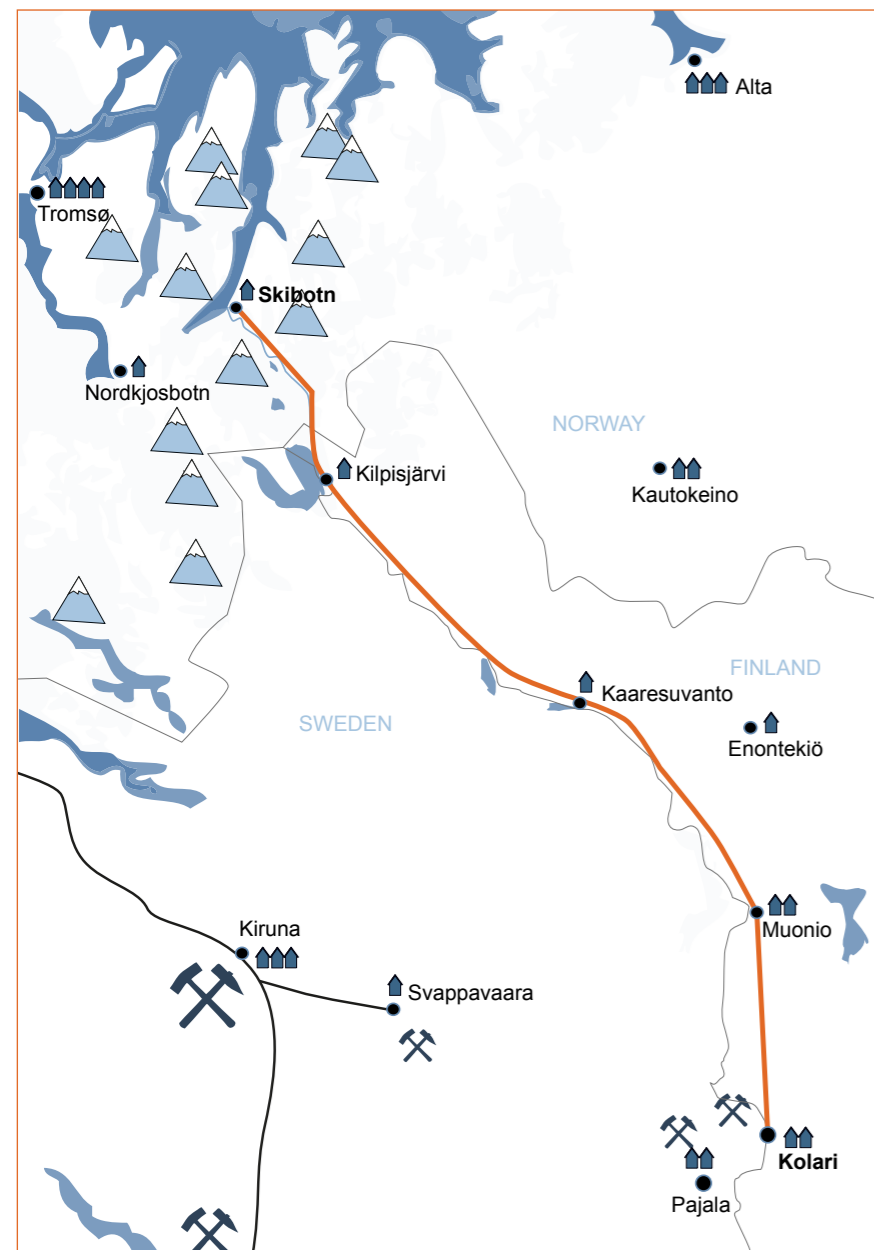
“The Western Arctic Railway” is a railway project between Kolari in the north of Finland and Skibotn in north of Norway. It is built on local, regional and national aims of development in the North and in the railway sector.

The tracks will follow two valleys, Tornådalen and Skibotndalen. The highest point is approximately 520 meters above sea level. The length is about 312 km, of which about 45 km is on the Norwegian side and the rest is on the Finnish side of the border. On the Norwegian side, a large portion of the tracks must be in tunnels.

In Skibotn it can be constructed an ice-free port that has no restrictions like those of the Gulf of Bothnia where the maximum draft limit is 10-13 meters. Transporting large volumes of ore, minerals and other natural products favors the use of ships with drafts from 14-20 meters. Large container ships have the same requirements. These requirements are met in Skibotn. Sufficient land areas are also available, since large container ships require a lot of space on land.

Finland has a track width on their railways and other technical systems corresponding with those in Russia. The Kolari - Skibotn railway is planned according to Finnish technical systems. The operation can be integrated into Finnish and Russian rail network in a better way than other railways between Finland / Russia and Sweden / Norway.

The railway's primary function will be freight transportation. It can also be used for passenger transportation, but speed is limited to about 100 km an hour. Freight trains will run at a reduced velocity, often as low as 50 km / hour. Maximum train weight will be about 7 000 tons, of which about 5 500 tons are cargo.

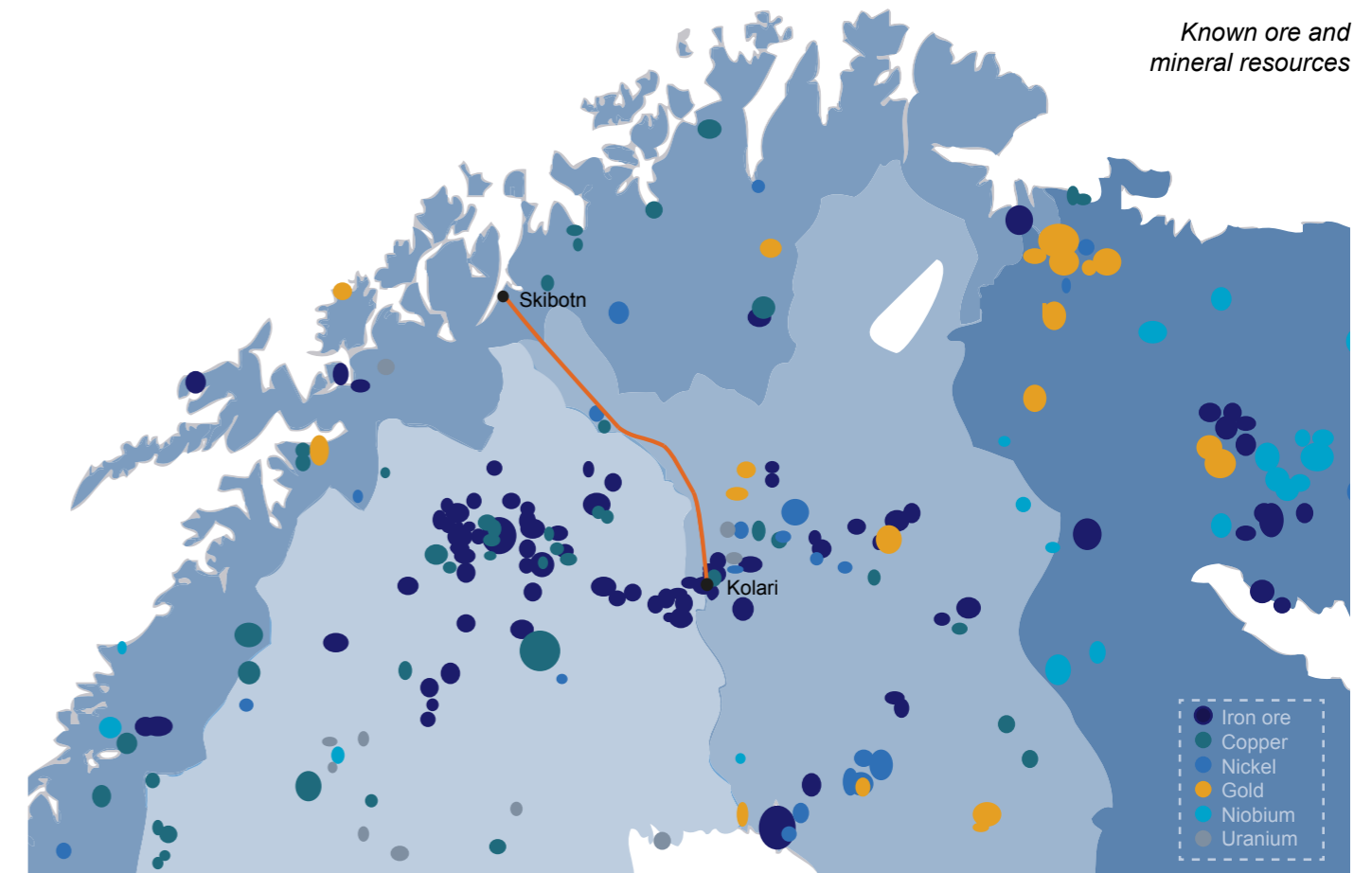


## COSTS

Investment costs in Finland	EUR 1,6 billion (NOK 13 billion)
Investment costs in Norway <ul style="list-style-type: none"> <li>including the container terminal in Skibotn</li> <li>excluding the ore- and container port</li> </ul>	EUR 0,6 billion (NOK 5,5 billion)
Electrification	EUR 0,2 billion (NOK 1,3 billion)

The costs are calculated based on Finnish and Swedish statistics for the parts of the path being in Finland. The Norwegian costs are based on Norwegian empirical data. They are higher than the Finnish and Swedish per kilometer completed path.

The costs for operating the trains between Kolari and Skibotn are estimated for alternative technical solutions. For ore transportation, it is possible to reach EUR 2.30 (NOK 18) per ton with the best technical solution, excluding payment for the use of track. Compared to the traditional long distance freight costs, this is a low cost. But it requires custom design of the track and electrification.



## MARKET ANALYSIS

The Western Arctic Railway can effectively serve heavy freight flows (ores, minerals) between inland North-Finland/ North-Sweden and ports worldwide through Skibotn. Currently existing freight flows are too small to truly benefit from the project. We have identified a flow between northern Norway and Finland / Russia that provides a basis of 0.2 to 0.5 million tons per year.

There are several possible future freight flows. The most tangible is the iron ore from the Kolari area to a port. It could be relevant to ship out up to 3.5 million tons per year for a few years, perhaps considerably more. There are also several other mineral and ore possibilities in northern Finland and northern Sweden.

It is estimated that it will be found new deposits that could generate new mines. In the future it might also be created a marked for known deposits that do not currently provide adequate profitability. Access to a new transport solution can provide profitability to deposits that are otherwise unprofitable.

Russia is a huge potential market. The development in the oil and gas industry in the north could benefit from an efficient railway between Russia and Norway. It may also be of interest for possible future cargo flows between Russia and America. Today, these flows are relatively small.

When the Finnish industry can use an efficient rail connection to the Atlantic Ocean, it can provide opportunities to develop markets overseas in a different way than before. Today, the Finnish export / import flow is concentrated through the Baltic Sea, and mainly to / from Europe.

**TRANSPORT MARKET FINLAND, figures for 2008**

- Freight traffic on railways Kolari - Tornio, 0.3 million tons
- Freight traffic on Finnish railways, 42 million tons.
- Transit by rail between the Russian and Finnish ports, 8 million tons
- Transit by road between the Russian and Finland, 8 million tons
- Trans Siberian container traffic by rail through Finland, insignificant in 2008
- Finland's largest trading partners, in order from the largest; Russia, Germany, Sweden, China, Netherlands, USA, Great-Britain, France, Italy, Belgium, Norway.
- Finnish export / import ports on the Baltic Sea, 25 ports with 93 million tons in 2010.
- 4 million overnight stays per year in Mountain-Lapland

**TRANSPORT MARKET NORWAY, figures for 2008**

- Freight flows to and from Finnmark and Troms 9 million tons, of which fish is 1.0 million tons.
  - Industrial goods, 0.7 million tons
  - General cargo, 1.7 million tons.
- Freight between Finnmark / Troms and North/East Europe and the world, estimated 1.1 million tons.
- Truck freight via E8 Skibotndalen, 0.2 million tons in 2010.
- Norwegian fish exports to Russia, 0.4 million tons.

**OTHER TRANSPORT MARKETS, figures for 2010**

- Exports from U.S. to China, 73 million tons, much finished goods and some raw materials
- Import from China to the United States, 54 million tons, mostly finished goods
- Exports from the United States to Russia, 1.5 million tons, finished products
- Import from Russia to the United States, 40 million tons, mostly oil