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# Development Scenarios of the East-West Transport Corridor in the Barents Euro-Arctic Region

Master Degree in International Business Management

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## Abstract

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The Barents Region is geographically unique, sparsely populated, rich in natural resources, located far from the main global markets. Transportation, accessibility, and the geographical location of the area were always crucial factors in the area's competitiveness. Transport links economic activities and gives access to resources, markets, and labour. The aim of the research is to establish links between the past, present, and alternative future scenarios in order to provide a holistic picture of the development of the east-west transport corridor.

This research focuses on the concept of foresight, which is closely related to strategic planning and development. Foresight is a narrower field of future research that applies futures research techniques to shaping strategies primarily. The research approach is based on a qualitative method. Specific materials such as studies, documents, events, and observations were examined. Research was conducted using secondary data. The data were originally collected and published for two international projects: Northern Axis-Barents Link (NABL) and Barents Region Transport and Logistics (BRTL). These projects were implemented in cooperation with more than 20 partners from four different countries between 2018 and 2022. The lead partner of both above-mentioned projects and the commissioner of this research is the Regional Council of Kainuu.

Several theoretical frameworks were used to analyse the data, such as PESTLE analysis, the future cone and triangle, and the general foresight process framework. The main driving forces for change in the transportation sector were identified and divided into six major categories: policy (1), demography and society (2), energy and environment (3), economics (4), finance (5), and technology (6). The research aims to answer three questions. The main bottlenecks of the Northern Axis-Barents Link transport corridor were identified and divided into physical and intangible categories, giving the answer to the first question. The second question explores alternative scenarios for east-west connections in the Barents Region. Scenarios were chosen as a method to present the research results. Each of them was named according to their context. The first is utopia: High north, low tension. Another is dystopia: The era of disasters. The other two are High North, High Global Risks, and Cat and Mouse Games in High North. Four scenarios were built around two critical uncertainties: geopolitical tension and climate change. The third research question was on recommendations for further use of the scenarios in strategic planning. A scenario-based examination could add value to the integration of the research results into the revision of strategic documents such as the Joint Barents Transport Plan and the Regional Transport System Plan of the Kainuu Region. Produced scenarios could be used to facilitate discussions on changes and perspectives in different working groups. They could also help to bridge the gap between research and science cooperation and regional development. Scenarios are expected to reduce uncertainty and raise the level of knowledge among policymakers and decision-makers.

This research describes the history of transport cooperation in the Barents region in order to help understand the current status and future course of development. 30 years of successful Barents cooperation provide us with a valuable lesson and an existing structure for dialogue that could be applied to some extent to the new realities in a meaningful time.

**Foreword**

January 2023 would have been the 30th anniversary of the Barents Cooperation. The unique cross-border cooperation between the northern parts of Finland, Sweden, Norway and Russia has promoted stability and sustainable development, as well as created dozens of success stories in just a few decades. The Barents Cooperation activities involving Russia were suspended in February 2022 due to military aggression of Russia against Ukraine. It seems that, the world was turned upside down, though not out of necessity.

For the past 2,5 years, I have been working as a project manager for the Northern Axis – Barents Link project (NABL) in the Regional Council of Kainuu, Finland. The project aimed to develop an east-west transport corridor and cross-border mobility in the Barents Euro-Arctic Region. The project was being implemented over several years with the support of the Kolarctic 2014-2020 EU-Russian Cross Border Cooperation Programme (CBC). CBC programmes are an important element of the EU's neighbourhood policy. Within the project activities, partners from four countries jointly explored the potential of the main transport infrastructure in the border areas along the Northern Axis – Barents Link transport corridor.

Unfortunately, the project partners didn't have the opportunity to complete all the studies and events originally planned. New tension between East and West and the related sanctions against Russian in 2022 have created serious constraints on the completion of the last and most important work package – the Action Plan – which aimed to form a synthesis of all previously implemented project studies by analysing the main findings, results and making further recommendations for the transport corridor development.

My personal motivation for this research is to summarise the project activities through futures studies, to create alternative scenarios and to have a look on future of transport.

# 1 Introduction

The main aim of this paper is to establish links between the past, present, and alternative future scenarios to provide a holistic picture of the development of the east-west transport corridor in the Barents Euro-Arctic Region (hereinafter referred to as the Barents Region). Correspondingly, the purpose of this research is to identify the main challenges of the Northern Axis-Barents Link transport corridor development, make a synthesis of more than 20 studies and materials produced in two recently ended projects closely related to the topic, and, through scenario techniques, generate useful data for policymakers.

This research aims to answer the following three questions:

*What are the main challenges of the Northern Axis-Barents Link transport corridor development?*

*What are the possible scenarios for the transport corridor's development?* The main idea behind scenarios is to have a look at changes in the operational environment, highlight some features and characteristics of the corridor, and create different futures, not to predict the future.

*How could the output of the research (scenarios) be further used in strategic planning?*

The Barents Region is geographically unique and rich in its natural resources. On the other hand, it is far from the main global markets. The Arctic climate, long distances, and sparse population pose their own challenges to cooperation in various fields and transport, without any exceptions. Two links—the Northern Axis and the Barents Link—form the east-west transport corridor, which lies in all four countries of the Barents Region and connects Scandinavian countries with the Northern Sea Route and northwestern Russia.

Transportation provides accessibility to markets, labour, and resources and is therefore considered a key factor for competitiveness. Transport links regions, economic activities, and people. Looking at the Barents Region as one area and a common platform for cooperation, the development of a viable regional economy can be achieved more efficiently and easily through cross-border cooperation than by the regions acting alone. The impact of transport projects implemented in one of the Barents countries will affect the transport systems of the others.

The goal of this research is to forecast the development of the east-west transport corridor in the Barents Region by exploring secondary data. The data were initially collected and published as open source by two international transportation and logistics projects: Northern Axis-Barents Link

(NABL) and Barents Region Transport and Logistics (BRTL). These projects were implemented by more than 20 partners from four different countries between 2018 and 2022. The lead partner of both above-mentioned projects and the commissioner of this research is the Regional Council of Kainuu.

This research is based on the concept of foresight. By definition, futures studies are a multidisciplinary approach that aims to study the future of humanity in general using different disciplines and methods, including theoretical and philosophical reflections. Foresight is a narrower field of future research that refers to the application of futures studies methods to business, preparing organisations for the future and shaping their strategies. In other words, foresight and futures studies use the same set of tools and methods but in different contexts. Both futures studies and foresight can use scenario techniques. The main difference is that futures studies will only create a scenario and possibly raise awareness of it. Foresight will create a scenario and use it as a management tool. Foresight is seen as a part of strategic thinking, closely linked to strategy development and planning processes.

The research approach is based on a qualitative method. It is future-oriented and explores abstract models and concepts. Specific materials such as studies, documents, events, and observations are examined. The data analysis process starts with PESTLE analysis for operating environment scanning, followed by identifications of the main change driving forces after dividing them into six major categories: policy (1), demography and society (2), energy and environment (3), economics (4), finance (5), and technology (6). In the next step, scenarios are elaborated based on the collected drivers and features. And finally, the generic foresight process framework is used to structure the results.

In this era of changes, scenario planning is a popular way to cope with uncertainties and complexity and to gather and analyse information. However, according to open sources, no similar research on east-west connections in the Barents Region has been done before.

## 2 Barents Cooperation

By the moment of writing this report (August 2023), Barents cooperation activities involving Russia have remained suspended for about 1,5 years, since March 2022.

Figure 1. Barents Region (Barentsinfo, n.d)

The Barents Euro-Arctic Region, Europe's largest region for interregional cooperation, covers the northernmost parts of Sweden, Norway, Finland and northwest Russia. Harsh climate, long distances and inaccessible natural resources characterise the region. Minerals, renewable energy potential, oil, gas, forests, and fish are unevenly available in Europe. Given the current geopolitical situation and the green transition process, the global demand for minerals and raw materials is expected to grow and the Barents Region continues to attract business and political attention. The population of the Barents Region is about 5.2 million and it is a home to several indigenous peoples.

## 2.1 History of the Barents Cooperation

Cooperation in the Barents Euro-Arctic Region was launched in 1993 on two levels: the intergovernmental Barents Euro-Arctic Council (BEAC) and the interregional Barents Regional Council (BRC). The Barents Euro-Arctic Council suspended its activities concerning Russia after the Russian attack on Ukraine in February 2022. The earliest history of the Barents Region can be traced back to Stone Age culture. The region has a long tradition of international trade. (Zimmerbauer, 2013; Barentsinfo, n.d)

The official chapter of the history of the Barents Region Cooperation starts in the small town of Kirkenes on the edge of Europe in Norway, where exactly 30 years ago the Kirkenes Declaration was signed. The Declaration was a founding document that describes a need to promote sustainable development in the region and defines the Barents Euro-Arctic Council (BEAC) as a forum for considering bilateral and multilateral cooperation in field of economy, trade, science and technology, tourism, environment, infrastructure, educational and cultural exchange, and projects aimed in improving the situation of indigenous peoples. (Heininen, 2004; Zimmerbauer, 2013)

The Pomor trade between Northern Norway and Murmansk-Arkhangelsk in Russia can be traced back to the end of the 17th century and it had a great impact on cultural and economic relations development between countries. The Russian Revolution put an end to the legal trade and personal contacts between Northern Norway and Russia in 1920. (Zimmerbauer, 2013)

The initiative to establish regional cooperation originally came from Norway. Military issues were excluded from the framework, but the Barents regionalisation project was an example of the use of political strategy to deal with both the opportunities and the former military threat arising from the post-Cold War reality. Political statements treat the region as a territorial phenomenon, except for certain environmental issues. In other words, cooperation was aimed at reducing military tensions between East and West and supporting stability in the region. (Zimmerbauer, 2013)

Two-level governing structure was a new innovative design in relations between states and regions, established by six state governments (Norway, Sweden, Finland, Russia, Denmark and Iceland) and the Commission of the European Union. (Heininen, 2004)

A major limitation of the initiative was that official cooperation did not cover the Barents Sea, making the Barents Region somewhat artificial. This fact reflected the strong national interests of Norway and Russia in competing for the rich natural resources of the Barents continental shelf. Security policy was also excluded from the cooperation agenda due to the highly sensitive strategic role of the ice-free areas of the Barents and Norwegian Seas. On the other hand, cooperation has successfully worked on nuclear safety issues, opened new border crossings between Finland and Russia, expanded networks and implemented many successful people-to-people projects. Environmental cooperation has also been quite positive in terms of agreeing on environmental action programs and allocating funds, while progress in business and economic co-operation has been slow. Border cooperation has succeeded in moving practical dialogue between the countries from a period of tension to a new phase of international, mostly interregional, cooperation. (Heininen, 2004)

## 2.2 Barents cooperation as a part of the Arctic cooperation

The Barents cooperation brings a regional and practical perspective to the broader Arctic cooperation. It is important to take a holistic view and define links between Barents and Arctic cooperations. According to the Arctic Monitoring and Assessment Programme there are several definitions of the Arctic based on physical, geographical, and/or ecological characteristics. For this research Arctic region can be defined as a geographical area that extends across northern North America, Northern Europe, Northern Asia, taking in eight countries and the expanses of the sea and ocean in between. (AMAP Assessment Report, Chapter 2, n.d.)

The Arctic Council, with its member states: Finland, Sweden, Norway, Iceland, Denmark, the United States, Russia and Canada has been playing a significant role in Arctic Cooperation. The establishment of the Arctic Council (1996) was considered an important milestone enhancing cooperation in circumpolar North.

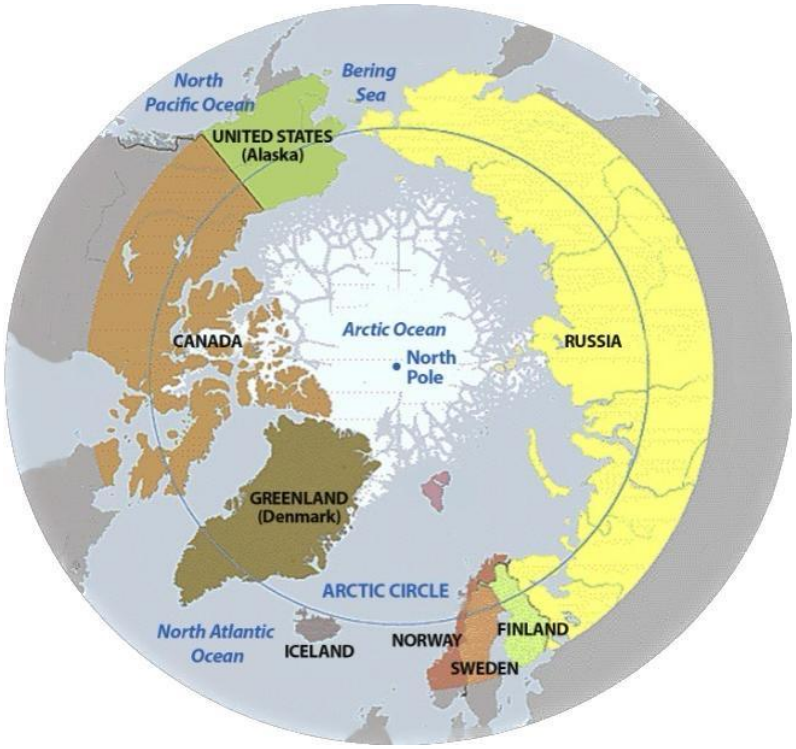



Figure 2. Arctic Council member states (National Oceanic and Atmospheric Administration, n.d.)

According to the Government Programme, the key premises for Finland's Arctic cooperation are the carrying capacity of the natural environment, climate protection and respect for the principles of sustainable development and the rights of indigenous peoples. Finland will also play an active role in strengthening the EU's Arctic policy. (Ministry for Foreign Affairs, n.d.)

In October 2022 a report commissioned by the Prime Minister's office was published in Finland, which examines the impact of Russian aggression on international cooperation in the Arctic Region and on the implementation of Finland's Arctic policy strategy. Despite the war, Finland is an Arctic country, and the Arctic will remain a crucial topic for Finland in any circumstances. Regardless of the geopolitical situation, climate change and adaptation, sustainable development and the status of indigenous people remain vital themes in the Arctic. (Koivurova et al., 2022)

Arctic political cooperation is in a temporary state of suspension, but the Arctic states continue to cooperate through legal agreements. Currently, the seven members of the Arctic Council have temporarily suspended their activities on the Arctic Council, which Russia chaired until spring 2023. However, they have expressed their will to preserve the Arctic Council. There is currently no cooperation between EU and Russia; all Russia-related programmes such as CBC Kolarctic and Karelia have been suspended and the resources allocated to them have been transferred to other funding programmes. In science and research, the impact is also significant as well in the position of indigenous people in Arctic decision making. There will be gaps in Arctic research, since Russia is about half of the geographical area of the entire Arctic (Koivurova et al., 2022)

### 2.3 Practical structure of the Barents cooperation and working groups

The practical work of the Barents cooperation is carried out in sectoral working groups, which are divided into different themes such as health, environment, youth rescue, transport and logistics, and tourism. There are separately presented Regional Youth Council (BRYC), Working Group of Indigenous People (WGIP) and The Joint Committee on Rescue Cooperation (JCRC). The International Barents Secretariat (IBS) has worked since 2008 in Kirkenes and serves both intergovernmental and regional Barents Cooperation. The Council's two-year Chairmanship rotates between the four Barents countries, that is, Norway, Sweden, Finland, and Russian Federation. In October 2021 Finland took 2-year presidency of BEAC from Norway. (Ministry for Foreign Affairs, n.d.)

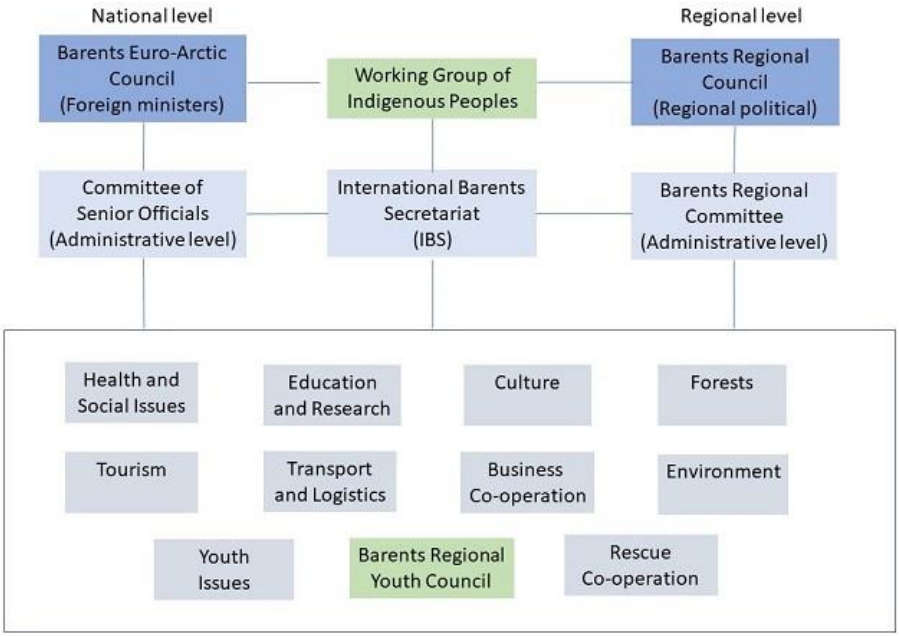



Figure 3. Structure of the Barents Cooperation (Ministry for Foreign Affairs, n.d.)

Chart on picture 4 shows the structure on national and regional levels. In the context of transport corridors and current research, the Barents Regional Working Group on Transport and Logistics (BRWGTL) is the most important actor.

## 2.4 Barents Regional Working Group on Transport and Logistics

The Transport and Logistics Working Group has an important role to play in ensuring that the development of transport and logistics in the Barents region is coherent and that the region is recognised as an important part of the national transport plans of each country. BRWGTL has recently been merged with the Steering Committee for the Euro-Arctic Transport Area (BEATA), but one of the tasks of the working group is to ensure that the voice of the regions and their needs and regional specificities are heard in relation to transport and logistics issues. In a wider context, it is important to follow and understand the development of neighbouring regions in a cross-border manner and to consider their economic structures and investment plans. (Kainuun liitto, n.d.)

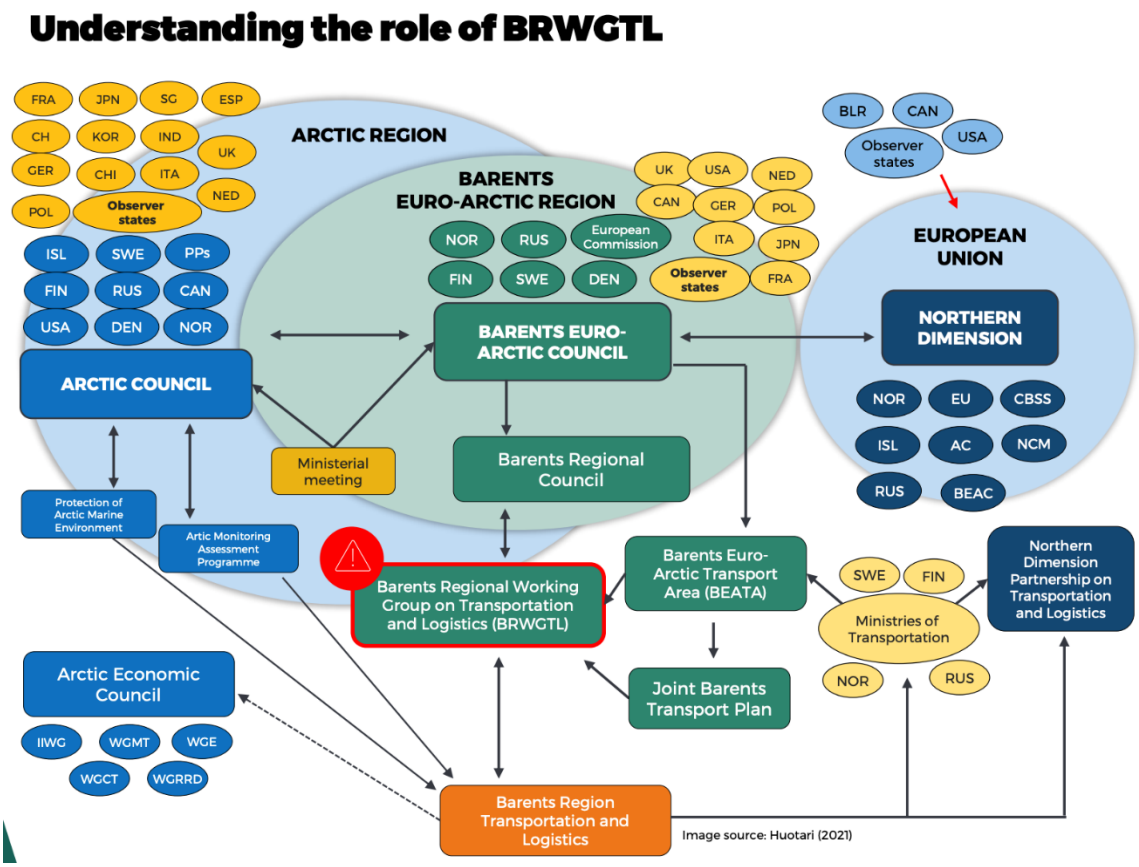



Figure 4. Role of the BRWGTL from Barents Regional Transport and Logistics Project. (Huotari, 2021; Kainuun liitto, n.d.)

Figure 4 explains the complexity of the structure and connection hierarchical between players. At the intergovernmental level, the Barents Euro-Arctic Council (BEAC) is one of the most important actors in Barents region development. The Foreign ministers of the member states – Iceland, Norway, Sweden, Finland, Denmark, the Russian Federation and the European Union use the BEAC to interact with each other and to develop, together, the Northern region through ministerial meetings organised biennially. Between the ministerial meetings, cooperation and hence development of the Barents region is organised by the Committee of Senior Officials (CSO) which consists of representatives of each member state and the European Union. (Kainuun liitto, n.d.)

There are also several Working Groups at the regional and national levels as well as Joint Working Groups between the levels tasked with addressing these questions. Their focus is on promoting and aiding national and regional development across the Barents region. One of the most significant working groups in respect to cooperation in the field of transport and logistics in the Barents region is Steering Committee for the Euro-Arctic Transport Area (BEATA). The main objective of this Committee is to enhance cooperation in the region in order to create a robust transport system consisting of various means of transportation. (Kainuun liitto, n.d.)

The objectives of cooperation include the management of border crossing points, customs cooperation and infrastructure maintenance and reconstruction as well as new projects relating to new infrastructure in the region. The steering committee consists of ministerial-level members from Finland, Sweden, Norway, the Russian federation, and the European Union. In October 2021, the high-level ministerial meeting decided to reorganise the working groups on transportation with a view to merging the various working groups into a single, joint working group (BEATA declaration Oct. 2021). In addition, there is also the International Barents Secretariat (IBS), located in Kirkenes, Norway which focuses on establishing regional coherence and multilateral cooperation in the Barents region. (Kainuun liitto, n.d.)

Both BEATA and BRWGTL participated in work on updates to the Joint Barents Transport Plan.

## 2.5 Joint Barents Transport Plan

The Joint Barents Transport Plan (JBTP) is a document prepared in cooperation with experts from the transport ministries of Finland, Norway, Russia and Sweden. The main objective of the JBTP is to improve the territorial connectivity between the Barents countries with integration to the labour market. According to the JBTP, the transport system should facilitate regional development in the Barents Region and create new opportunities for important industries.

The transport system should be developed in a way that respects the environment and improves safety and accessibility for all. The need for open dialogue and its further development in cooperation between all four countries is emphasised in the joint document. This applies to road, rail, and air transport networks, which represent obstacles to regional development in remote areas. Depending on the country, railways have different track gauges, electricity, and signalling systems, while road networks may have different permissible maximum weights of the vehicles or restrictions on the types of tyres.

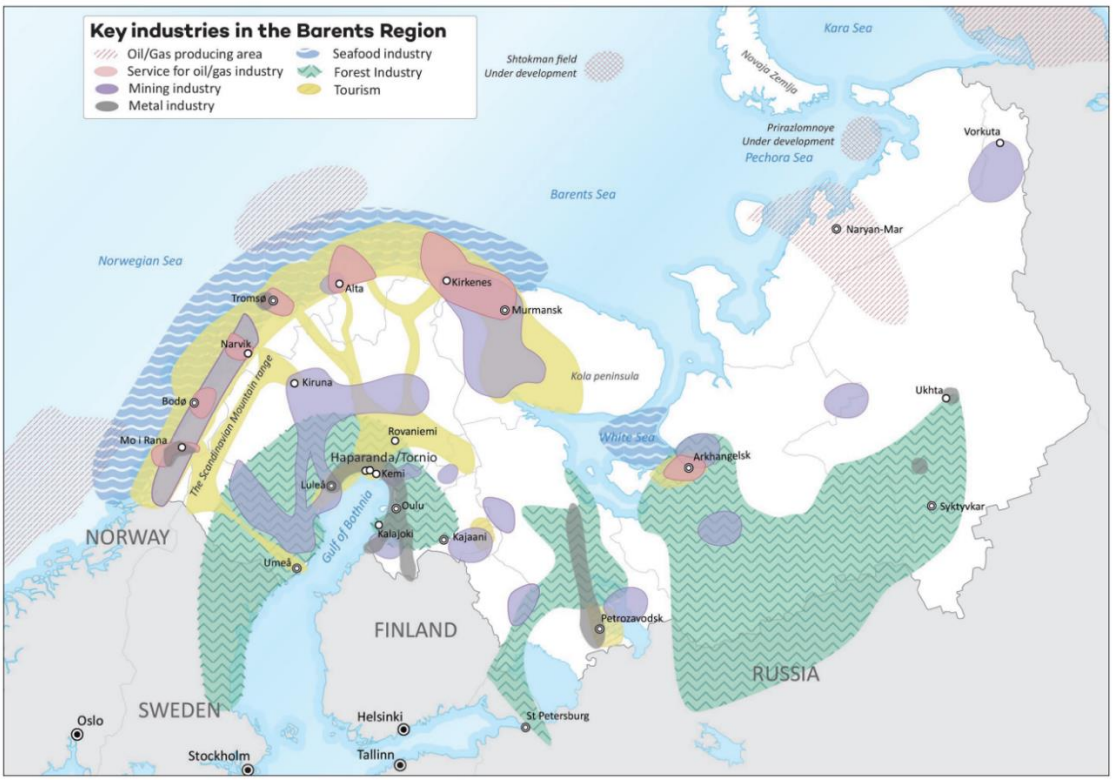



Figure 5. Key industries in the Barents Region. (Joint Barents Transport Plan, 2019)

Industries in the Barents Region are mainly related to the utilisation of natural resources. The geographic location of the key industries is shown on figure 5. Mining is dominating, energy production is growing, seafood and the forest industry have a big share as well. Traditional oil and gas production and related services are represented in the region in Norway and Russia. The tourism industry creates products that utilise persistent winter and snow, cool summers and clear four seasons. Logistics is a precondition for the operation of all industries in the region and for the introduction of raw materials and products to the market as well as accessibility for services and labour.

The Barents Region is not only rich in natural resources including energy, but also very promising in terms of the development of various industries and logistics. At national levels transport infrastructure and systems are based on southbound transport connections in each country. From a transportation point of view there are a lot of transport flows in east-west direction in cross-border transport chains. For the region to remain vital, transport connections in all directions are important. Road transport dominates as a transport mode in the Barents Region and accessibility is mainly based on road transport in both passengers and freight in regional and cross-border transport. (Kainuun liitto, n.d.)

# 3 International transport corridors

The international transport corridor, as a term, is a high-tech transport system, which concentrates various modes of transportation (railway, road, maritime and air transport) in several general directions. Transport corridors are the backbones of transportation networks, linking major gateways and transport hubs and facing a convergence of freight and passenger flows. Movement of people, freight and information have always been fundamental components of economic and social life of societies. People are dependent on transport systems in terms of their own mobility needs, supply energy needs, distributing parts and goods, as well as tourism. Development of the transport system is a continuous challenge. Transport systems support economic development and link territories to the global economy. (Rodrigue et al., 2016, 89)

The core components of the transport corridors are their modes, infrastructures, networks and flows. Transportation provides accessibility to markets, labour, and resources and for this reason are considered to be a key factor for competitiveness. Development in the transport sector is matched by global and regional interdependence and competition. Improving transportation is thus assumed to improve the competitiveness of regions. (Rodrigue et al., 2016, 7)


Figure 6. The main routing alternatives between East Asia and Northern Europe. (Notteboom et al., 2021)

Ships carry more than 80% of world trade. The Panama Canal, the Suez Canal, the Strait of Malacca and the Strait of Hormuz account for the world's four most important strategic maritime passages. The global trade system is highly reliant on their use. (Notteboom et al., 2021) In March 2021, an accident where the container ship Ever Given blocked the e Suez Canal for six days, added to COVID-19 disruptions and reminded consumers and businesses worldwide of the invisible, but vital role of transportation.

The Suez Canal is the main commercial artery between Europe and Asia. In the figure above, alternative routes to the Suez Canal are marked. The first is the Northern Sea Route (explained in detail in the next chapter 3.1). The second alternative route is the North-South land corridor, which connects the Persian Gulf via Iran to Russia. The third alternative is the East-West rail corridor. It is the set of railway lines, including the Trans-Siberian Railway, which connects Saint-Petersburg with the port of Vladivostok, the Trans-Manchurian Railway, the Trans-Mongolian Railway and the Baikal Amur Mainline (BAM). Rail land bridge offers shorter delivery times of cargo, but capacities remain low compared to container shipping. (Rodrigue et al., 2016, 37–39)

## 3.1 Polar shipping routes

Climate change and melting ice in the Arctic are opening new logistics opportunities. One of the Russian Federation's best-known initiatives in the Arctic is the development of the Northern Sea Route (NSR). The Northern Sea Route is about a third shorter than other sea routes between Europe and Asia. It saves both time and transport costs in supply chains. Transit traffic along the NSR is currently increasing and it plays an important role in the extraction and transport of natural resources from the Arctic. Huge deposits of oil, gas and economically valuable minerals in the Arctic are attracting interest from Arctic and non-Arctic states, making the region vulnerable.

Compared to the Suez Canal, the Northern Sea Route (NSR) is about 40% shorter from a northwestern European port to the Far East. The NSR is a seasonal route, and this is its main disadvantage. The NSR route option can facilitate the agility and adaptability of the supply chain, especially for bulk trades. (Schøyen & Bråthen, 2011)


Figure 7. Northern Sea Route versus Suez Canal (The Economist, n.d.)

In addition to the NSR, the main trans-Arctic routes include the Northwest Passage, the Transpolar Sea route and the Arctic Bridge. The Northwest Passage is a shipping route along the Arctic coast of Canada and Alaska that connects the Atlantic and Pacific Oceans. Compared to the Panama Canal, the Northwest Passage shortens the route by about 10,000 km. (see Figure 8). The Transpolar Sea Route is hypothetical until ice-free, and it would use the central Arctic to connect the Bering Strait and the Atlantic Ocean to Murmansk in the most direct way. The Arctic bridge links the Norwegian port of Narvik or the Russian port of Murmansk with the Canadian port of Churchill. (Rodrigue et al., 2016, 14-15)


Figure 8. Polar Shipping Routes (Rodrigue et al., 2016, 15)

Although Arctic routes have become regularly accessible in the summertime, seasonal changes along with uncertainty and unreliable navigation impose serious limitations on their commercial use. Economic activity beyond the Arctic Circle is limited, there is no way to drop off and pick up cargo. Shipping in the Arctic is suitable for point-to-point services to link the source port and destination port. The basic features of international transportation are constrained by geography, which involves geopolitical considerations. In past centuries many wars were started to gain control over trade routes, mineral or energy deposits. Passages were subjects of many conflicts to get control over strategic locations. International transport infrastructure, such as ports, airports, canals were also subject to geopolitical considerations as they provide access to strategic resources or key markets. (Rodrigue et al., 2016, 14-15)

## 3.2 Railway system and gauge differences

Different countries operate on different railway gauge which creates technical challenges and additional costs and time for transport operators. Different gauges require reloading/loading the

freight or adapting the equipment to the gauge change. The Finnish railway system has a similar gauge as the Russian one and they are well integrated. Swedish and Norwegian railway systems are integrated to the European one because of the similar gauge. Picture 9 is illustrateses the public railways differences in Europe.

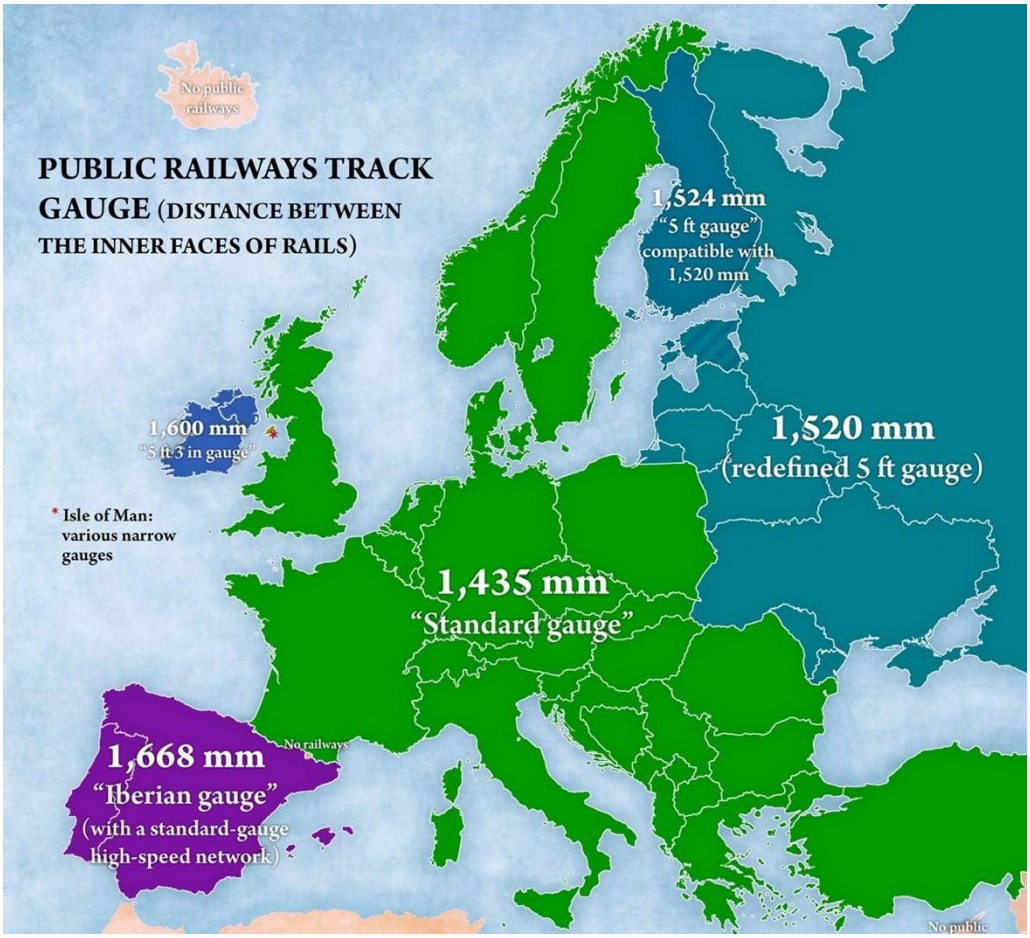



Figure 9. Public railway track gauges in Europe. (Track Gauge by Country in Europe, n.d.)

Multimodality in transportation means utilisation and combinations of diverse transport modes in the most efficient way to optimise transport chains in terms of costs and energy. Movement of freight is from one mode of transport to another, commonly taking place at a terminal specifically designed for such a purpose and using transport units like containers for freight. Changing the mode of transport usually brings additional costs and makes it difficult to monitor the transport, so usually the aim is to handle the fright for as long as possible with the same mode of transport. (Kainuun liitto, n.d.)

## 3.3 Trans-European Transport Network (TEN-T)

The Trans-European Transport Network (TEN-T) policy addresses the implementation and development of a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports and railroad terminals. The ultimate objective is to close gaps, remove bottlenecks and technical barriers, as well as to strengthen social, economic and territorial cohesion in the EU. Besides the construction of new physical infrastructure, the TEN-T policy supports the application of innovation, new technologies and digital solutions to all modes of transport. The objective is improved use of infrastructure, reduced environmental impact of transport, enhanced energy efficiency and improved safety. (Trans-European Transport Network, n.d.)

The TEN-T network comprises two levels: the core network, to be completed by 2030 and the comprehensive network to be completed by 2050. The goal of the TEN-T network is a safe and sustainable EU transport system that promotes the seamless movement of goods and people. The TEN-T core network focuses on the most important connections and hubs. The implementation of the core network is advanced by a corridor-based approach. The TEN-T network covers all transport modes: road, air, internal waterways, sea, as well as platforms enabling a combination of different transport modes. (Finnish Transport Infrastructure Agency, n.d)

Several huge infrastructure projects or initiatives related to the TEN-T development are worth mentioning. The first is the Fehmernbelt road-rail link between Germany and Denmark. The world's longest underwater road and rail tunnel is due for completion in 2029. The tunnel will replace an intensive ferry service and reduce the trip time from Copenhagen to Hamburg from 4,5 hours to 2,5 hours. The new tunnel will cut down emissions, speed up transportation of goods regardless of weather or strong winds, and will become the main transport connection between Central and Eastern Europe and Scandinavia. (Trans-European Transport Network, n.d.)

The second is the Rail Baltica initiative. This is a project with the main goal of integrating Estonia, Latvia and Lithuania into the European railway network as part of the development of the North Sea – Baltic TEN-T corridor. So far, the Rail Baltica is partly financed by the Baltic States and Connecting Europe Facility (CEF) funding instrument. The total estimated construction cost is about 5.8 billion euros, and the length is 870 km. By some optimistic prognoses, Rail Baltica is planned to be completed by 2030. The fully electrified railway will reduce emissions, pollution and noise. Historically, the railroad networks in the Baltic States and Finland had the same gauge as the Russian networks because they were built in the second half of the 19th century, when they were under the control of the Russian Empire. (Trans-European Transport Network, n.d.)

The third major infrastructure initiative, which is far from the Barents Region but could have a significant effect on transportation between Europe and Asia, is the new Aegean-Baltic TEN-T corridor. The project involves the construction of two maritime ports in the Aegean and Baltic Seas, several multimodal and logistic centres, plus several missing rail and motorway links. The corridor is a joint initiative of the governments of Greece, Bulgaria, Romania, Hungary, Slovakia, and Poland. In case of successful investment and construction, it will be located on the territory of the before mentioned countries making the shortest route for the main commodity flows between the Suez Canal, Central Europe, and the Baltic Sea region. It will greatly reduce shipping time and distance between the Indian Ocean Region, Southeast Asia, China, Korea, Japan and Central and Eastern Europe and the Baltic Sea. (Trans-European Transport Network, n.d.)

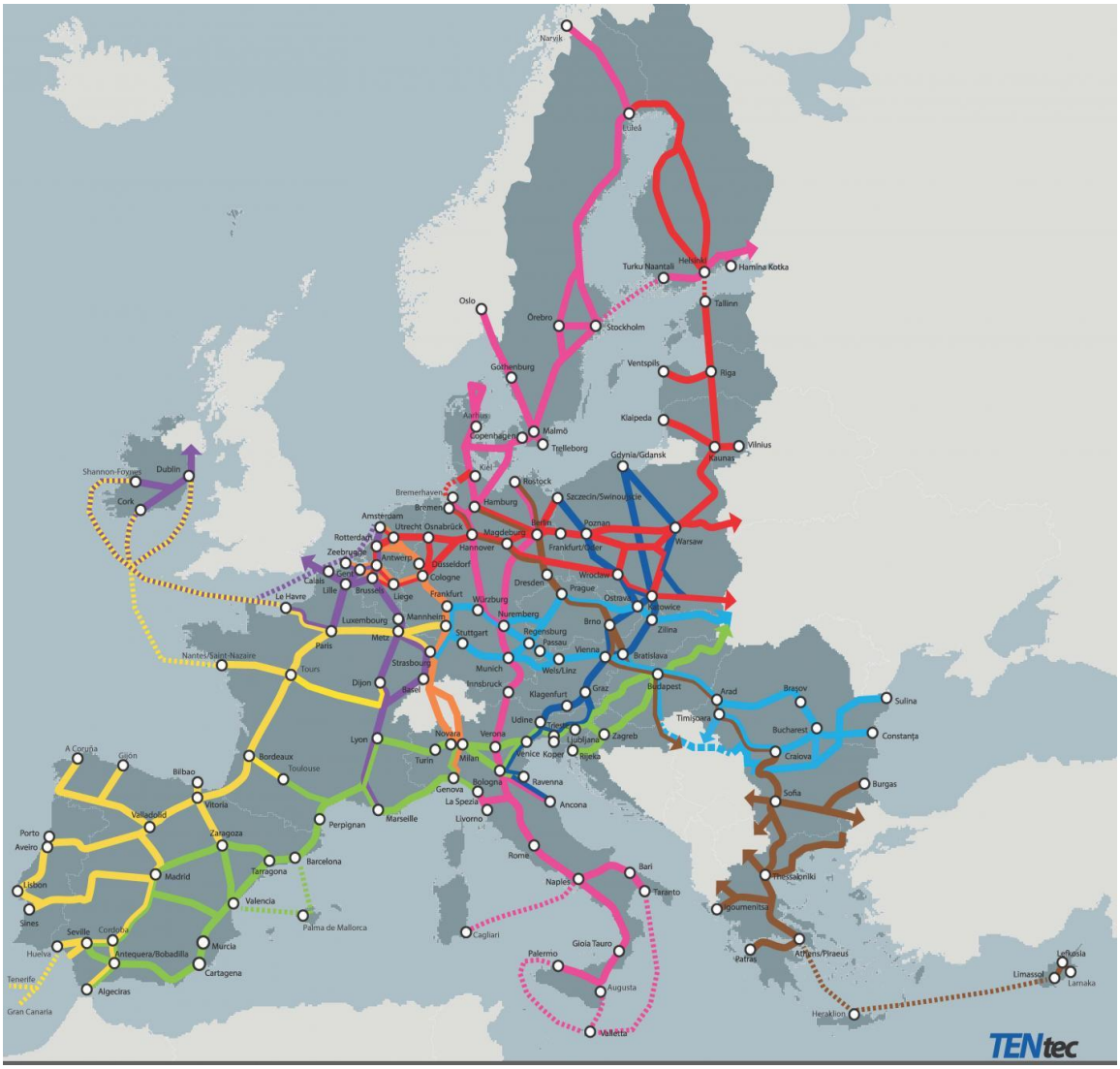



Figure 10. The Trans-European Transport Network (TEN-T), core network (Trans-European Transport Network, n.d.)

## 3.4 Extension of the TEN-T to Sweden and Finland

The extension of the TEN-T to Northern Sweden and Finland is creating a strategic gateway for the EU to the Arctic and consolidates the engagement of the EU as an actor in the development of the Arctic region. Recently, the North Sea – Baltic Corridor was extended up to Luleå on the Finnish side and the Scandinavian-Mediterranean Corridor up to Narvik on the Swedish side.

It is worth mentioning a project on developing the cross-border facilities between Finland and Sweden in Tornio & Haparanda. The project is a big milestone for Swedish and Norwegian railway network integration. The Finnish and Russian railway networks are well integrated in theory. The area of Tornio and Haparanda is a hub for international transport corridors and part of the ongoing European-wide TEN-T core network corridor extension around the Gulf of Bothnia. The project improves the cost-effectiveness of rail transport and the competitiveness of industry and enables passenger train traffic between Finland and Sweden as part of the Europe-wide TEN-T core network. EU Connecting Europe Facility (CEF) supports planning of the project with a grant. (Finnish Transport Infrastructure Agency, n.d)

## 3.5 Northern Axis – Barents Link corridor

The Northern Axis is one of the five Trans-European (TEN-T) transport axes. The Axis is the main trade and transport connection between Russia and the EU countries. The Axis consists of main rail and road corridors starting with the Berlin – Moscow corridor in the south and ending with St. Petersburg – Narvik corridor in the north. The Northern Axis connects the northern EU with Norway to the north and with Belarus and Russia and beyond to the east and consists of the multimodal transport corridor Narvik - Haparanda/Tornio - Vartius - St. Petersburg (rail and road corridor), which are directly linked to the TEN-T network.


Figure 11. Northern Axis – Barents Link project map (Kainuun liitto, n.d.)

Barents Link is the extended gateway from Arkhangelsk via Sweden to Narvik in Norway. The Northern Sea Route is a direct continuation of the Barents Link to the Asian market. Together these (NA and BL) have been recognized by the Northern Dimension in the Northern Dimension Partnership of Transport and Logistics (NDPTL) regional road and rail network and 5 corridors were included in the Joint Barents Transport Plan (road, rail, air).

From the NABL project perspective, Barents Link connects Kainuu and Northern Finland to Asian markets. The northernmost railway connection between Russia and the EU passes through the Kainuu Region. On the Russian side, it is connected to the Kirov Railway, a 1448 km railway linking the ice-free seaport and transport hub of Murmansk to the north and St. Petersburg to the south. Murmansk is the world's largest city north of the Arctic Circle. Physically, the infrastructure exists, but it has not been used in practice for freight or passenger transport from Finland to Russia. However, this fact gave motivation and opportunities to build many joint projects on infrastructure development with officials from the Russian Federation during the past 30 years.

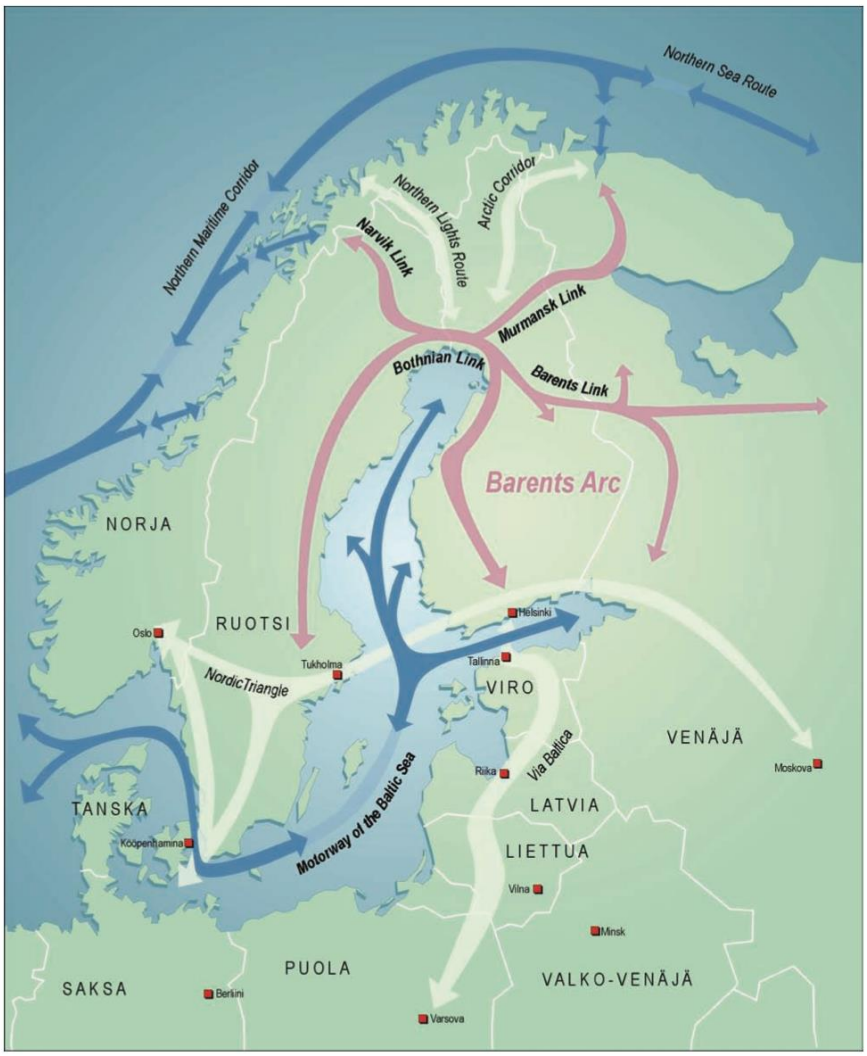



Figure 12. The Bothnian Link and the Motorway of the Baltic Sea (Joint Barents Transport Plan, 2019)

The Bothnian Link consists of the rail and road connection between Southern Sweden–Haparanda–Southern Finland. It connects the Barents Region with the southern metropolitan areas of the Nordic countries and at the same time the northern branch of the Northern Axis (named Narvik Link in this picture) with the Motorways of the Sea. The Oulu–Tampere and the Helsinki–Tampere lines are the busiest railways forming the backbone of the Finnish transport system. There are versatile industries and businesses and people living around the Bothnian Link. On the Swedish side, there are many growing industries and investment plans.

The Motorway of the Baltic Sea consists of the North Sea and the Gulf of Finland, the Baltic Sea, the Danish straits, as well as the North Sea lanes, ports, and their land transport connections. It connects the Nordic countries with Central and Western Europe and has connections to all the central international traffic corridors of Northern Finland. The corridor is one of the EU's thirty

TEN-T priority areas. Almost 80 percent of Finland's foreign trade is shipped by sea through the corridor. In addition to Finland, the corridor is a very important transport route for Sweden, Russia, the Baltic States and Central Europe. (Joint Barents Transport Plan, 2019)

## 3.6 Importance of the Arctic Ocean railway connection for Finland

From spring 2022, Finland's supply security has been one of the top issues in various forums and platforms. In case of any traffic disruptions in the Baltic Sea, it is vital for Finland to have alternative shipping routes. The Finnish rail connection to the Atlantic Ocean pops up from time to time in public discussions and media headlines.

In 2018, the Finnish Transport Infrastructure Agency conducted the latest study on alternatives for a rail link to connect Finland to the Atlantic Ocean. The Kemi – Tornio – Haparanda – Kiruna – Narvik option is the only one that physically exists. One of the options was through Kemijärvi – Kandalaksha – Murmansk to the Murmansk transport hub. Another option followed the one from Finnish Lapland to the port of Kirkenes but was recently removed from the land plans. Kemi – Kolari – Skibotn – Tromsø is the next option, and another is Kemi – Kolari – Kiruna – Narvik. (Finnish Transport Infrastructure Agency, 2018)

The Ofotbanen line has long been on the development agenda of Nordland County Municipality of Norway. The Malmbanan line is strategically important for Sweden because of the large quantities of iron ore exported through the port of Narvik. Finland sees these links in a new light, particularly in terms of military mobility, security and supply, and new opportunities for importing and exporting. (Finnish Transport Infrastructure Agency, 2018)


Figure 13. The five alternative routes for the Arctic Ocean Railway (Finnish Transport Infrastructure Agency, 2018)

# 4 Futures studies as a research strategy

Future studies have roots in the ancient world. The ancient tradition of foretelling included various techniques. There is a famous example of the Delphi Oracle, who consulted political decision-making in ancient Greece. As strictly defined, future research and studies means systematic action and approach to utilise and develop scientific methods and tools for possible, probable, and preferred future alternatives. The main difference between old future thinking and foretelling and modern future thinking is that modern futures studies claim that futurists cannot predict or know the futures, they are only looking into the future. (Heinonen, 2018)

People have many different ideas about future studies. According to some opinions, futurists are a kind of modern-day Nostradamus who, by gazing into a crystal ball, strive to see the future of humanity. Unlike the forecasters of earlier times, today's futurists use a broad technical and sci-

entific understanding instead of a crystal ball, which should enable them to make accurate predictions. Future knowledge was always part of interest to people, it has helped to orientate, share resources, and make better choices. (Kuusi & Virmajoki, 2022, 19-21)

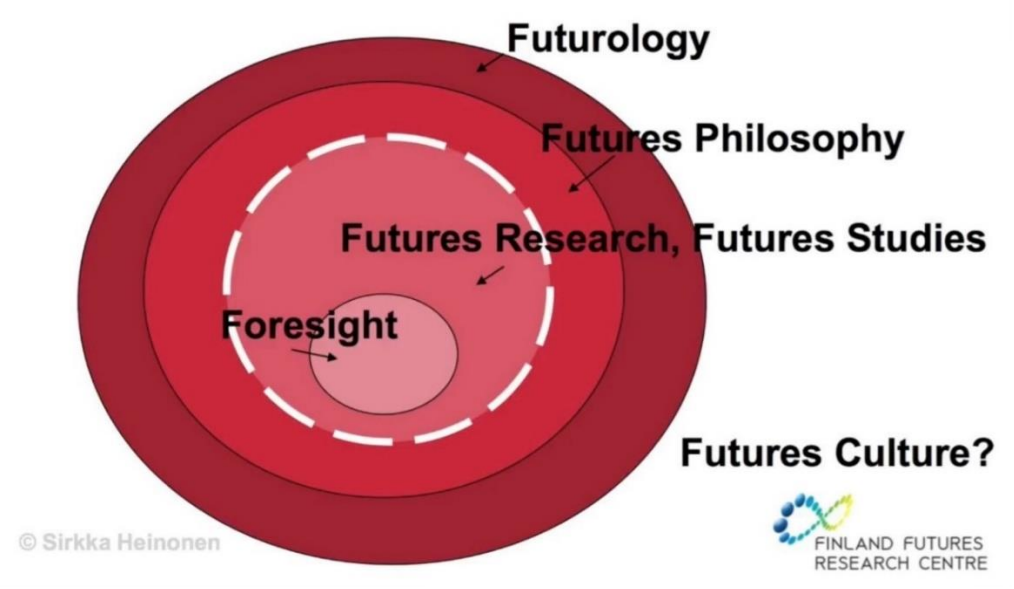



Figure 14. Future research paradigm (Heinonen, 2018)

According to the Finland Future Research Center, the modern future research paradigm has been established and means systematic, multidisciplinary, holistic, long-term, critical exploration of future development alternatives. Figure 14 explains interconnections between Futurology, Future Philosophy, Future Research, Futures Studies, and Foresight. Future Research and Future Studies are almost synonyms and form a broader sphere inside of Futurology and Future Philosophy. Future Research includes all theoretical and philosophical reflections. Foresight is a narrower field of future research and is of interest to the public, private and academic sectors all over the world. It can be defined as a pragmatic futures studies approach as structured debate about future-related topics. (Heinonen, 2018)

The World Future Studies Federation defines future studies as an art and a science with a strong emphasis on imagination and creativity in creating different possible futures. Its main purpose is to discover and master the complex chains of cause and effect through conceptualization, systemic approach, and feedback loops, ultimately providing innovation in the social and technological fields. Futures studies is the systematic study of possible, probable, and preferable futures including the worldviews and myths that underlie each future. (World Futures Studies Federation, n.d)

In the last fifty or so years, the study of the future has moved from predicting or forecasting the future to mapping alternative futures to shaping desired futures and sometimes anticipation for emergence, i.e., embracing novelty, uncertainty, complexity, and emergence, both at external collective levels and inner individual levels. (World Futures Studies Federation, n.d)

## 4.1 Future cone

Future research deals with possible, probable, preferred futures and plausible futures. Figure 15 shows a graphical representation of the different types of future and visualizes the future cone, which expands from the present into alternative futures.

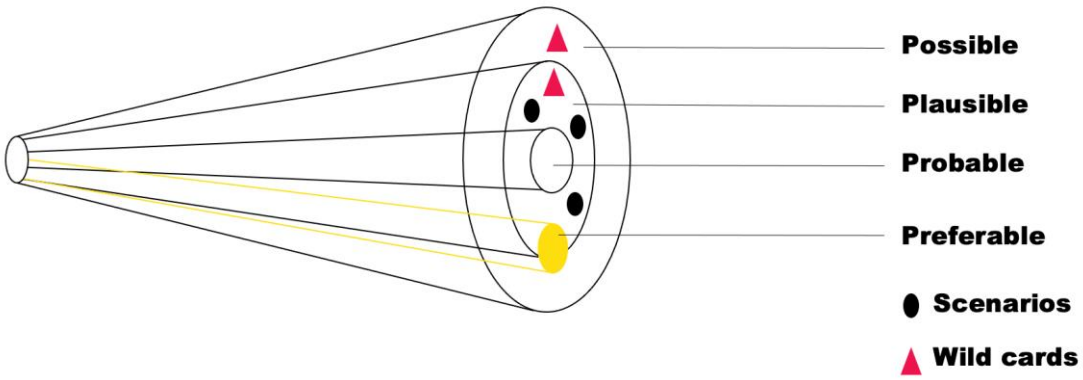



Figure 15. Future Cone (Poussa & Lähdemäki-Pekkinen, 2021; Voros, 2003)

Hancock and Bezol (1994) originally adapted the “future cone” metaphor. Everything beyond the present moment is a potential future. This comes from the assumption that the future is undetermined and open, rather than inevitable or “fixed”. This is perhaps the foundational axiom of Futures Studies. In figure 15, the biggest sphere of the cone is the possible futures, which include all other kinds of future that people can possibly imagine. Probable futures are likely to happen and work as continuation of current trends, often called “business-as-usual”. Plausible futures are based on our current understanding of how the world works. They stem from understanding of physical laws, social processes, systems of human interactions etc. Preferable futures are what people want to see happen. These futures are largely emotional rather than cognitive. On the diagram scenarios are placed inside of the plausible futures and wild cards (low-probably events) outside of the probable futures. It is necessary to expand the cone of possibilities and to imagine impossible or implausible futures by challenging assumptions and expanding thinking. (Voros, 2003)

## 4.2 Future Triangle

The “futures triangle” by Sohail Inayatullah (2013) is one of the tools to reimagine the future and better understand needs for change. It sees the potential future as being influenced by three things: the weight of the past, the push of the present and the pull of the future.

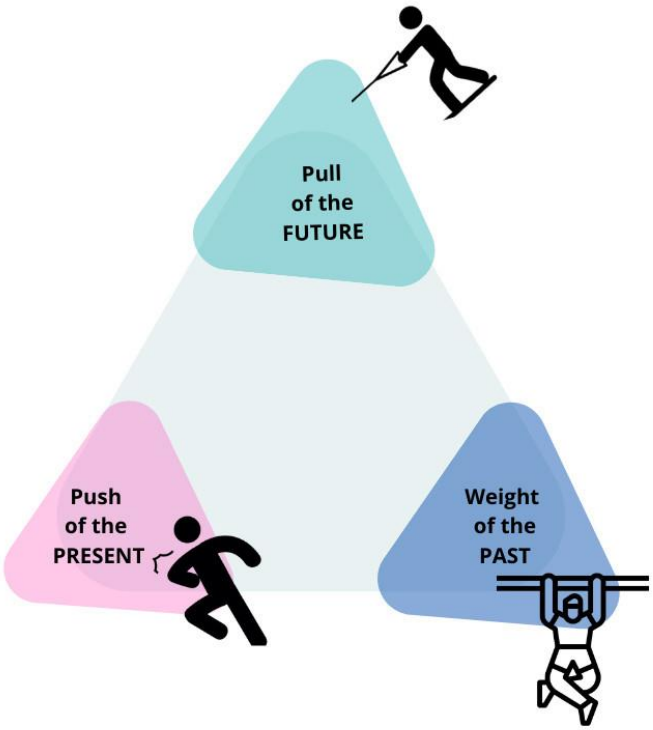



Figure 16. Sohail Inayatullah’s futures triangle (Inayatullah, 2013; Pozzi, 2022)

Figure 16 shows a future triangle framework to help to reimagine the future. The weight of the past refers to all the commitments, path dependencies, obstacles to change and patterns of thinking that limit possibilities. The push of the present includes the changes happening currently. The pull of the future refers to the dreams, hopes, plans and inspiring visions of the future that we aim to achieve. Plausible futures can be found inside the main triangle. (The European Sting, n.d.)

## 4.3 Futures studies and foresight

People can have knowledge of forecasts and visions, scenarios and expert opinions, concepts, and methodologies of futures studies, but this is not the same thing as knowing the future. Forecasts and visions are based on some theory of knowledge, but they do not give knowledge of the future

itself. All they do is to provide us with ready-made knowledge of a restricted number of possibilities. (Sardar, 2010)

A great deal of foresight work is concerned with “scenario planning”, which is only one method from the futures studies. Some businesses, corporations and government institutions see scenarios as the only way to explore the future. Thus, futures studies become synonymous with “strategic foresight” or ‘scenario planning” with a clear emphasis on winning over others, instead of exploring and developing creative, novel and inclusive solutions. Scenario work is turned into a management tool. (Sardar, 2010)

According to Voros (2022), strategic thinking is about exploring the options, strategy development is about making decisions and choosing directions, strategic planning refers to implementation of the planned actions. All three stages are vital and necessary to successfully address the strategic environment. Foresight is an element of strategic thinking which informs both strategy-making and strategic planning and actions. Foresight work enriches the context within which strategy is developed, planned, and executed.

The Generic Foresight Process Framework is a model developed by Joseph Voros (2003) that aims to structure a foresight process in the context of strategy development. According to the author, this model can be applied in a business and research context whenever foresight, i.e. strategic thinking, is advisable. It is intended to be a generic design template for any futures research.

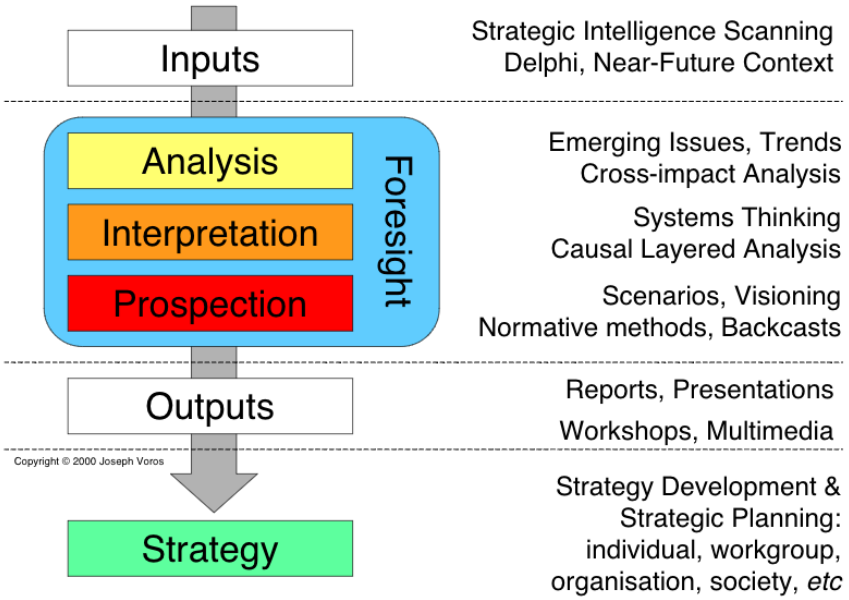



Figure 17. The Generic Foresight Process Framework by (Voros, 2003)

The framework is divided into separate steps, with input at the top and output at the bottom. There are three foresight steps between input and output i.e. analysis, interpretation and prospection.

The first step is called input and starts with gathering information through various methods, e.g., Delphi (Delphi method is similar to questionnaire research, forecasting of unpredictable or unclear future trends and changes of phenomenon), environmental scanning, etc. The next step, analysis, answers the question: what seems to be happening? This includes trend analysis, cross impact matrices, STEEP (or PESTE, PESTLE) analysis etc. The interpretation step answers the question: what's really happening? Tasks could be supported by systems thinking methods. The next question is: what might happen? Prospection stage focuses on imagining alternative futures. Here forward thinking could be used with scenario techniques. After four steps, process comes to tangible or intangible outputs such as reports, presentations, stories, or future thinking, understanding of options and perspectives. The task of the last step of the framework is to incorporate the results into strategic development and planning. The methods used in each stage differ according to their purpose. (Voros, 2003.)

## 4.4 Drivers of change for future transportation

Drivers of changes for the transportation system come in six major categories: policy, demography and society, energy and environment, technology, economics, and finance.

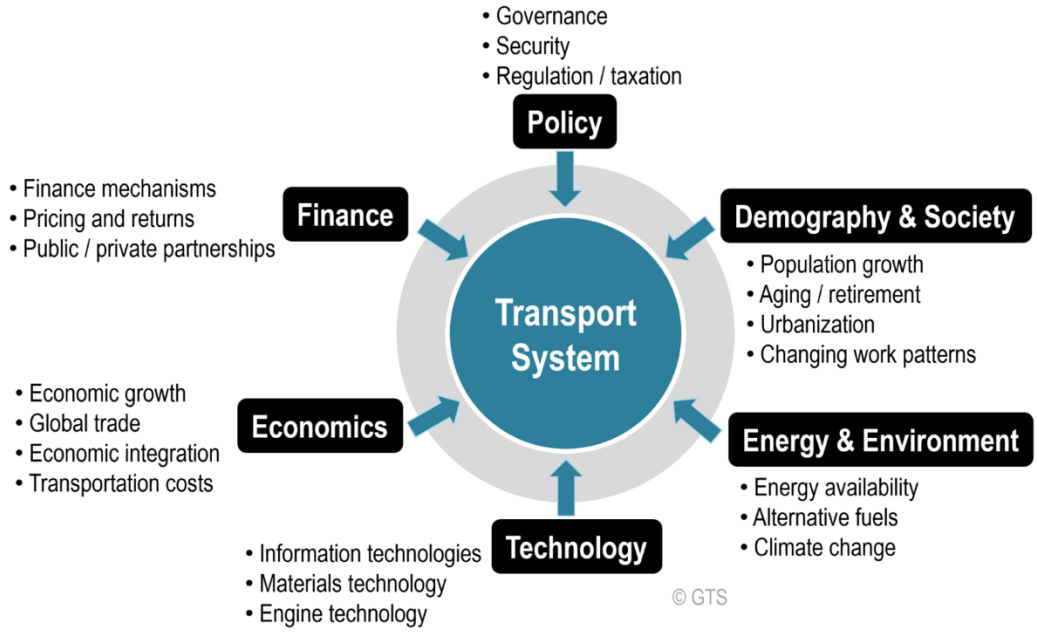



Figure 18. Drivers of change for future transportation (Rodrigue et al., 2016, 88-89)

Future transportation systems are facing growing concerns related to energy, the environment, safety, and security. Transport systems will be developed to accommodate additional demands for mobility or to offer alternatives or a transition to existing demand. Future transportation is linked to the level of economic activities, which create specific passengers and freight volumes. An important challenge lies in the balance between market forces and public policies, as both have a role to play in the transition. In recent years, economic development and globalisation have boosted integration of transportation systems. Affordable energy prices, increasing accessibility and openness to trade could globalise transportation systems further. On the other hand, higher energy prices and protectionism in the commercial environment could lead to regionalization and setting of more effective regional transport systems. (Rodrigue et al., 2016, 88-89)

The war in Ukraine has renewed attention to the supply of raw materials such as metals, noble gases, and agricultural fertilisers. Over the last three decades, companies have taken advantages of reliable, low-cost transportation and low-cost labour in Asia. Trade restrictions and disruptions

during pandemics, climate-related events and requirements and increased logistics costs decreased the likelihood of moving relatively bulky and low-value goods over long distances for processing. For example, Alaska-caught fish are sent to China for processing and freezing before re-exporting them to the United States. The situation shows conditions for localization of the production. Shippers, carriers, and logistics service providers increasingly face the need to assess and manage their greenhouse gas emissions. (Willy, 2022)

## 4.5 Megatrends and trends


Figure 19. Megatrends 2023 (Dufva & Rekola, 2023)

Megatrend's review presents an interpretation of the directions of global change. Megatrend is a great wave of development. Through megatrends, we can understand the changes that are happening in the present and reflect them on the future. A megatrend is a recognizable entity of phenomena with a history, and that has a long-term effect on various aspects of society.

According to the Finnish Innovation Fund Sitra, megatrends 2023 describe the big picture of change through five themes: nature, people, power, technology, and the economy. Nature's carrying capacity is being eroded as we live during an ecological sustainability crisis. There is an urgent need for ecological reconstruction, which means transitioning to a society that improves the state of nature and human well-being. The population is ageing and concentrated in growing centers, which impacts the funding of the welfare state, suitability of social and health services, democracy, and the adoption of technology. General uncertainty about the future is leading to growth of mental health problems. (Dufva & Rekola, 2023)

Societies are being tested with crises and the battle for democracy is intensifying. Geopolitical tensions have returned and the rules-based world and trust in the institutions are shaking. At the same time, competition for digital power is intensifying. Technology and data are increasingly integrated into people's everyday life, and data is being collected and utilised more and more. The foundation of the economy is cracking as global inequality grows and the ecological sustainability crisis progresses. Increased extreme weather events and the collapse of the services provided by nature are eroding the conditions of the economy; wealth is concentrated in a smaller and smaller group, creating an increasingly urgent need to reform the economy. (Dufva & Rekola, 2023)

### 4.6 Scenarios

Scenario is originally a term used in the context of the theatre and filmmaking to mean the functional script of a play. Such a script contains not only the text by which the action with dialogues will take place, but also instructions for the director, actors, cinematographers and set designers regarding action, lighting, and angles. It also describes, on a general level, the actors' movements, stage locations, the scenery and possibly actors' accessories and other details. The concept of scenario and scenario thinking was first used in futures studies by Herman Kahn in the 1950s in the United States. (Rubin, 2023)

Scenarios form the foundational method in futures studies. Scenarios assume that there is not just one future, but also a range of alternative futures. They help to outline the unknown. To some they help predict the future. For others, they clarify alternatives. Scenarios give us distance from the present, allowing the present to become remarkable. Deconstruction opens up not only the future and the present, but also the past, showing that history is open to interpretation. The task

then is to create alternative histories, to show histories that did not happen, but that could have happened if some factor had been changed. Scenarios have an important visionary function, allowing us to gain insight into what people want the future to be like. Scenarios are important because they allow people not only to predict the future, but also to create it. There are several approaches to scenario development. These include archetypal, single driver, dual driver, content, organisational, contradiction etc. (Inayatullah, 2008)

In addition to drivers and uncertainties, wild cards, weak signals or "black swans" are used for scenario building. They are different names for the same term, which mean an essential change factor appears unexpectedly, making the course of event development uncertain.

# 5 Data collection and analysis

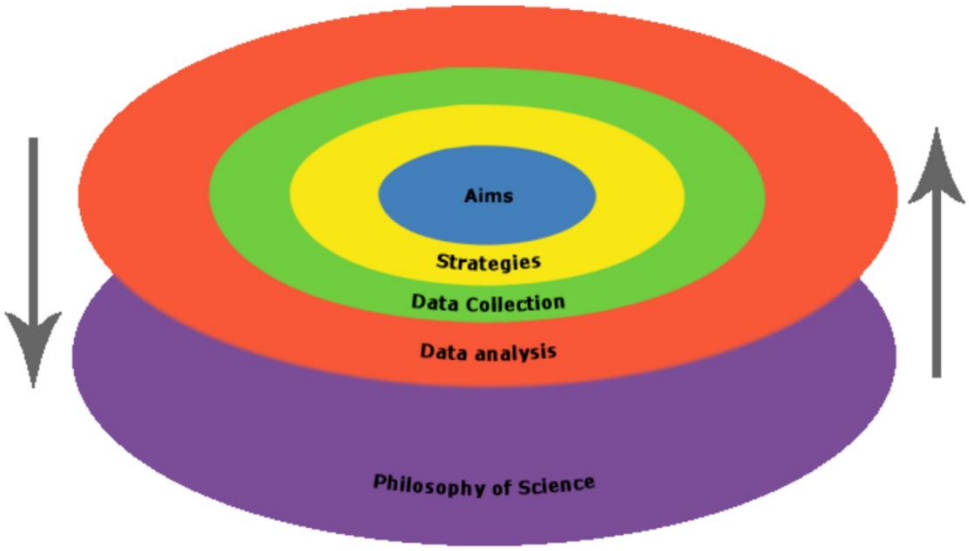



Figure 20. Method map (University of Jyväskylä n.d.)

Scientific research always involves a method. One of the most important parts of the research is choosing a method and following its rules. The choice of research method affects all areas of the research process. According to the diagram on picture 20, the method can be understood in the research process as a single complete sub-process, which includes choosing and following a particular research strategy, data collection method and data analysis method. (University of Jyväskylä n.d.)

The study is commissioned by the Regional Council of Kainuu. The main task of the Regional Council of Kainuu is to promote the vitality and sustainable development of the region and to support the well-being of its inhabitants. Its main responsibilities are the general development of Kainuu and regional land use planning. Among other things, the Regional Council is in charge of the region's transport plan and its updates.

The study topic was proposed by the researcher and quickly took its shapes and scopes in discussions with the commissioner. The research time is about 1,5 years starting from the ideation process in Spring 2022 and developing until report and conclusion writing and presenting of the results in Autumn 2023. Please see figure 21.

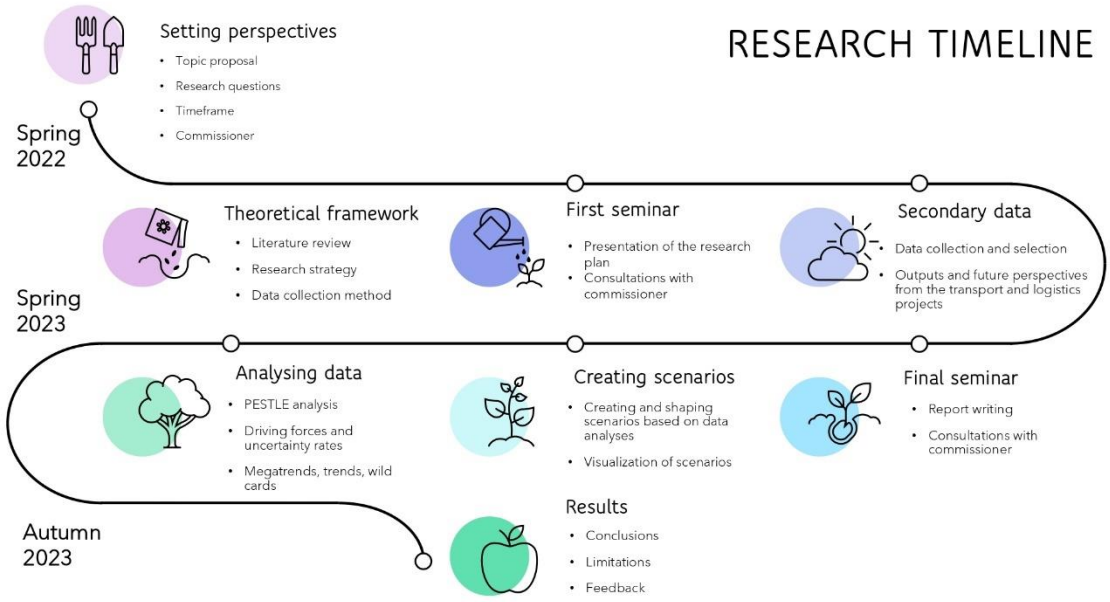



Figure 21. Research timeline

After the perspective setting in Spring 2022 work on research strategy, theoretical framework and data gathering was started. Presentations of the research plan took place in Spring 2023. It was followed by the data analysis and final scenarios creation in April-June 2023. The researcher has asked for consultations and feedback from the commissioner in several different phases of the research. Firstly, in connection with the research plan, secondly, they were asked to give comments on the drafts of the scenarios and finally – to evaluate results of the whole work. Almost all used data was available for use and selection from the beginning of the process, and it was completed by observations of the researcher along the journey. Without secondary data this research would require significant financial and logistical resources for its implementation.

## 5.1 Secondary data

If the data set in question was collected by a researcher or team of researchers for the specific purpose, it is primary data. (Boslaugh, 2007) Secondary data analysis is analysis of the data that was collected by someone else for another primary purpose. Secondary analysis is empirical research that applies basic research principles in the same way as utilising the primary data. The utilisation of existing data is becoming more and more prevalent and helps researchers save time and resources. (Long-Sutehall et al., 2011)

The first major advantage of the secondary data is economy. Even if the secondary data must be purchased, usually costs are lower than expenses to collect a similar data set from scratch. Second advantage is availability; it exists and is ready for use. The third advantage of using secondary data is that often the data collection process is informed by expertise and professionalism that may not be available to smaller researcher projects. The main disadvantage is that data were not collected to answer specific questions of the research. And the second point is that with the secondary data set the researcher does not know exactly how it was collected. (Boslaugh, 2007)

The Regional Council of Kainuu is the commissioner of the thesis and the former lead partner of two transport and logistics projects in the Barents Region. Barents Region Transport and Logistic and Northern Axis – Barents Link projects were implemented almost at the same time in 2018-2022, and they have produced more than twenty studies related to status and development of the transportation system in the Barents Region. All studies are open access reports and published on the Regional Council's homepage. Links are available from the list of references.

In this particular case, the researcher had the benefit of the professional relationship with almost all teams and people originally involved in collection of the information for the studies. Studies were implemented with CBC Kolarctic Funding Programme grant and outsourced to different consulting companies. The process of outsourcing was followed by procurement and tendering. All consulting companies were tendered according to the procurement act.

Both projects NABL & BRTL have cooperated with the different Finnish and international consulting companies like WSP, Korkia, Ramboll, MDI, Proxion, Tyrens, Traficon, Infraterra etc. The budget of one study varies between 15 000 and 120 000 euro.

Development of the east-west transport corridor is a 30-year-old joint initiative of the several regions involved in the Barents cooperation. A number of previous cross-border cooperation projects like Barents Link Forum, Barents Link Corridor, Barents Link Free Way, and Sustainable Transport in the Barents Region etc on the same theme were carried out with participation of the Regional Council of Kainuu in different roles. Some materials and reports from these past projects were utilised for the studies produced by consulting companies during implementation of BRTL and NABL. Old project reports are available and can be requested from the commissioner's archives.

In addition to NABL & BRTL projects studies several other up-to-date materials were used in research for a broader understanding. For example, "The effects of the change in the international operating environment on regional development in Eastern and Northern Finland" produced by the Regional Council of North Karelia and "Setting the steps for accelerating the green transition in the Northern region" produced by Lapland Chamber of Commerce.

Data were supplemented by observations from the following international conferences, closely related to the topic of the research:

Arctic Infrastructure Conference 2022 in Kiruna, Sweden https://www.arcticinfrastructure.se/

Arctic Circle Assembly 2022 in Reykjavik, Iceland https://www.arcticcircle.org/assemblies

The Calotte Academy 2022, School of Arctic Dialogue and annual travelling symposium and an international scientific forum in the North Calotte region of Europe https://calotte-academy.com

High North Dialogue 2023 in Bodø, Norway https://www.highnorthdialogue.no

The use of secondary data means that it was not collected by the researcher. It would be right to use term "data selection" instead of "data collection". Observation techniques were used throughout the research to spot changes and weak signals in webinars, workshops and synergy meetings with the other projects and organisations.

## 5.2 Commissioner - The Regional Council of Kainuu

The Regional Council of Kainuu also plays an important role as a funding authority for several EU programmes. It actively participates in various forums and platforms at the regional, national, and

international levels to support local communities and represent the interests of the people of Kainuu. Regional councils in Finland have a statutory responsibility for regional development. (Kainuun liitto, n.d.)

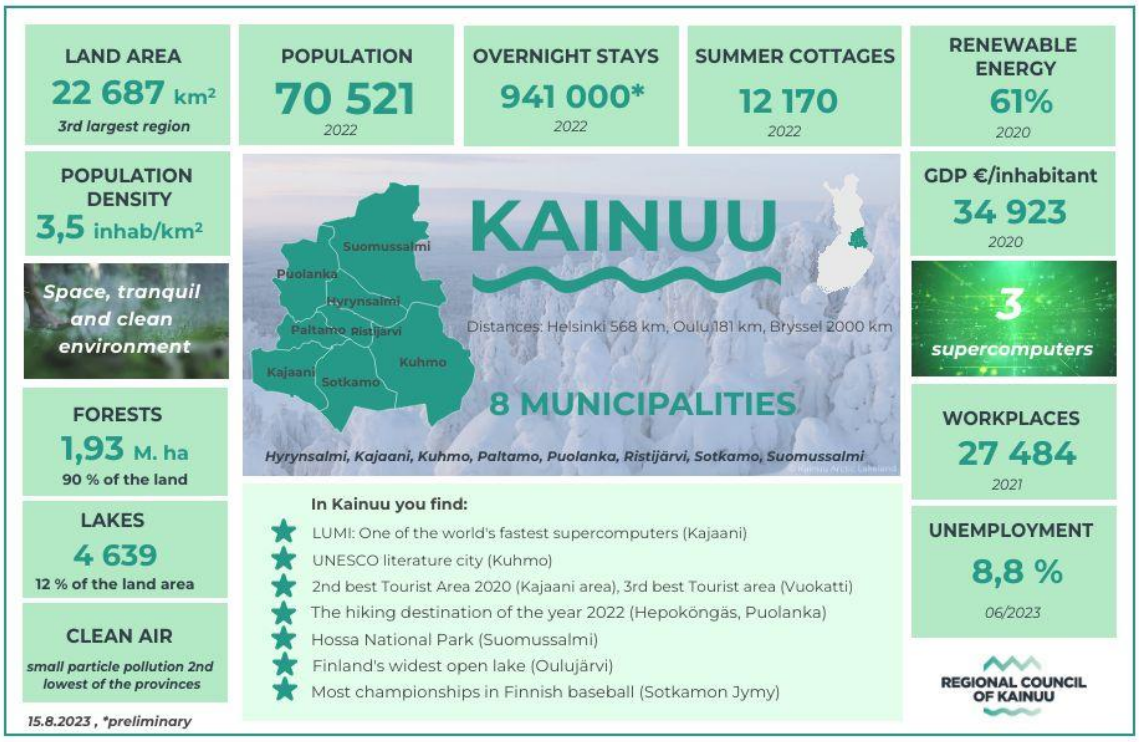



Figure 22. Kainuu Region in figures (Kainuun liitto, n.d.)

Kainuu is about the size of Belgium and consists of 8 municipalities. However, the region is sparsely populated, with about 3.5 inhabitants per km$^2$. The distance from the Finnish capital Helsinki is 568 km and from Brussels about 2,000 km. According to the Kainuu Programme, the region's main industries are tourism, technology, bioeconomy, and mining. The development of these industries has been subject to monitoring, for example, in terms of net sales and the number of employees. (Kainuun liitto, n.d.)

European networks and the European Union are the most important areas of cooperation for Kainuu. The national and regional cooperation structures and working groups of the Barents Euro-Arctic cooperation area play an important role. In recent years, before the political conflict in Ukraine, the Regional Council of Kainuu has actively participated in cooperation with neighbouring regions in Russia, especially with Kostomuksha and Petrozavodsk. Kostomuksha is a small town on the territory of the Russian Federation that is close to Kainuu, just across the border. The activities of the Euregio Karelia Forum and the Karelia CBC programme were suspended in spring 2022, but the former structures are still in place. The Northern Sparsely Populated Areas Network

(NSPA) represents close cooperation between the four northernmost counties in Sweden, 7 regions in northern Finland and northern regions in Norway. (Kainuun liitto, n.d.)

The northernmost railway connection between the European Union and the Russian Federation passes through the Kivijärvi railway border crossing in Kainuu. The same border crossing is also known as Vartius/Lyttä for passengers travelling by car.

## 5.3 Northern Axis – Barents Link project studies

As mentioned before, this research analyses studies from two international projects NABL and BRTL. International project planning and implementation requires resources, time and efforts from people from many different organisations. For NABL, the time cycle was more than 5 years, counting days from idea transformation to the project's final seminar in spring 2022. Budget of the NABL project was around 1.2 million euros and involved 10 partners from 4 different countries and produced 10 studies.

NABL project included the following studies:

- Pre-studies of principles of the alternative main lines, impact assessment, preliminary environmental impact assessment, economic calculations, citizen participation, assessment of need, capacity building on roads between Vartius — Arkhangelsk and Arkhangelsk — Naryan- Mar, the Nenets Autonomous District
- Study on the impact of Russian railways projects on the Barents Region transport
- Study on the impacts of several diversifying possibilities on Vartius/Lytta border crossing for freight and passenger transport on both road & railway
- Study on the economic viability of Kontiomaki —Taivalkoski — Kemijarvi railway connection
- Understanding the improvement needs of Oulu — Kontiomaki railway
- Exploring the possibilities and impact of creating a low—flight (civil aviation) corridor between the Northern Finland and Russia

- Study on wind energy potential to facilitate normal living of remote territories along Northern Axis — Barents link and possibly in the future along the Northern Sea Route to Asian market

- Study on the economic feasibility and impact to transport flows of double tracking of the Ofotbanen — Malmbanan railway study, the Norwegian — Swedish railway

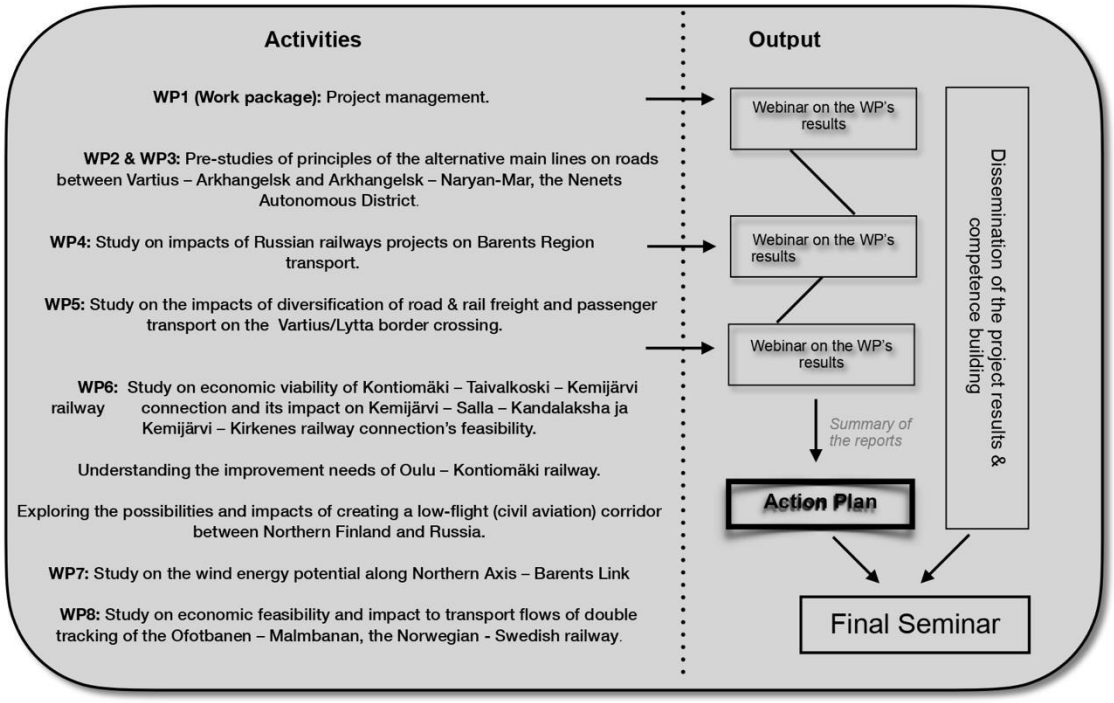



Figure 23. Structure of the project Northern Axis – Barents Link (Kainuun liitto, n.d.)

The figure 23 shows the structure of the NABL project. All work packages or studies are listed on the left side. On the right side are listed expected outputs, including dissemination activities, main events and action plan, which wasn't implemented due to suspension of the Barents Cooperation in Spring 2022.

The NABL project had a strong focus on cooperation with the Russian Federation. Of the 10 project partners, four were organisations from the Russian Federation. The Northern Axis itself, as well as the Barents Link with the Northern Sea Route as a continuation, pass through all four countries of the Barents Region.

## 5.4 Barents Region Transport and Logistics project studies

Barents Transport and Logistics project aimed to facilitate the platform where the authorities responsible for coordinating regional development in the Barents Region could agree upon implementation of the Joint Barents Transport Plan, which is a joint strategy-level document for the transport on the state level. The main challenge is that decisions of transport and logistics made in Barents Regions have too often been based on national plans and neighbouring regions not so much aware of the plans in this field of regions situated next to each other.

Total budget of the project was more than 1.4 million euros and was implemented in a consortium of 12 partners from 4 countries of the Barents Region. Partners were mainly Regional Councils from Finland, County Administrative Board from Northern Sweden, and similar organizations from Norway (Fylkeskommune) and some administrative organizations from Russia. The project was led by the regional representatives of the Barents Regional Working Group on Transport and Logistics (BRWGTL).

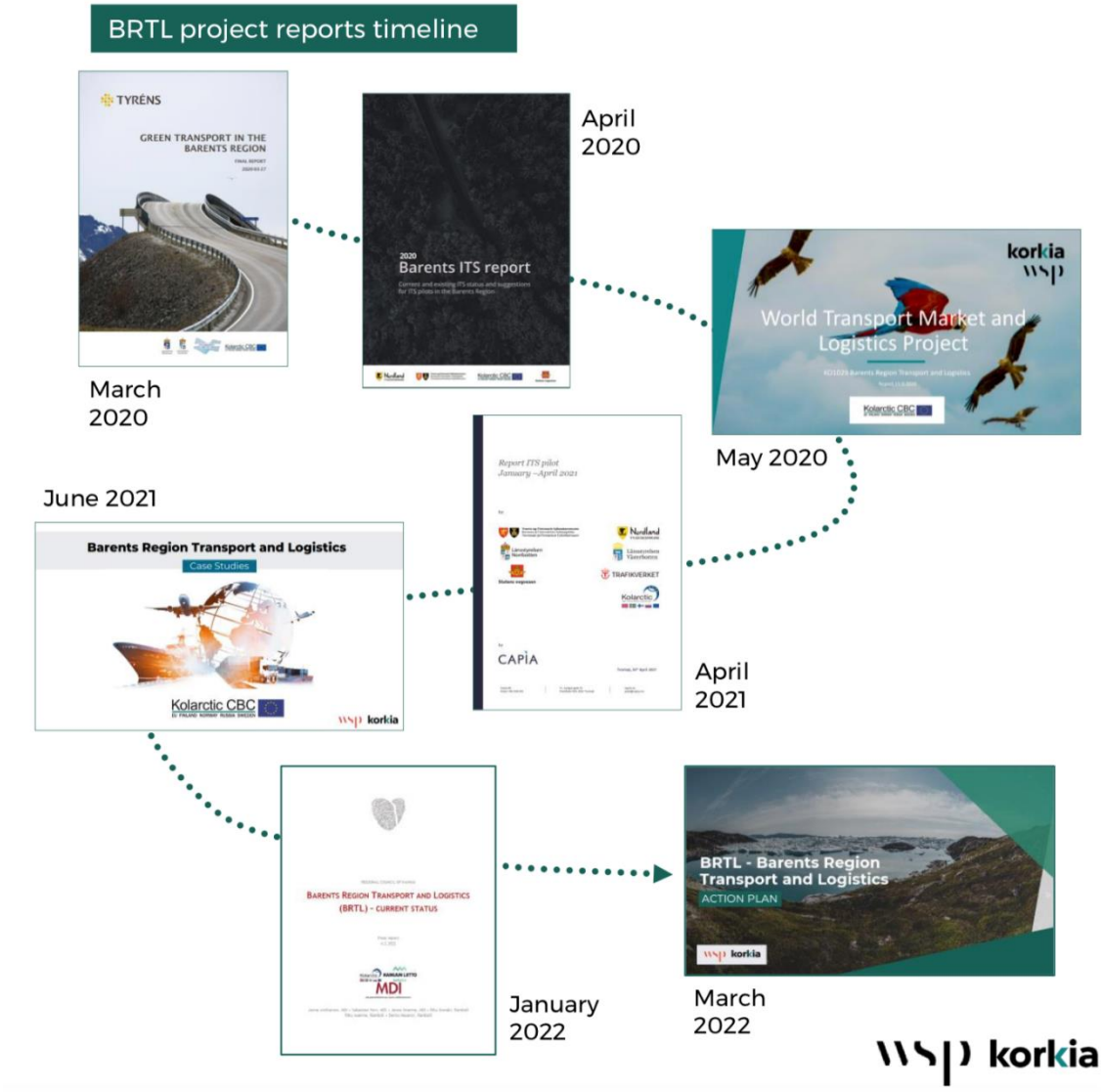



Figure 24. Structure of the project Barents Region Transport and Logistics (Kainuun liitto, n.d.; WSP Korkia)

The project produced the following eight studies:

1. World Transport Market and Logistics Project focuses on both status of present transportation and logistics systems and brings future perspectives.

2. Green Transport in the Barents Region report examines the role of global warming and raises awareness of the topic, adapting some common green transport definitions and measures.

3. Barents Intelligent Transport Systems (ITS) report focuses on the current status and challenges of development ITS in the Barents Region, and also includes suggestions for future pilot projects.

4. Barents Transport and Logistics Case Studies explores 4 main topics. First is the EU Green Deal and Smart Mobility strategy and correspondent strategies in Norway and Russia. The second part focuses on modal shift and multimodal transport chains.

5. Barents ITS pilot project has developed a solution using cameras and mobile application to report availability of on the track parking spaces helping to optimise the rest time planning for drivers.

6. Current Status is a small study of the current state of the cross-border regional cooperation in the Barents Region.

7. Report on the analysis of the implementation of ITS development and carbon footprint reduction projects in the Russian territory of the Barents Region.

8. Action Plan is a summary of the previous studies, focusing on the key development areas of the transport sector.

## 5.5 The main bottlenecks of the east-west transport connection in the Barents Region

One of the research questions is to identify the main challenges of the Northern – Axis transport corridor development. According to results of both project studies the main bottlenecks of the transport corridor can be divided into physical and intangible bottlenecks.

The main physical bottlenecks of the corridor are missing road and rail links, limited capacity for time-critical cargo, insufficient electrification of the railway links, different gauges as well as administrative barriers and border-crossing paperwork requirements. In some studies, the bottlenecks are cited as the lack of passenger and freight flows, insufficient volumes, and lack of interest from local operators in creating and opening alternative services.

The main intangible challenge is the lack of common vision, commitment, and cooperation among the players. One needs an open, ongoing dialogue to develop a more efficient and sustainable

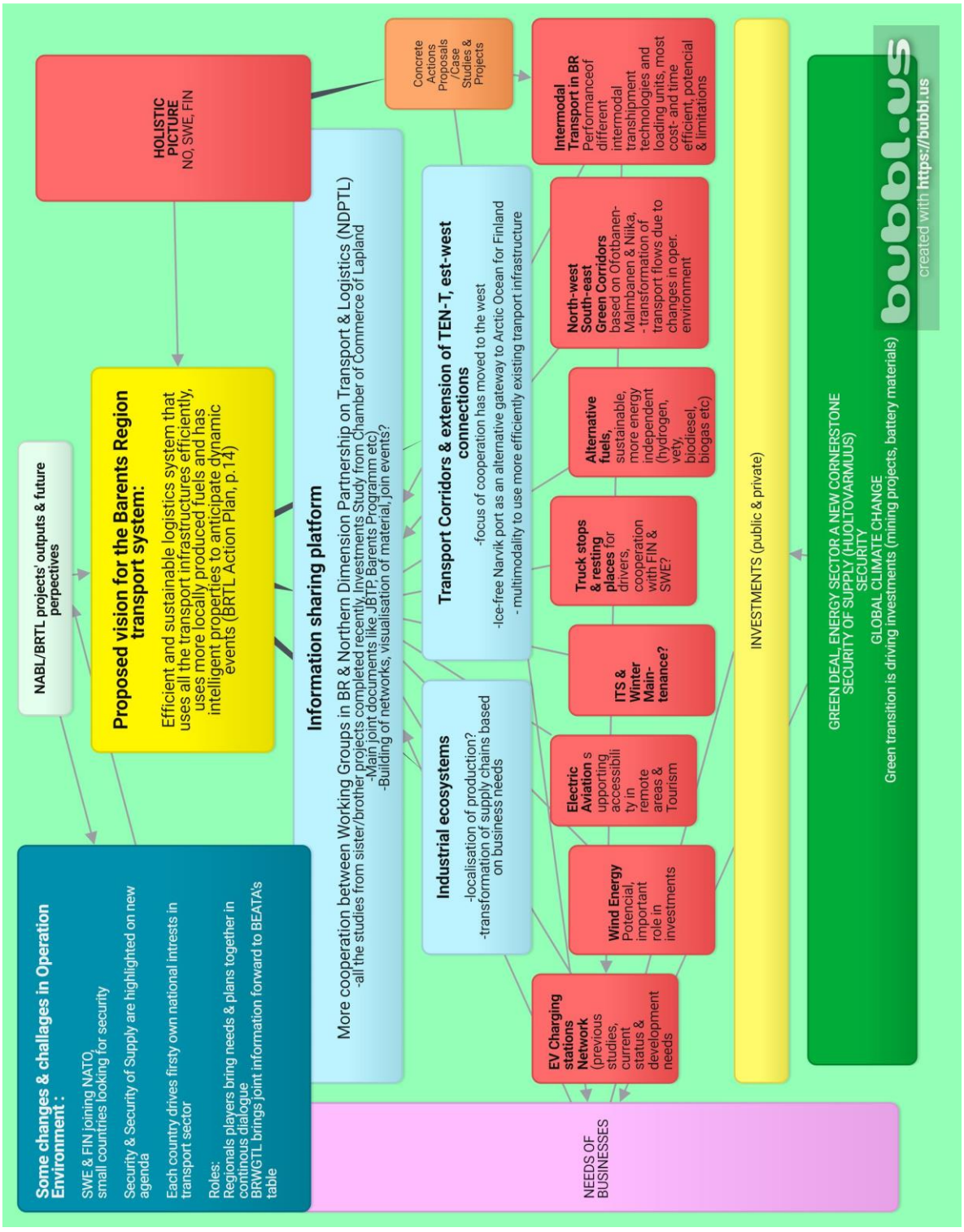
logistics system and to attract investment in its development. Physical bottlenecks cannot be removed without removing intangible bottlenecks first. Transportation and logistics are sensitive topics and related to national security questions. Partner countries have their own national strategies and transport plans. A joint initiative to create the Joint Barents Transport Plan is a great step forward. However, the regional level of cooperation in transport and logistics is driven by the nation's interests. Main conclusions of the document are advisory in nature and do not obligate partner countries and regions to apply them in reality.

Recently, the regions have also made some concrete steps by improving charging infrastructure for electric vehicles, propulsion power networks, truck rest areas concept, which is crucial for drivers' wellbeing and security on the roads. ITS pilots were tested, and winter maintenance of road & rails road have been studied in cooperation recently. And consolidation of the rail transport systems between Finland and Sweden is a huge positive result of the joint initiatives. At this moment, there are no common platforms for information sharing and completed studies and pilot projects in the field of transport and logistics. This kind of platform would facilitate information sharing, communications of stakeholders around the Barents Region, including science and educational institutions and strengthen overall preconditions for future development.

### 5.6 NABL & BRTL project outputs and future perspectives

The Barents Region Transport and Logistics (BRTL) and the Northern Axis – Barents Link (NABL) projects were both carried by the Regional Council of Kainuu as their lead partner. The two transport and logistics related projects operated in parallel for most of their implementation period.

As a result of the cooperation between "sister" projects the following table of future outputs has been created (see figure 25).




Picture 25. Future perspectives from NABL & BRTL projects.

This mind map was created as a result of a workshop with teams of both projects and several transport and regional development experts. The starting point of the mind map is the proposed vision for the Barents Region transport system. “An efficient and sustainable logistics system that

uses all the transport infrastructure efficiently, uses more locally produced fuels and has intelligent properties to anticipate dynamic events." (Kainuun liitto, n.d.)

From the vision written on the yellow background in Figure 25 the logics go down to three development areas (sky blue background) recognised by the Action Plan of the BRTL project. First is a focus on industrial ecosystems development with an emphasis on strong development of diverse industries in the Barents Region. Industrial ecosystems are connected to each other through supply chains and affects mobility of labour. The second highlights transport corridors development because they form a basis for accessibility and competitive advantage for the region. Development of transport corridors, including multimodal transport corridors and modal shift opportunities, ITS and propulsion power networks are preconditions for efficient and sustainable logistics. The third development area is information sharing platforms. Developments areas with more active cooperation are needed between stakeholders in the Barents Region regarding transport and logistics. Also, active participation in the Arctic cooperation including science and education will accelerate knowledge-based development in the field. (Kainuun liitto, n.d.)

Based on the discussions of project and transport experts, the common topics for future development in the Barents Region are the networks of charging stations, truck stops and resting places for truck drivers, production of alternative fuels such as hydrogen, biodiesel, biogas, etc., intermodal transport, North-West and South-East green corridors and transformation of the traffic flows due to changes in operational environment, regional electric aviation, as detailed on the red background figure 25.

There are main change drivers identified on the bottom of the mind map (green background) and in the left upper corner (blue background). Climate change is the main driver for green transition. Security and supply security are cross-sectional topics. The energy sector is a new cornerstone and green transition is driving investments. Wind power potential continues to grow and maintains an important share of investment. Transformation of supply chains is based on updated business needs.

In general, the focus of cooperation has shifted westward and continues through the participation of Finland, Sweden, and Norway, excluding regions of the Russian Federation. With its existing rail connections and infrastructure, the ice-free port of Narvik is seen as a major alternative gateway to the Arctic Ocean for Finland. Multimodality is the key to making better use of existing transportation infrastructure. More detailed operation environment analysis is done in following sections, using the PESTLE analysis framework.

## 5.7 Environmental scanning and PESTLE analysis

Environmental scanning is an important part of the scenario creation process. The operational environment has changed dramatically in the last two years. The PESTLE analysis looks at the trends in the surrounding environment of certain industries, businesses, or organisations. PESTLE stands for political, economic, social, technological, legal, and environmental factors.

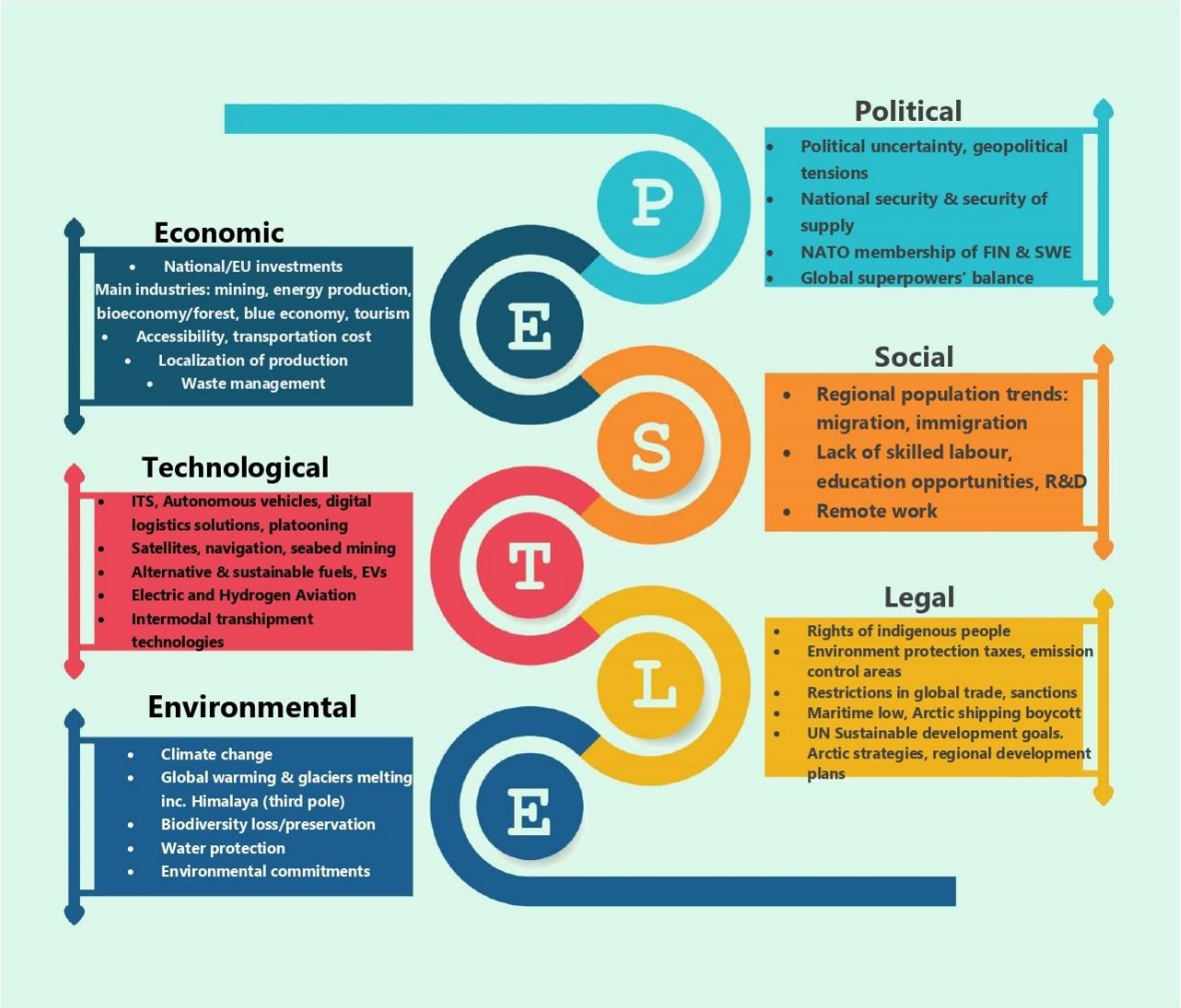



Figure 26. PESTLE analysis used as a tool to understand the transportation industry environment, especially for the east-west connections in the Barents Region.

Against the backdrop of political trends of uncertainty and geopolitical tensions, the balance of global superpowers stands out. National security, military mobility and supply security, and the implications of Finland and Sweden joining NATO are high on the agenda.

Environmental issues are linked to global warming, climate change, glacier and permafrost melting and biodiversity loss. Water protection is important. Countries, regions, companies, and non-governmental organisations announce environmental commitments.

Within economic trends green transition is driving national and EU investments and the energy sector is a new cornerstone. The metal and mining industries, energy production, battery production, blue economy, bioeconomy, and forest harvesting are developing. Accessibility is a competitive advantage of the region and functional transport connections reduce logistics costs. On the other hand, supply chains are still in a process of transformation. They have been shocked by pandemic-related disruptions, the global political situation and increased pressure from decarbonisation requirements.

The main social challenges are the lack of skilled labour in remote regions, an aging of population and its concentration around bigger cities and towns. With remote work and education opportunities, people do not always have to live in the Barents Region physically. All these social factors may slow down investments. On the other hand, immigration of foreigners and refugees is increasing.

The development of new technologies brings ITS, autonomous vehicles, and platooning (cooperative driving of a group of vehicles using automated driving systems), digital logistics solutions, and artificial intelligence to the transportation industry. The development of satellites and navigation systems, alternative and sustainable fuels define all modes of transportation. Multimodality, meaning freight processes through multiple modes of transport and intermodal transhipment, the process involving multiple carriers and contracts optimise supply chains and keep shaping the industry. Airbus, the famed aircraft producer is developing the world's first commercial hydrogen-powered aeroplane. Several electric aviation pilot projects are implemented in the Barents Region.  Data centres, data cables and processing of the data and related services is a rapidly growing industry.

Legal factors in PESTLE analysis include the rights of indigenous people and communities, restrictions in global trade, sanctions against other countries, environment protection taxes, emission control areas etc, including international and national level documents, for example Arctic strategies, United Nation Development Programme and its sustainable development goals as well as regional development plans.

The development of east-west transport corridors in all transport modes supports industrial development and vitality in the European Arctic. After February 2022, the Barents cooperation was suspended, effectively isolating Russia from many Barents and Arctic international forums and platforms. The unpredictable operational environment is a reminder that we are a small part of the big puzzle and that accidents on the other side of the world can have an impact on the overall balance and harmony.

## 5.8 Critical drivers and wild cards

According to Rodrigue (figure 18, chapter 4.5) the change factors for future transportation can be divided into six categories: policy (1), demography and society (2), energy and environment (3), technology (4), economics (5) and finance (6).

The researcher has used PESTLE analysis and observations techniques to cluster drivers from both project studies. Drivers are the factors that can cause or sustain change. The following figure shows the most important driving forces divided by six categories that are deeply uncertain and could have a major impact on the development of the east-west transport corridor.

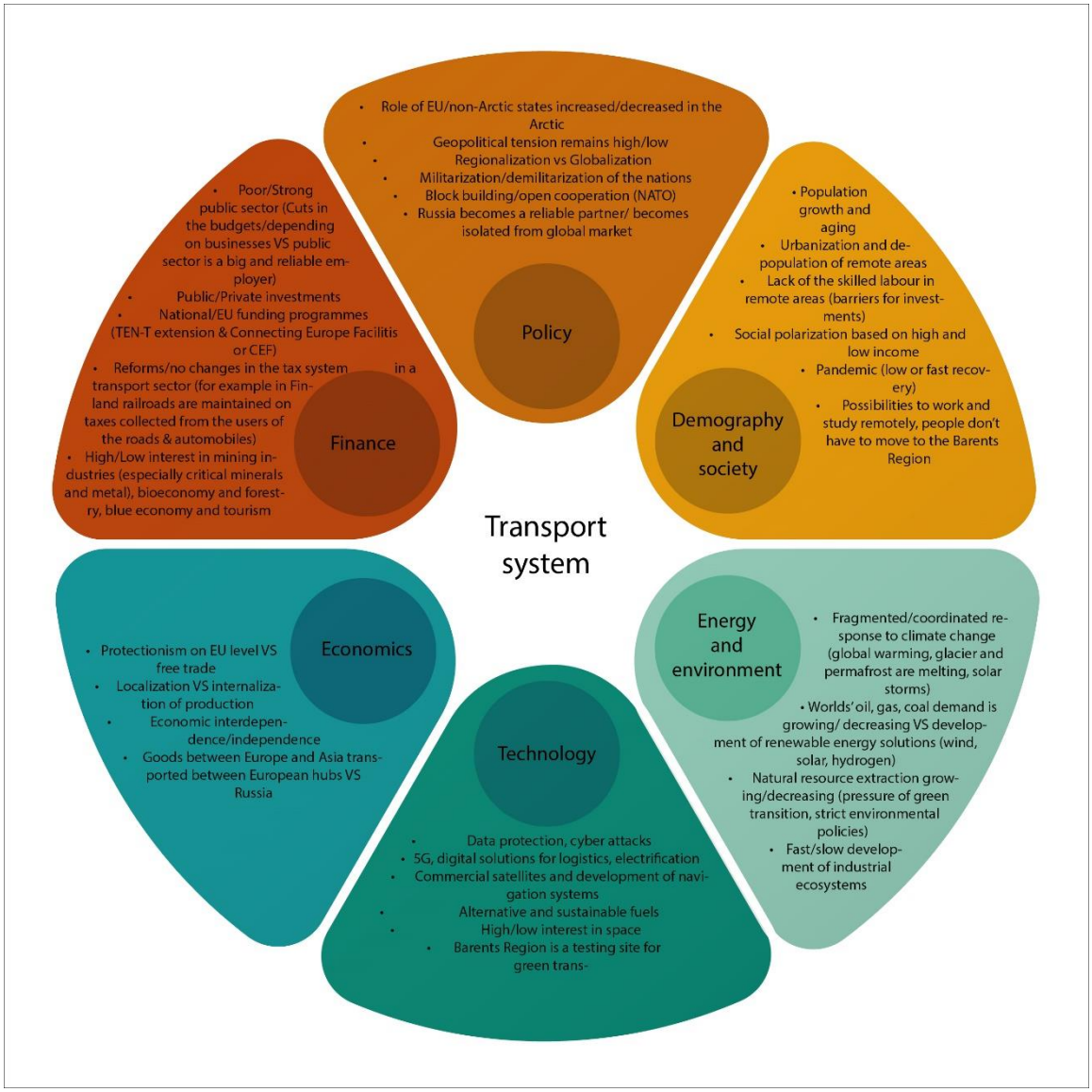



Figure 27. Change drivers for future transportation based on NABL & BRTL projects.

In addition to uncertain drivers, wild cards are used for the scenario building process. Wild cards or black swans, as they are named sometimes, are low-probability events, but they may change situations and futures dramatically. One of the common examples of the wild cards is COVID-19 with all its global consequences. Below are listed ideas of wild cards, which are gathered from studies and materials and observations during the research.

- Nuclear waste crisis
- Drinking water crisis
- Third World War

- Collapse of Gulfstream
- Ecological refugees in Scandinavia from the Himalayan area resulting from glacial melt and biodiversity loss
- Baltic Sea shipping boycotted
- Indigenous people's traditional knowledge and livelihoods receiving global attention

# 6 Creating Scenarios

The process of creating scenarios started by exploring past activities and projects in the Barents Region and an operation environment analysis. The following steps were to identify the main driving forces. Driving forces are factors that can cause or sustain change. After brainstorming and collecting a list of driving forces, they have been selected by groups and organised to the most natural positions. For the scenarios, the researcher selected the two most important drivers or critical uncertainties. Based on the data, two drivers have been mentioned more than any other: geopolitical tension and response to climate change. See figure 28 below.


Figure 28. Framework for the scenarios with 2 main uncertainty factors (Pictures were created using artificial intelligence image generator)

Two axes were drawn for the scenarios, one for each uncertainty, including extremes or outcomes on each axis. The main criteria for facts to be chosen is their major impact on the development of the transport corridor, within deep uncertainties. In this case high and low geopolitical tension and fragmented and coordinated response to climate change have been chosen for the scenario work. Then two axes are crossed in the middle forming four boxes or potential scenarios. For example, scenario number one in the bottom right corner has low geopolitical tension and coordinated response to climate change, accordingly, scenario number two in the top left corner has high geopolitical tensions and fragmented response to climate change.

## 6.1 Scenario 1 – Utopia: High North – Low tension

The main drivers are low tension and coordinated response to climate change. “High North, low tension” was a Norwegian slogan that was used to promote a form of soft cooperation between the eight Arctic nations. This scenario is utopia, with stability, peace & economic growth.

In this scenario we can assume a resolution to the Russia – Ukraine war have at the beginning of 2024. The Arctic Council and Barents Euro-Arctic Council (BEAC) continue their work. Regardless of many disagreements, eight Arctic states unite for coordinated response to climate change. Climate change is a key driving force for cooperation in the Arctic. Because of low geopolitical tension, there is no need to invest in defence.

The Northern Sea Route (NSR) then becomes an open waterway for almost eight months a year. Russia, with support of investments from China, develops NSR infrastructure, satellites and navigation systems and finally opens NSR to commercial traffic. Globalisation continues and transportation systems become more and more integrated internationally and globally. Finland uses northernmost railway connections through the Kainuu Region, Vartius & Kivijärvi for the container flows to/from Asia. In 2045 Russia will finish two huge railway projects in its North, Belkamur and Northern Latitudinal Railway. This means that Northern Axis – Barents Link transport corridor will connect Scandinavian countries and Europe to Asia by railways and by the sea. Railway Kemijärvi – Kandalaksha is rebuilt and is in active use. The port of Murmansk is an international transport hub, not only for Asian traffic, but for freight to the United States and Canada.

North is repopulated, due to extractions of minerals and energy sector growth, there are plenty of jobs. People move to the north to live close to nature, to have a balance between working life and hobbies. By 2050, the EU will decide to make extend TEN-T from Oulu to Vartius/Kivijärvi. Electric aviation is widely used for leisure and tourism, it works as a taxi service. Airlines are using hydrogen aircrafts for long haul flights. Arctic Data Cable is built between China and Europe. Data centres are built all around Scandinavia. NABL is a part of a Global New East-West Corridor, which connects Scandinavian countries with Asia and Asia and Scandinavia with Northern America and Canada. Goods between Europe and Asia are transported mainly through Russia, its railway network and bulk fright via the Northern Sea Route.

## 6.2 Scenario 2 – Cat and mouse games in High North

The main drivers of the scenario are high tension and fragmented response to climate change, leading the world towards a growing gap between East and West.

The Arctic Council and BEAC disappeared in 2026, because their use is not needed. Arctic Mayor Forum is a new platform for regional cooperation in the former Barents Region, except Russia. Russia has formed a new Russia – Asia Union, including China, India, Bangladesh, Nepal etc. Other Arctic countries have responded by forming the Euro-Arctic Union, including EU, USA, Canada, Norway, Iceland, Greenland.

Global demand for oil, gas and coal is growing. China invests in the Arctic to get access to natural resources and their interest in NSR development remains high. High technologies and satellite development gives Chinese-Russian companies opportunities to start seabed mining in the Arctic. Platooning bulk and containerships are moving between Russia & China. Russia rents its land in North Siberia for Chinese agriculture. Svalbard has its own Chinatown. Population in Asian countries is growing, economies are growing, and energy demand is increasing with demand on consumer goods and attributes of the high standards of life. Russia and parts of Asia are facing a waste crisis. It leads world to new diseases and pandemics in 2042.

Russia together with Iran has finished construction of the International North - South Transport corridors (INSTC). The Suez Canal has lost its importance. Both the NSR and the INSTC have significantly changed the structure of global trade. The world is divided between east and west and tension between the two parts continues to grow.

Nordic cooperation is stronger than ever. NATO has invested in infrastructure in Finland and Sweden. Ofotbanen – Malmbanan railway has a double track. The Port of Narvik expands capacities, including container shipping. A new railway is built from Kolari to Svappavaara and continued to Boden on the Swedish side. Plans for east-west transport corridor development get financial support from the EU and from special national funding programmes for military mobility and security of supply. Arctic countries continue investments in defence. The Kainuu brigade, a Finnish army unit situated in the Kainuu Region, close to the border with Russia, have been turned into a big NATO base.

## 6.3 Scenario 3 – High North, High Global risks

Drivers: High tension and conflicts and coordinated response to climate change.

Arctic countries have once again, after the break, come to common understanding on joint action against global warming. This fact, common will and vision were the main reasons to restart functions of the Arctic Council and scientific cooperation with Russia. New jointly updated environment policies are extremely strict. Global demand for oil, gas and coal is decreasing. High tension between states is still present in 2040. NATO is losing power and driven down partly by several conflicts in the Middle East and Africa with US involvement.

A new energy crisis in Europe 25 years after the wind power boom. The life cycle of a windmill in northern conditions is about 20-25 years. Hydrogen creates fires and explosions because of its flammability. Chinese and Indian companies came to global markets with innovative renewable energy solutions. The EU drives protectionism and localization of production to protect jobs at home. Prices goes up.

Goods between Europe and Asia are transported mainly through the main European hubs and New Silk Road. The Chinese Belt and Road initiative, known also as New Silk Road will be finished by 2050. It was implemented as a global infrastructure development strategy financed by the Republic of China and involving more than 150 countries. As a result, Asia, Middle East, Africa, and Europe have new land and maritime networks lowering transportation cost and increasing trade volumes. China manages to stimulate its own economic growth.

Barents Region becomes the main testing space for green transport solutions and ITS and autonomous vehicles. Logistics are digitalised, 5G network covers even remote areas. Data communication infrastructure and data connections are strong, but cyber-attacks are the new normal.

In 2030, the Fehmarnbelt tunnel and the Rail Baltica are open for full operation. The Aegean - Baltic corridor (a shortcut between Suez Canal, Central Europe, and Baltic Sea Region) is under construction and is expected to be operational in 2040. Europe has succeeded in green transition, but it is not enough to stop global warming. In recent years, the northern parts of Scandinavia receives more than 160 billion euros of new investments for mining, forestry and bioproducts, green energy production, fishing and aquaculture and tourism industries. Lack of skilled labour has slowed down both public and private investments and was relieved by international recruitment.

The North Bothnia Line (Bothnian Link), a new 270 km long coastal railway between Umeå and Luleå is constructed and electrified, and the Finnish railway system is integrated with the Swedish and European systems through Tornio – Haaparanda. Oulu Port is the growing multimodal logistic hub, other Baltic Sea ports receive investments for capacity expansion. However, several disruptions of shipping activities in the Baltic Sea have shown weak sites of the Nordic cooperation. In critical situations nations are driving their own needs and interests first, giving only limited or no access to their own infrastructure. In Finland the Saimaa Canal is still not in use, cross-border cooperation and trade with Russian are in its minimum records. European Arctic countries continue investments in defence, geopolitical tension remains high.

### 6.4 Scenario 4 – Dystopia: Era of disasters

The main drivers are low response to climate change and low geopolitical tension.

The third pole, the Himalayas, is experiencing the ecological crisis. Melting glaciers are accompanied by loss of biodiversity. Natural ecosystems are broken, risks of erosion and extreme events are very high. Ecological refugees are moving to the north. Solar storms happen several times a year, large satellites and other technical equipment are burnt or damaged. High risk that Gulfstream will collapse. A high risk of nuclear waste disaster near Murmansk and near Greenland due to climate change and permafrost melting. In new realities fisheries will not be able to continue their activities.

Politics, geopolitics do not matter that much anymore, the crisis is getting to a global scope. Scientists are trying to save the rest of the world. People are not allowed to buy new cars or to build bigger houses; prices on goods have increased many times over. Petrol and electricity prices are breaking all records as well as crime. People go back to the life of their ancestors, to farming, to meeting only basic needs.

There is no need to develop transport corridors, production is mostly localised. Mining is forbidden, industry is dying. Indigenous peoples and their knowledge are finally getting the attention they deserve. The rest of the world is trying to learn from them, from traditional knowledge, how to sustain themselves.

## 6.5 How research output and scenarios could be further used in strategic planning?

The Foresight Process Framework is a model, which aims to structure a foresight process in the context of strategy development. (Please see Figure 17 in chapter 4.) The framework consists of several steps: input, analysis, interpretation, prospection, and output. In this research input is near-future context gathered from the studies and materials of the project, including workshops with project teams at the earliest stages of the work.

Next steps consist of analysis of the operational environment with PESTLE, selecting and organising drivers and uncertainties into groups, then the interpretation of them. Prospection is a scenarios' building process through the imagination of alternative futures. The written report, including scenarios, is the main output. Output will be delivered and presented to the commissioner or other stakeholders, if needed. According to the framework the last step is to incorporate the results into the strategic development process. Strategic planning is a part of the work of officials from the Regional Council of Kainuu and Barents Region Working Group on Transport and Logistics (BRWGTL) and they also have a mandate to apply scenarios to some extent in planning and regional development work. However, research includes some recommendations on possible utilisation for the commissioner.

Firstly, scenarios could be used in the process of revision of the Transport System Plan for Kainuu Region to give a holistic picture of plausible changes in development of the east-west transport corridor and connections with neighbouring regions and countries. The Transport System Plan is integrated into the regional development plan of Kainuu. Accessibility of the region and development of cross-border connections, mobility and efficient, low-emission trip chain is one of the critical topics not only for industries, but for local residents and tourists. It's important to update links to transport systems and transport system strategies of nearby areas. Transportation systems are complex and infrastructure projects in nearby areas may change the inbound and outbound transport flows of the region.

Secondly, scenarios could be used to facilitate discussion on changes and future perspectives of the BRWGTL functions, which was recently merged with the Steering Committee of the Barents Euro-Arctic Transport Area (BEATA). In fact, discussion could be arranged with members of the working group from Finland, Sweden, and Norway. Current future research is based on studies and materials produced from NABL and BRTL projects and both projects have been created based on the recommendations from the Joint Barents Transport Plan. In other words, scenarios as a

synthesis of the project studies and materials could support integration of the project results to the next strategic document or documents.

Thirdly, this independent futures research is a part of studies in a Master School in Kajaani University of Applied Sciences, and it could be seen as an example of scientific research. Kajaani University of Applied Sciences is an international educational institute and plays a crucial role in regional development. Building cooperation between the Regional Council and Master school and students could help to bring more science to regional level decision-making and more regional development topics to the classrooms.

Traditional research and science cooperation could be used more actively and could be adapted to some extent to support regional level policymakers. The studies and materials, used as a secondary data, for this research were produced mainly by consulting companies. Their studies are the high-quality products of their services and businesses. The concept of giving more space to research and traditional science in regional development is connected to a broader approach of science diplomacy in global politics. Definition of the science diplomacy could be divided into three general forms: diplomacy for science, science for diplomacy and science in diplomacy. Diplomacy for science means the use of diplomatic action to facilitate international scientific collaboration, science in diplomacy means the direct support of diplomatic processes through science and science for diplomacy – the use of science as a soft power to advance diplomatic objectives, or building bridges between nations and creating good will on which diplomatic relations can be built. (The Diplomatic Service of the European Union, 2023)

# 7 Conclusion

The future is shaped by our actions and choices we make in the present, as well as by the things we don't do. People have a responsibility to be long-term thinkers, taking care of future generations. We can influence the future with our actions and choices. In order to make an impact, we need future awareness and the ability to see alternatives. Awareness and action can be at any level: global, local, organisational, or personal. The collected materials and created scenarios, which are the main output of the research, are expected to serve policymakers in the Kainuu Region and the Barents Euro-Arctic Region in their interest lobbying and strategic planning processes. The main objective of the research was to establish links between the past, present, and

alternative future scenarios to create a holistic picture of the development of the east-west transport corridor.

If we look back at the evolution of transportation, it starts with times when people used animals to get from one point to another and wind to sail. The Industrial Revolution has transformed transport systems into more modern ones, bringing engines, railways, and later airplanes. People have tools for developing and constructing infrastructure. The Suez Canal and Panama Canal are the most significant shortcuts ever built by humans. The old and traditional Silk Road is another great example of an international transport corridor and trade route between the Middle East and Europe. Transportation, accessibility, and the geographical location of the area were always directly related to economic and geopolitical importance. And the same characteristics remain crucial today.

The research answers the three main questions. The first is about the main bottlenecks of the Northern Axis-Barents Link transport corridor. The bottlenecks can be divided into physical and intangible: physical bottlenecks like missing railway links or lack of electrification, different gauges, etc. cannot be eliminated without removing intangible bottlenecks first. The main intangible challenges are the lack of common vision and will. The statement that railroads are built on the will of politicians has its truth. Countries lobby first for their own priorities, and this is understandable because transport and accessibility are sensitive and strategic topics for every nation.

The answers to the second question regarding east-west connection development are four alternative scenarios. Several theoretical frameworks were used to analyse the data, such as the future cone and triangle and the foresight process framework. Scenarios were chosen as a method to present the results of this study. Four scenarios are built around two critical uncertainties: geopolitical tension and climate change. The scenarios are named according to their context. One is utopia: High North, Low Tension. Another is dystopia: the Era of Disasters. The other two are named High North, High Global Risks, and Cat and Mouse Games in High North.

The third research question was on recommendations for further use of the scenarios in strategic planning. The output of this research project is expected to bring arguments and facts to the tables of policymakers and decision-makers. Strong arguments in the right hands could support lobbying by interests and draw attention to the accessibility and connectivity of Kainuu and the Barents Region as a whole. Scenarios could be used in the process of revising the Transport System Plan for Kainuu Region and, to some extent, the regional development plan.

The future of Barents cooperation is open, not predetermined. Before we can forecast the future, we need to know the past and understand the present. The past 30 years of fruitful Barents Co-operation provide us with a valuable lesson and an existing structure for dialogue that could be applied to the new realities in a meaningful time.

## 7.1 Reliability, validity and limitations

Utilisation of the research and science cooperation on regional level development and in cross-border cooperation could be a topic for further research. Another possible topic to expand is to take more closely into consideration the needs of the local businesses, by collecting data on supply chains they use and numbers of import and export of material and final products they transport. One of the limitations of this research is that needs of local business were not a part of the secondary data. Some information was collected by consulting companies, but there is no detailed data. Detailed analysis of traffic flows in east-west directions and needs of businesses would bring an added value to research.

The study report is based on secondary data, which means that the original data were not collected to answer specific research questions. Both projects, NABL and BRTL, have cooperated with different Finnish and international consulting companies to produce studies and materials. Participatory methods like joint workshops and discussions involving a wide range of stakeholders were used to collect the primary data and produce more than 20 studies. In addition, consulting companies have interviewed key players, policymakers, and decision-makers depending on the specific theme of the work. The review of available materials for scenario building is based on the researcher's own several-year expertise in the field. The first scenario drafts have been supplemented by comments from about seven experts from different organisations around the Western Barents Region to minimise possible contradictions in facts. Regardless of the limitations of the secondary data, it has made it possible to conduct this type of futures research with such limited resources in an uncertain environment and in times of unclear prospects for the Barents Cooperation.

Future research was chosen as a method or so-called prism through which data was analysed and synthesized. Scenarios are expected to reduce uncertainty and raise the level of knowledge in times of high geopolitical tension between east and west and the growing importance of coordinated responses to climate change. The main idea behind the scenarios is to have a look at

alternative futures, not to predict the future. Transportation is a complex field that is interconnected with various fields, changes, and events. The transport sector is affected by changes in the energy sector, environmental issues, safety and security, market forces, and public policies. Some dramatic changes in the operational environment and their long-term impacts are difficult to analyse quickly, like, for example, Finland's decision to join NATO. The timeframe of the selected data is from spring 2022 until the beginning of summer 2023. Events after those time limits and the changes they might bring to the situation could no longer be included in the content of the research.

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