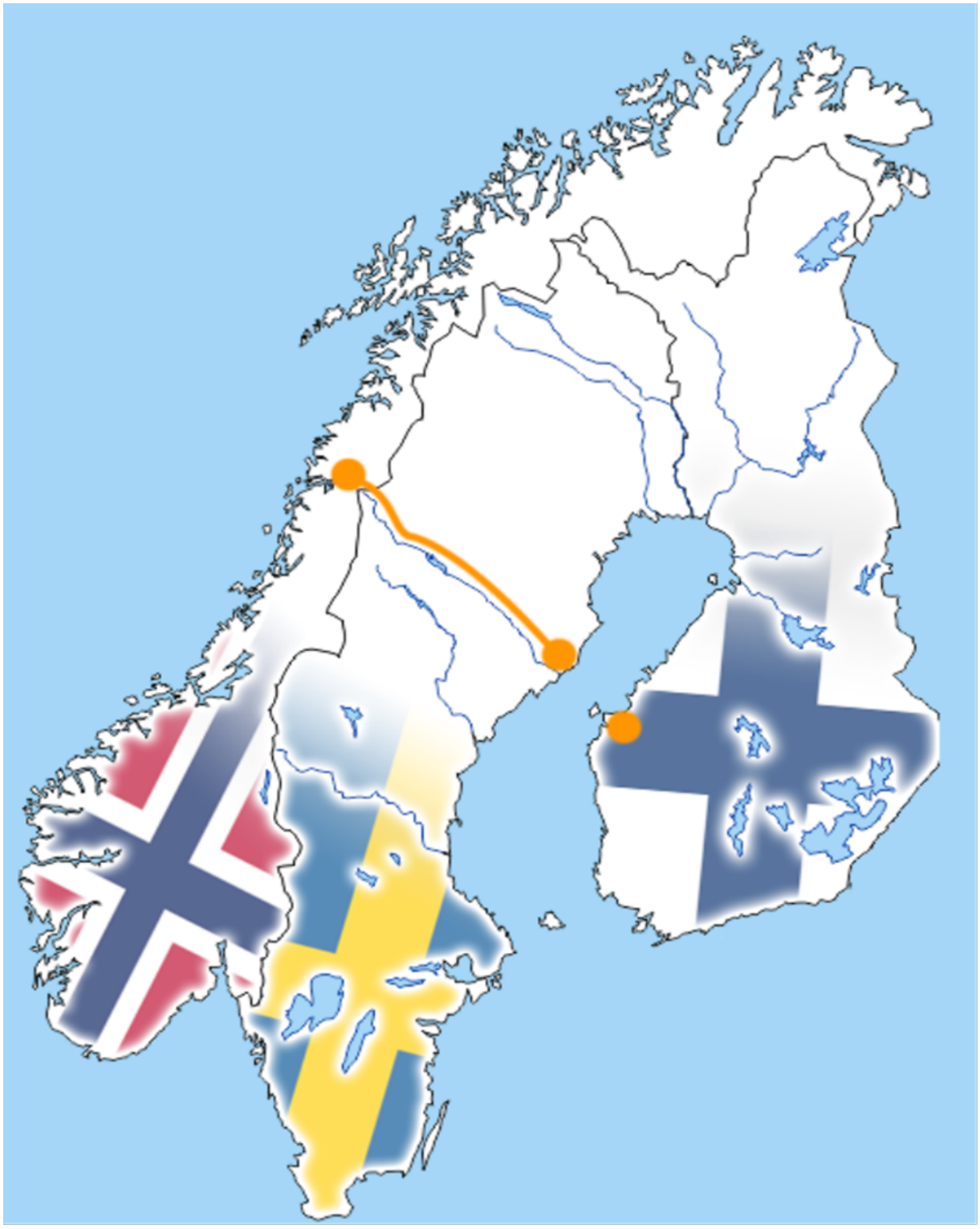
COMCAP
Communication and Capacity in MidtSkandia



RAMBØLL Bright ideas. Sustainable change.

From the Atlantic Ocean to the Baltic Sea
A study of trends and drivers for the further development of the E12 corridor

COMCAP

Communication and Capacity in MidtSkandia

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Beskrivelse	I denne rapporten beskrives utviklingstrender og forventede klimaendringer som kan utvide behovet for kapasitet i vei- og banenettet og i havnene i E12 regionen.

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SUMMARY

The organization MidtSkandia has commissioned Rambøll to assess the need for further development of transport infrastructure in the E12 region, stretching from the Atlantic Ocean to the Baltic Sea. This is a preliminary study intended to provide a foundation for more extensive projects in the next phase. The basis for this study is the new security policy situation in the Nordic region, with Sweden and Finland becoming members of NATO.
An Exciting Development Toward 2060

The national road and railway networks, along with the municipal ports in the E12 region, currently meet the need for transport capacity in a satisfactory manner. Only minor improvements are planned at the national level toward 2030. However, in a longer-term perspective, it is likely that societal changes may occur that will require more substantial investments in the cross-border transport network, with particular emphasis on sea and rail transport over long distances.

The driving forces behind societal development in Northern Norway and Northern Sweden can be divided into three main categories:
Geopolitical conditions

- Increased defense activity between countries
- Increased investments in critical infrastructure

Key societal goals

- Increased self-sufficiency in Europe of critical raw materials
- Increased production of energy from renewable resources

Climate change

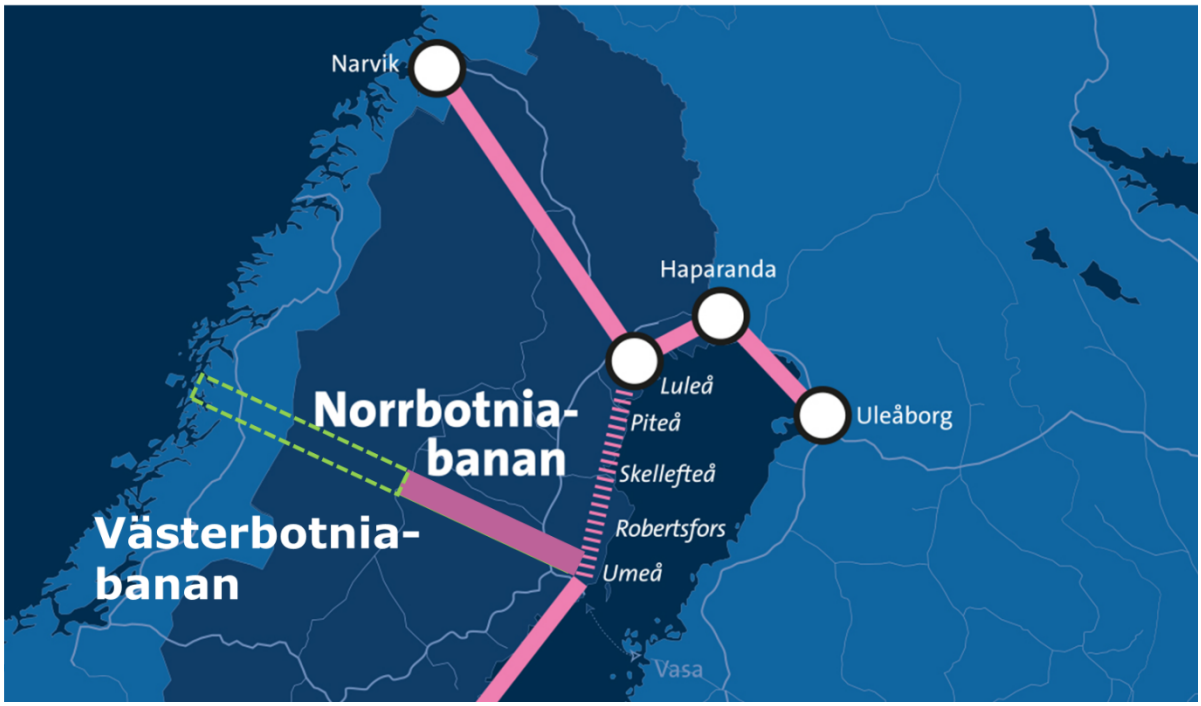
- Increased population and business development
- New international transport corridors

There is a wide range of expectations regarding societal changes toward 2060. In a scenario analysis for the further development of transport systems in Northern Norway, three different scenarios were presented with completely different societal impacts — ranging from uncontrolled growth ("Klondike") to the last wilderness in the Nordic region. Nevertheless, there was broad consensus that the need for transport will increase.

This report discusses national plans and goals in key societal areas that are expected to influence economic development and transport demand. The natural resources in the northern region are vast and are becoming increasingly important. At the same time, there may be operational disruptions in the transport systems, leading to more traffic in the Baltic Sea area being redirected westward to ports along the Atlantic coast. The report outlines specific areas where MidtSkandia, on behalf of its members, can take an active role in influencing future developments.

In 2016, Trafikverket (the Swedish Transport Administration) prepared an overview of a series of measures for the further development of the E12 corridor. The key points of that study are reviewed in this report. Rail transport has a low market share and is the least developed mode of transport in the region. The members of MidtSkandia wish to see a significant improvement of the Västerbotten Line (Västerbotniabanan) and further expansion of the railway network westward once the Norrbotten Line (Norrbotniabanan) has been completed.

In June this year, the Prime Ministers of Norway, Sweden, and Finland agreed to establish a cross-border railway corridor that can serve both civilian and military transport purposes. Time will tell whether there will be a foundation for extending the Västerbotten Line all the way to the Nordland Line (Nordlandsbanen) on the Norwegian side.



Figur 1: Illustration of the Railroads ”Norrbotniabanan” and ”Västerbotniabanan” (Tvärbanan).

1. MANDATE AND IMPLEMENTATION

1.1 Mandate for the Study

The organization MidtSkandia has commissioned Rambøll to map and assess the need for further development of the transport infrastructure in the E12 corridor between the Atlantic Ocean and the Baltic Sea, from a long-term perspective. MidtSkandia is an interest organization that facilitates increased cross-border cooperation between municipalities and regions in Nordland (Norway) and Västerbotten (Sweden). This report is a preliminary study for further work in the project *"Capacity Building in MidtSkandia" (CABUMS)*. It will also contribute to an update of the 2018 analysis of the corridor titled *"Botnia Atlantica – Traffic Strategy for the E12 Region."*

1.2 Background

The background for this study lies in the significant societal changes expected to take place in Northern Norway and Northern Sweden over the coming decades. Many of these changes will lead to an increased need for transport capacity. Some changes are the result of implementing overarching political goals, while others stem from factors beyond the control of the Nordic countries — such as rising geopolitical tensions and climate change. There is great uncertainty in assessing which factors will have decisive impacts on societal development and how rapidly these changes will occur.
The triggering factor for this study is the new security policy situation in the Nordic region, with Sweden and Finland joining NATO.
The designated military reinforcement corridors in Norway for allied forces are the E14 corridor through Trøndelag and the E10 corridor through the Ofoten region. This is largely due to the presence of military units along these axes that may require support from allied forces. The geographical distance between these military corridors is approximately 900 kilometers. From both Narvik and Trondheim, the distance to the Baltic Sea is about 500 kilometers, which challenges the ambition for high mobility, short response times, and joint military exercises. The Norwegian government has expressed a desire for the Nordic region to become the most integrated region in Europe in terms of military cooperation.
The E12 corridor, running from Mo i Rana to Umeå, lies midway between the military reinforcement corridors in Trøndelag and Ofoten. Facilitating increased mobility implies more storage and transport of military equipment and supplies across national borders. In this context, the ports and rail terminals along the E12 corridor are strategically well-positioned to support military operations — to the south, to the north, and not least, to the east.
The Finnish government is currently assessing the construction of a fixed connection across the Baltic Sea. With the planned construction of a new deep-water quay, the port in Mo i Rana will have significant capacity to receive allied forces. A new airport is also under construction near the E12 corridor on the Norwegian side of the border. The E12 region already has road and rail infrastructure that can contribute to strengthening the defense capabilities of the Nordic region. Therefore, MidtSkandia is actively working to raise awareness of the strategic importance of the E12 corridor and its connected transport network in terms of security policy.

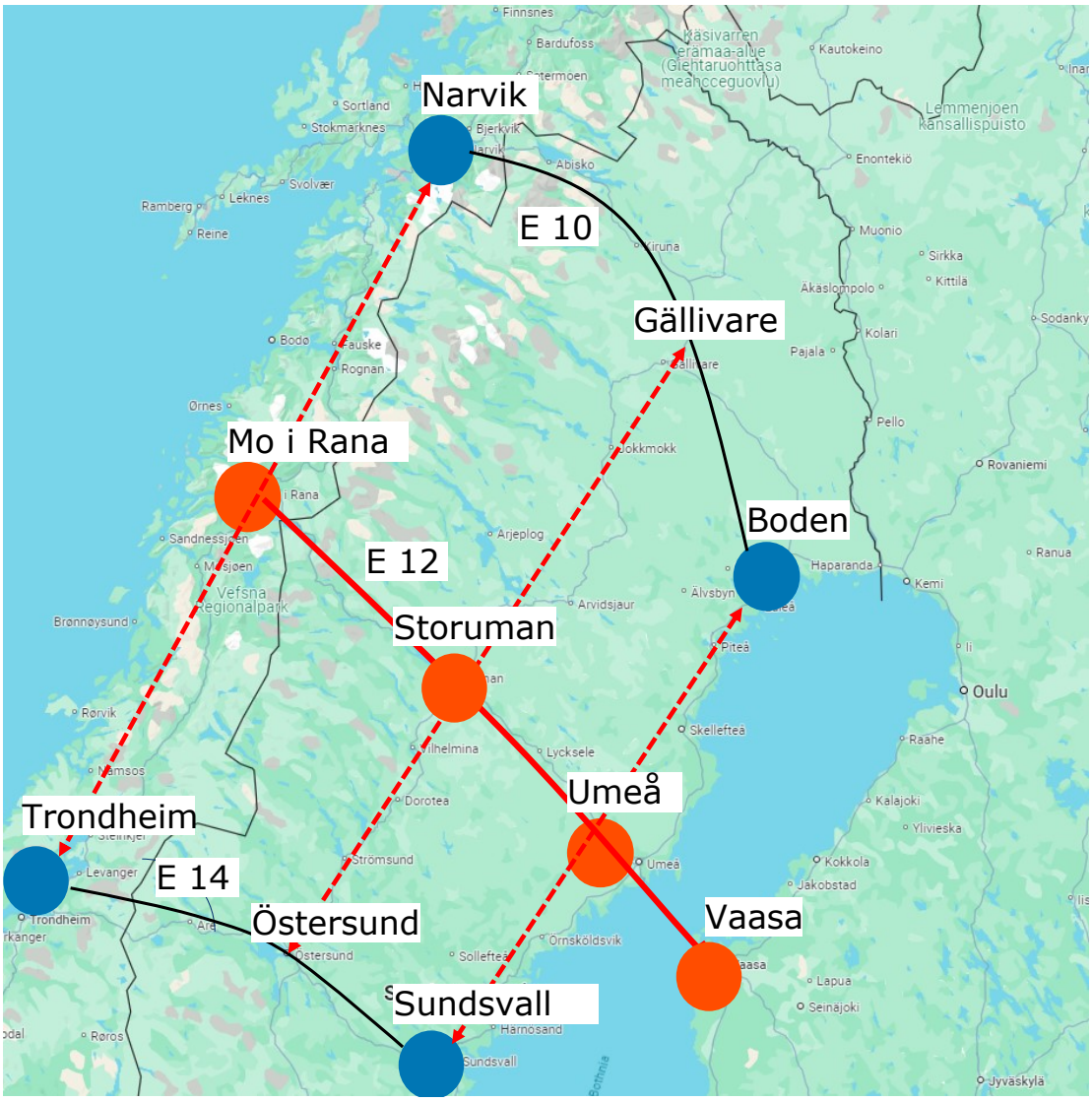


Figure 2: Illustration of current allied reinforcement corridors (blue) and other transport corridors and terminals that may become important in preparedness and defense policy contexts (red)

In the E12 corridor, several connected road and rail sections are included, such as National Road 73 between E6 and E12, County Road 363, and the Västerbotten Line (Västerbotniabanan/Tvärbanan) between Umeå and Storuman. The main north–south corridors for road and rail pass through Mo i Rana, Storuman, and Umeå.

Implementation of the Feasibility Study

At the beginning of the feasibility study, various development scenarios are discussed, based on analyses carried out by national authorities.
The work on the feasibility study report is based on a range of public documents, covering transport, emergency preparedness, security, and business development. Representatives from several member organizations of MidtSkandia have been interviewed regarding their assessments of the factors that may lead to a need for increased transport capacity in the E12 corridor. The respondents were also asked which factors they believe will have the greatest significance in the short and long term.
The study was carried out by staff at Rambøll Norway, who have extensive experience in business development and the development of public transport infrastructure. In addition to assessing the

drivers behind the increasing transport needs in the E12 corridor, the report also includes a summary




of current national plans for the corridor looking ahead to 2035.

Pictures from Umeå, Lycksele, Storuman and Mo i Rana

2. DRIVING FORCES FOR TRANSPORT DEVELOPMENT TOWARD 2060

Investments Are Becoming More Aligned with Broader Societal Goals

Over the past decade, transport policy has become increasingly focused on the transport system itself, and to a lesser extent on the broader societal goals the policy is meant to support. The government's objective in the latest National Transport Plan is to continue the development of an efficient, safe, and environmentally friendly transport system by 2050.

Investments Are Becoming More Aligned with Overarching Societal Goals

In earlier plans, there was more discussion of the societal objectives behind investments and of conflicting goals between different public interests. For example, there was an emphasis on how transport systems should contribute to regional development, increased competitiveness for industry, or better roads in rural areas. The distance-related costs for businesses to access European markets were a recurring justification for investments in improving access and mobility within the national transport network. In general, regional development has been a key objective when Members of Parliament have debated specific road or rail projects.

In the National Transport Plan adopted in June of this year, the introduction emphasizes that Norway is in a period of transition, with significant international obligations and growing challenges related to preparedness and security policy. The government has also set a goal of increasing exports from mainland industries by 50% by 2030. It remains to be seen how international obligations and challenges will influence transport policy.

Currently, the general rule in both Norway and Sweden is that rail infrastructure is developed for short-distance travel in urban areas, while the road network serves long-distance travel between countries and regions. The benefit of infrastructure investments tends to stop at the national borders. A greater prioritization of international transport corridors, based on long-term and overarching societal objectives, could have a significant impact on the further development of transport networks and terminals in the E12 corridor.

The 2024 Long-Term Perspectives Report

A key document underpinning the national transport plans is the Long-Term Perspectives Report (*Perspektivmeldingen*), presented by the Ministry of Finance every four years. It is a report to Parliament about the trends shaping society. However, the highlighted trends focus more on challenges than on opportunities.

The 2024 report places strong emphasis on the challenges of an aging population and the fact that about 20% of the working-age population is outside the labor market. The employment rate must increase, and people must work longer than before. A further concern is that productivity growth has stagnated, making it harder to maintain the current level of public services.

Another central theme is the need for societal transformation. The government emphasizes the need for greater prioritization of security, preparedness, and the transition to a low-emission society. This will increase the demand for land, electricity, and raw materials. The report also notes conflicting goals, such as those between power development and nature conservation. It describes a wide range of trends influencing societal development, with more focus on known and measurable domestic factors in Norway than on potential geopolitical changes.

Scenarios in the Concept Selection Study for Northern Norway's Transport System

In 2023, the national transport agencies presented their proposal for the further development of the transport systems in Northern Norway. Many of the needs and challenges are shared between Northern Norway and Northern Sweden. One significant difference is rail investment: Sweden is building the Norrbotniabanan, whereas Northern Norway has not seen new rail construction since 1961. Moreover, the Concept Selection Study (*Konseptvalgutredning*) did not propose any new rail lines, even though such options were evaluated.

As part of the study, a scenario process was carried out to explore developments toward 2060. The aim was to present new perspectives on transport needs and how different modes of transport could complement each other. The scenarios highlight different directions for societal development. They strengthen the connection between transport capacity and goals related to business development, security, preparedness, and sustainable development. The summary in the report clearly outlines the need for improved transport infrastructure:

The scenarios describe three radically different future realities, each with its own opportunities and limitations for the region. A somewhat surprising finding is that the overall transport demand — both within the region and to/from the region — may increase significantly over the next 40 years. With the partial exception of "The Last Wilderness", it is possible to envision a much higher level of activity. The justifications vary, but the conclusion is the same: transport corridors in the north will become increasingly important for Norway, the Nordic region, and Europe. Transport needs are also likely to become more complex, which places new demands on transport operators and their cooperation.

The scenario process was conducted with a diverse scenario group of around 35 participants, in addition to 14 in-depth interviews. The first workshop aimed to identify major trends affecting societal development. Ten trends were selected as the most important:

- A more unstable world – defense becomes more important
- The Arctic and northern areas gain greater significance
- Climate change continues, especially in the north
- Climate awareness increases – "a knife to the throat"
- New technology will change transport needs and systems
- Global population continues to grow (10 billion by 2060)
- Rising demand for energy, including renewables (from cheap to expensive energy)
- Increased demand for seafood, minerals, and other resources in Northern Norway
- Aging population and low birth rates in Norway, especially in small municipalities
- Centralization both within the region and nationally (North–South)

These driving forces were grouped into three categories. For example, the increased demand for seafood, minerals, and other resources was placed under geopolitical conditions, as it is influenced by the framework for international trade. The three categories were visualized in a triangle.

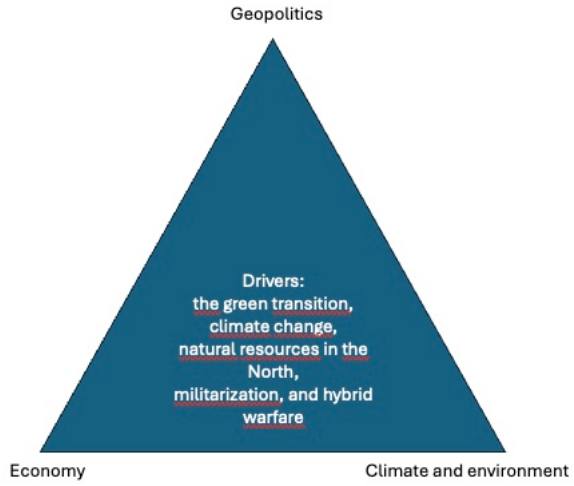


Figure 3: Scenarios for the development of Northern Norway towards 2060 in connection with the concept evaluation study for the further development of transport systems. Asplan Viak and Dietz Foresight, November 2022

Among the topics discussed were how climate change would impact mobility in society and population development in Northern Norway. In addition to trends and driving forces, it was emphasized that unexpected events—both positive and negative—are likely to occur. There may be changes that today seem unlikely, such as sufficient renewable energy to meet all needs, or the occurrence of uncontrolled mass immigration from other countries.

Based on this foundation, three main scenarios were developed for the period leading up to 2060:

Bastion North
This is the story of a turbulent and unpredictable world, where the EU pushes for European self-sufficiency and the exploitation of minerals and other raw materials. By 2060, security and preparedness in the north are of critical importance, and the demand for transporting goods and people to and from Northern Norway has increased significantly.

Klondike
This is the story of a rapid, often chaotic and uncontrolled industrial development in Northern Norway, driven by the demand for energy and seafood. By 2060, the ice at the North Pole has long since vanished, and Northern Norway functions as a gateway for exports to Europe.

The Last Wilderness
This is the story of how climate change, the indigenous population’s fight to preserve their cultural heritage, and a growing desire to protect the remaining untouched nature, have curbed the exploitation of natural resources in the north. By 2060, the need for transport in Northern Norway is relatively limited, except within the tourism sector.

When the scenarios are viewed together, it becomes clear that the level of activity in Northern Norway, Svalbard, and the Arctic region could be considerably higher in 2060 than it is today. In two of the scenarios—Bastion North and Klondike—the demand for transport will increase significantly. In the third scenario—The Last Wilderness—overall transport demand will be lower, but it is expected that some areas of Northern Norway and certain times of the year will still experience higher activity than today.

The conclusions of the report are summarized as follows:

Figure 4: Summary of the scenarios' implications for transport needs in Northern Norway towards 2060 in connection with the concept evaluation study for the further development of transport systems. Asplan Viak and Dietz Foresight, November 2022
Bastion North: Defense + minerals + supply security = More freight transport and passenger transport
Klondike: Strong business development + surveillance and control = Significantly more freight transport and passenger transport
The Last Wilderness: Reduced overall activity + stricter requirements = Less freight transport and passenger transport, and more tourism

The national concept selection studies (*konseptvalgutredninger*) in Norway and the action plan studies (*åtgärdsvalsstudier*) in Sweden are based on the current situation and traffic forecasts toward 2060. These forecasts are largely projections of historical trends. In both Helgeland and Västerbotten, the expected traffic growth is approximately 1% per year up to 2060. Therefore, it is difficult to determine whether the scenarios had any real impact on the transport authorities' recommendations for the further development of the transport systems in Northern Norway.

Several Changes Since the Scenario Process in 2022

The trends and driving forces emphasized in the concept selection study for the transport system in Northern Norway would likely have been roughly the same in a corresponding scenario process for the E12 corridor. However, there might have been somewhat more emphasis on societal preparedness as a supplement to military preparedness, partly due to the increasing number of operational disruptions affecting critical societal infrastructure in the Baltic Sea region.
At the time the scenarios were developed, Sweden and Finland were not yet members of NATO. Their accession would have strengthened the focus on cross-border traffic and cooperation between the three countries. It is difficult to predict with certainty how much this would have affected the top 10 list of driving forces.
In this report, four overarching driving forces are discussed in separate chapters:

Chapters in the feasibility study

- The development of military defense in the Nordic region

- Preparedness for unwanted incidents
- Plans for reducing greenhouse gas emissions
- Increased European self-sufficiency in raw materials

The driving forces will require adaptation and a willingness to change. In the Long-Term Perspectives Report, a lack of willingness to change was identified as a significant challenge. However, this does not appear to have been a theme in the scenario discussions leading up to 2060 in Northern Norway. There, expectations for long-term development are primarily driven by faith in economic growth.

3. DEFENSE DEVELOPMENT IN THE NORDIC REGION

New Geopolitical Framework Conditions

This chapter discusses the security policy implications of new geopolitical framework conditions. Europe must take greater responsibility for its own security. The United States is urging that the defense budget of each country should amount to at least 2% of their gross domestic product. Investments will be made in both conventional forces and defense against hybrid threats.
In Norway, the Storting (Parliament) adopts a new Long-Term Defense Plan every four years. The latest plan entails a significant strengthening of the Armed Forces over the next 20 years. The 2025 defense budget has been increased to NOK 110 billion.

In the early years, the focus will be on reinforcing existing military resources. Toward the end of the planning period, there will be investments in new capabilities, such as fighter aircraft, submarines, and maritime patrol aircraft. The war in Ukraine has demonstrated the importance of air defense, and increased investments in air defense are likely to be prioritized early in the period.

There are three main areas where defense investments may have particular relevance for the E12 region:
Strengthening Defense in the Nordic Region

- Increased military mobility between the countries
- The E12 as a military transport corridor
- Establishment of new defense industries and supply centers

Increased Military Mobility Across Borders

The Norwegian Army is expanding from one to three brigades: one in Finnmark, one in Troms, and a new Brigade South. The Army is also being strengthened with long-range precision weapons, more tanks, air defense systems, and helicopters. The Home Guard is being expanded to a total of 45,000 soldiers. There are plans for increased training, reception, and support for allied forces, along with closer cooperation with the armed forces of Sweden and Finland in the north.

The government notes that logistical readiness is a challenge. Reaction capability—which includes force build-up and redeployment to new operational areas at short notice—is not adapted to today's reality. The Armed Forces must be able to prepare entire force structures within set timeframes and move units efficiently from their bases. The total defense concept will be further developed, including the ability to requisition civilian goods and services when needed. The Armed Forces will improve logistics solutions with fewer warehouses and better flow of goods.

The Norwegian Defence Research Establishment (FFI) has begun developing a joint Nordic defense concept with similar institutions in Sweden and Finland. FFI researchers emphasize that scenario-based planning must be based on a shared Nordic understanding of the need for balance between deterrence and reassurance.

During 2024, Sweden and Finland will present their new long-term defense plans, based on their NATO membership. There is agreement on establishing a joint Nordic air force, and Finland has proposed a NATO base in Lapland to defend the entire High North, with contributions from Norway and Sweden.

Establishing a Military Transport Corridor

The military requirements for increased mobility will impact transport infrastructure between the countries. The defense ministers of the three nations are to determine how to facilitate efficient cross-border transport of people and materiel, including coordination with allied forces during both peacetime exercises and reinforcement scenarios. “What this means for railways, roads, aviation, and coordination — we want to make improvements, and we want to get started quickly,” said Prime Minister Støre during a joint visit with his Swedish and Finnish counterparts in Bodø in June. There was agreement to establish a military transport corridor running through Northern Norway, Northern Sweden, and Northern Finland. At the same time, it was noted that financing remains unresolved.

This ambition has created expectations of a renewed focus on rail in the north, an area long deprioritized by national authorities. There is no railway in Troms and Finnmark. Proposals in the media include extending the railway from Narvik to Bardufoss or constructing a new route from Skibotn to Finland. The Northern Norway Line, an extension of the Nordland Line to Tromsø, is unlikely to be prioritized over strengthening the cross-border corridors.

Positioning the E12 Corridor as a Military Transport Corridor

The client has high expectations for positioning the E12 corridor as a key military transport corridor for cross-border movement of military resources and receiving allied reinforcements. The volume of military mobility between countries is not yet determined.

The E12 corridor holds particular advantages in logistical readiness and storage, with well-developed transport infrastructure in all directions. However, it should not be viewed as a competitor to the E10 and E14 corridors, which are already designated as core corridors for receiving allied forces. There are shared interests in expanding cross-border corridors and investing in ports and rail terminals. The E12 corridor could be positioned using four strategic approaches:

1. A supplementary military reinforcement corridor for both troops and materiel
2. A supplementary military supply corridor supporting the E10 and E14 corridors
3. A supply corridor of civilian services needed by the military — to the north, south, and east
4. A comprehensive supply corridor for all categories of societal security and preparedness, including support to military forces, especially in Northern Norway and Northern Sweden

The distance between E14 (Stjørdal) and E10 (Narvik) is almost 900 km through Norway, with a minimum driving time of 15 hours for heavy vehicles. The distance increases further when driving via Sweden. The long distances and strategic location of the E12 corridor suggest growing relevance in defense policy.

- Mo i Rana to Narvik: ~420 km (approx. 8 hours by truck)
- Stjørdal to Mo i Rana: ~440 km (approx. 7+ hours by truck)

MidtSkandia aims to develop and highlight resources within the E12 corridor that the Armed Forces and national authorities may need:

- Transport infrastructure: ports, terminals
- Supply of basic services: food, water, shelter, medicine
- Industry: support for military operations
-

These same resources are also vital in responding to natural disasters, pandemics, and terrorism. At the Bodø meeting, the Finnish Prime Minister emphasized:
"We have 1,340 kilometers of border with Russia and the Baltic Sea on our southern and western coast. If for any reason logistics through the Baltic Sea become unavailable, Norway becomes our route."

Development of the Defense and Security Industry

The armed forces of Norway, Sweden, and Finland, along with NATO, plan to strengthen their presence in the High North, based on shared resource needs. Currently, no military field units are permanently stationed in the E12 region, but the Home Guard plays an active role and its tasks and resources will be enhanced.

In Umeå, there are several national and international expert units in CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosive threats).
The Norwegian Armed Forces are concerned that the defense industry is concentrated in the south, requiring long supply lines and complex logistics. This concern is likely shared in Sweden and Finland. As a result, there is a push to develop defense industry capacity in the north, including production, maintenance, and storage of all categories of equipment — such as spare parts for key weapons systems.

In Mid-Norway, several small firms already produce physical security solutions. The MIDSEC Defence and Security Cluster, based in Trøndelag, supports business development in the defense and security industry. A similar organization has been established in Sweden: the Nordic Industry Cluster, coordinated by IUC Jämtland and Härjedalen.

The establishment of new defense industry capacity is urgent. In the 2025 state budget, the Norwegian government has allocated NOK 967 million to strengthen the national defense industry, including:

- Small and medium-sized companies supplying Ukrainian forces
- A new rocket motor production line
- Norwegian hexamine production for explosives
- A feasibility study for a new explosives manufacturing facility

The EU is preparing a new defense industry program, which Norway plans to join. The goal is that by 2035, 60% of all new defense materiel will be produced in Europe (currently 22%), and at least 40% of procurement will be joint European. The European Defence Investment Program (EDIP) is expected to be adopted in spring 2025.

Except for BAE Systems, there is little defense industry in the E12 region — but there is significant metalworking industry. MidtSkandia could initiate a development project for this industry across Northern Norway, Sweden, and Finland, aiming to increase supply of materiel, components, and spare parts for weapons systems, vehicles, and energy infrastructure. This could be done in collaboration with MIDSEC or other industry clusters and would enhance the military relevance of the E12 region.

EU Requirements for Dual-Use Military and Civilian Infrastructure

The EU is investing heavily in the Trans-European Transport Network (TEN-T). System and plan coordination is essential for the competitiveness of export-oriented industries.
In 2021, the European Commission adopted a regulation setting technical requirements for infrastructure used for both civilian and military purposes (dual use). The regulation does not define specific corridors, but outlines standards for airports, ports, rail terminals, and transport networks.
Key requirements include:

- Three berths for ships 310–340 m in length, 12–14 m draft
- Support for ro-ro ships (roll-on/roll-off cargo)
- Three rail sidings in ports, one 300+ m long, to allow simultaneous loading/unloading
- Electrified railways with backup power in multimodal terminals
- Freight trains up to 740 meters long
- Road width minimum 8.2 m for opposing traffic, with 130-ton gross vehicle weight
- Max load height: 4.5 m, length: 27.5 m
-

Norway is not part of the EU's transport infrastructure funding program, but should build to these standards. The regulation includes 49 specific requirements.

Comparison of EU Requirements with the Current Transport Network

Mo i Rana, Storuman, and Umeå are likely to become key hubs in a security context, with well-developed multimodal infrastructure. The biggest gap in the E12 region is the lack of an east–west railway link between Storuman and the Nordland Line. Much of the network is not electrified.
International standard train length is 740 meters, but:

- Norway: 450–480 m
- Sweden: up to 620 m

Cross-border routes like Oslo–Narvik are being upgraded, but full adaptation may take decades.
There's mismatch in the regulation between train length and siding length requirements — only one siding >300 m is required, which exists in Mo and Umeå, though port draft in Umeå is 10.2 m (requirement: 12 m); Mo i Rana has a 15 m deep quay and is building a new deep-water terminal.
Road infrastructure diverges significantly from the 130-ton EU standard. Norway's max gross weight is 76 tons. The E12 is narrower than 8.2 m in some stretches (e.g., Mo–Hemavan), though national standards allow 7.5 m width in low-traffic areas.

The regulation doesn't require all corridors to include rail and airports, but good rail access is preferred, especially for land transport over 200 km.

From left: Finland's Minister of Defence Antti Häkkänen, Finland's President Alexander Stubb, Prime Minister Jonas Gahr Støre, and Minister of Defence Bjørn Arild Gram during the signing of the Memorandum of Understanding (MoU) between Finland and Norway, at the Prime Minister's meeting in Bodø, June 19–20, 2024. Photo: Torbjørn Kjosvold / Norwegian Armed Forces

4. PREPAREDNESS AND CIVIL PROTECTION

Strengthening Civil Defense

The military defense and civil defense together form the concept of total defense. This concept encompasses mutual support and cooperation between civilian and military sectors to prevent and manage crises, conflicts, and war.

Civil defense in Sweden is significantly more comprehensive than the Civil Protection system in Norway. It encompasses all of society and includes all functions that must continue to operate, even in times of crisis and war. As such, many organizations are part of civil defense, including businesses and voluntary organizations. The Armed Forces and the County Governors (*Länsstyrelsen* in Sweden) hold overall responsibility.

The County Governor coordinates civil protection efforts among public agencies and oversees municipalities' work on civil security. This supervision includes:

- Assessing municipalities' understanding of their vulnerabilities
- Evaluating their risk assessments regarding unwanted incidents
- Reviewing their efforts in prevention, preparedness, and crisis management

This chapter discusses three key themes particularly relevant for the E12 region:
Strengthening Civil Defense

- Inter-municipal cooperation on preparedness for unwanted incidents
- Increased supply security through the establishment of regional centers for critical products
- Facilitation of alternative transport corridors in the event of prolonged disruptions in the core corridors

Over the past decade, the total defence concept has been modernized. New types of societal risks have received increased attention, creating a need for enhanced emergency preparedness. A closer collaboration between the Armed Forces, civil authorities, and private actors has been established, partly due to the Armed Forces' growing dependence on business and civil authorities.
In 2022, Sweden made significant changes to the organization of its civil preparedness. A clearer structure was established for responsibility, leadership, and coordination of the civil part of Sweden's total defence. The purpose of the reform was to strengthen emergency preparedness, for example, by making critical societal functions more robust and enhancing cooperation with businesses. Sixty of Sweden's 343 state agencies were given the status of preparedness authorities. In addition, the Psychological Defence Agency (MPF) and the National Cybersecurity Center (CFCS) were established.

Ten preparedness sectors were defined, each with a corresponding responsible agency, covering areas such as electronic communication, energy supply, healthcare, financial services, and transport. The reform also introduced a new division of six geographic areas for civil defence. The Swedish Civil Contingencies Agency (MSB) has estimated that building sufficiently strong civil defence will cost SEK 27 billion annually from 2026 to 2030.

Norwegian Total Defence and NATO Strategy

Recent developments in Norway's total defence have been closely aligned with NATO's strategic initiatives, especially with an emphasis on resilience. In 2016, NATO adopted a four-step strategy to strengthen civil preparedness in member states. The first step involves increased resilience in seven critical societal functions:

- Ensuring continuity of government and essential public services
- Securing a robust power supply

- Managing uncontrolled movement of people
- Securing food and water supplies
- Handling mass casualty incidents
- Ensuring resilient civil communication systems
- Ensuring resilient transport systems

In January 2022, the Norwegian government appointed a Total Preparedness Commission, which submitted its report in June 2023. This report, spanning 554 pages and subtitled *"Now it's serious"*, will inform a white paper to be presented later this year. The Commission concluded that preparedness must be improved in many areas. It found the situation in the northern regions, particularly the North Calotte and Norway's northern areas, to be worrisome.

The geographic definition of Norway's northern areas includes land and sea from South Helgeland in the south to the Greenland Sea in the west and the Pechora Sea (southeastern Barents Sea) in the east. In chapter 9.5, the report highlights:

"More extreme weather in already highly weather-exposed areas demands more from preparedness and increases the risk of various undesirable events. Northern Norway marks the end of national supply lines and faces significant challenges in accessibility and regularity. Infrastructure is vital locally for freight, medicines, healthcare, and emergency response. Large distances mean the region heavily depends on air transport. Supply challenges become critical when infrastructure for power, transport, or electronic communication fails."

Additional threats include a potential influx of Russian citizens and nuclear incidents such as radiation from nuclear waste. The Commission emphasizes that strong local communities in the north must be prioritized for both security and preparedness reasons. It asserts that each sector—especially the Armed Forces, which will increase its presence—bears special responsibility.

Municipalities' Role in Preparedness and Security

Local and regional levels play key roles in civil protection. All events occur within a municipality. Examples include extreme weather, major accidents, fires, and epidemics. As vital functions and services are increasingly digitized, the risk landscape becomes more complex and volatile. Local actors must understand the challenges and be well-coordinated.

Municipalities are legally obliged to integrate preparedness and crisis management into daily operations. They must assess potential undesirable events, their likelihood, and potential impacts, and summarize the findings in a comprehensive Risk and Vulnerability Analysis (ROS). This analysis forms the basis for the municipality's preparedness plans. The Commission found that this work could be improved, citing a 2020 survey showing many municipalities have outdated plans and lack follow-up measures.

The Directorate for Civil Protection has developed a knowledge base on natural disasters to help strengthen preventive efforts.

Threats to Societal Security

A core challenge is prioritizing among the many threats to societal security. In 2023, Sweden's MSB published a list of 17 potential critical incidents, noting that their likelihood hasn't increased—but the scope of events to plan for is vast.

In May 2024, the County Governor of Nordland presented a regional ROS analysis evaluating 16 scenarios, including shipwrecks, major accidents involving hazardous goods, offshore nuclear incidents, and prolonged power outages. A flu pandemic ranked highest on the risk matrix due to its combination of likelihood and impact.

A critical aspect of preparedness is assessing vulnerability: the ability of essential functions to withstand incidents. The analysis in Nordland focused on nine such functions, including supply security, transport, and water/sewer systems.

Norway rarely conducts exercises for security-policy scenarios compared to Sweden. Thus, extra funding was allocated for municipalities wanting to train with the Armed Forces and Police. In Västerbotten, Sweden, 17 seminar exercises were conducted with municipalities, the regional health system, and the police in 2023–2024, involving 281 participants.

Supply Security and Emergency Stockpiling

The Commission summarized its 10 main recommendations:

1. A resilient and enduring population
2. Strengthen local and regional preparedness
3. Improve cross-sectoral cooperation
4. Integrate businesses into national preparedness structures
5. Develop national situational awareness, leadership, and unified advisory structures
6. Expand Nordic cooperation
7. Further develop basic preparedness
8. Strengthen the role of volunteer organizations
9. Improve infrastructure and digital security
10. Strengthen supply security

Several of these, especially point 10, are highly relevant for cross-border cooperation projects. The E12 corridor is strategically located with multimodal transport terminals and well-developed infrastructure in all directions. It is also unlikely to be the frontline in security-policy conflicts. The E12 corridor offers better storage potential for emergency supplies critical to societal security in Northern Norway and Sweden compared to E10 and E14. NATO's planning assumptions require 30 days of supplies, though this depends on the scenario.

The Commission points to Finland as a model. There, the National Emergency Supply Agency (NESA) plays a central role, managing an emergency fund through levies and organizing 25 industrial pools across seven key sectors including food, energy, transport, and health. These pools include critical companies, trade associations, public authorities, and the Finnish military. Procurement regulations, the Commission notes, must better account for emergency preparedness when needed.

A relevant MidtSkandia project could aim to give the E12 corridor a key role in enhancing total defence supply security—through stockpiling in hubs like Mo i Rana, Storuman, or Umeå and establishing emergency supply centers in cooperation with the Armed Forces and businesses.

Cooperation on Preparedness in the E12 Corridor

The Commission strongly emphasizes strengthening municipal preparedness. It recommends: “New mandates from national authorities that increase municipal resource use must be followed by increased funding. All municipalities must be required to join a preparedness council.

Preparedness plans must be resourced—funded and with the planned capacities readily available. Extended inter-municipal and regional collaboration is essential, especially where individual municipalities lack sufficient resources. Mutual aid and formal cooperation are key focus areas."
It is unclear how municipalities and regions along the E12 corridor currently collaborate on emergency planning, incident prevention, exercises, and stockpiling. Funding appears limited. Earlier in 2025, a pre-study in Västerbotten assessed civil preparedness, focusing on regional leadership and the healthcare board. It recommended deeper analysis of medical and pharmaceutical stockpiling.

A potential project could be extended collaboration between municipalities on emergency equipment storage for natural disasters that may disrupt critical infrastructure—like the E12, energy supply, and digital infrastructure—for prolonged periods. This initiative should come from regional authorities responsible for civil protection.

The Role of Business in Preparedness and Security

Another key message from the Commission is that businesses are not sufficiently integrated into preparedness efforts. Along the E12 corridor, there are several metalworking businesses—from recycling and mechanical workshops to precision manufacturing of components and spare parts. These are vital for regional defence and post-incident repairs.

The war in Ukraine has demonstrated the importance of mechanical industry resources and competence. The Norwegian Chief of Defence stated in 2023: "Supply chain delays and cost increases from the pandemic are compounded by the Ukraine war. Both Ukraine and Russia are major suppliers of raw materials and metals for modern systems. Market instability and delivery issues shorten industry timelines, limiting our own decision-making time. Low industrial production over time, and lack of focus on stockpiling, worsen these challenges. Scaling up production depends on a financial foundation. We must plan for longer delivery times."
The ability to produce components and spare parts is especially critical. For example, Norway supplied Ukraine with 22 M109 artillery vehicles early in the war. Over half are now unusable due to lack of spare parts (according to *Forsvarets Forum*, September 2024).

MidtSkandia should aim to highlight and expand the role of mechanical industry in security-related tasks and bolster national supply security by producing key components domestically instead of relying on overseas suppliers. Regional defence and security industry development is also discussed in chapter 3.4.

Backup Solutions for Critical Infrastructure Disruptions

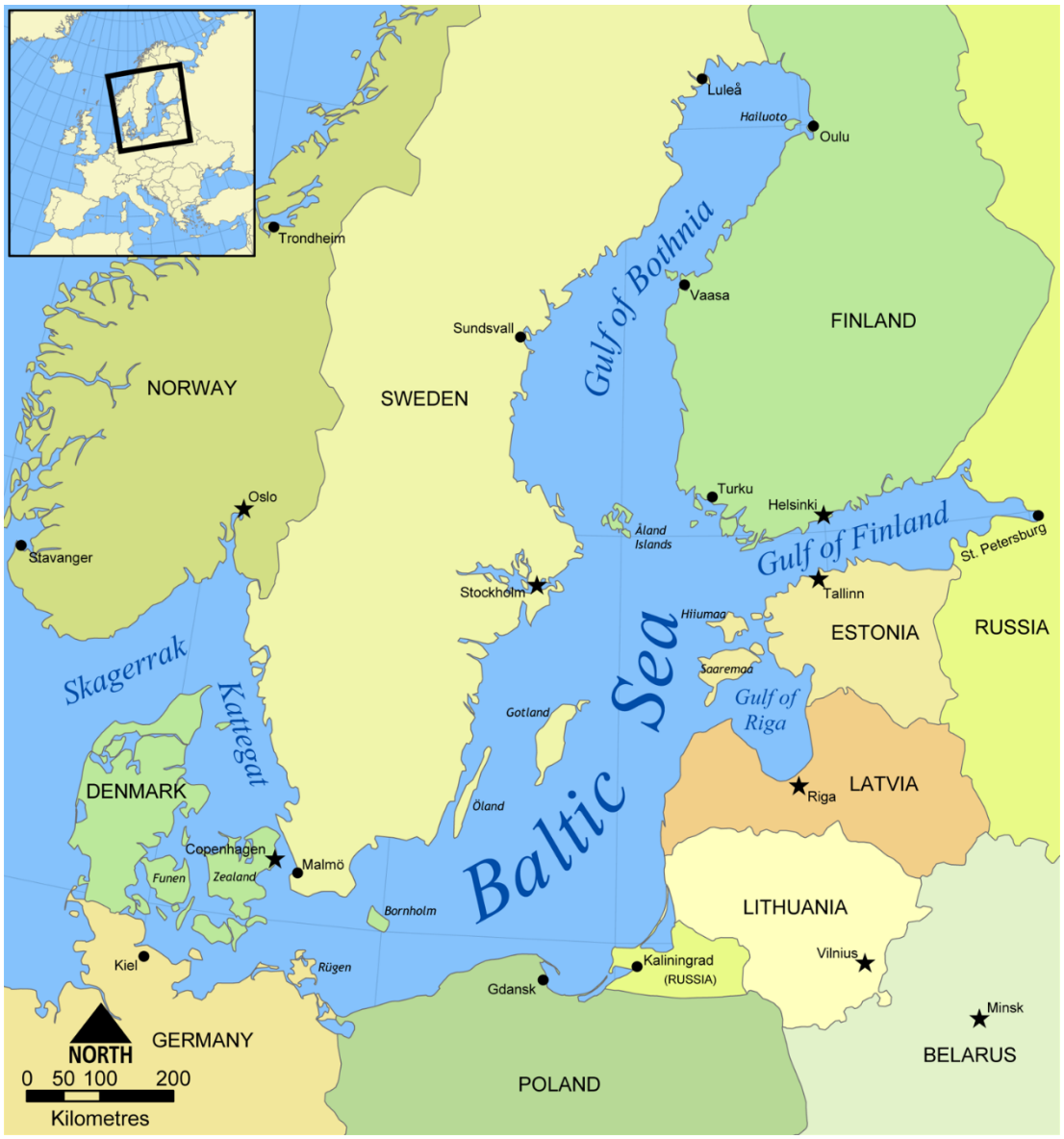
Recent events have shown that critical transport infrastructure is vulnerable to hybrid warfare and extreme weather. Lack of maintenance or upgrades—like on the Malmbanen railway—is a key cause of prolonged outages. Alternative transport routes are essential, as Finland's Prime Minister stated in Bodø. Both Sweden and Finland rely heavily on Baltic Sea maritime transport. The war in Ukraine has exposed the vulnerability of underwater infrastructure and bridges to sabotage. Sweden and Finland's NATO membership has increased military activity in the Baltic. Two gas pipeline explosions occurred in 2022 and 2023. The cause of the second is unclear—possibly sabotage or weather-related.

Ukraine has attacked Russian military ships in the Baltic in 2024. Russia has placed cruise missiles northeast of Finland and hinted at border changes in the eastern Gulf of Finland. There has also been a sudden influx of migrants from Russia to Finland.

Hybrid warfare against Western countries has surged in recent years. Attacks on installations in Europe happen daily, most of which are thwarted. Climate-related incidents add to the threat.

NATO's former Secretary General Jens Stoltenberg said in 2023:
"The war in Ukraine shows how crucial it is to move supplies and troops in a crisis. Nordic countries have lots of north–south infrastructure but few cross-border links. We must improve ports, rail, and roads to move military assets between our countries."

Railway networks are most vulnerable. Only one route exists between the Baltic and the Atlantic in Northern Norway and Sweden. This weakness is likely to be emphasized in upcoming studies on cross-border defence logistics.



Map of the Baltic Sea (www.wikimedia.org)

5. NEW TRANSPORT NEEDS AS A RESULT OF THE GREEN TRANSITION

The Green Transition Creates New Traffic Flows

The greatest challenge of all is decarbonization and the transition to a climate-neutral society by 2050. The emissions of CO_2 equivalents in Norway, Sweden, and Finland in 2023 were 46.6 million tons, 44.2 million tons, and 40.6 million tons respectively. Of these, the industrial sector accounts for 10–15 million tons of CO_2 equivalents in each country, either related to production processes or to energy generation, such as oil and gas.

Another major source of emissions is transportation by ships and heavy vehicles. All emissions are measured within each country's own territory. However, the transport sector also generates significant emissions from cross-border operations, which are not included in national emissions statistics.

Globally, total emissions of CO_2 equivalents were estimated at 37.5 billion tons in 2023. There is therefore a large market for solutions with international competitiveness. This chapter discusses two topics of particular importance for the E12 region:

The Green Transition
- Strong growth in the production of renewable energy sources
- Strong growth in the transport of CO_2 for storage in the North Sea

To achieve climate neutrality, the carbon footprint of fossil fuel combustion must either be remove through carbon capture or replaced with fossil-neutral or fossil-free energy sources. Both options imply new and significant traffic flows. Today, most oil and gas are transported to the European market via interconnected pipeline systems. It is unlikely this scale of pipeline-based transport will be maintained when production sites and volumes per site change. Consequently, maritime and rail transport will become vital for transporting new energy carriers.

Many countries lack the necessary input materials to develop fossil-free energy carriers at the desired scale—such as wind, water, minerals, and biomass. These are resources that the E12 region has in significant surplus. Therefore, it is reasonable to assume there will be high future demand for fossil-free or fossil-neutral energy carriers in various forms from countries outside the Nordic region, either as finished products or as processed raw materials.
All countries aim to establish new green industries that generate many jobs and economic ripple effects. A good example is battery production in Skellefteå and Mo i Rana. Although green industries face considerable start-up challenges due to emerging technologies and overproduction in other countries, they will over time lead to substantial growth in demand for maritime and rail transport to and from international destinations. Energy storage is also a necessary supplement to wind and solar power production in many European countries.

The EU's position on investing in new fossil-free energy carriers is that there is no alternative. To complete the green transition without being dependent on China, the USA, and Russia, Europe must build its own industry in the critical sectors upon which society depends.

High Uncertainty Around Future Energy Forms

The goal of CO_2 neutrality by 2050 in industry and heavy transport cannot be achieved using only wind, solar, and hydropower. It would be too expensive to expand the grid, and likely too

controversial due to land use conflicts. Another energy source with high transport demands is natural gas. In various forms, gas is a key energy source today and will remain so for decades.

Natural gas is a fossil fuel formed under high pressure over hundreds of millions of years. Both natural gas and biogas mainly consist of methane (CH_4), meaning they can substitute for each other. Natural gas is divided into dry and wet gas. Dry gas is primarily methane and is sold as "natural gas." Wet gas includes heavier hydrocarbons such as ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), and condensates, and is known as NGL (Natural Gas Liquids). Natural gas has lower energy density compared to, for example, coal. By cooling it to a liquid state, its volume is reduced by a factor of 600, and it is called LNG (Liquefied Natural Gas). The only large-scale LNG production facility in Europe is located at Melkøya in Hammerfest Municipality.

While natural gas or biogas reduces CO_2-equivalent emissions compared to other fossil energy carriers, they are not fossil-free. One challenge is methane leakage during extraction. Methane is 28 times more potent than CO_2 as a greenhouse gas but leaves the atmosphere more quickly. Since the 2000s, atmospheric methane emissions have increased significantly, partly due to increased releases from wetlands and tropical areas driven by a milder climate.

Both the UN and the EU point to hydrogen as a more durable solution for phasing out fossil energy and transitioning to a low-emission society. Extensive research is being done to produce hydrogen from natural gas by making it react with steam and oxygen at high temperatures. If CO_2 is captured as a by-product, the result is called *blue hydrogen*. Hydrogen can also be produced through electrolysis of water; if done using renewable energy, the result is *green hydrogen*. This production requires large amounts of energy and water, making it most viable in areas with a significant surplus of both—such as the E12 region—provided such use does not conflict with other societal priorities. Today, compressed hydrogen is traded in tanks pressurized to 350 or 700 bar, similarly to compressed natural gas (CNG). To reduce transport volumes and storage risks, it is desirable to convert natural gas, biogas, and hydrogen into liquid energy forms. Hydrogen becomes liquid at atmospheric pressure when cooled to -252.87°C—yielding the most energy-dense form of hydrogen, although the cooling is very energy-intensive. Once liquefied, it must be stored immediately in well-insulated cryotanks.

In the future, it will likely be more practical to store hydrogen with solid materials or other chemical compounds. Ammonia is the most relevant due to its higher liquefaction temperature. However, ammonia is highly toxic and corrosive in high concentrations. Hydrogen readily forms bonds with elements such as magnesium, creating *magnesium hydride*. Research from the Institute for Energy Technology (IFE) and Hydrogen Storage shows that hydrogen storage as magnesium hydride is safer and more efficient. It also stores more energy per volume than liquid or gaseous hydrogen and is released as a paste when it comes into contact with water.

Many of the new energy carriers are classified as hazardous goods. Therefore, large-scale transport by ship or rail is preferable to smaller-scale road transport.

Production and Transport of Gas and Hydrogen

Among the most important transition projects is the conversion to new energy carriers in the mineral and metal industry. LKAB aims to produce sponge iron instead of iron pellets using green hydrogen in furnaces, replacing fossil coal. Full conversion by 2045 could reduce emissions from customers such as steel producers by 40–45 million tons of CO_2 annually.

The demonstration plant is being built in Gällivare, with a production capacity of 1.3 million tons of sponge iron per year. This requires 5 TWh of energy annually, mainly for green hydrogen production. LKAB's total ore production is about 30 times larger than the demonstration facility. It will not be possible to produce the necessary amounts of green or blue hydrogen directly at the furnace locations. Therefore, large volumes of fossil-free energy must be transported from other regions by sea and rail. Malmbanen has long been overburdened, so additional transport corridors are needed. LKAB has stated that it could become Europe's largest buyer of fossil-free energy.
Forests play a key role in replacing plastics with renewable materials and have many other uses—such as producing biofuels and biochar. Boliden, Nevel, Skellefteå Kraft, and Sveaskog are conducting a feasibility study to produce green hydrogen and biofuels in Västerbotten. The goal is to replace fossil fuel consumption at Boliden's smelter in Skellefteå with alternative energy carriers.

The EU strategy envisions hydrogen increasing from 2% of Europe's energy consumption in 2018 to 13–14% by 2050. It has set concrete goals for building a European hydrogen production system:

- 2020–2024: 6 GW renewable hydrogen electrolysers and 1 million tons of green hydrogen
- 2024–2030: 40 GW renewable hydrogen electrolysers and 10 million tons of green hydrogen

There are many ongoing projects in green hydrogen production and distribution. One initiative is a feasibility study for a 2,500 km pipeline between Finland, Poland, and the Baltic countries. One producer, Gen2 Energy, was granted a building permit in 2023 to establish a plant in Mosjøen. Like others, they plan to deliver hydrogen in custom containers by ship and rail. A 40-foot container typically holds about 25 tons. To meet EU targets, 400,000 such containers must be transported in Europe by 2030.

As a major natural gas exporter, Norway is also very interested in producing blue hydrogen for Europe, which requires CO_2 capture. It is likely that Norway will have high exports of both green and blue hydrogen in the future.

Transport of Captured CO_2 in the E12 Region

Carbon capture and the transport of liquefied CO_2 to storage sites—such as depleted oil wells in the North Sea—will become a major industry. Capturing CO_2 from industrial and combustion facilities is seen as the most effective measure for rapidly reducing greenhouse gas emissions.
The EU's goal is to remove 310 million tons of CO_2 through carbon capture by 2030. Norway's goal is 5.2 million tons. The gas is transported in liquid, cooled form by ship or in compressed form through pipelines. Several carbon capture projects are underway in Norway, Sweden, and Finland. In Norway, a capture plant is being built in Brevik to treat flue gas from cement production. Although the cost per ton of captured CO_2 is high, there is strong political will to invest in carbon capture to reduce emissions.

Effects on Transport Demand in the E12 Region

The greatest impact on sea and rail transport demand from the green transition is expected in 10–15 years. Significant green hydrogen production may emerge in the E12 region. Norway, Sweden, and Finland have favorable natural conditions for producing and exporting new energy carriers. Demand is unlikely to be the main obstacle—assuming competitive transport costs.
A key issue will be balancing the production of fossil-free or renewable energy with other societal considerations. Major efforts in industrial energy conversion will also be needed. Around 40 million tons of CO_2 from heavy industry and transport in Norway, Sweden, and Finland must be eliminated by 2050 to achieve carbon neutrality.

Converting the largest emission sources to hydroelectric energy would require investments so large they may be infeasible—as demonstrated by the electrification of gas production at Melkøya, which requires as much electricity as all of Finnmark currently consumes.
Conclusion: The green transition will necessitate significant investments in the transport network to handle new, high-volume goods flows that are still in their early stages today.

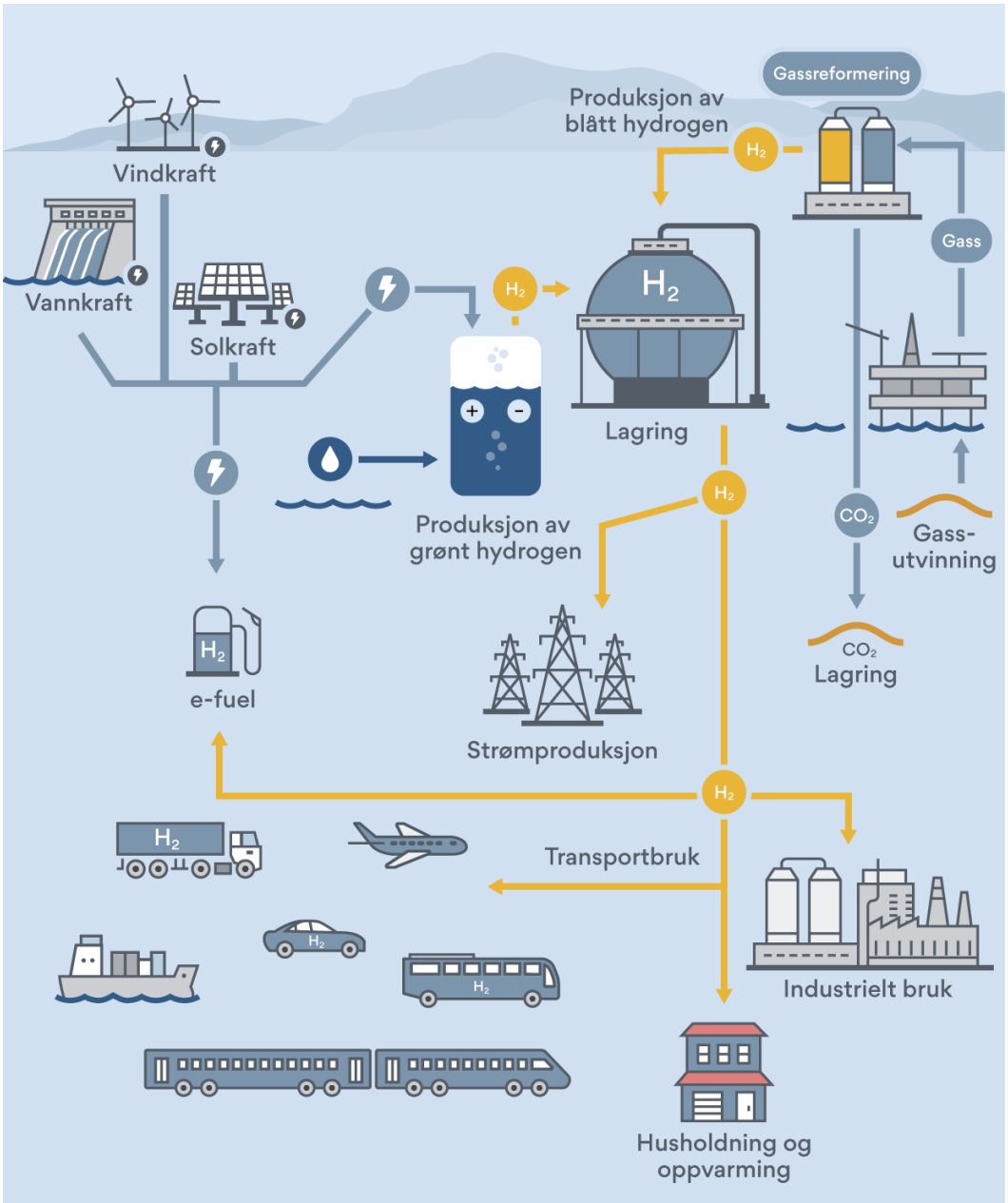


Figure 6: Illustration of hydrogen production and use. Source: Norwegian Climate Foundation (www.energiogklima.no)

6. PROJECTS IN BUSINESS DEVELOPMENT

Many Opportunities in the Sustainable Use of Natural Resources

In Mo i Rana, Celsa Nordic Group produces reinforcing steel based on recycled steel from Celsa Recycling and other partners across the Nordic region. A comprehensive recycling industry is expected to emerge if ambitious political targets for 2040 are to be met. Steel already has a high recycling rate compared to other metals and product categories. Plastic recycling, however, is a high-priority area where current recycling rates are low.
Establishing new process industries requires substantial volumes and the management of residual products that are currently considered waste. In addition, access to electricity or other fossil-free energy sources will be necessary to avoid the need for flue gas CO_2 purification. Establishing new process industries in the E12 region is challenging, especially in areas where such industries do not currently exist.

Helgeland, Västerbotten, and the E12 regions in Finland all have rich natural resources that will become increasingly attractive. As such, the production of raw and processed materials will primarily drive growth in transport demand toward 2050. The most transport-intensive goods flows are minerals and biobased raw materials. In the forestry sector, a well-established system already exists for transporting raw materials to industrial facilities along the Baltic Sea. In the mineral sector, however, most resources still remain in the ground—this is where the largest growth in transport demand is likely to occur.

This pre-study is therefore focused on the plans and expectations within the mineral sector. However, there are multiple driving forces for business development and for the development of transport systems using ships and freight trains:
Business Development

- Increased cross-border transport as a result of higher extraction of raw materials, such as minerals and biomass
- More jobs in the North, which in turn increases the demand for transport, both within each country and across borders
- EU requirements for strengthening cross-border transport corridors

Extraction of Ore and Minerals

Both Nordland and Västerbotten have significant mineral industries. The production of metals and minerals carries a security policy dimension that will grow in importance as global demand increases. The rapid pace of technological innovation has only been possible because an ever-expanding range of metals and other raw materials are being utilized. Many of these metals are extracted in countries with low environmental standards and authoritarian political regimes.
China holds a dominant position in the production and distribution of critical raw materials, which are crucial for the speed of the green transition. The issue is not a lack of raw materials per se. The main challenges lie in insufficient extraction, lack of economic viability in utilizing by-products, and monopolization of production.

In 2023, the EU published a list of 34 critical raw materials considered to have the highest supply risk and the greatest significance for the European economy. A high supply risk means that there are only a limited number of global suppliers. At the same time, the EU compiled a list of 17 strategic raw materials—those for which strong growth in demand is expected. To a large extent, these materials are also critical. An exception is aluminium, which is considered strategic but not critical.

One of the challenges is that critical raw materials make up only a very small share of total mineral production. They are typically extracted as by-products of other mining operations and must be separated and refined through dedicated processes. The proportion of technology and precious metals is illustrated in the figure below:

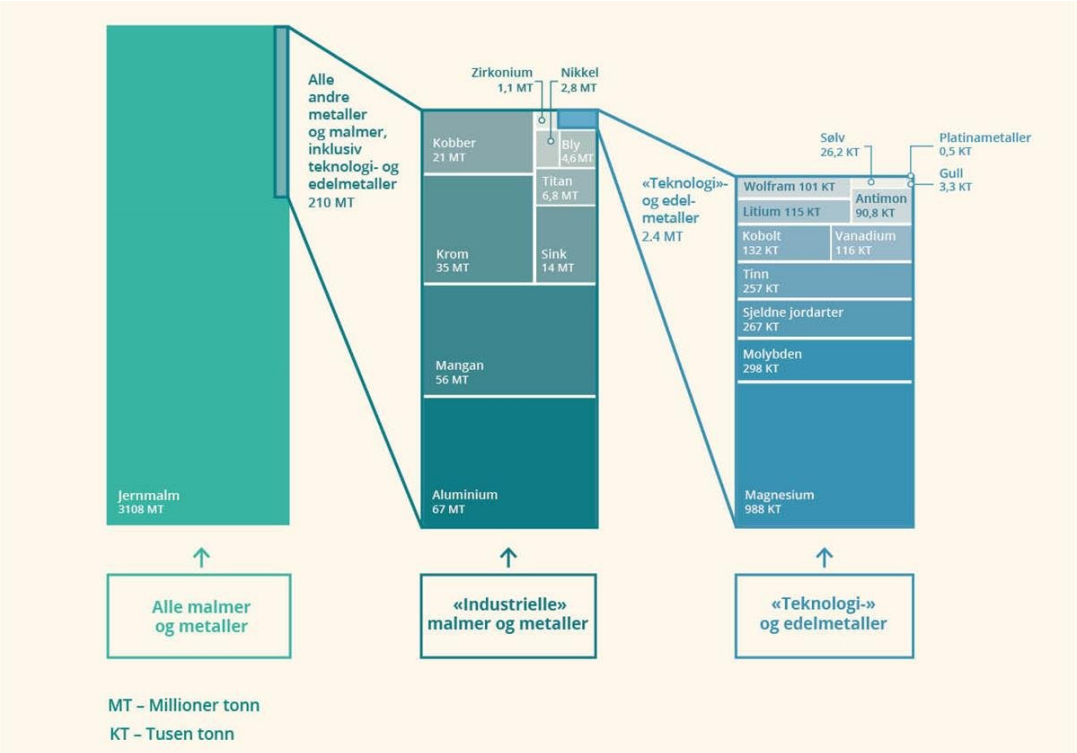


Figure 7: Composition of global mineral production. Source: BGS World Mineral Production 2017–2021 (reproduced from the Norwegian Government's mineral strategy)

Classification of Mineral Resources in Norway

In Norway, mineral resources are divided into five categories:

- Metals
  Elements extracted from metal-bearing minerals.
- Industrial minerals
  Minerals and rocks with industrial applications.
- Natural stone
  Stone that can be sawn, split, or carved for use in buildings, monuments, and outdoor areas.
- Energy minerals
  Minerals that can be converted into energy, such as coal, uranium, and thorium.
- Sand, gravel, and crushed stone
  Naturally occurring aggregates or crushed rock used for construction purposes.

The largest volumes in land-based extraction are sand, gravel, and crushed stone, with a production of 81 million tons in 2023. These materials are extracted in all counties and are primarily used for domestic consumption. By comparison, 2.4 million tons of metals and 8.1 million tons of industrial minerals were sold.

In 2023, there were only two companies in Norway with continuous extraction of metallic ore:

- Rana Gruber AS (magnetite and hematite)
- Titania AS in Rogaland (ilmenite)

Additionally, mining licenses have been granted to three new metal ore mines since the Mineral Act came into force in 2010:

- Nussir Copper Mine
- Engebø Project (rutile and garnet)
- Reopening of the Sydvaranger Mine

Industrial minerals extracted in Norway include dolomite, feldspar, graphite, limestone, quartz/quartzite, nepheline syenite, and olivine. These minerals are used in products such as paper, microchips, solar panels, mobile batteries, and paint.
Nordland County is by far the largest exporter of metallic and industrial minerals.
Norway has known occurrences of 14 out of the 34 critical raw materials listed by the EU, including copper and nickel. For four of them, production is already established, such as ultra-pure silicon.

Sweden's Mining Industry

In 2023, Sweden's mining industry produced 84 million tons. Iron ore dominated with 36 million tons, representing 93% of Europe's iron ore production—but only 1% of the global market. Sweden also has a relatively high share of European production of zinc, lead, and copper.
Most mineral extraction occurs in three main regions:

- Norrbotten
- Skelleftefältet
- Bergslagen
-

By the end of 2023, there were 12 active mines in Sweden, four of which were in Västerbotten:

- Kristineberg, Björkdal, Kankberg, and Rönnskär

These mines extract gold or base metals.
Sweden updated its national mineral strategy in 2013, and a new one is in development in accordance with EU guidelines. Eleven years ago, there were six operating mines in Västerbotten between Storuman and Skellefteå, mainly extracting gold and base metals. At that time, there was great optimism about the establishment of new mines:

According to the Swedish Geological Survey (SGU), there could be around 30 metal mines in Sweden by 2020, up from 16 at the time. By 2030, as many as 50 mines could be in production. The forecast was based on the mining capacity of projects that had obtained or applied for processing permits and were actively pursuing them. The forecast assumed all permits would lead to active mines.

That did not happen. As in Norway, the number of operating mines has declined. A century ago, Sweden had 500 operating mines. Fifty years ago, there were 100. Still, current production volumes are far higher than they were 50 years ago.
The 2013 mineral strategy emphasized research and innovation, cooperation with the reindeer herding industry, and recruiting skilled labor. Sweden also has a mineral category known as *conflict minerals*, which includes gold and tungsten. These minerals are extracted in conflict zones where the revenue is likely used to finance weapons purchases. The EU will introduce a new regulation promoting more responsible sourcing of mine minerals among importers, known as the EU Conflict Minerals Regulation.

More State Control in Mineral Resource Extraction

The EU has set ambitious targets for building up Europe's mineral industry by 2030. These targets span the entire supply chain—from extraction to production and recycling—to reduce the vulnerability of critical raw material supply. In response to the EU's *Critical Raw Materials Act*, the Norwegian government presented its national mineral strategy last year, structured around five focus areas:

1. Mineral projects must be realized faster
2. The mineral industry must contribute to the circular economy
3. The mineral industry must become more sustainable
4. Private capital is essential for profitable and sustainable projects
5. Norway shall be a stable supplier of raw materials to green value chains

The government aims to reduce processing time and facilitate faster approval processes.
The Directorate of Mining with the Commissioner of Mines at Svalbard has been designated the expert authority. A *"mineral compass"* is being developed to provide better information for project developers and affected stakeholders. This compass will be most useful in the early exploration phase, offering data on regulations, biodiversity, other industries, and cultural heritage.
There are also considerations to establish a state-owned mineral company or a mineral fund, with financial instruments to promote increased extraction, improved sustainability, or greater local value creation.
Mineral extraction generates large amounts of excess material. The government aims to minimize this through requirements for a circular business plan that outlines how surplus materials can be reused.

Challenging Approval Processes

In Sweden, the approval process for starting production consists of four phases:

- Exploration permit
- Exploitation concession
- Environmental permit
- Land allocation/building permit

According to the International Energy Agency (IEA), it takes an average of 16.5 years from the discovery of a mineral resource to the start of production. In Norway and Sweden, it may take even longer.

An article in *Finansavisen* (August 5, this year) discussed SMA Mineral, which aims to establish a new production process at its factory in Mo i Rana using local dolomite. The drilling survey was conducted 30 years ago. Twelve years ago, an agreement was made with the Saltfjellet Reindeer Grazing District. Nine years ago, the application for an operating license was submitted to the Directorate for Nature Management. Notably, the new generation in the grazing district holds different views on the agreement than those who originally signed it.
Like the EU, the Norwegian Mineral Industry Association wants to significantly shorten the approval process. They propose three specific measures:

- Establish a clear regulatory framework for processing applications, and give the Directorate of Mining a more coordinating and advisory role in addition to being the licensing authority
- Introduce time limits for consultation with the reindeer industry
- Merge multiple local processes and hearings into a single process

Regional Facilitation for Mineral Extraction

There are significant mineral deposits along the entire E12 corridor, including in Nordland, Västerbotten, and Finland.
Attached is a map of registered mineral deposits of national interest in northern Sweden.

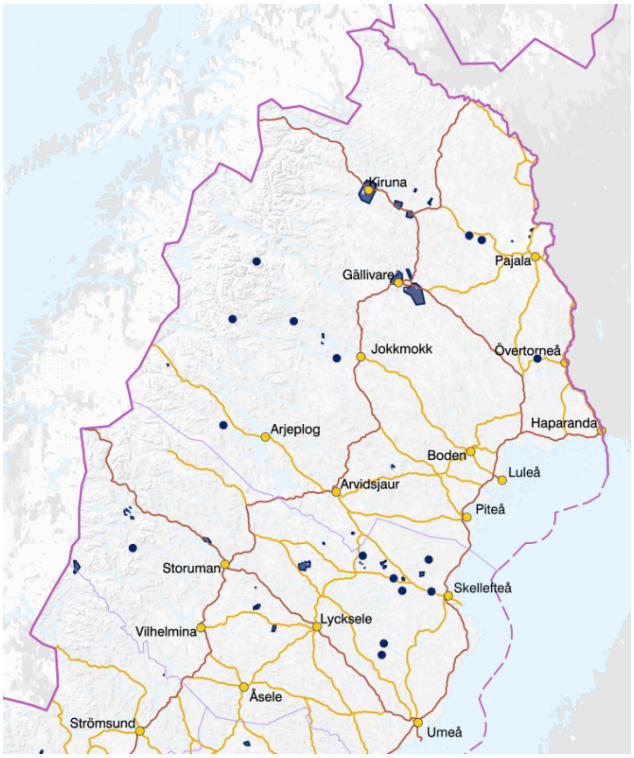


Figure 8 Registered mineral deposits of national interest Source: Geological Survey of Sweden (SGU)

New mineral production may increase the need for transport capacity and enhance the importance of the E12 corridor from a national perspective, while also contributing to regional value creation. A project could be based on the goal of more sustainable utilization of mineral resources. This aligns with international trends as well. Recommendations from international advisory bodies emphasize that the industry must place much greater focus on cooperation with the local communities in which they operate. 54% of all critical mineral resources are located in countries with Indigenous populations. There is also a need to develop new business models for value creation and place greater emphasis on small-scale production.

Municipalities have an important facilitating and advisory role, even though decision-making authority lies at the national level. There appear to be three key challenges that project developers seeking to extract new mineral deposits must prioritize in the years ahead:

- How to collaborate with local authorities and stakeholders in a way that minimizes negative impacts and helps shorten the timeline from exploration to extraction.
- How to create value from the residual materials produced—through dialogue with other stakeholders who may use the waste for their own purposes.
- How to develop new business models for collaboration, so that investment needs can be reduced in the initial phase and enable stepwise development.

Many of the minerals targeted for production will generate more than 90% residual material after extraction and processing. Authorities are clear that large-scale waste disposal is not acceptable. However, solutions do exist. For example, in the development of the E10 road, the Norwegian Public Roads Administration facilitated the use of excess rock material to reshape slopes, making them flatter. This makes it easier for reindeer to pass and reduces the need for guardrails to prevent accidents.

LKAB's mine in Kirunavaara. Photo: Henrik Montgomery /TT.

7. PLANS AND BARRIERS FOR FURTHER DEVELOPMENT OF THE TRANSPORT NETWORK

Transport Infrastructure in the E12 Corridor

Neither the Norwegian Public Roads Administration (Statens vegvesen) nor the Swedish Transport Administration (Trafikverket) has prioritized major investments in the E12 corridor for the coming decade. The only exception is the approximately 30 km stretch from Vännäs to Umeå. On this stretch, Trafikverket is planning two projects near Brännland and Vännäsby, aimed at improving road safety for cyclists and pedestrians, and enhancing public transport. Other corridors are receiving higher priority.

The largest road project in Nordland is the development of the E6 through Sørfold. Trafikverket's overview of ongoing and planned projects in Västerbotten shows that only the two projects near Umeå involve the E12—out of a total of 40 projects. By comparison, there are nine projects on the E4, most of which focus on upgrading to collision-free roads.
In 2023, Trafikverket's Region North prepared an assessment of the quality of the national road network in Norrbotten, Västerbotten, Västernorrland, and Jämtland. The report showed minor differences, but 13% of the national road network in Västerbotten was considered to be of very poor quality.

Access to railways has historically been important for industrial development in inland municipalities. Storuman is a hub where the Inlandsbanan connects with the Västerbotten Line (Tvärbanan). However, the railway is in poor condition compared to the road network. The stretch from Hällnäs to Storuman—about 160 km—is not electrified, and the maximum speed is limited to 70 km/h. This low speed makes it difficult to shift passenger traffic and goods other than bulk timber to the railway.

In 2023, Helena Lindahl (Centre Party) submitted a motion to the Riksdag proposing electrification. The argument emphasized the potential to shift freight traffic from road to rail. The decision was: "The Riksdag supports the proposal in the motion to review the possibility of financing the electrification of the Tvärbanan in Västerbotten and conveys this to the government."
It remains unclear what this decision entails. Many studies have been conducted since 2000, but they have not resulted in significant measures to enable new traffic along the railway.

The "Åtgärdsvalsstudie" (Measures Selection Study) of the E12 Corridor

Transport demand is crucial for national infrastructure investments. The market usually comes first, and infrastructure follows. However, in some areas—such as the transition to renewable energy carriers—the reverse is needed: infrastructure must come first to enable the market. Without charging and refueling stations, demand for vehicles that rely on new energy infrastructure remains weak.
The major focus in the transport sector toward 2030 is reducing greenhouse gas emissions. This will be achieved by converting the vehicle fleet to new energy carriers and by facilitating increased use of public transport, cycling, and walking.

For new project proposals, it is natural to refer to the "Åtgärdsvalsstudie" (Measures Selection Study) of the entire E12 corridor from Mo i Rana to Helsinki, conducted by Trafikverket between October 2014 and March 2016. The study involved broad participation from affected municipalities, regions, and stakeholders. Four workshops were held with 20–40 participants each.
The study resulted in a wide range of small and large initiatives, divided into 14 categories and organized according to the Swedish Transport Agencies' four-step model:

- Step 1: Rethink – Measures that influence the need for transport and choice of transport modes
- Step 2: Optimize – Measures that improve the efficiency of existing infrastructure and vehicles
- Step 3: Rebuild – Limited reconstruction measures
- Step 4: Build New – New investments and major reconstruction projects

In the study, participants placed the most emphasis on measures in Steps 3 and 4. Key priorities for the continued development of the E12 corridor included wider roads, improved intersections, and better winter maintenance.

There were expectations for the opening of a new nickel mine in Storuman Municipality, potentially generating up to 350 daily truck transports. Most of the Step 4 measures involved railway expansion. Among general needs, the highest priorities were traffic safety improvements, especially for cyclists and pedestrians. There were also expectations that increased tourism could trigger demand for new public transport services, including connections to the new airport in Rana.
The study includes 108 measures on the Swedish side and 30 on the Norwegian side. It could be of interest for MidtSkandia to request an overview from Trafikverket on how many of these measures have been implemented or are planned.
Below is the ranking of measures by category, as prioritized by participants in the final workshop (Trafikverket):

1. Accessibility and availability
2. Border crossing
3. Railway
4. Public transport
5. Tourism industry as well as mining and other major transport-intensive investments
6. Towns and cities
7. Review of 363/E12
8. Walking and cycling
9. Parking options and information points
10. Load-bearing capacity
11. Environmentally friendly travel
12. Operation and maintenance
13. Diversion routes and oversized transports
14. Reindeer husbandry

Facilitation of Service and Rest Areas

In recent years, the vehicle composition along the E12 corridor has gradually changed. Trucks are becoming larger and longer, and the number of motorhomes increases significantly during the summer season, while more microvehicles such as electric bikes and off-road vehicles (ATVs) also take to the roads. Road users' needs are evolving. When building new main roads in Norway, significant emphasis is placed on establishing rest areas and service stations tailored to different needs.
For example, full-service highway stations outside cities now have significantly larger plots—up to around 30 decares—and provide charging and refueling facilities as well as complete user services. North of Trondheim, there is a 24-hour service station located next to a hotel, offering a range of services for motorhome and truck drivers. Typically, the Norwegian Public Roads Administration acquires the land and tenders it out to service providers through 20–30-year contracts.

As for vehicles using electric charging infrastructure, there appears to be no special need for municipal facilitation, as a functioning commercial market already exists. In Storuman and Lycksele, there are about 30 charging points established near shopping centers, hotels, and offices.
The challenge lies with users of energy carriers that require different refueling infrastructure—such as biogas, methanol, or hydrogen. The primary target group for these energy carriers is likely to be users of heavy-duty vehicles, such as trucks, forestry and construction machinery, and energy-intensive industries. Hydrogen and methanol are also relevant for the introduction of new locomotives.

In Norway, 18 national scenic routes have been designated in areas of outstanding natural beauty. These feature rest areas with a focus on views, sanitation, and modern architectural design. The outer national road along the Helgeland coast between Holm and Godøystraumen is the longest scenic route in Norway, including six ferry crossings.

The *Åtgärdsvalsstudie* proposed that part of the E12 should become the first international scenic route between Norway and Sweden—for example, between Tärnaby and Hattfjelldal (Rv. 73). A special focus area could be how service facilities can integrate locally produced goods and services. Service stations can also play a role in emergency response.

The *Åtgärdsvalsstudie* showed that there are four rest areas maintained by Trafikverket on the Swedish side of the border: Tallbacken, Blåvikssjön, Buktes, and Gränsen. These are relatively simple rest stops, and the driving time between them ranges from one hour to two hours and twenty minutes. In 2016, Trafikverket had plans to build two additional rest areas.
There appears to be a significant need for more systematic planning of rest stops tailored to the needs of different road users—partly to avoid motorhomes stopping everywhere. Without a good structure for service facilities, fewer people stop, leading to reduced revenue for local businesses.
Municipalities could jointly initiate planning and construction of more modern rest and service areas along the E12 corridor, preferably in combination with other local services.

Diverse Perspectives on National Transport Models

In both Norway and Sweden, model-based analyses are critical to the investment decisions and traffic solutions that policymakers ultimately consider. Outside of expert circles, there is little knowledge of the factors included and how benefits are calculated. The guidelines for transport-economic analyses are set by the finance ministries in each country, based on input from expert groups on socioeconomic evaluations. The aim is to ensure consistent assessments across sectors.
Sweden delegates more decision-making authority to transport agencies regarding infrastructure investments than Norway does.

Over time, there have been varied views among professionals about the content and structure of these models. Previously, criticism focused on the lack of emphasis on “wider economic benefits” such as ripple effects from infrastructure investments. Today, there is growing concern about how poorly the models reflect environmental and energy effects, and maintenance needs.
There is also criticism that time savings are overvalued compared to other benefits like traffic safety.

From a MidtSkandia perspective, transport agencies’ models present several barriers:

- The societal benefits of investments stop at the national border—this includes emissions reductions. Cross-border east-west corridors always lose out to north-south corridors in current models.
- The models emphasize priced benefits from increased mobility, largely ignoring benefits to other markets and non-monetized effects (like environmental impact).

- The most valued factor is travel time savings. For freight, only the operator's savings are considered—the goods themselves have no value in the analysis. For passenger traffic, it's based on the traveler's perceived value. This inherently favors passenger over freight transport, and high-traffic corridors over low-traffic ones.
- Benefit estimates are based on historic traffic trends, and future traffic growth is projected using national forecasts. If a corridor previously had little or no traffic, investment can only be justified with concrete documentation of major developments—such as board-approved and fully funded new mines or factories.
- Benefits increase when financing comes from non-state sources, which leads to road projects being prioritized over rail projects. Toll funding means urban road projects appear more beneficial than rural rail ones.

Both Norway and Sweden traditionally place more weight on cost-benefit models than many other countries. To upgrade non-electrified rail lines, either the methodology must change, or greater political discretion must be allowed—as is the case in many southern European countries. Alternatively, private infrastructure financing, as seen in Finland, could be pursued. None of these alternatives are easy to implement.

The Value of Cross-Border Rail Lines

Twelve years ago, transport agencies studied the construction of a double-track rail line between Narvik and Kiruna, a distance of about 150 km. The estimated cost was NOK 20 billion. The project was not deemed socio-economically viable, based on time savings for transport companies and increased iron ore volumes. A round-trip freight train cost roughly NOK 100,000. A 10% savings offered little return on investment—even over 40 years.

Yet LKAB is entirely dependent on rail transport for its ore to Narvik. Ignoring the benefits for LKAB and the Kiruna community was unreasonable. The company's net economic margin per freight train from Kiruna to Narvik was NOK 9 million. When this was factored in, the project's socio-economic benefit improved dramatically. The Norwegian Railway Directorate deemed it the most beneficial investment in the 2014–2023 National Transport Plan.
But it was a one-off. Since then, benefits beyond the transport sector have not been considered in state evaluations. Even with high net benefits, the project was not realized.
30% of the line was on the Norwegian side, 70% on the Swedish side. Trafikverket had not included it in its plans. In Norway, the benefits were on the "wrong" side of the border.
Swedish companies offered to co-finance—but were turned down. Norway's transport minister proposed a state-private joint venture, which also failed.

To meet demand, authorities allowed heavier wagons with increased axle loads—leading to major wear and growing operational problems. A derailment in December cost the mining companies NOK 100 million per day. It took several such incidents before Trafikverket prioritized Malmbanen.

The Need for New Financing Models for Low-Passenger Rail Lines

With current models, it is nearly impossible to justify upgrades or electrification of low-speed, low-traffic rail lines. In 2019, a pre-study by MIDEK Ab examined electrifying the Hällnäs–Lycksele Storuman line. It referenced many studies from the 2000s with little impact. Trafikverket's 2017–2018 study estimated the investment cost for the full stretch at just over NOK 1 billion.
In Norway, road investment accelerated after a dedicated infrastructure fund was created outside the annual budget—a controversial move opposed by the finance ministry. A separate delivery organization independent of the Norwegian Public Roads Administration was also established. Long-

term contracts (20–30 years) with large contractors were signed, focused on performance standards, not detailed specs. This reduced costs and fostered competition and innovation.
Similar innovation is needed in rail. In a 2023 report for Narvik Havn KF on the Narvik–Boden–Tornio line, project financing was proposed—similar to what Norway's transport minister proposed for Narvik–Kiruna in 2014.

Public-private project financing is common in Europe because cross-border corridors serve industries but always lose out to higher-traffic domestic lines in model-based funding systems. This model includes funding from the EU, national governments, and industry contributions.

Railway Expansion in the E12 Region

For municipalities in Helgeland and Västerbotten, improving rail's competitiveness and attractiveness is important. A project could focus on developing the Nordland Line, the Inland Line, and the Västerbotten Line, but with new assumptions:

- Eliminating speed bottlenecks so that rail becomes more competitive with roads—including the construction of passing tracks to avoid delays from opposing trains. Speed targets between cities with high modal shift potential should be established, as per the BAT system analysis (2018).
- Introducing hybrid energy solutions (e.g. hydrogen with electricity and batteries) to reduce investment needs in the green transition.
- Focusing on travel comfort, so rail travel is seen as productive time—unlike private car travel. Norway's parliament has decided to purchase new sleeping cars for long-distance services, with deliveries starting in 2027.
- Valuing regional spillover effects and other benefits not captured in current cost-benefit models.
- Exploring new financing solutions through public-private partnerships.

The best outcome would be for the EU to upgrade more rail lines to core network corridors, as it has with the railway to Narvik. The EU is currently considering upgrading the Jutland Corridor between Norway and Denmark to core corridor status, due to vulnerability in the Øresund connection. Emphasizing the north–south vulnerability of transport networks is a crucial condition for prioritizing new east–west corridors.

Tvärbanan (Sveriges Radio) BOTNIA ATLANTICA – TRAFFIC STRATEGY FOR THE E12 REGION (BAT)

Railway Infrastructure

- Equipped with ERTMS
- Full electrification
- 22.5 t axle load (freight lines)
- 100 km/h line speed (freight lines)
- Possibility to operate 740 m long trains (freight lines)
- Nominal track gauge for new railway lines: 1435 mm

Road Transport Infrastructure

- Rest areas at intervals of approximately 100 km
- Availability of alternative fuels
- Motorways / expressways
- Road toll systems as well as all intelligent transport systems according to directives

Air Transport Infrastructure

- Capacity to provide alternative fuels
- Terminal open to all operators
- Infrastructure for air traffic management systems
- Defined main airports connected to the railway network

Maritime Transport

- Freight terminals open to all operators
- Access to alternative fuels
- Connection to railway and road networks as well as IWW (inland waterways)
- VTMIS – SafeSeaNet and e-services for shipping
- Infrastructure for ship-generated waste

8. BOTNIA ATLANTICA – TRAFFIC STRATEGY FOR THE E12 REGION (BAT)

The 2018 Plan

In 2018, a system analysis was conducted of the entire transport corridor between Mo i Rana and Helsinki. This stretch covers 910 kilometers, of which 460 kilometers are located in Västerbotten. The analysis encompassed a somewhat larger geographical area than the municipalities directly along the E12 in Norway and Sweden. It was conducted according to the Swedish Transport Administration's (Trafikverket's) guidelines. The aim was to develop a transport systems strategy for the E12 corridor as a basis for planning at both national and regional levels in each country.
The analysis builds on existing goals and strategies across administrative levels and expectations for traffic development. At the highest level, it was anchored in the EU's objectives for the TEN-T network (comprehensive network) across national borders:

Gaps and Alignment with EU Guidelines

As shown in the overview, there are deficiencies in both the rail and road networks. Two of the project proposals in this report aim to address EU guidelines: development of railway infrastructure, and the establishment of rest areas / service areas with shorter distances and facilities for charging or refueling using new energy carriers.

Regional and National Goals for the Transport System

When the system analysis was created, most attention was directed toward reducing greenhouse gas emissions through less use of private cars and increased reliance on public transportation. There were also expectations for significant industrial growth in the corridor. Two overarching goals were formulated for the transport infrastructure:

- Strengthen the Botnia-Atlantica region's growth and competitiveness
- Reduce environmental and climate impact from the transport sector in the region

Since 2018, greenhouse gas emissions have mostly trended in the right direction, but not at the pace required to meet national 2030 targets. In Västerbotten, public transport accounts for around 19% of trips—below the 25% target for 2025. Achieving growth in public transport without applying restrictive measures on car usage is extremely challenging. When it comes to growth and competitiveness, development has been uneven across key nodes in the corridor. Plans for establishing new "green" industries, such as energy storage, have not progressed as intended.

Sub-goals in the BAT Report

The BAT analysis includes seven sub-goals, accompanied by quality benchmarks, interventions, and measures. Five relate to passenger transport, and two to freight. The goals are:

1. Improve access for passenger travel to primary nodes in the region, via:
   a. High-quality regional infrastructure and transport systems
   b. Shorter travel times and better opportunities for public transport
2. Enhance accessibility and functionality for cross-border passenger travel, via:
   a. Improved road standards and public transport between Mo i Rana and Storuman
   b. Enhanced connections and functionality for travel via Umeå–Holmsund–Vaasa and within ports
   c. Develop cross-border air links
3. Improve access to strategic destinations outside the region, via:
   a. Shorter travel times to adjacent primary nodes, primarily via rail
   b. Shorter travel times to Nordic capitals and other large cities, primarily by air
4. Improve access to regional tourism destinations, via:
   a. Short travel times and improved offerings, especially to larger towns, coastal areas, and mountain destinations

5. Reduce environmental impact from passenger transport, via:
   a. Providing and enabling alternative fuels
   b. Enhancing conditions for public transport
6. Improve transport system functionality for freight, via:
   a. High-quality roads and rail links to ports and terminals
   b. Ensure adequate load-bearing capacity
   c. Improve rail connections to national freight hubs
   d. Improve corridor access to ice-free Atlantic ports
   e. Improve western and eastern connections
7. Reduce environmental impact from freight transport, via:
   a. Providing and enabling alternative fuels
   b. Allowing higher cargo capacity across all modes

9. SUMMARY

Government Forecasts for Traffic Development

In the traffic forecast developed by Trafikverket in 2023, freight traffic on the road network in Västerbotten is projected to grow by an average of 1.04% per year toward 2040. The corresponding growth rate for Norrbotten is 1.22%, while the national average for Sweden is 1.58%. A key limitation of the transport agencies' forecasting models is their inability to account for changes that have not yet been politically decided. Therefore, transport researchers suggest that scenario-based forecasts should be used as a supplement to the current models. Uncertainty about future traffic growth is also identified as a challenge in Norway's most recent national transport plan. Nothing is more costly to society than waiting until measures must be implemented urgently.

Topics for New Projects

This report outlines 10 topics that MidtSkandia could pursue in future projects, which could have significant impacts on the development of the E12 region and the need for transport capacity. These topics can be followed up either as stand-alone projects or as areas for further analysis in other contexts. They are listed in no particular order:

1. Positioning the E12 as a military reinforcement or emergency preparedness corridor for allied forces, both as a supplement to and as a relief route from the E10 and E14 corridors.
2. A project in cooperation with the business sector, innovation environments, and other northern regions to facilitate the development of a business cluster within the defense and security industry. The E12 region already has several companies in the metal processing sector. In Umeå, the Armed Forces operate a center for protection against chemical, biological, and radiological threats.
3. Strengthening the visibility of the E12 region among major companies in the defense sector. The Armed Forces emphasize that the defense industry must strengthen its presence in Northern Norway and Northern Sweden—both in terms of production and in maintenance and storage of defense equipment.
4. Promoting the establishment of a national or Scandinavian supply preparedness organization in the E12 region, modeled after Finland's NESA system, as recommended by Norway's Total Defense Commission.
5. Working toward the establishment of emergency preparedness centers for critical goods—such as food, housing modules, pharmaceuticals, and fuel—in key transport nodes like Mo i Rana, Storuman, and Umeå.
6. Following up on the Action Plan Study (Åtgärdsvalsstudien) of the E12 corridor developed by Trafikverket ten years ago. The study identified 108 proposed measures between Mo and Umeå. A review of what has been implemented and a reassessment of current needs is recommended.
7. Collaborating with Trafikverket and the Norwegian Public Roads Administration to establish more rest areas along the E12, with modern service facilities for road users.
8. Partnering to facilitate and establish a cross-border tourist route that gains international attention and strengthens traffic through the new airport and the region as a tourist destination. The creation of such a route would be the first international tourist road in Scandinavia.
9. Launching a project to support increased utilization of natural resources, such as minerals, focusing on sustainable solutions and the reuse of resulting waste.
10. Collaborating on the continued development of the Västerbotten Railway (Västerbotniabanen), with an emphasis on new financing solutions and the railway's role in emergency preparedness in case of disruptions in international transport via the Baltic Sea or through Narvik.

10. DEFINITIONS

- CNG (Compressed Natural Gas) is pressurized natural gas compressed to less than one percent of its volume at atmospheric pressure. The gas primarily consists of methane.
- CO_2 equivalents are a unit used in greenhouse gas accounting. The unit reflects the effect a given amount (usually one ton) of CO_2 has on global warming over a specified period (typically 100 years).
- Dual use means that the transport network is adapted for both civilian and military purposes.
- Energy carrier is a unit that can store or transport energy so that it can be used later or elsewhere. A battery is a well-known energy carrier. Substances and materials that can release energy through a chemical reaction, such as oil and coal, are also energy carriers.
- HCT (High Capacity Transport) is an abbreviation used to describe the largest types of trucks.
- Klondike is an area in the Yukon, northwestern Canada, where gold was discovered in 1896. This led to thousands of people from around the world flocking to the region to dig for gold.
- LNG (Liquefied Natural Gas) is natural gas that has been liquefied through cooling.
- MOU (Memorandum of Understanding) outlines the main content of an agreement between two parties.

REFERENCES

This report is based on interviews, combined with information from plans, reports, and white papers. The following documents formed the basis of the work, in addition to a large number of articles and presentations found online:

- *Åtgärdvalsstudie över E12 stråket Mo i Rana - Umeå - Helsingfors, med fokus på delen genom Sverige*, Trafikverket 2016
- *Bergverksstatistik 2023*, Sveriges geologiska undersökning (SGU)
- *Civil beredskap samt beredskap för extraordinära händelser*, Feasibility Study No. 15/2023, Region Västerbotten
- *Elektrifiering av järnvägen Hällnäs-Lycksele-Storuman*, MIDEK 2019
- *Erfarenheter från Ukraina*, Swedish Civil Contingencies Agency (MSB)
- *EU Commission Implementing Regulation (EU) 2021/1328 of 10 August 2021* on setting infrastructure requirements for certain categories of dual-use infrastructure investments, pursuant to Regulation (EU) 2021/1153
- *European Regional Development Fund – Summary of the Upper Norrland Program*, Report 0464
- *The Defence Commission's Report*, NOU 2023:14
- *Fylkes-ROS 2024–2028*, County Governor of Nordland
- *Godsstrømsanalyse Nord-Helgeland 2020*, Transportutvikling AS
- *Crisis Preparedness – A Review of the Region's Efforts to Prevent, Withstand and Handle a Crisis*, In-depth Review No. 10/2020, Region Västerbotten
- *Charging Infrastructure for Electric Vehicles along Road E12*, Sweco 2020
- *County Transport Plan 2022–2033*, Västerbotten County
- *Long-term Effects of Underfunded Road Maintenance*, Salbo.ai, 2023
- *National Transport Plan 2025–2036*, White Paper No. 14 (2023–2024)
- *National Risk and Vulnerability Assessment (NRSB) 2023*, Swedish Civil Contingencies Agency (MSB)
- *Nordic Battery Belt Logistics*, Rambøll
- *Regional Public Transport Program for Västerbotten County 2020–2025*
- *Regional Development Strategy 2020–2030*, Region Västerbotten

- *Prepared for an Uncertain Future*, Total Preparedness Commission's Report, NOU 2023:17
- *Strengths and Weaknesses of Today's Total Defense – Report to the Total Preparedness Commission*, Norwegian Defence Research Establishment (FFI) 2022
- *System Analysis E12 Atlantica Transport*, Rambøll 2018
- *Traffic Strategy for the E12 Region 2018–2040*, E12 Atlantica Transport, 2018
- *Tvärbanan Electrification Hällnäs–Lycksele*, Review Document 2019, Trafikverket
- *Guide to Comprehensive Risk and Vulnerability Assessments in Municipalities*, Norwegian Directorate for Civil Protection (DSB)