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Military Mobility Northern Nordics

Strategic infrastructure needs for military mobility and security of supply in the northern Nordics

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Foreword

The aim of this study is to look at the strategic transport infrastructure needs for military mobility and generally for security of supply and preparedness in the Kvarken region (including Central Finland), Jämtland, Härjedalen, Västernorrland, Västerbotten, Trøndelag, and Helgeland. The study aims to identify the capacity requirements associated with large-scale strategic movements in case of a crisis, their impact on the current and near-future transport infrastructure in the study region and finally identify and analyse the impact of infrastructure investments and improvements that would significantly improve military mobility in the region. This study has been ordered jointly by the Kvarken Council EGTC as well as the cross-border councils MidtSkandia and Fellesrådet for Trøndelag Jämtland Härjedalen, and cover the area these three organisations operate in - stretching through central Norway, through Sweden, and over the Kvarken sea region and into Ostrobothnia and Central Finland. The study is being carried out as part of the Interreg Aurora project FLINC – Financing Large-scale Cross-border Infrastructure – Case Nordic Connector, and specifically its Work Package 3 - Impact assessment of wider benefits, from which part of the funding was acquired. Risk Intelligence A/S was selected in November 2025 to perform the study as the winner of a competitive tendering process[1].

The report is based fully on open and unclassified sources, including written ones as well as interviews with subject matter experts and key stakeholders throughout the Study Region and beyond. These have been conducted both remotely, as well as through study trips to a number of key locations in the Study Region. To ensure an open and honest discussion, these interviews have been held under the Chatham House Rule[2]. The authors of this report extend a heartful ‘Thank You’ to all who have lent us their time for discussions and exchanges of information on the topic.

The report was written over the span of roughly seven months from December 2025 to June 2026. It was a volatile time in the world, and during the work it also became evidently clear that with Finland’s and Sweden’s NATO-memberships being just a few years old, the practical work of integrating two new members into the overall plans of an alliance finding itself in a state of rapid and constant change was still a

1 Published on Hilma 23 October 2025, notification number 2025-159798

2 Participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed.

work in progress. While there is a debate to be had about how NATO will look by 2030, that discussion is outside the scope of this report. Instead, the report is based as far as possible on the current situation, based on NATO's current plans and concepts.

Ever since the emergence of modern democracy in the late 18th century, the ability of the public to demand transparency when it comes to public spending has been one of the core pillars of the social contract[3]. With defence budgets on an upward trajectory and up to 1.5% of GDP annually to be allocated to among other things protecting critical infrastructure and ensuring civil preparedness and resilience[4], the allocation of defence budgets and defence-affiliated budgets is a topic of significant public interest. At the same time, it is evident that analysing detailed operational planning and identifying potential weaknesses in the infrastructure these plans rely on is not beneficial to anyone except a potential adversary. A crucial consideration when writing this report has thus been to balance these two values, to ensure and promote a well-informed public discussion based on facts and hard numbers, without straying into information that is better kept out of the spotlight[5]. Risk Intelligence as a company as well as the individuals involved in the project are well aware of, and have considerable experience in producing written reports and doing presentations, that respect both of these factors.

In essence, the need for operational secrecy is ensured through a number of different items:

- None of those involved in the writing of the report has any classified information on or insight into the actual operational plans drawn up nationally or by the alliance,
- No individual structures are discussed,
- The discussion of bottlenecks and capacity is kept at a high level, offering insights that are readily available to people with an understanding of the topic,
- And, crucially, geography is not a secret.

In essence, the report aims to collect, analyse, and present information that is readily available, but has not been looked at from this particular scale and angle, and present them in a clear and coherent matter so that the casual reader may get a better understanding of the issue. It is our

[3] See e.g. point 14. In the French Declaration of the Rights of Man and Citizen of 1789

[4] The full text from the Hague summit state "up to 1.5% of GDP annually to *inter alia* protect our critical infrastructure, defend our networks, ensure our civil preparedness and resilience, unleash innovation, and strengthen our defence industrial base". See: NATO. 'The Hague Summit Declaration'. Official Texts and Resources | NATO, 25 June 2025. https://www.nato.int/en/about-us/official-texts-and-resources/official-texts/2025/06/25/the-hague-summit-declaration

[5] Crucially this also includes cases of openly available information of such a nature that we consider drawing attention to it might not be in line with the best of interest of the countries involved

hope that the report in doing so will provide a higher appreciation for the challenges facing military mobility in the Nordics – the scale of which is not always understood – and provide a valuable tool for discussion among both experts and laymen alike.

In January of 1940 the Swedish officer[6] Ernst Linder arrived in northern Finland as part of the Swedish volunteer forces in the Winter War. In his essay “Kring Finlands andra frihetskrig – strödda minnen från min verksamhet”[7] he noted that upon arrival to the theatre “The [Finnish] troops were found in widely dispersed groups in conjunction to the road network”, a concise description of the wartime realities of the North and the effect the transport infrastructure had on the combat operations in 1940, and words that could be spoken at a major exercise or military operation in the Nordics to this very day.

[6] Later general of the cavalry in Finland

[7] Eng. *Around Finland's Second War of Independence - scattered memories from my activities*

Executive Summary

This report examines military mobility and broader transport preparedness across a Study Region spanning Kvarken region (including Central Finland), Jämtland, Härjedalen, Västernorrland, Västerbotten, Trøndelag, and Helgeland, the Study Region following the area where the organisations – Kvarken Council EGTC, MidtSkandia, and Fellesrådet for Trøndelag Jämtland Härjedalen – who jointly ordered the study operate. It is based on a combination of open sources as well as expert and stakeholder interviews, and uses scenario-based analysis to assesses how existing transport infrastructure would perform if faced with significant military reinforcements arriving in the region in case of a major crisis. The central finding is that the region offers important strategic advantages, including multiple east-west corridors, a suitable location balancing the need between ports of debarkation close to the eventual frontline with the need to keep the threat picture manageable, and access to ports, roads, railways, and airfields that could support reinforcements to both Finland and the High North.

At the same time, the study shows that the scale of potential demand is far greater than is often recognised. In a significant crisis, reinforcement and sustainment requirements would place severe pressure on the region's infrastructure, especially as military flows must compete with continued civilian transport. In case of a crisis restricting traffic in the southern parts of the Baltic Sea which would reroute trade flows, the strain on the available transport resources would increase further. The scenarios discussed include a baseline major exercise and the demands it would place, a rapid crisis demanding fast movement of units which due to their nature tend to be lighter, to a full-scale reinforcement of the region involving significant numbers of mechanised units, heavy equipment, tracked vehicles, and sustained logistical support. The latter two scenarios are then further discussed in light of a disruption in the southern Baltic Sea, and how this would sharply increase the burden on

overland and Gulf of Bothnia routes, making military mobility inseparable from wider societal resilience and security of supply considerations.

The report identifies several recurring bottlenecks. These include weak connections between ports and inland road or rail networks, limited storage and staging areas, insufficient redundancy in key Norwegian and cross-border road and rail links, vulnerabilities in single-track railways and the E6 corridor, uncertainty around convoy support capacity, and the growing difficulty of moving heavier modern main battle tanks across infrastructure not originally designed for today's loads. In many cases, the most important weaknesses are not the transport corridors themselves, but the capacity of the transfer nodes allowing for cargo to be switched from one transport mode to another. Furthermore, a number of issues related more to processes than physical infrastructure or resources were highlighted in the interviews, including the limited exchange of information between military and civilian stakeholders, which makes it harder to prioritise dual-use investments and align infrastructure upgrades with likely defence needs.

The report concludes that improving military mobility in the region does not depend on a single solution, but on a combination of targeted measures. Priority areas include stronger port-to-road and port-to-rail connections, increased rail capacity on existing lines, greater redundancy in cross-border rail and road infrastructure, more capacity across the Gulf of Bothnia, assurance of critical equipment availability, and continued development of existing transport routes including the Meråkerbanen/Mittbanan-railway and key roads running east-west. Major strategic projects such as the reopening of Suupohjan rata, further investment in Inlandsbanan, a rail connection between Mo i Rana[8] and Storuman[9], and crucially the long-term Nordic Connector concept for a fixed-link over Kvarken could materially strengthen both defence mobility and civilian resilience.

Overall, the Study Region provide a key strategic transport route for NATO's northeastern flank, but its ability to support major reinforcement and crisis logistics depends on deliberate investment, better coordination, and a strong dual-use approach to transport planning.

[8] Sa. Måefie

[9] Sa. Luspie/Lusspie

Background and method explanation

Summary

This study assesses military mobility requirements across a Study Region situated in the Northern Nordics using scenario-based analysis and open-source data combined with stakeholder interviews. The purpose is not to replicate operational military planning, but to model realistic transport demands under crisis conditions. The methodology includes scenario construction to estimate force movements, infrastructure stress, and logistical requirements, while not forgetting civilian transport needs and competing demands.

This study looks at the strategic transport infrastructure needs for military mobility, and more generally for security of supply and preparedness in the Study Region[10]. The aim is to identify the capacity requirements associated with large-scale strategic movements in case of a crisis, their impact on the current and near-future transport infrastructure in the study region and finally identify and analyse the impact of infrastructure investments and improvements that would significantly improve military mobility in the region.

[10] Kvarken region (including Central Finland), Jämtland, Härjedalen, Västernorrland, Västerbotten, Trøndelag, and Helgeland

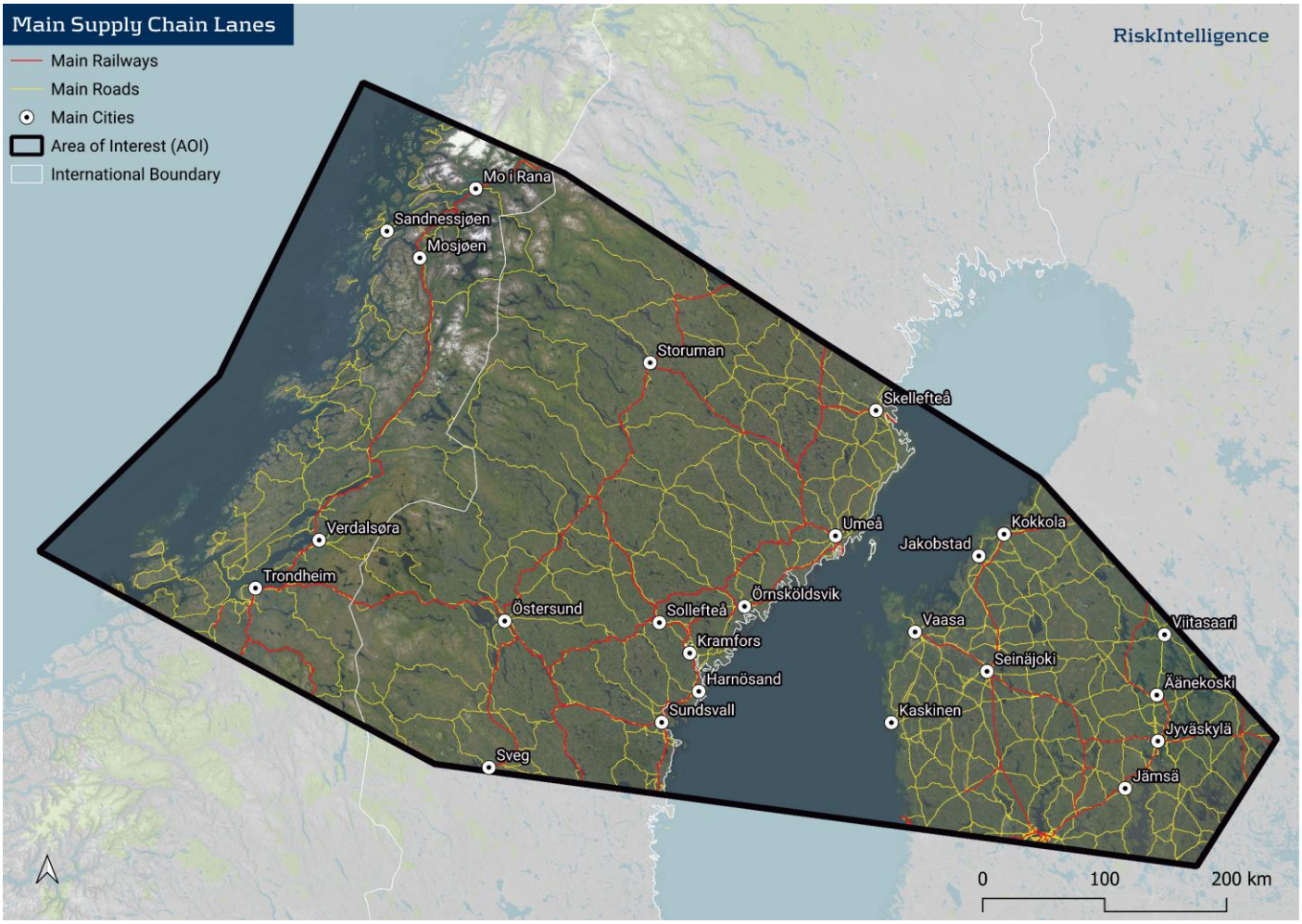


Figure 1. An overview of approximately where the Study Region is situated, and the major transport infrastructure arteries and nodes featured in it

The information gathered for this report include several different unclassified sources, these including statistics, plans, and other documentation provided by the authorities involved in the process. These include work done by civilian and military authorities, as well as reports by external consultants. Finally, a major part of the work has been interviews with stakeholders and subject matter experts, which have been held under the Chatham House Rule, to provide for an honest and open exchange of views. While we recognise a comprehensive list of the interviewees would be beneficial in certain cases, our experience is that the benefits of the use of Chatham House Rule for this kind of report outweighs the drawbacks. In particular for a strategic level overview, such as is the case here, it is a proven and internationally recognised solution.

To investigate the needs of reinforcements brought into the Nordic countries an understanding of the scale and qualities of these needs to be established. This is done through a number of scenarios which will be presented in Chapter Three. These are based on open information, and while fleshed out with a certain amount of details, the purpose of this exercise has not been to recreate NATO's operational planning, but

rather to provide a realistic example of the size and kind of challenge faced. Individual units are mentioned to provide an explanation for the numbers used, as well as to give examples of the general kind of and number of units which could make up the order of battle in the given scenarios.

Military Mobility in the Northern Nordics

Summary

The chapter describes how military mobility has shifted from national planning toward multinational NATO-linked movement across borders. Reinforcement flows would occur both north-south and east-west, requiring movement of large formations through Sweden, Norway, and Finland. The strategic location of the Study Region means it acts as a corridor for reinforcing both the High North and Finland's eastern border areas. The challenging geography and the constraints it create need to be acknowledged, including limited population density, long distances, natural bottlenecks and chokepoints, as well as seasonal variability. It is notable that weaknesses in the transport infrastructure often lie in transfer nodes rather than in the corridors themselves.

Host Nation Support and Reception, Staging, and Onward Movement

Host Nation Support (HNS) is defined as the NATO framework under which host countries provide logistical and operational support to allied forces transiting or operating within their territory. This includes legal coordination, infrastructure access, and operational services during both peacetime and crisis.

Reception, Staging, and Onward Movement (RSOM) is in turn logistical process in which incoming forces are received, gathered into operational units, and then deployed to their operational areas. The efficiency of RSOM operations is heavily dependent on local infrastructure capacity.

It needs to be emphasised that staging areas and logistics hubs are critical nodes where delays or congestion can occur. These areas must accommodate simultaneous flows of personnel, vehicles, and equipment.

Together, HNS and RSOM are central enablers of military mobility, but also potential bottlenecks if coordination between civilian authorities and military planners is insufficient, or if local resources or transport infrastructure is found lacking.

Modes of Transport

Military mobility, like its civilian counterpart, is reliant on different modes of transport, all with their individual benefits and compromises.

Sealift is the most efficient method for heavy equipment transport, particularly via Ro-Ro and Ro-Pax vessels. However, it is reliant on port infrastructure and is relatively slow. For civilian shipping, the threat of enemy action may also limit which waters can be traversed and which harbours may be used for loading or unloading.

Airlift provides unmatched speed but limited capacity, making it suitable primarily for personnel, light equipment, and high-value systems. Fixed-wing aircraft, including strategic airlifters, provide unmatched speed when it comes to strategic mobility, while helicopters and lighter aircraft provide excellent mobility inside the theatre.

Rail transport is the most efficient land-based heavy transport mode, but is highly dependent on available infrastructure, rolling stock, and suffer from cross-border technical incompatibilities. As such, while preferable for land transports over 200 km in range, it does suffer from being inflexible and from being relatively vulnerable to disruptions, both natural and man-made ones.

Road transport offers maximum flexibility but suffers from inefficiency and congestion risks, in particular when recognising the number of vehicles involved in a major military movement, and the need for supporting services.

Military mobility throughout the region has historically been seen as a largely national question, with Sweden and Finland as non-NATO countries having treated operational planning as a largely domestic topic. Norway, as a founding NATO-member, has had an international element in its defence planning, but these have officially not included cross-border movements11. Instead, the focus in Swedish and Norwegian planning for military mobility in the region has been on the movement of forces north to the planned lines of defence against a Soviet attack in the High North[12]. This requirement is still present, with open sources indicating that both countries plan on deploying more than

[11] There were however informal plans for deeper cooperation than was acknowledged openly, which did include movement over the border. See e.g. Holmström, Mikael. Den dolda alliansen - Sveriges hemliga NATO-förbindelser. 2015. 5th edn. Natur & Kultur, 2023, p. 482

[12] For both Norway and Sweden, a significant number of units destined for the High North were trained and mobilised south of the study region, due to the geography of the countries with their relatively sparsely populated northern regions

a brigade worth of forces from the south through the study region in case of a major crisis or conflict in the High North[13]. At the same time, it is evident that Sweden's and Finland's NATO-memberships have made the picture more multi-faceted, and there is a need to shift non-Finnish units from their home countries to the Finnish border as well as to the Norwegian defensive lines in the High North. This creates major flows on the east-west axis in addition to the south-north axis.

For the wartime scenarios, based on historical experiences and the unchanging geography, any units arriving in the region to reinforce the local armed forces would likely have one of three different directions as their destination. The south-easternmost corner of Finland with Kymenlaakso and South Karelia is a key location[14], as it guards the shortest and most accessible route towards not only the capital of Helsinki[15], but also to a number of other key population centres and key industrial regions. Further north, the axis Kuhmo-Kajaani-Oulu is the narrowest point of Finland, offering the shortest alternative to cutting the country in two in a region dominated by significant differences between the urban centres and difficult terrain in the form of large forests and wetlands[16]. The territory of southern Finland is of interest to Russia both due to its relative closeness to St Petersburg and key Russian oil and gas export terminals in the Gulf of Finland allowing for long-range strikes or even ground operations against these, but also as the northern flank of the three Baltic countries, and as a key strategic location for controlling the Gulf of Finland and by extension the sea lines of communication to and from St Petersburg and the earlier mentioned energy export infrastructure. Further north yet, the Russian border towards Norway and Finland is the closest NATO territory to key bases for the Northern Fleet and the nuclear second-strike capability that comes with its submarine-launched ballistic missiles, as well as a number of key units and facilities related to both defensive and offensive operations on the trans-Arctic route which provide the shortest direct route to the North American mainland. As such, there are two possible drivers which are often cited as possibly leading to Russian offensive ground operations in the area in case of a major crisis in the High North. The first is a Russian desire to push NATO forces further away from the basing area of their Northern Fleet to increase the size and protection of not only the bastion within which their ballistic missile submarines operate, but also to be able to better protect the bases and infrastructure of the air, sea, and ground

[13] For Norway this includes the Telemark bataljon, parts of Ingeniørbataljonen, and Brigade Sør (when operational) while for Sweden this would include MekB 4 as well as the divisional units of 1. division which are not mobilised in Boden

[14] The so called Kaakonkulma

[15] Swe. Helsingfors

[16] Comparisons can be made to the outbreak of the Winter War, which saw Soviet advances against southern Finland (mainly concentrated along the Karelian Isthmus along the coast), on the Olonets Isthmus between the lakes Ladoga and Onega, on the narrow Kuhmo-Kajaani-Oulu axis, from Salla towards to Rovaniemi and aiming towards Tornio, as well as in the High North at the coast. Of these, the Olonets Isthmus direction is of less interest today due to the Saimaa lake system (and Pielinen) blocking easy advances over the border (the Isthmus itself having been ceded as part of the Paris Peace Treaty of 1947), while the persistence of geography means the other directions remain highly relevant

systems which support and protect these deployments. The second is the temptation to acquire the usage of Norwegian ports and air bases for operations against the NATO sea lines of communication in the North Atlantic.[17]

As such, major combat formations sent by NATO as reinforcement to the Nordics will likely be concentrated opposite of these likely axes of advances, while the staging areas and ports of debarkation would see increased military presence in the form of e.g. logistics, security, and air defence units.

Thanks to the central location within each country, the Study Region offers significant flexibility in that military formations transiting through it can be directed either north or south depending on the need, or continue due east towards Kainuu. The traffic flows are also in many locations more limited compared to roads and railways further south in the respective countries, providing greater spare capacity which can be diverted to military usage[18]. There is also an existing cross-border traffic on the east-west axis, relying on historical trade connections both between Sweden and Norway and between Sweden and Finland[19].

[17] See e.g. Black, James, Stephen Flanagan, Gene Germanovich, et al. Enhancing Deterrence and Defence on NATO's Northern Flank: Allied Perspectives on Strategic Options for Norway. RAND Corporation, 2020. https://doi.org/10.7249/RR4381, p. 8, for the current strategic situation, or Holmström, Mikael. Den dolda alliansen - Sveriges hemliga NATO-förbindelser. 2015. 5th edn. Natur & Kultur, 2023, p. 464-480 regarding the Cold War roots of the question, while for the effect of the ongoing (as of the summer of 2026) strikes on the Russian oil infrastructure in the area, see Risk Intelligence. The Expansion of the Russia-Ukraine War into the Baltic Sea. White Paper. Copenhagen, 2026. https://www.riskintelligence.eu/white-papers

[18] Depending on the particularities of the scenario and which phase of the scenario is chosen for study, the answer to the question of whether non-military traffic flows in the Study Region or other parts of the Nordic transport system would remain stable, increase, or decrease would vary. Refugee streams can create significant spikes in traffic early on in a conflict. The demand for consumer goods can on the other hand generally be assumed to go down in case of a conflict, although as evident from experience of the War in Ukraine it should not be assumed that the demand for non-essential consumer goods will disappear. Similarly, the need to continue exporting goods and services to generate revenue streams to pay for the war effort in a prolonged conflict tend to be overlooked in purely military-oriented studies of transport demands. For the Study Region in particular, rerouting of civilian goods flows away from the Baltic Sea can also lead to regional increases even if overall flows are decreasing. These factors are discussed in more detail in the relevant scenarios

[19] In addition to trade, the cross-border route to Trondheim historically also played a significant role as a pilgrimage route to the Nidaros Cathedral and the burial site of saint Olaf II



Figure 2: Convoy operations on smaller roads in the Nordics will lead to disruptions and delays in the civilian usage of those routes, as is demonstrated by this convoy from a Combat Engineer Battalion of the US 2nd Marine Division photographed in Härjedalen. Credit: U.S. Marine Corps photo by Sgt. Christian M. Garcia

However, it is also notable that the transport infrastructure in the study region – and in particular many of the east-west connections – are characterised by long distances, relatively few urban centres and associated facilities, as well as in many cases suffering from a maintenance debt which can create limitations when it comes to the ability to handle heavy loads and the reliability of vulnerable parts of the system.

While the Study Region does offer an attractive compromise between accessibility, available transport infrastructure capacity, and distance to the Russian border, there are obviously a number of other recognised alternatives which fall outside of the scope of this study, each with their own set of benefits and drawbacks.

At the same time, the sheer amount of traffic created by a major movement of reinforcements to the Norwegian and Finnish borders with Russia is often not recognised. Notable is the fact that NATO has created a dedicated Multi-Corps Land Component Command North (MCLCC-N) under Joint Force Command Norfolk (JFC-NF)[20]. The MCLCC-N is a high-level command structure, which will be able to command numerous operational-level formations i.e. corps, of which each may consist of 2-5 divisions. This is a clear indication the alliance envisions a scenario where hundreds of thousands of soldiers are operating in Finland, Sweden and Norway, with the total transports to get these, their equipment and supplies moving including thousands of train sets and/or

[20] Puolustusministeriö. 'Finnish Minister of Defence Häkkänen at Opening of NATO's MCLCC-N: This Is a Historic Day for Finland, NATO and Mikkeli'. 3 October 2025. https://defmin.fi/en/-/finnish-minister-of-defence-hakkanen-at-opening-of-nato-s-mclcc-n-this-is-a-historic-day-for-finland-nato-and-mikkeli

hundreds of thousands of heavy vehicles[21]. As such, no single port of debarkation will be able to handle the requirements independently. Rather, a significant number of the routes will be called upon to meet these logistical requirements, something that will also ensure dispersion of the arriving units which is prudent from a military point of view.

The amount of traffic this would bring – including both the transfer of the formations themselves, but also their continued requirements for supplies and replacement of losses – would in any scenario come on top of the current transport needs of civil society. As has been demonstrated throughout history and most recently by Ukraine, even in a major war society will still need a functioning industrial base creating revenue as well as producing civilian, dual-use, and military goods. There will also be a need for transporting these goods, as well as for moving exported and imported goods. There will also be a requirement for transports of different kinds, including everyday tasks such as people getting to and from their workplaces and children getting to and from their schools. While some adjustment can be expected to take place, such as a drop in consumer goods, these can roughly be assumed to be replaced by an increase in other areas, such as an increase in the output of the defence industry. The effects will vary depending on the circumstances and may include highly localised increases[22] or decreases[23] in civilian transport needs. However, as a general rule of thumb the assumption can be made that civilian transport needs will remain in place, and military mobility needs will either have to rely on excess capacity available for transports or will compete with and potentially crowd out civilian transports. This will require a detailed and to some extent pre-planned logistical prioritisation.

A key factor when looking at the availability of transport infrastructure in the study region is the impact of weather and seasonal changes. In particular for the more remote parts of the transport network significant differences in real capacity are observed depending on the season. While the most obvious example includes snow and ice creating potential delays due to the need for snow-clearing equipment as well as a higher risk for accidents and the delays associated with these, winter is not universally a bottleneck. In certain cases, the frozen ground will provide for a higher capacity, thanks to increased load-carrying capacity of roads and railroads. The topic is complex and needs to be included in any detailed studies of the network capacity[24], but for the purpose of this

[21] A good general comparison is that each soldier will need transport capacity corresponding to a single twenty-foot container, or one TEU. This cover items such as equipment and supplies. See Listou, Tore, and Ekström, Thomas. 'Russland i Ukraina: uten logistikk skjer det lite på slagmarken'. Stratagem, 28 March 2022. https://www.stratagem.no/russland-ukraina-logistikk/

[22] E.g. spontaneous refugee streams appearing on a single road axis

[23] E.g. a major factory ceasing production

[24] See e.g. Takvam, Torstein, Stein W. Wallace, and Falko Müller. "Stochastic Port Selection Under Correlated Arc Disruptions: Improving Defence Supply Lines in the Nordics." Scandinavian Journal of Military Studies 8, no. 1 (2025): 20. https://doi.org/10.31374/sjms.330. for an example of how the seasons impact the available capacity and efficiency of different routes

study the recognition of the fact that these factors exist and will play a part is adequate.

Brief overview of alternative routes outside the scope of this study

North of the study region we find Narvik[25] as a possible port of debarkation connected to the E6 road east to Kirkenes as well as the E10 south-east towards the Finnish border[1] and the corresponding Ofotbanen/Malmbanan single-track railway. Narvik is historically an important port of debarkation, and continues to be identified as such in official documents. However, Narvik, and in particular its connections, comes with limitations as well, having been described as "the largest bottleneck in Norway"[26], on account of limited availability of the single-track railway and the limited spare capacity of the port. Adding significant amount of new traffic on the railway would have an adverse effect on the supply of ore from the mines in northernmost Sweden, which at the current time supply 80% of the ore mined in the European Union[27]. In addition, the northernly location close to the eventual destinations of any military formations transiting through the port also means that it has an increased threat profile compared to more southerly ports of debarkation. On the positive side, the road connections east and north in connection with the railway offer flexibility, and while the location closer to the Russian border increases the threat profile, it similarly shortens the distance military formations are required to travel on road or railroad to reach Lappi or Finnmark.

South of the study region a number of other possible ports of debarkation are found, such as port facilities in and around Oslofjord and Rogaland in southern Norway, as well as the port of Gothenburg in Sweden. However, these are located far away from the potential lines of defence, and feed largely into a transport system connecting several major population centres and industrial hubs, meaning the transport infrastructure is significantly more developed compared to most of the regions further north. At the same time, it needs to be recognised this also comes with a higher demand for that transport capacity, meaning higher total capacity does not directly translate into available spare capacity. Crucially, these routes also provide the shortest route from the North Sea to the three Baltic States, with both Denmark and southern Sweden. As such, these provide the possibility for a relatively safe rear area for units headed towards the Baltic States, which can be used as a

[25] Sa. Áhkanjárga

[26] Narvik Havn and Narvik Kommune. 'NATOs Generalsekretær Fikk Høre Og Se Norges Største Flaskehals'. Norges Største Flaskehals, Narvik, 25 March 2026. https://www.norgesflaskehals.no/post/natos-generalsekretaer-fikk-hore-og-se-norges-storste-flaskehals

[27] LKAB. 'Vad vi gör'. lkab.com, n.d. Accessed 5 June 2026. https://lkab.com/vad-vi-gor/

staging area during transits, for switching to vessels which may be more appropriate for crossing the Baltic Sea[28], or more generally to open up alternative routes – such as Nynäshamn to Ventspils – compared to passing through the Danish straits transit. As such, the West-East corridors in Denmark and southern Sweden can be expected to handle the transit and supply of a number of formations heading to the Baltic States, meaning military transport needs related to Finland and northern Norway are likely to be better served by using the routes further north.

Similarly, in the Baltic Sea on the Finnish west coast ports such as Oulu, Kemi, and Tornio north of the study region offer alternative ports of debarkation, as does ports to south of it including Pori and Rauma[29], as well as ports in Southwest Finland and further east into the Gulf of Finland. All of these have their possible uses, though it is notable that the southernmost ports would feed traffic directly into the heavily trafficked parts of the Finnish rail- and road networks. Ports in the Gulf of Finland would also come with a significantly higher threat profile compared to those in the Gulf of Bothnia. Ports to the north of study region are well-suited for transports heading to the northern half of the country, but increase the travel distance for military formations heading to southern half of the country, including Kymenlaakso, Karelia, and Savo. On the Swedish east coast, ports such as Gävle south of the study region and Luleå[30] north of the study offer alternative ports of embarkation for a 'hop' over the Gulf of Bothnian, while ports opposite the Baltic states can be assumed to work as hubs for the movement to and the supply of these. For Gävle, the connections feeding into the port are largely directed towards the southwest, including the port of Gothenburg, or south towards Denmark. However, Danish sea- and land-transport capacity can largely be expected to be reserved for the needs of the Baltic states, with little spare capacity for Finland.

Host Nation Support and Reception, Staging, and Onward Movement

Host Nation Support (HSN) is one of the key concept when discussing cross-border logistics and unit movements within NATO[31]. In short, it puts the responsibility of a number of tasks upon the nation hosting the

[28] Such as e.g. embarking on faster vessels, switching from civilian vessels to ones under military command, or vessels which otherwise due to some feature of their design fit the mission better (lower draught, ice reinforcements, …)

[29] The ports of Pori and Rauma were identified as being prioritised for flows from Trondheim via Sundsvall in the recent Joint Nordic Strategy for Transport System Preparedness. However, as noted in the report, it is not intended to be seen as a mark of exclusivity, and as discussed in detail later in the report there are questions regarding whether the Sundsvall-Pori/Rauma connection really is the optimal route from a military mobility or security of supply point of view. Joint Nordic Strategy for Transport System Preparedness. Nordic Transport Preparedness Cooperation, 2026.

[30] Sa. Luleju

[31] See NATO, *AJP-4.3* for details

foreign armed forces on their territory either during transit or during an extended stay. Host Nation Support describe the civil and military assistance rendered by a host nation to NATO and/or other forces that are located on, operating on (or from) or in transit through the host nation's territory, be it in peacetime, during a major crisis, or during war. Host Nation Support include both supporting the planning process, such as through providing information about local laws and regulations or facilitating site surveys, as well as being the entity that eventually approves, controls and coordinates movements on its territory. During the active phase, the host nation can also provide force protection, logistical-, medical-, and military engineering support. Under the same concept, the nation sending the forces into a foreign country is in turn designated as the sending nation.



Figure 3: An example of how the staging phase of movement may end up looking. Here a US Army Field Support Battalion has set up a staging area, after which it will spend a number of days going through the vehicles and inspect the vehicles themselves, their basic items, and support equipment, to ensure that everything is in order, before handing over the complete package to a battalion-sized unit of a US Army National Guard Cavalry Regiment. Credit: DoW photo by Cameron Porter

Another key part of the logistics chain is Reception, Staging, and Onward Movement (RSOM), which in turn describe the phases of a deployment under which personnel, vehicles and materiel arrive in the theatre of operations (Reception), the personnel and materiel are married up and integrated back into working units (Staging), and the marshalling that takes place prior to onward deployment to the actual destination[32] (Onward Movement). After a deployment, this process is then reversed through Rearward Movement, Staging, and Dispatch (RMSD).

As such, RSOM/RMSD is a key feature of HNS, and will usually rely heavily on a number of capabilities and capacities provided by the host

[32] The destination being the designated area of operations

nation, many of which are connected to the question of military mobility and local transport infrastructure and capabilities.

Modes of Transport

Major movement of military units in the region would see a combination off all common modes of transport. These include sealift, airlift, road transport, as well as railways.

Sealift

Sealift would see both naval vessels as well as civilian vessels, either still under civilian flag on regular routes or chartered for the purpose, or vessels taken up from trade[33]. The most significant benefit of sealift is the efficiency. Large modern vessels can lift significant amounts of people and/or equipment, and while the transit speed is slower compared to other modes of transport, the lack of friction during transit and efficient loading and unloading in ports means it is generally the preferred mode of transport for equipment and vehicles if available. The risks and vulnerabilities are however notable, where a single vessel being sunk could cause a major blow[34]. When faced with enemy action the differences in damage control designed into naval vessels, their generally higher operating speeds, and naval crews being trained to deal with combat damage also means that there is a significant difference in the risk calculations associated with sending a dedicated amphibious assault ship into harm's way compared to a civilian Ro-Ro-vessel, something that also affect the choice of ports for debarkation.

Modern Merchant and Amphibious Vessels

There are a number of different vessel classes and sizes that need to be accounted for. The most important distinction for military mobility is the question of whether cargo is loaded and offloaded over the side of the vessel, referred to as Lo-Lo, using cranes (either cranes found on the dock or cranes mounted aboard the vessel itself), or whether cargo can be driven aboard using a ramp. This latter method is commonly referred to as Ro-Ro, for roll on/roll off, and include both vessels transporting only cargo, but also vessels handling both cargo and passenger, designated Ro-Pax. Ro-Pax vessels are common in the North Sea and Baltic Sea, and offer significant flexibility when it comes to their ability to transport different kinds of cargo. A particular sub-type of the Ro-Ro is the stowable roll on/roll off (Sto-Ro), which designates a vessel built to be loaded over a ramp, but once in the cargo hold the cargo is removed from the transporter, and stowed as regular bulk cargo. This ensures that break-bulk can be loaded without the use of the port infrastructure

[33] The exact nature of these arrangements can be expected to vary from country to country, but in short many countries have some variety of process and legal framework to be able to requisition militarily useful vessels in certain circumstances

[34] The loss of the SS Atlantic Conveyor to Argentinian air- launched anti-ship missiles in May 1982 and the effect it had on the whole Falklands War is the prime example of the risks involved

normally associated with break-bulk cargo handling, including cranes and cargo handlers in the port, allowing for greater flexibility and the usage of simple quays as ports for loading and unloading. In addition, there are numerous hybrids where e.g. the upper decks are used as Lo-Lo decks for containers or break-bulk cargo while lower decks accommodate vehicles and trailers.



Figure 4: Unloading of a 23-ton curb weight LVSR over the side of the vessel using the ship's own crane. Lo-Lo handling is more often associated with containers and other forms of break bulk, but can be used for vehicles as well. In particular for heavy vehicles or if the port of debarkation lacks a suitable Ro-Ro ramp it can be the preferred option. Credit: U.S. Marine Corps photo by Cpl. Apollo Wilson

For military mobility purposes, the requirement for military units to be able to move efficiently means that they are often able to pick up the majority of their necessary equipment and load it onto their vehicles. This means that in many cases, Ro-Ro vessels are the preferred mode of transport for the unit itself, as the unit can just drive the vehicles onto the vessel, and once at their port of debarkation, it can similarly drive the vehicles off the vessel. This makes the loading and offloading processes extremely efficient. Often, when employing commercial shipping to move vehicles in this way, the majority of the soldiers are transported directly to the port of debarkation (or a nearby staging area), while a dedicated unit or skeleton crew from the parent unit is designated to handle the loading and off-loading as well as the guarding of the vehicles and equipment during the transport and staging phase.

However, there are two distinct factors that come into play that calls for Lo-Lo vessels as well. The first is that to ensure any prolonged time out in the field, any given unit will need more supplies than they can carry on their organic vehicles. This include not only fuel, food, and munitions all of which are areas where the limited amount which can be brought along will be used up relatively quickly, but also seemingly mundane items such as replacement textiles. These loads are most efficiently being moved either as containers or as break-bulk (with the exception of fuel, which is better served in most cases by dedicated fuel transport capabilities, i.e.tanker vessels when handling large loads and fuel trucks

for smaller ones). The other major factor where Ro-Ro can run into issues is with heavy, often tracked, vehicles. For these to be able to use Ro-Ro as their mode of transport, requires the whole infrastructure chain to be able to handle the loads and ground pressure required. This includes the port infrastructure, but also the loading ramps and vehicle decks on the vessels chosen. The weak point in these cases can often end up being the vessel ramp, or alternatively the capacity of the port infrastructure around the loading ramp. In these cases, Lo-Lo capacity – in essence a combination of pier length, the availability of cranes and cargo handling equipment, as well as available storage space for the cargo while staging – is the deciding factor.



Figure 5: The Ro-Ro MV ARC INTEGRITY is typical of the large car and truck carriers which have capacity measured in thousands of vehicles, in the case of MV ARC INTEGRITY she is able to carry 8,000 cars. Here she is employed during exercise DEFENDER 24, having unloaded part of the heavy vehicles of a US Army Transportation Battalion in a Finnish port. The vehicles are staged on the open quay, before moving out. Credit: U.S. Army photo by Eugen Warkentin

Another major difference between vessels is the size restrictions. Individual ports have varying restrictions regarding the size of vessels that can be accommodated due to draft, width and length, while the Baltic Sea as a whole is restricted by the Danish Straits[35]. For the ports in the Study Region, many have limited draft, and in many cases, there may also be restrictions related to the length of vessels able to dock at certain parts of a port, such as e.g. when requiring the use of a specific ramp.

[35] The draft and air draft are the two main limiting factors, which in practice sets an upper limit for size at around 100,000 DWT, though as the Baltic Sea itself is deeper than the Belt, larger vessels can enter as long as they are not passing the Great Belt fully loaded. Note that the limiting location when it comes to draft is not the Belt itself, but rather the waters south of Gedser which need to be transited to reach the Great Belt (or the Kiel Canal for that matter)



Figure 6: Dedicated amphibious assault ships are able to transport soldiers, vehicles, and equipment, and then bring them ashore using either landing craft or helicopters, or a combination of both. Here an LCAC landing craft from the Wasp-class amphibious assault ship USS KEARSARGE (in the background) transport marines and their vehicles ashore in a Norwegian fjord. Credit: U.S. Navy photo by Chief Mass Communication Specialist Oliver Cole

In addition to civilian vessels, a number of naval vessels and naval auxiliaries are available for the transport mission. The most advanced of these are amphibious warfare vessels equipped with large decks such as the US America-class and Wasp-class, the French Mistral-class, the Italian San Giorgio-class, and the single-vessel classes Juan I and Trieste of the Spanish and Italian navies respectively. These vessels are able to both transport light units – typically marines or airborne infantry – and then move them ashore by embarked helicopters and landing crafts. The capabilities of the vessels vary, with the America-class being on the high-end when it comes to the aviation facilities, able to operate F-35B multirole fighters and MV-22B Osprey tiltrotor transports as well as embarking 1,871 marines[36], the San Giorgio-class is able to embark a handful of helicopters and approximately 350 equipped marines[37], while the Mistral-class sits in between with the ability to embark up to 900 marines and 16 helicopters[38]. In addition, a number of navies operate vessels with less capable aviation facilities, including the Dutch Rotterdam-class[39], the British Bay-class[40], and the US San Antonio-class[41], all of which can carry 500 to 800 soldiers which can then be transported to shore using landing craft operating out of the well decks or helicopters from the helicopter deck.

[36] Atlhough lacking a well deck for landing craft. Source: U.S. Navy. 'USS America (LHA-6) - About'. SURFPAC. Accessed 14 April 2026. https://www.surfpac.navy.mil/Warships/USS-America-LHA-6/About/

[37] Ministero Della Difesa. 'Navi Anfibie Classe San Giorgio (LPD) - Marina Militare'. Marina Militare. Accessed 14 April 2026. http://www.marina.difesa.it/noi-siamo-la-marina/pilastro-operativo/mezzi/forze-navali/Pagine/Assaltoanfibio.aspx

[38] Ministère des Armées et des Anciens combattants. 'Porte-hélicoptères amphibie'. Marine Nationale, 1 March 2022. https://www.defense.gouv.fr/marine/forces-surface/porte-helicopteres-amphibie

[39] Defensie, Ministerie van. 'Amfibisch transportschip (LPD)'. Defensie.nl, Ministerie van Defensie, 3 May 2023. https://www.defensie.nl/onderwerpen/m/materieel/schepen/amfibische-transportschepen

[40] Royal Navy. 'Bay Class'. Royal Navy, 22 September 2025. https://www.royalnavy.mod.uk/equipment/ships/bay-class

[41] USN. 'Amphibious Transport Dock - LPD'. United States Navy. Accessed 14 April 2026. https://www.navy.mil/OLD-PAGES/Fact-Files-OLD/Display-FactFiles-OLD/Article/2222713/amphibious-transport-dock-lpd/

Notable is that from a pure logistics perspective, merchant vessels in many cases can be regarded as more efficient for the task of transporting a set number of vehicles or stores to a given port. However, the added capabilities of dedicated amphibious assault vessels that include the ability to land forces on unprepared beaches, the ability to airlift troops, and the added layer of protection offered by trained crews, sensors, weapons systems, and military shipbuilding standards, means that their flexibility and survivability is significantly higher compared to civilian vessels or even vessels taken up from trade and temporarily put into military service. As such, locations that might be deemed too risky when employing civilian vessels might still be usable when employing amphibious warfare ships.

Airlift

For airlift, this would include military aircraft being employed (including both larger aircraft able to move units and equipment into the theatre or make longer transports at speed, as well as smaller fixed wing transports and helicopters), but also civilian assets either in the form of chartered or regular flights. While larger airlifters with a strategic role are able to transport vehicles such as self-propelled artillery systems, armoured personnel carriers, helicopters, or even in rare cases tanks, the number of systems they are able to lift is generally limited. This does not mean the capability should be overlooked – there are historical examples where a handful of key systems being brought to the right location in a few hours instead of arriving in a few days' time has had a significant impact – but the more common use case is to lift palletised cargo or (light) infantry units. For movement within the theatre, helicopters provide mobility at speeds significantly greater than ground- or sea-based modes of transport, while offering higher flexibility when it comes to landing spots compared to fixed-wing assets. Due to the limited range of helicopters, these often are brought into the theatre by sea (or as cargo aboard transport aircraft) where they are reassembled and overhauled in the rear areas before being flown to their destinations.



Figure 7: Soldiers and civilian technicians at work attaching the rotor blades on a US Army CH-47F Chinook after it has been unloaded from the Ro-Ro vessel MV GREEN OCEAN in the Danish port of Kalundborg. Due to their limited range, helicopters most often are transported into the theatre as cargo aboard ships or large military transport aircraft, and then require a certain amount of reassembly and overhaul before they are ready for usage. Due to their great mobility once in the theatre of operations, helicopters can use ports of disembarkation further back without this leading to additional delays or undue load on the local transport infrastructure, in contrast to many ground units. Credit: U.S. Army photo by Elena Baladelli

In all cases, transport by air offer the highest transit speed by a significant margin[42] but will quickly become uncompetitive when the need is for bulky and/or heavy loads. The most direct way of using air transport is through the use of airdropped soldiers and equipment, which allow for combat units to be dropped by parachute and after a brief regrouping start conducting combat operations. These are however by their nature very lightly equipped unit, and will in most cases quickly need to be resupplied and preferably linked up with heavier units to provide increased firepower, mobility, and protection.

A common way of combining different modes of transport is to have a limited number of personnel take part in getting the vehicles and equipment of a unit to a staging area, to which the rest of the unit's personnel is then flown in by air. This can also be done by using pre-positioned equipment, i.e. by storing vehicles and larger pieces of equipment closer to the expected area of operations the speed of deployment can be increased significantly[43].

Countries which operate significant numbers of military transport aircraft usually also have dedicated units to handle loading and

[42] Demonstrated high-profile examples of this include the US 82nd Airborne Division being able to within "18-hours notice strategically plan, deploy and secure main objectives", as shown during Swift Response 18 when parts of the unit was flown directly from their US base of Fort Bragg in a non-stop 7,000 km flight that ended with them being airdropped close to Riga, see: Spc. Andrew McNeil. '82nd Airborne Division Descends on the Baltics for Swift Response Exercise'. www.army.mil, U.S. Army, 13 June 2018. https://www.army.mil/article/206906/82nd_airborne_division_descends_on_the_baltics_for_swift_response_exercise. Similar capability has also been demonstrated by the Alaska-based 11th Airborne Division which has flown soldiers over the pole from their US bases to drop them in Norway as part of exercise Arctic Shock 24, see: Guzman, Anyssa. 'US Army Conducts Over-the-Pole Airborne Operation into Norway'. www.army.mil, U.S. Army, 19 March 2024. https://www.army.mil/article/274630/us_army_conducts_over_the_pole_airborne_operation_into_norway

[43] The most significant example for the Study Region is the USMC prepositioned stocks located in Norway under Marine Corps Prepositioning Program-Norway (MCPP-N), which has been ongoing since the Cold War. For usage of these stocks during exercise Cold Response 26, see 1st Lt. Jorin Hollenbeak. 'Beneath Norway's Mountains'. Official U.S. Marine Corps Website. United States Marine Corps Flagship, 2nd Marine Logistics Group, USMC, 23 February 2026. https://www.marines.mil/News/News-Display/Article/4412038/beneath-norways-mountains/

unloading of cargo as part of expeditionary operations. As such, as long as there are working airports[44] with room to park a handful of airlifters on, the bottleneck is more likely to come from the number of available aircraft than from lacking aviation infrastructure. It is, however, notable that a potential airbridge to any given airport also rests on the ability of the surrounding area to support staging and onwards movement, i.e. enough resources to move equipment and people onwards by land or sea, and storage areas for those loads that are awaiting onwards movement.

Railroad

Railways provide the most efficient method of transporting large and bulky loads on land. The main issue is their lack of flexibility in routing and surging, as there are usually only a limited number of tracks available to travel any given route, and a limited number of free slots and available railcars to cater to military transports. For military purposes, a number of different sets of requirements are placed upon suitable freight terminals. As an example the Swedish Armed Force have specified that their preference is 750 m track of which at least 720 m runs straight and is suitable for loading, coupled with a free area at least 15 m long behind the end platform, as well as side platforms for loading and unloading cargo which needs to be side-loaded[45]. In addition, good connections to both the general rail network and to the road network are needed for movement to and from the freight terminal used.[46]

[44] Which also means that there is a significant difference between pre-war scenarios in which airports can be assumed to operate as normal, and wartime scenarios in which airports likely will be targets of enemy strikes. However, closing large airports for traffic for extended times – in particular if the aircraft used are modern airlifters, which often have good short-field performance for their size – have historically proved to be difficult provided there are basic repair capabilities available

[45] Either due to its nature, or due to damage to the vehicle/cargo

[46] Forslin Rail Consulting 2.0 AB. Teknisk Förstudie Omlastningsterminaler Brunflo. 2024



Figure 8: Railway connections between Sweden and the continent allows for the transportation of units and equipment from further away without the need for multiple modes of transport, including vehicles and equipment from prepositioned stocks such as the pictured M1A2 Abrams tank being loaded onto a trainset in Germany for deployment by the 1st ABCT of the 3rd Infantry Division. Note the width of the tank relative to the flatbed, underscoring the challenges associated with transporting heavy military vehicles. Credit: DoW photo by Maj. Allan Laggui

From a military mobility point of view, a particular issue when discussing cross-border movement between Finland and Sweden is the gauge-break[47]. This means that any train arriving at the border needs to unload its cargo. It also means that the Swedish and Norwegian railway networks are connected to that of continental Europe, and compete for rolling stock on a common market that include the better part of Europe, while for the Finnish network the rolling stock currently on the track is what is available. This means that depending on the situation elsewhere it is possible that Sweden and Norway can secure more rolling stock in case of a crisis, but there is also a risk that there is less rolling stock available than expected due to increased demand in other locations[48]. A smaller issue, but one which deserves to be mentioned, is that the Finnish and Danish rail networks are electrified according to the 50 Hz / 25 kV standard, while Sweden and Norway use a system based around 16 Hz / 15 kV. This means many locomotives are not able to cross the borders[49], although it should be recognised that changing locomotive or using diesel ones are a smaller nuisance compared to a gauge break. In addition, certain security measures and signalling systems are not necessarily compatible, something that however have a greater effect on fast passenger trains compared to slower cargo trains.[50]

[47] Finland employing the 5 ft, or 1,524 mm standard, while Sweden uses the 1,435 mm standard gauge

[48] E.g. due to a need to move NATO units through Germany to the Polish-Belarussian border

[49] There are a number of dedicated 'international' locomotives made for either the Sweden-Denmark route or for German international routes, as Germany uses the 16 Hz / 15 kV standard while several of its neighbours uses the 50 Hz / 25 kV one. See e.g. Tellerup, Fredrik. 'Ellok 119/185/241/482/Br/Re'. Järnväg.net. Accessed 5 June 2026. https://www.jarnvag.net/lokguide/185

[50] Suojanen, Kristiina. 'Raideleveys ei suinkaan ole ainoa ongelma, joka estää Suomen ja Euroopan välisen junaliikenteen – Nämä kaikki pitää myös huomioida'. Uutinen. Tekniikka&Talous, 3 June 2026. https://www.tekniikkatalous.fi/uutiset/a/2e946970-6b82-4176-938a-a0aeb0be21b7

As opposed to sea- and airlift discussed above where use could be made of regularly scheduled civilian services, it can be assumed that larger transports would be dedicated military transports. Note that due to the fixed nature of the railways and the limited number of tracks available, railways are relatively vulnerable to damage, both from environmental effects as well as from hostile action. The resilience of the railway network in the face of enemy action is highly dependent on a number of factors, where modern high speed connections and signalling can become bottleneck, while dispatching trains manually and relying on diesel power allow for some level of operation as long as basic repair capabilities are provided to e.g. fix broken tracks. Experiences from Ukraine indicate that significant capacity can be provided by railway, even when faced with significant enemy air attacks.[51]

Road transport

Road transports are in many ways the most flexible mode of transport, but are also relatively inefficient both when it comes to fuel consumption and transit speed, but also due to the friction inherent in coordinating the simultaneous movement of a large number of different vehicles. The flexibility in turn stems from the ease with which a large unit can be broken up into smaller and more easily routed parts, which can choose the optimal corridor based on their individual characteristics, as well as the ability to choose between a much larger number of routes compared to other modes of transport.

It is, however, crucial to note that all road transports are not created equal. The main question is whether the unit is moving in a combat ready state or not. Not doing so offer higher efficiency in that vehicles can be loaded up on heavy load trucks and trailers better suited for long road transports and passengers and non-vital personnel and equipment can be transported along different routes and using different modes of transport to increase the efficiency of the overall transport network. Marching in a combat ready state decreases the efficiency and increases wear on the unit, but also decreases the vulnerability to enemy action. Another major difference is between units relying solely on wheeled vehicles as opposed to those mechanised units which has a large number of tracked vehicles, as these lack the strategic and operational mobility compared to wheeled ones[52]. In practice, the tracked vehicles will require heavy transport vehicles for any medium to longer range transportation to the appropriate region. A notable development in the War in Ukraine is the appearance of medium-range drones at scale, able to interdict individual vehicles on the road network

[51] MSB. Developing Sweden's Civil Defence: Lessons from Ukraine - Summary of Report to the Swedish Government. Fö2023/01325. Myndigheten för samhällsskydd och beredskap, 2025, p. 47

[52] The benefit is significantly better tactical mobility, in particular in difficult terrain including soft and loose ground that is found in significant numbers in large areas of the Nordics

far behind the frontlines. This calls for new tactics and operating procedures as part of road transports, and will in part also have an effect on the level of losses that are needed to be accounted for during the transport phase as well as the order of battle of and equipment of units expected to perform road movements within range of these systems[53].

Summary

As a very rough general rule of thumb, the preferred method of transport is chosen accordingly:

- If possible (i.e. there are suitable ports of embarkation and debarkation) and the threat picture is acceptable, going by sea is preferred thanks to its efficiency,
- If there is a road transport over 200 km, it is usually more efficient to load vehicles and equipment onto a train and go by rail,
- If the transport is below 200 km, going by road is preferrable,
- If speed is of the essence, and/or if it is purely about moving personnel and light equipment, going by air is the preferred method of transportation.

It is important to understand that the preferred mode of transport is not necessarily the one chosen, as other factors also come into play such as the availability of transport platforms, the geography of the transport nodes, and the locations of the transport nodes where it is possible to transfer from one mode of transport to another. Instead, the preferred mode of transport should be seen as a 'all other things being equal' qualifier. To give an example, before a conflict it might be possible to move equipment by ship directly into Finnish ports from their ports of embarkation. However, at the early stages of an open conflict or at a time of extreme tension, the risk calculation changes and transiting over the southern and central part of the Baltic Sea might carry too much of a risk. This causes a shift to overland routes, until the alliance is confident in its ability to secure sea control[54].

[53] I.e. a higher focus placed on organic close-range air defence and electronic warfare systems to counter drones

[54] At the very least temporary sea control in the area of a convoy

Scenarios

Summary

Four scenarios are used to model increasing levels of stress on the transport system: a baseline exercise, a rapid crisis, a simmering crisis, and a Baltic Sea disruption scenario. The baseline scenario is manageable within existing infrastructure. The rapid crisis stresses ports and staging areas due to compressed timelines. The simmering crisis involves large-scale mechanised force deployment and major logistical strain. The Baltic disruption scenario shows severe cascading effects, forcing a shift from maritime to land-based logistics and overwhelming road and rail systems. The chapter includes force-size estimates and highlights exponential growth in transport demand across scenarios.

Scenario 1: Baseline Exercise

This scenario describes a high-intensity peacetime exercise environment involving approximately 25,000 troops and supporting naval and air assets. It represents a stress test for existing infrastructure under controlled conditions.

The scenario assumes coordinated planning to minimize civilian disruption, though timing requirements for exercise effectiveness still create localised congestion at ports, rail hubs, and staging areas. The need for synchronised arrival of forces creates pressure on logistics nodes.

Key movement corridors include Norwegian ports feeding into northern training areas and Swedish-Finnish inland routes supporting exercise distribution. While manageable, the system operates close to capacity in certain nodes during peak movement phases.

Notable is that this scenario closely align with certain large-scale exercises that have taken place in the region.

Scenario 2: Rapid Crisis

This scenario models a fast-developing security crisis requiring rapid deployment of forces. By their nature these would in most cases be light unit with expeditionary capability. Initial deployments are characterized by urgency rather than optimal sequencing of logistics flows.

The result is significant strain on ports, staging areas, and inland transport systems, due to the sequencing of the arrival of personnel and equipment largely depending on the speed by which they can be moved. This creates inefficiencies in unit assembly, and increases demand for temporary storage and marshalling spaces.

Civilian transport flows become less predictable, with potential evacuation movements and industrial disruptions compounding military logistics challenges. Airlift usage increases but remains a compliment to other modes of transport.

The key characteristic of this scenario is compression of the timeline, where speed of deployment creates systemic inefficiencies that ripple across the entire logistics network.

Scenario 3: Simmering Crisis

This scenario represents a prolonged escalation allowing for large-scale mobilisation of heavy mechanised forces. It involves full corps-level deployments and sustained logistical throughput over extended periods.

Military requirements increase dramatically, with hundreds of thousands of personnel and extensive heavy equipment movements across the Study Region – including not only movement on the east-west axis but also on the north-south one. Rail and port systems become primary enablers, but are stretched to capacity and vulnerable to disruption.

Civilian supply chains remain active and compete directly with military logistics, particularly in energy, industrial goods, and other security of supply flows. This creates structural competition for transport resources.

The scenario highlights systemic fragility under sustained high-intensity operations, where redundancy gaps and infrastructure limitations become critical constraints on operational effectiveness.

Scenario 4: Disturbances in the Southern Baltic Sea

This scenario introduces maritime disruption in the Baltic Sea, significantly altering trade flows and forcing rerouting of civilian and military logistics onto land-based corridors.

The reduction or cessation of safe maritime traffic creates massive pressure on Swedish and Finnish overland routes, as well as Norwegian

Atlantic ports. The shift from sea to land transport increases demand for rail and road capacity beyond sustainable levels.

Escort requirements for maritime convoys further reduce naval availability for other tasks, while the limited number of suitable escort vessels creates systemic constraints on maritime logistics. In particular critical traffic such as tankers would require much of NATO's available naval forces in the region for escort missions in order to be able to safely pass through the Baltic Sea to ports in the northern and eastern parts of the Baltic Sea.

The scenario demonstrates that maritime disruption has cascading effects far beyond naval operations, fundamentally reshaping logistics demand patterns.

Since this is an unclassified report based on unclassified information the following scenarios are based on information available in the public domain and analysis based on likely developments and possible force contribution nations and military formations. This means that no reference is made to already existing plans for reinforcements to the region.

The size of military units differs between countries and service branches. However, as a general rule of thumb, the different levels correspond to the following number of personnel in a US Army order of battle.[55]

Size	Number of personnel
Company[56]	60 - 200
Battalion[57]	400 - 1,000
Brigade[58]	4,000 – 4,700
Division	12,000 – 16,000
Corps	40,000 – 100,000

Table 1: Military unit sizes

[55] 'Defense Primer: Organization of U.S. Ground Forces'. Congressional Research Service, 4 December 2025

[56] Also troop (cavalry) or battery (artillery)

[57] Also squadron (cavalry)

[58] Including brigade combat teams, support brigades, regiments in the cavalry, and some support groups

The US Marine Corps has a unique structure due to their expeditionary and joint structure[59], meaning that a Marine Expeditionary Brigade (MEB) is significantly larger than an army brigade, the largest ones numbering up to 16,000 marines. In addition there are smaller Marine Expeditionary Units (MEU) that sit between battalions and brigades at 2,200 marines, and corps-sized Marine Expeditionary Forces (MEF) at 46,000 – 90,000.[60]

Units of other NATO countries roughly follow the structure of the US Army, although differences exist, in particular when it comes to the size of supporting units found organically within the structure at different levels. For our scenarios, it is also important to note that in many cases additional supporting units[61] would be added to the structure on an as-needed basis to increase the survivability and combat capability of the baseline units and formations.

Scenario 1: Baseline exercise

It was business as usual – another major multinational exercise, another time for NATO to declare that something was 'the largest since the end of the Cold War'. But at the same time it was clear for everyone involved that the growth had been rapid. There were 25,000 soldiers on the ground in the Nordics, from almost a dozen member states.

Added to this came the logistics requirements of the 65 vessels and almost 150 aircraft taking part. Together with the growth in the national forces of Sweden and Norway, space was starting to become tight at the available garrisons and exercise areas.

General description

The opening scenario is one where the military mobility requirement is set at a high peacetime-level. This means that while there are not any direct disturbances and civil society does not place any additional strains on the transport network compared to the current baseline, major exercises do regularly create significant temporary increases in the military mobility requirements placed on the current network.

On the positive side, it is possible to plan to ensure as little disturbances to civilian society as possible, but at the same time exercise troops ideally arrive at the exercise area at roughly the same time to avoid having units in the field waiting for the rest of the participants to arrive so that the exercise can begin.

[59] In other words, the MEB will include e.g. a basic level of air units supporting it to ensure there will be some level of fighter cover in case the unit is handling a mission independently and not part of a larger force structure

[60] 'Defense Primer: Organization of U.S. Ground Forces'. Congressional Research Service, 4 December 2025

[61] These could include e.g. more logistics, additional electronic warfare and intelligence gathering capabilities, as well as more air defence units

Requirements

The training area will be north of the study region – including Rovajärvi (FI), Kalixfors (SE), Boden[62] with surroundings (SE), and the Evenes[63]–Bjerkvik[64]–Nordkjosbotn[65] triangle (N) – and some of the traffic will head straight to that region. However, other units will transit from the southern parts of the countries, while some will have their ports of debarkation in the study region. A limited number of the aircraft involved will be based in the study region, mainly at Jyväskylä-Tikkakoski (FI), and some vessels will use port infrastructure in the Norwegian parts of the study region for resupply.

Units coming north from their peacetime garrisons through the Study Region (partly or in full):

- Telemark bataljon from Rena Leir,
- Skaraborgs regemente P 4 from Skövde,
- 31. Jägarbataljonen, Livregementets husarer from Karlsborg,
- Companies from Göta ingenjörregemente Ing 2 from Eksjö,
- Artillery units of Satakunnan tykistörykmentti from Niinisalo,
- Panssariprikaati from Parola

Foreign units deploying to the exercise through the Study Region:

- A 4,000 strong contingent of the USMC,
- Parts of 27e BIM,
- Parts of 45 Commando

A particular feature of this scenario is that a number of Finnish units which most likely would be deployed in the southern half of the country in case of a war – and as such would not affect the transport network in the Study Region in a significant way in this scenario – still rely on the training opportunities provided by the vast areas available in the High North. As such, the transport network in the Finnish part of the Study Region will see more usage compared to other scenarios.

Scenario 2: Rapid crisis

The crisis escalated quickly during the early days. It all started with a Russian demand for a demilitarized zone including most of the northern half of Finland, as well as major parts of northern Norway and Sweden to ensure the safety of the basing areas of the Northern Fleet. When these demands were refused, the Russian forces started mobilising units from the Leningrad Military District, and moving several corps drawn from it and

[62] Sa. Suttes
[63] Sa. Evenášši
[64] Sa. Rahkka
[65] Sa. Gárgán

from the Moscow Military District[66] to the border region, with some of the key mechanised units taking up position in the Karelian republic and Murmansk oblast. At the same time the diplomatic language and messaging in Russian media was becoming ever harsher, and with every day the situation was becoming more tense. The allies moved quickly to shore up the defences.

The UK deployed the UK Commando Force while preparing to follow up with the heavier parts of the 1st Division. At the same time, the US activated the Marine Corps Prepositioning Program-Norway, and started moving units of the XVIII Airborne Corps to the Nordics, where they were joined by a battalion each of the French 27e Brigade d'Infanterie de Montagne and Italian mountain troops.

General description

This scenario envisions a rapidly expanding crisis, which is answered by a build-up of forces on a tight schedule. The majority of the troops and equipment arriving in the first wave will be relatively light units from countries with a traditional interest in the region, and which will be pre-planned for deployment to the region. These can be expected to be first-movers, springing into action based on bilateral and minilateral agreements, rather than waiting for an Article 5 scenario or decision at NATO's political level to fully mobilise.

While this would mean a low amount of heavy equipment transferred in the first wave, the number of units arriving in theatre within a very short time span will put a higher momentary strain on ports and other chokepoints, in turn calling for more movement by air closer to the planned deployment areas. In general, a shorter build-up time frame would cause more issues with equipment not arriving in the optimal sequence or in the optimal locations, with a higher need to shift unloaded cargo and units around after they had been disembarked in the region, in turn creating a more dragged out staging phase with a corresponding greater need for storage areas. At the same time, civilian movements are more unpredicted as the implementation of national and alliance plans for evacuations and security of supply-related measures are not necessarily keeping pace with developments on the ground and may only be fully activated in war.

[66] The former Western Military District, see Kjellén, Jonas. Russia's Revamp of Military Districts - Back to a Centralised Future? FOI Memo No. 8540. Totalförsvarets forskningsinstitut - FOI, 2024



Figure 9: Vehicles from a USMC Combat Logistics Battalion having recently disembarked of the Ro-Ro vessel M/V NEW AMSTERDAM, gathering on to the pier in Norway before being prepared for further movement. Credit: U.S. Marine Corps photo by Lance Cpl. Christian Salazar

To discuss the detailed example order of battle, it envisions a strong UK and US contingent, supported by a handful of other NATO countries which have shown interest in the region. The units involved are generally in relatively high readiness, though being able to mobilise whole divisions might take some time as often parts of any given unit are in higher readiness than other parts are at that time. The focus in our example is on those units that have been training in the region.

If the crisis would be wider geographically, with e.g. a strong buildup on the border of the Baltic States as well, it is unlikely that all of the mentioned units would be sent to the Nordics, with e.g. the 1st (UK) Division probably being diverted towards the Baltic states instead. At the same time, the scenario used here does leave out a number of key units which would be able to deploy at short notice, such as the 82nd Airborne Division, the German Division Schnelle Kräfte (and the associated Dutch 11 Luchtmobiele Brigade), and any units of the French Troupes de Marine. In case of a larger crisis covering the Baltic states and the Polish-Belarus border as well, the assumption is that we would see a larger part of NATO's total available forces mobilised. As such, regardless of events outside of the Nordics, the number and general type of units described in this scenario is in all likelihood of the correct order of magnitude for the envisioned scenario.

Numbers

A number of units need to be deployed to the region, some of which will head to the High North (north of 65º N) while others will boost the Finnish defences south of that border. Note the role of ports outside of the study region (including Narvik).

Units coming north from their peacetime garrisons through the Study Region (partly or in full):

- Telemark bataljon from Rena Leir,
- Skaraborgs regemente P 4 from Skövde,
- Companies from Göta ingenjörregemente Ing 2 from Eksjö

Foreign units deploying through the Study Region:

- 2nd Marine Expeditionary Brigade, USMC[67],
- 40 and 45 Commando Battalions, Royal Marines,
- 1st (UK) Division (4th Light Brigade, 7th Light Mechanised Brigade, 16 Air Assault Brigade),
- 3rd Battalion, The Rifles,
- 27e BIM (parts),
- Alpine Brigades "Taurinense" (parts),
- 2nd Infantry BCT, Arctic Aviation Command , 1st Airborne Division,
- 1st Mobile Brigade, parts of 101st Combat Aviation Brigade and 101st Airborne Division Artillery Brigade , 101st Airborne Division,
- 2 squadrons of AAC (Wildcat + Apache)

This would see a total of 55,000+ soldiers deploying to the region from other NATO allies, the majority of whom would come from the 2nd Marine Expeditionary Brigade of the USMC, the 1st (UK) Division, and the 101st Airborne Division of the US Army. In addition, approximately 6,000 soldiers would be deploying north through the region, the majority of whom would be part of the Swedish wartime MekB 4 (Skaraborgsbrigaden).

Scenario 3: Simmering crisis

When people one day would look back upon the period they would argue about when the crisis actually began. It was hard to pin down a single date, but over the weeks things slowly escalated as the diplomatic exchanges went from bad to worse to terrible. In parallel, the armed forces on both sides of the border started moving troops and equipment to the border between Russia and the Nordic NATO-countries. Ro-Ro ships and container vessels arrived, bringing the equipment and vehicles of full brigades and divisions into the theatre, while around the ports air defence positions were set up and soldiers patrolled the parameters, looking for signs of hostile special forces or other security threats. M1A2 Abrams tanks weighing 70 tons were loaded onto semi-trailers and headed out in small convoys for the trip over the Scandinavian mountains, accompanied by large numbers of smaller vehicles.

[67] "Total manning for this MEB is about 17,000 to 20,000 Marines", source: https://www.29palms.marines.mil/Portals/56/Docs/LAS-SUA-Archive/CNA-Studies/CNA-MEB-Training-Exercise-Study-Dec-2004.pdf?ver=eHWI0qeYQ4GDhCFGuXRSzA%3D%3D

General description

Given more time to react, the alliance could put more thought into creating a truly combined arms force of a size that could function as an effective deterrent – or if the worst came to pass, beat back a coordinated Russian offensive before launching a counter-offensive. As such, the core would be made up of modern armoured and heavy mechanised units, most likely with a full armoured corps as the major manoeuvre unit. However, the geography of the Nordics with limited infrastructure in many regions makes it well-suited to lighter infantry units – preferably with some experience of cold weather-operations – and the sheer length of approximately 1,500 km of the combined Finnish/Norwegian border with Russia means that several more units would be needed to bolster the defences and avoid creating an overly porous defensive line. Depending on where in the theatre the sector assigned to a specific unit would be, some of these would preferably be heavy mechanised or armoured units, while in other sectors lighter units would be acceptable or even preferrable. As such, the scenario includes a balanced multi-corps force with a mix of heavier units and lighter units with winter combat capability, although compared to the earlier scenarios discussed here we in most cases would see the latter deployed as full-strength brigades.

This would in essence create a total force in Finland and northern Norway of 350,000-400,000 soldiers[68], of which approximately 200,000-250,000 would be from Finland, Sweden, and Norway[69]. While the numbers may sound considerable, it is still significantly smaller than the number of soldiers mobilised for the same stretch of geography during WWII[70]. In case of a serious crisis which geographically would be limited to northern flank of NATO and which would enjoy the highest level of political support throughout the alliance[71] it is conceivable that the number could be significantly higher than the figures given above. The US increasing their number of deployed divisions, France increasing their deployment to a full division, and significant contributions from countries such as Germany, Poland, and the Netherlands[72] could see another 100,000 soldiers added to the force composition.

Scenario 3 also creates serious considerations regarding other logistics flows in case of major crisis. Even if geographically limited to the region

[68] This being the ground forces, in addition there would be units outside of this organisation, such as base protection units of the air forces

[69] The majority being Finnish, as the example here is based on the units operating in Finland and northern Norway include all Finnish local forces, while the majority of Swedish and Norwegian home guard units are left out of the calculations

[70] Finland alone mobilised approximately 390,000 soldiers for the ground forces for the outbreak of the Continuation War in 1941, increasing to over half a million men in August of 1944 (including all service branches), while the German contribution in the area was over 200,000 soldiers

[71] Including alliance members taking a clear stand politically, but also there not being other significant crisis taking place at the same time drawing forces from member states to other locations

[72] This would also likely include Canada and Denmark, provided there is no indication of the crisis spreading to the Baltic states

north of the Gulf of Finland – a closure or major disruption of access through the Baltic Sea is discussed in Scenario 4 – could threaten the Finnish ports in the Gulf of Finland, where the three largest ports measured in tons traded internationally sits[73]. Even if the ports in Helsinki were kept open, which might be possible thanks to the synergies in allocating air defence units and other efforts to the defence of the capital region more generally, the ports of Sköldvik[74] and Hamina[75] -Kotka would see a shortfall of 35.5 million tons of gods on an annual basis. One semi-trailer brings 15-20 tons of cargo, meaning that all other things being equal, replacing that shortfall would see a need for 1.8-2.4 million semi-trailers annually to replace that cargo capacity[76]. In particular Sköldvik is however difficult to replace, as it is the last remaining oil refinery in Finland with an annual output of approximately 12 million tons while requiring approximately 10 million tons of crude each year as raw material[77], and the pure scope of and specialised nature of the goods handled in the port means that there are no direct replacements in case the port is unavailable[78]. In essence there would need to be a shift to refined products being delivered from foreign refineries directly to oil terminals and depots along the coast, which in turn would cause significant disruptions on the European market as Neste's customers would be looking for new suppliers, while the redrawn trade flows would change the map regarding which tankers are needed where.

[73] These being Sköldvik, Hamina-Kotka, and Helsinki. In addition, Hanko ranks number six behind Raahe and Rauma. Source: Ojala, Lauri, Juuli Jokinen, and Rasmus Hellström. Suomen satamien lastinkäsittelykapasiteetti. Logistiikka 2030, E-3:2025. Turun Kauppakorkeakoulu, 2025

[74] Fi. Kilpilahti, close to Porvoo/Borgå

[75] Swe. Fredrikshamn

[76] Though note that road transport is less fuel efficient than vessels, meaning there is a need for more fuel to be delivered to the different components of the transport system

[77] Neste. 'Porvoon jalostamo'. Accessed 6 May 2026. https://www.neste.com/fi-fi/tietoa-meista/toimintatapamme/tuotanto/porvoon-jalostamo

[78] Ojala, Lauri, Juuli Jokinen, and Rasmus Hellström. Suomen satamien lastinkäsittelykapasiteetti. Logistiikka 2030, E-3:2025. Turun Kauppakorkeakoulu, 2025



Figure 10: Two containers being loaded onto a transporter for movement out from a prepositioned site as part of exercise DEFENDER 24, a stark visualisation aiding in the understanding of what 486,000 TEU would look like on another mode of transport. Credit: U.S. Army photo by Sandra Wilson, USAG Benelux Public Affair

If the ports of Helsinki would also in addition to the ports further east come under threat, the situation looks increasingly more complex, both for local industry using the ports for import of raw material and export of produced goods – for Hamina-Kotka the forestry industry is key here – but also for certain types of cargo where the ports play an important role in Finnish international trade. During 2025 Helsinki handled 486,000 TEU of containers[79], and the three ports of Helsinki, Hamina-Kotka, and Kantvik[80] together handled 60 % of Finnish cereal imports in 2025[81]. Finland is however a net exporter of cereals with 2024 seeing a surplus of 600,000 tons[82], of which the majority was exported, meaning there would not be an immediate grain shortage. Still, the total imports amounted to 151,000 tons in 2025, the majority passing through ports east of Hanko in the Gulf of Finland.

[79] 'Helsingin Sataman tavara- ja matkustajaliikenteen volyymit vakaalla tasolla vuonna 2025'. Helsingin Satama, 20 January 2026. https://www.portofhelsinki.fi/tietoa-meista/helsingin-satama/ajankohtaista/helsingin-sataman-tavara-ja-matkustajaliikenteen-volyymit-vakaalla-tasolla-vuonna-2025/

[80] Situated in Kirkkonummi/Kyrkslätt, 30 km west of Helsinki

[81] Official Statistics of Finland (OSF). 'Ulkomaan meriliikenne'. Tilastokeskuksen maksuttomat tilastotietokannat, n.d. Accessed 6 May 2026. https://pxdata.stat.fi/PxWeb/pxweb/fi/StatFin/StatFin__uvliik/

[82] Official Statistics of Finland (OSF). 'Cereals Balance Sheet, 2024- 2025 (Provisional) and 2023 - 2024 Final Figures'. Natural Resources Institute Finland (Luke), Natural Resources Institute Finland, 19 September 2025. https://www.luke.fi/en/statistics/cereals-balance-sheet/cereals-balance-sheet-2024-2025-provisional-and-2023-2024-final-figures



Figure 11: Transports related to the forestry and paper industry are key for a number of ports in the Study Region. This include both timber, but also finished paper products, chemicals used in the process, and other raw materials. Credit: Robin Häggblom/Risk Intelligence A/S

The exact nature of how the trade flows would change in case of a major crisis is difficult to predict. However, it needs to be recognised that e.g. a closure of the ports of Hamina-Kotka would see flows including 1.4 million tons of timber, 1.6 million tons of sawn wood, 3.4 million tons of paper and related goods, 3.1 million tons of fertilizer, and 1.1 million tons of oil products needing new routes.[83] This should make it clear that any crisis threatening the ports of the Gulf of Finland or more generally the shores of the Baltic Sea will force significantly more traffic onto the existing east-west connections.

A reasonable assumption to make is that the majority of these new flows would look for connections through Finnish ports further west, either directly to the major hubs in Europe or alternatively passage over to Sweden. In Sweden the majority of the flows would likely be directed towards the southern and central parts of the country, in particular passing through either Gothenburg or using road and rail through Denmark to connect with the existing trade flows in continental Europe.

Numbers

A number of military formations need to be deployed to the region, some of which will head to the High North (north of 65° N) while others will boost the Finnish defences south of that border. Note the role of ports outside of the study region (including Narvik), which as discussed may or may not be available for ships depending on the threat of air and naval strikes, or alternatively may be judged to be available to naval amphibious assault vessels but not to civilian ships with military cargo.

[83] To which also comes significant amounts of other goods that are not traded in volumes exceeding one million tons annually, such as 610,000 tons of break bulk

Units coming north from their peacetime garrisons through the Study Region (partly or in full):

- Brigade Nord, components trained in Rena[84]
- Brigade Sør
- MekB 4, main components coming from P 4 Skövde
- 1. div divisional units not trained in Boden

Foreign units deploying through the Study Region:

- 2nd Marine Expeditionary Brigade, USMC
- United Kingdom Commando Force[85]
- 1st (UK) Division
- 3rd Battalion, The Rifles
- 27e BIM (France)
- Alpine Brigade "Taurinese" (Italy)
- 11th Airborne Division
- 10th Mountain Division (Light Infantry)
- 1st Infantry Division
- 1st Armored Division
- 29th Infantry Division [86]
- 101st Airborne Division
- US Army Corps level assets (headquarters and headquarters battalion, field artillery brigade, engineer brigade, corps signal brigade, military intelligence brigade, corps sustainment, medical, military police, …)
- 2 squadrons of AAC (Wildcat + Apache)

This would see a total of 150,000 soldiers deploying to the region from other NATO allies, the majority of whom would come from a US Army armoured corps, in this scenario likely the III Armored Corps. Notable is that in the scenario we have not calculated with all units currently associated with the III Corps arriving in theatre, but rather with two divisions backed up by the 2nd MEB of the USMC and some units of the XVIII Airborne Corps. The characteristics of the later units make them well-suited to deploying to a cold region with relatively limited infrastructure, and where a limited logistical footprint would be valuable. In addition, several of the major NATO countries in Europe which have shown interest in the region deploy infantry brigades, in the form of units trained for cold weather operations. Approximately 8,000 soldiers would be deploying north through the region, the majority of whom would be

[84] Telemark bataljon, parts of Ingeniørbataljonen, Kp 4 of Stridstrenbataljonen

[85] Formerly the 3 Commando Brigade

[86] Virginia Army National Guard

part of the Swedish wartime MekB 4 (Skaraborgsbrigaden) and a number of Norwegian units mobilised south of the Study Region.

Scenario 3 puts an emphasis on the ability to use ports of debarkation as close to their eventual destination as possible, as well as being able to use railway transport for as much of the land movement as possible. Where this is not possible, tracked vehicles will need to rely on trucks and semi-trailers for their movement outside of the battlefield itself and its immediate surroundings. The main battle tank also stands out, as these are the only systems significantly heavier than standard truck combinations which are seen in everyday civilian traffic[87], and as such will be classified as special transports whenever they are on the move. Their growth in weight over the last three decades also means that there is a risk that infrastructure built for military movement during the Cold War and in the 1990's may not be able to handle them.

The issue with moving modern main battle tanks needs to be acknowledged, but without straying into alarmist territory. There are in the study region a significant number of companies who on a weekly basis handle 100+ ton special transports on the road network in question. However, the transport routes available for these will be significantly more restricted compared to vehicle combinations which stay below the limit.

Scenario 4: Disturbances in the Southern Baltic Sea

The Baltic Sea is one of the most heavily trafficked water areas in the world, with thousands of ships present at any given time[88]. Much of this is related to critical goods and supplies to the states surrounding the Baltic Seas, where in particular the three Baltic States and Finland are highly reliant on seaborne trade.

In case of a shooting war which would see attacks on or a serious threat of attack on commercial shipping, such as in case of a declared blockade of vessels going to and from NATO ports, commercial traffic would likely become more cautious. As has been seen in recent conflicts such as the Russian full-scale invasion of Ukraine in 2022, the attacks by the Houthis in the Red Sea and Bab el-Mandeb, and most recently in the Strait of Hormuz, the behaviour of shipping can be difficult to accurately forecast, and depend on a number of factors. In general, however, rates will be higher, major operators will choose to avoid what they see as unacceptable risk to their crews and vessels, and in extreme cases

[87] Though transports with certain other military vehicles will also cross the threshold once the combined weight of the semi-trailer and the military vehicle it carries are taken into account. As an example, the heavy tracked SPGs such as the K9 Thunder tips the scale at almost 50 t, depending on the exact conditions (e.g. whether it is combat-ready). Source: Finnish Defence Forces. 'Panssarihaupitsi K9'. Maavoimat. Accessed 21 April 2026. https://maavoimat.fi/panssarihaupitsi-k9

[88] Source: Stankiewicz, Monika, and Nikolay Vlasov, eds. Ensuring Safe Shipping in the Baltic – HELCOM. Helsinki Commission (HELCOM) - Baltic Marine Environment Protection Commission, 2009. https://helcom.fi/publications/ensuring-safe-shipping-in-the-baltic/.

merchant shipping will only move under escort from friendly naval vessels.

For the Baltic Sea, the Danish Straits and the Kiel Canal[89] form chokepoints through which all commercial shipping enter and exit the Baltic Sea[90]. One of the methods that could create significant disturbances early in a conflict is if Russia would lay naval mines in the Baltic Sea. This would naturally be most effective in the chokepoints, where it is also notable that Russia in peacetime has the right to peaceful passage, which is a right employed on regular basis by Russian naval vessels, including vessels with mining capabilities. While a traditional minefield to completely stop traffic is unlikely – both due to the number of mines needed but also because once the mines are discovered Russia has very limited capability to stop the clearing of the minefield and to resow cleared areas – even a handful of mines found would raise questions. A good historical example is the so-called Mines of August episode, where between 9 July and 15 August 1984 seventeen merchant vessels were affected by underwater explosions in the Bab el-Mandeb straits. Approximately 25 mines in total were used, and caused significant disturbances and only ended after an international force cleared the area. No formal attribution was ever made, but strong suspicion fell upon Libya and in particular the use of the ferry GHAT as a clandestine minelayer.[91] In the Baltic Sea, a similar dynamic could easily be envisioned, where a vessel drops a handful of mines covertly to harass civilian shipping, or even a scenario where a naval minelayer[92] would lay a larger minefield before the outbreak of hostilities to slow down reinforcements heading to the Baltic states as well as to divert naval assets to the Danish Straits.

While the straits are vulnerable to surprise mining at the start of a conflict, after the immediate start of hostilities the Danish armed forces in cooperation with their Swedish and German allies should be able to secure the narrow waters. The Russian forces in Kaliningrad do, however, have the ability to interdict shipping roughly east of the line Rügen-Trelleborg. This include both traditional threats from surface vessels, submarines, anti-ship missiles and airstrikes, but also from unmanned systems. While the Russian forces lack the ability to

[89] Ger. Nord-Ostsee-Kanal

[90] There are other options for vessels wanting to enter the Baltic Sea, including crossing Sweden through Trollhätte kanal and Göta kanal, entering through the Neva River and the Russian Unified Deep Water System connecting the White Sea, Baltic Sea, and Black Sea, but these do not offer viable alternatives for the purposes of this report

[91] O'Flaherty, Chris. Naval Minewarfare: Politics to Practicalities. 1st edn. The Choir Press, 2019. Pages 133-137, 361. The official wording by the US State Department was that "there is persuasive circumstantial evidence that Libya was involved in mining the entrances to the Red Sea". No motive was ascribed to the actions

[92] Russian landing ships of the Project 775 Ropucha-class can fit 90 mines per vessel, although several of the available vessels are currently in the Black Sea where the force has suffered significant losses as part of the war. Several of the Russian mine countermeasure craft are also able to mount rails, with e.g. the Project 1266.0 Gorya able to carry 16 mines, and the somewhat smaller Project 12700 Alexandrit-class also able to lay an unconfirmed number of mines

physically stop traffic through striking every vessel sailing in the Baltic Sea, the threat to shipping could have an effect similar to what we have seen in the Strait of Hormuz, where the number of vessels passing through each day shrank to single digits.

Impact on civilian cargo flows

It needs to be recognised how significant a shortfall in goods moving this would constitute. Finnish ports handled 90.3 million tons of goods in 2024[93]. For Sweden, the ports likely affected by this scenario handled 58.0 million tons[94]. With one semi-trailer handling 15-20 tons of cargo, or 40-50 tons for a railway wagon[95], a direct change in which all Finnish international cargo and all cargo handled in the affected Swedish ports[96] would be transferred onto Swedish road and rail would in other words see an additional 22,600 semi-trailers or 290 trains added to the Swedish transport network each day[97]. While these comparisons are simplified in the extreme, they do highlight the scope of the strain a closure of or even serious reduction in capacity of the Baltic Sea would place on other modes of transport. Based on 2024 figures, the average port visit by a vessel to a Finnish port saw 3,830 tons of cargo handled[98]. In other words, every time a vessel stays away from the Baltic Sea and do not call a port, there is 220 semi-trailers worth of cargo that either is not moving or needs to be moved on alternative routes.

Any vessel entering the Baltic Sea will have to travel approximately 750 km (400 nautical miles) before it reaches Finnish coastal waters, while any vessel heading for Baltic ports such as Klaipeda or Ventspils will spend about 500-550 km (270-300 nautical miles) in the zone of danger. Depending on the speed of travel, this means every commercial vessel would spend anywhere from half a day to two full days within range of Russian anti-ship weapons and aircraft, depending on the exact route and speed. In such a scenario, it is possible that the majority of vessels – in particular vessels identified as transporting strategically important cargo such as tankers – will only move when escorted by naval vessels.

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[93] Of which 86.1 million tons are international trade, and 4.2 million tons domestic. Source: Official Statistics of Finland (OSF). 'Ulkomaan meriliikenne'. Tilastokeskuksen maksuttomat tilastotietokannat, n.d. Accessed 6 May 2026. https://pxdata.stat.fi/PxWeb/pxweb/fi/StatFin/StatFin__uvliik/ and Official Statistics of Finland (OSF) 'Kotimaan vesiliikenne'. Tilastokeskuksen maksuttomat tilastotietokannat (Helsinki), n.d. Accessed 6 May 2026. https://pxdata.stat.fi/PxWeb/pxweb/fi/StatFin/StatFin__kvliik/statfin_kvliik_pxt_12il.px/table/tableViewLayout1/

[94] For the purpose of this report, it is assumed that the NUTS II regions SE22 South Sweden and SE23 West Sweden remain unaffected, corresponding to the counties of Blekinge, Skåne, Halland, and Västra Götaland. Statistics from Trafikanalys. 'Sjötrafik 2024'. Trafikanalys, 2 March 2026. https://www.trafa.se/sjofart/sjotrafik/

[95] In both cases these are loads that can be expected to be handled on average, with some cargo being more efficient while others will be limited by volume rather than weight

[96] 144.1 million tons in total

[97] This is the average load from the 8.2 million trucks or 3.2 million railway wagons needed for the annual load, divided by 365 days each year. If the average time to transport the goods through Sweden would be higher than a day, the added load on the transport network would obviously increase

[98] Based on 87.3 million tons of goods imported or exported handled in ports, with 22,792 port visists related to international trade. Source: Ojala, Lauri, Juuli Jokinen, and Rasmus Hellström. Suomen satamien lastinkäsittelykapasiteetti. Logistiikka 2030, E-3:2025. Turun Kauppakorkeakoulu, 2025

It is however also important to remember that the littoral nature of the Baltic Sea means that any maritime operation will by default have a 'joint' aspect to it, as air and surface-based assets will be able to play a significant part. NATO being able to call upon a significant advantage in airpower would have an impact, both in protecting friendly vessels but also in attacking hostile naval units as well as shore-based missiles and surveillance systems.

While NATO is the significantly stronger part in the maritime domain in the Baltic Sea, the number of vessels suitable for escort duty is relatively limited:

- K130 Braunschweig-class (2,000 t) corvettes, six vessels operational with four more being built. Multi-role capable with point-defence RAM air defence missiles, a 76 mm deck gun, and anti-ship missiles,
- Visby-class corvettes (650 t), five vessels operational. Being upgraded with short-range CAMM air-defence missiles. Has a 57 mm deck gun, light torpedoes, and anti-ship missiles,
- Gävle-class corvette (400 t), two vessels operational. Single 57 mm deck gun, light torpedoes, and anti-ship missiles,
- Hamina-class fast attack craft (250 t), four vessels operational. Equipped with short-range Umkhonto air defence missiles, a 40 mm deck gun, light torpedoes, and anti-ship missiles. Endurance is limited to less than a week,
- Hämeenmaa-class mineship (1,300 t), two vessels. Secondary escort capability, equipped with short-range Umkhonto air defence missiles and a 57 mm deck gun,
- Orkan-class fast attack craft (370 t), three vessels operational. Outdated point air defence missile systems, a 76 mm deck gun, and anti-ship missiles.

As such, the current pool of vessels capable of performing escort duty is around 20 ships, the majority of which are not capable in all three dimensions (air defence, surface warfare, and anti-submarine warfare). In addition, the Danish and German navies have several capable vessels[99], but these are likely to be operating in the North Sea and in the Atlantic. A number of offshore patrol vessels with limited armament can also be drawn upon, mainly to provide additional sensors and to counter unmanned systems. Significant additions are also coming in the form of the Polish Wicher-class[100] frigate, three of which are being built, Finnish Pohjanmaa-class heavy corvette, four of which are being built, and the

[99] The three Iver Huitfeldt-class frigates, the two Absalon-class frigates, the four F123 Brandenburg-class frigates, the three F124 Sachsen-class, and the four F125 Baden-Württemberg-class frigates (the F125-class is lightly armed for their size, but their combat capability is still comparable to the lighter vessels mentioned in the Baltic Sea)

[100] Also known as the Miecznik-program

Swedish Luleå-class frigate based on the French 4,600 t FDI-class, four of which are planned. All of these classes will add significant multi-role capability.



Figure 12: The Hamina-class fast attack craft FNS HANKO is in many ways typical of the escorts available to the navies of the Baltic Sea. The vessel has the ability to counter threats on and below the surface, as well as from the air, but has a limited endurance and magazine depth due to its size, and some key systems are lacking in range. Credit: Robin Häggblom/Risk Intelligence A/S

To be able to escort a convoy or group of ships[101], the minimum number of escorts needed depends on the number of vessels needing escort. This is due to the need to provide coverage in all directions from where the threat can be expected to appear. Also, as several of the weapon systems operated have a relatively limited range, this require the escorting vessel to stand between the escorted vessels and the threat, to increase the time available to engage the attacker.[102]

[101] Note that the word 'convoy' as defined by some of the navies in the region carries with it defining features, such as the designation of a convoy commodore and changes related to questions of insurance and overall responsibility, that are not necessarily part of the everyday usage of the term. When using the word 'convoy' in a maritime context in this report, it refers to a formation of merchant ships or naval auxiliaries sailing together under naval escort, regardless of whether this from a legal and doctrinal point of view is a convoy or not. See e.g. NATO. 'ATP-02.1 Naval Cooperation and Guidance for Shipping - Guide to Owners, Operators, Masters and Officers'. NATO Standards Related Document. NATO Standardization Office, September 2014

[102] Alternatively, a single naval vessel can escort two or three merchants in close formation, which ensure the area to be covered is small enough that a single vessel might be able to provide the coverage needed. However, this would require a corvette/frigate with a significant number of medium-range air defence weaponry. In either case, a single naval vessel covering two-three vessels or a larger convoy with a higher number of escorts will roughly average out to the same ratio of escorted vessels per escorting vessel



Figure 13: The general outline of the convoy lanes used for the examples in this report

To understand the demand for escorts, we can envision two convoy lanes: Rügen to the Archipelago Sea from where vessels can peel off to either Turku[103], Stockholm, or the Bothnian Bay under the protection of shore-based systems[104]. Let us designate this convoy route RA, while return convoys similarly are designated AR. A second convoy route would be needed to serve the Baltic States. This could be arranged as a single route with the end-point located e.g. outside the port of Ventspils[105], from which other ports would be reached by vessels heading to and from this location staying within the range of shore-based protection. This route can then be designated RV, with the convoys heading out towards the Atlantic being designated VR.

[103] Swe. Åbo

[104] Ports on the Swedish east coast can be served by ships on this route leaving/joining when the convoy passes outside of the port in question

[105] The exact nature of this convoy route would vary more depending on the situation on the ground and in the air. Another alternative might be to gather and disperse the convoy in the Gulf of Riga, or divide the convoy into smaller convoys closer to shore which under protection of one or two escorts serve ports such as Klaipėda, Liepāja, Riga, Pärnu, and Paldiski

Travelling at 12 knots, an RA convoy would take 33 hours to reach the Utö-Kapellskär line[106]. Here, the escorts could then turn around and head back with the next AR convoy, or alternatively be replaced by fresh escorts if they need to go to port for replenishment and maintenance. The AR convoy would then take a similar 33-hour trip south, where the escorts would again shift to the next RA convoy. This would allow the escorts to minimise the time sailing to and from escort missions, while relying on the naval bases close to the respective endpoints[107]. This means that a round trip escorting one inbound and one outbound convoy on the RA/AR-route would take at least three days[108].

Similarly, the RV route would take approximately 24 hours sailing in one direction[109], or 54 hours (two days and six hours) for a round trip with three hours for the turnaround.

A quick back of the envelope calculation would then indicate that if we then assume 20 available escorts based on the vessels mentioned above and there being no significant naval reinforcements due to the need for a strong naval presence in the Atlantic, as well as calculating with a need of four escorts per convoy, we can create five escort groups, each able to escort a single convoy at any given time. We can then further assume that every ship would be able to spend half the time at sea performing escort duties[110]. If, for the purpose of calculating an average[111], the escort groups would alternate between routes any single escort group could escort one RA convoy followed by an AR convoy in 72 hours, then move on to escorting an RV convoy followed by a VR convoy out in another 54, meaning the escorts would have spent almost six days on station. Followed by six days of down time, every single escort group could ensure one convoy to the Archipelago Sea and one to the Baltic States every twelve days. Since we have five escort groups, the theoretical maximum in our scenario is five convoys on both routes every twelve days, or just over two days between every convoy.

Conclusions Regarding Lack of Naval Escorts

In short, in the scenario above even in case of a working convoy system seeing a convoy reach the northern part of the Baltic Sea every two

[106] Based on the route being 730 km or 395 nautical miles long

[107] Berga and Pansio in the north, Karlskrona, Rostock, and Korsør in the south. In addition several civilian shipyards and facilities are found in both regions

[108] 66 hours effective sailing time. Leaving just three hours for the turnaround is probably overly optimistic, but is acceptable as a ballpark figure considering the uncertainties in the details surrounding this scenario

[109] Based on the route being 540 km or 290 nautical miles

[110] The other half being allocated to travelling to and from the mission, undergoing maintenance, rest and replenishment, or being repaired from potential battle damage

[111] In reality, having escort groups work the same routes would almost certainly be preferable as that would increase local knowledge and allow for the tailoring of the escort groups for the threat picture of that route

days[112], there would still be a shortfall of 75-90 % of port visits in international trade for all Finnish and for the majority of the Swedish ports. This would not impact all kinds of traffic evenly, as there would be a focus on vessels carrying critical goods which is difficult to cover through other modes of transport. As such, refined oil products and other energy-related transports would likely be a high priority, while low-value cargo or goods that could relatively easily be shifted to other modes of transport[113] would likely be impacted harder. Certain routes, mainly in the Gulf of Bothnia or Swedish coastal trade, would likely not be directly affected at all, though they could still face issues related to e.g. disturbances in fuel distribution.

The shortfall in transport capacity described above is large enough that even if we drastically change key parameters to the scenario[114], the overall demand for alternative transport resources – trucks, train, and air freight – would by far outstrip the available supply. In other words, any military demands placed on civilian transport resources for the purpose of moving military units or supplies will have to compete against critical civilian supply chains in a logistical system that is already operating at full capacity. The least issues would be encountered by military units able to use their own vehicles to deploy through road marches, but even in these cases the disturbances encountered by civil society would create issues when it comes to which civilian support functions[115] would be available.[116]

A reasonable assumption to make is that the majority of the routes available for diverting the trade flows impacted would aim towards the southern and central parts of Sweden, with the aim of passing through either Gothenburg or using road and rail through Denmark to connect with the existing trade flows in continental Europe. A secondary alternative is to use Norwegian Atlantic ports, which depending on the final destination as well as source of the cargo may be a more viable option when accounting for the congestion likely to hit the more popular routes. In particular traffic increases on the E12 and E14 would have an

[112] It should also be noted that the scenario presented above is based on in essence all surface warfare vessel of NATO taking part in the escort duty. In other words, this would significantly reduce the ability of the alliance to perform other key missions, including offensive operations against hostile ports and vessels as well as defensive missions such as taking part in the integrated air and missile defences of key coastal cities and installations. As such, the number of available vessels calculated with above is probably on the high side, as it seems unlikely all suitable alliance resources would be allocated to protecting seaborn trade

[113] Such as many kinds of break-bulk

[114] E.g. increasing the speed of the convoys, or allowing for certain vessels to proceed unescorted

[115] Such as e.g. the ability to refuel or acquire food from civilian service providers

[116] There are scenarios that foresee a significantly greater hit to commercial shipping, with e.g. the recently published scenario by the Finnish Huoltovarmuuskeskus (the National Emergency Supply Agency) envisioning a ”temporary halt to commercial maritime traffic for several weeks or months”, in the face of which they see ”Military operations, the movement of equipment and units taking up an increasing portion of the capacity still operational”, forcing transports catering to civilian needs onto to ”the back-up routes of the back-up routes”. This prioritisation of the military needs aids with the military mobility question to some extent, but at the cost of international trade completely drying up, leading to an immediate economic shock and rapidly rising prices. Source: Suomeen kohdistuva sotilaallinen voimankäyttö ja huoltovarmuus -skenaario. Huoltovarmuuskeskus, 2026, p. 13

impact on the military mobility needs, as would a general increase in cargo traffic on the Swedish railway network.

Scenario 4a: Rapid crisis with closed South Baltic Sea

In case of a rapidly escalating crisis, as we have seen the military formations deployed would be better suited to be airlifted over the Baltic Sea, and they would also be better equipped to land at ports of debarkation further away from their planned deployment area, and road march with their own vehicles to the eventual sector of responsibility. At the same time, it is clear that if there were a significant disturbance in the Baltic Sea, it could have ripple effects as stakeholders in shipping, trade, industry, and security of supply-related fields all scramble to come to grips with the situation and determine which trade flows need to be redirected and to where. This could easily affect the availability of vessels to transport the units from the sending nations to the Nordics, but also have an effect on the availability of port facilities and slots on railway lines. The uncertainty and rapidly changing environment in such a crisis would all come together to create a highly complex situational picture with added friction.

However, once the units are ashore, the situation from a strictly military mobility point of view is somewhat straightforward, thanks to the flexibility of light units and their good strategic and operational mobility. The main question is that of fuel, as a fuel shortage could hit the study region relatively quickly in case of a total closure of the South Baltic Sea[117], while at the same time a longer road march than planned would create a need for more fuel to the deploying units compared to what debarkation in Finnish ports would call for. In addition, the other types of supplies needed to sustain their operations will also need to be planned for.

Scenario 4b: Simmering crisis with closed South Baltic Sea

The disruption would be felt much more keenly for heavier units with worse organic strategic and operational mobility. The need for longer overland movement will add to the complexity, in particular as the heavier vehicles and more complex logistics associated with transporting tracked vehicles will aggravate all of the issues mentioned in Scenario 4a with higher than calculated fuel consumption and competing with redirected civilian flows for transport resources while also being less flexible with regards to which transport routes and facilities can be used.

[117] As an effect of hoarding and distribution issues, rather than an out-and-out lack of fuel in the Nordics

The Military Mobility Needs

Summary

This section quantifies infrastructure strain across scenarios, showing that Scenario 1 is manageable while Scenarios 2 and 3 progressively exceed system capacity. Scenario 3 in particular requires extensive coordination across the whole transport network to avoid systemic breakdown.

Scenario 1 sees relatively smooth movement of forces, thanks to the predictability and pre-planning of the movements. Even though military convoys increase traffic, they do not overwhelm infrastructure because movements are coordinated with civilian transport priorities.

Scenario 2 introduces more complexity due to faster deployment timelines. Bottlenecks appear at certain ports and staging areas because units, vehicles, and equipment do not always arrive in optimal sequence. Airlift helps, but is limited in capacity, meaning it is mainly useful for personnel or high-value assets, while the majority of vehicles and equipment will come by sea and road/rail. Civilian population movements (including refugee streams) also add unpredictability.

Scenario 3 represents a major escalation with heavy mechanised forces (including armoured brigades and corps-level assets). These forces include modern main battle tanks, tracked vehicles, and large logistical elements, significantly increasing transport demands. It is worth emphasising that scaling from brigades to divisions creates exponential strain on infrastructure and coordination systems. Even in the best case where the longer timespan allows for greater efficiencies in the planning and scheduling process, the scenario would still see thousands of vehicles and extensive road transports across long distances, with bottlenecks at key nodes.

It is also notable that a crisis could see a **combined Scenario 2+3**, where rapid initial deployment is followed by heavier force buildup. This creates compounded inefficiencies because early-stage deployment already consumes infrastructure capacity and planning resources.

The scenarios also further underline the differences in transport modes:

Rail and Ro-Ro shipping are far more efficient than road movement for large-scale deployments,

A single armoured brigade could require dozens of trains or multiple large vessels,

At scale, strategic movement translates into enormous logistical equivalents (hundreds of trains, tens of thousands of trucks, or over a hundred cargo vessels).

Overall, modern large-force military deployment is fundamentally constrained not by combat capability alone, but also by **transport infrastructure capacity, sequencing, and logistical coordination across civilian and military systems**.

A key detail is that not all military units place similar demands on the transport system. Armoured formations are especially resource-intensive due to their heavier vehicles and larger proportion of tracked vehicles, requiring rail and heavy road transport for efficient strategic mobility.

Road convoy density and length area also major stress factors for road networks. Even moderate deployments generate hundreds of kilometres of convoy formations distributed across multiple corridors. Scenario 3 if relying purely on road transport would see over 10,000 km of road convoys, covering the full length of road from Trondheim to Rovaniemi ten times over (or three times the distance by road to Rovaniemi from the home of the French mountain infantry in Grenoble at the foot of the French Alps).

For Scenario 1, it is demonstrated throughout the exercises conducted in the region in recent years that while it will lead to increased traffic, it will not challenge the existing transport infrastructure. This is in large part due to the planning effort of the movements, where civilian transports on e.g. the railroad network are prioritised, and considerable care is taken to ensure the safe deployment of the military units with as little disturbance as possible.



Figure 14: Armoured personnel carriers such as the Patria 6x6 of the CAVS programme are ubiquitous to many military units, including both motorised and mechanised ones. The 6x6 comes in at 15.5 tons empty, and at 7.5 meters long and 2.9 m wide is roughly similar in size to many trucks found on the roads. Credit: Robin Häggblom/Risk Intelligence A/S

Scenario 2 is already more complex, largely due to the speed with which the deployment is supposed to take place. This will create logistical issues, starting with the loading of the vessels and aircraft at the ports of embarkation in the sending nations where the units might not arrive with their vehicles and equipment in the order that would be preferrable, or the vessels and aircraft needed for the transport might not be available in the preferred order[118]. This will in turn create bottlenecks at the ports of debarkation and/or the staging areas, as the process of marrying up soldiers to their equipment and vehicles become less efficient. This in turn will clash with the need for rapid deployment, meaning that it might not be possible to wait for one unit to clear a port of debarkation before the next unit is being offloaded in the same area. This creates a higher need for storage areas as well as facilities for the soldiers waiting to move on. Similarly, several units on the move simultaneously on the same routes will put a serious strain on both the transport network itself, but also on supporting services such as convoy support centres and civilian service providers.

On the positive side, the light nature of the units envisioned means that they are able to deploy with relatively little outside assistance. The vehicles involved are almost exclusively wheeled ones, and the sizes and weights are comparable to normal road-legal vehicles. A good example of how a unit involved in this scenario could look is the French ad-hoc Brigade Serval sent to Mali for Opération Serval in 2013. This was made up of the kind of light units discussed in Scenario 2, and consisted of approximately 1,300 vehicles, of which approximately 290 were 15-30 ton armoured vehicles, around 200 were unarmoured

[118] A good example of the issues encountered during rapid deployment can be found in the British experience during the Falkland's War of 1982. See e.g. Thompson, Julian. No Picnic. 1985; Pen and Sword Military, 2008. Kindle Edition, or Clapp, Michael, and Ewen Southby-Tailyour. Amphibious Assault Falklands: The Battle of San Carlos Water. 1997. 2nd edn. Pen and Sword Maritime, 2012. Kindle Edition.

vehicles in the same range, around 350 were lighter trucks, and around 440 were light utility vehicles[119]. Notable is that no vehicles were above 35 ton in weight, and by and large the unit could also be deployed by air, with aircraft such as the Airbus A400M able to lift two 6x6 armoured personnel carriers or a single Caesar 155 mm self-propelled gun[120]. However, the number of airlifters is limited – France as an example has 25 Airbus A400M while Germany operate 53 of the same aircraft[121] in service as of early 2026[122], the British Royal Air Force in turn has 22 A400M while also operating eight of the somewhat larger and more versatile C-17 Globemaster III, in addition to which the multi-national Heavy Airlift Wing of NATO operate three C-17 Globemaster III[123]. This, coupled with the limited number of vehicles able to fit into any single aircraft, means that airlifts are better used for bringing in soldiers or single high-value vehicles[124] rather than for the deployment of complete motorised units.

	Belgium	France	Germany	Luxembourg	United Kingdom	Heavy Airligt Wing (NATO)	Spain	Turkey	USA	**Total**
Airbus A400M	7	26	53	1	22	-	14	10	-	133
C-17 Globemaster III	-	-	-	-	8	3	-	-	222	233

Table 2: Strategic airlifters in service with NATO countries

To this need to be added that in a rapidly changing and unpredictable scenario, the behaviour of the civilian population also becomes more unpredictable. Plans for orderly evacuations of the border regions close to Russia might not be implemented in an organised and orderly fashion due to the rapid escalation, but instead spontaneous refugee streams might appear. This might include people from regions further from the border, but who judge it to be in their interest to e.g. leave major cities and instead take up temporary refuge at a cottage or with friends or

[119] The breakdown is 252 armoured personnel carriers (13 t 4x4 VAB and a small number of 30 t 8x8 VBCI), 34 armoured fighting vehicles (wheeled AMX-10 RC and ERC 90 Sagaie), 185 protected 4x4 vehicles (PVP and VBL), 173 heavy trucks (25 t and above), 354 light trucks (6-13 t), 22 fuel trucks, and 262 light utility vehicles (the majority being Peugeot P4). The engineering vehicles included 8 EGRAP engineering tractors, while indirect fire support included four 155 mm CAESAR self-propelled guns and eight heavy mortars. Source: Guilloteau, Christophe, and Philippe Nauche. Rapport d'information de MM. Christophe Guilloteau et Philippe Nauche déposé en application de l'article 145 du règlement, par la commission de la défense nationale et des forces armées, en conclusion des travaux d'une mission d'information sur l'opération Serval au Mali. Rapports d'information N° 1288. Assemblée nationale, 2013. https://www.assemblee-nationale.fr/14/rap-info/i1288.asp

[120] Häggblom, Robin. 'The One Who Bore the Skies Upon His Back'. Blog. Corporal Frisk, 16 July 2025. https://corporalfrisk.com/2025/07/16/the-one-who-bore-the-skies-upon-his-back/

[121] Likely to be increased to 63-73. Source: Hoffmann, Lars. 'Neue A400M-Transportflugzeuge für die Luftwaffe im Gespräch'. Hartpunkt.de, Hartpunkt, 29 May 2026. https://www.hartpunkt.de/neue-a400m-transportflugzeuge-fuer-die-luftwaffe-im-gespraech/

[122] GIFAS. 'Livraison du 25ème A400M de l'armée de l'Air et de l'Espace'. 20 January 2026. https://www.gifas.fr/press-summary/livraison-du-25eme-a400m-de-l-armee-de-l-air-et-de-l-espace

[123] NATO. 'Strategic Airlift'. What We Do. Accessed 30 April 2026. https://www.nato.int/en/what-we-do/deterrence-and-defence/strategic-airlift

[124] Such as engineering vehicles

relatives. These movements might be spontaneous or pre-planned at the individual level, and may involve significant number of people moving in directions that are unexpected[125].



Figure 15: Although not on par with modern main battle tanks, self-propelled artillery such as this Norwegian K9 Thunder 155 mm tracked howitzer with a weight of 47 tons are some of the heaviest vehicles on the modern battlefield. Credit: U.S. Marine Corps photo by Sgt. Addysyn Tobar

A major difference for Scenario 3, when compared to Scenario 2, is that not only is the number of people, vehicles, and equipment involved significantly higher, but a truly mechanised force is also significantly heavier compared to the light rapid-reaction units of Scenario 2. A US armoured brigade combat team will have its heavy firepower in the form of 80-100 heavy main battle tanks with a combat weight of over 70 tons, each of which will need to be loaded onto either a semi-trailer or a train to be able to move longer distances. They will be accompanied by almost 20 artillery pieces, mainly the M109A7 Paladin tipping the scale at 35.4 ton[126], backed up by almost 350 other tracked vehicles. An additional 700+ wheeled vehicles and 350+ trailers and semi-trailers are also found in unit. In other words, while the number of vehicles per ABCT is roughly comparable to the total number for the Brigade Serval, the inclusion of roughly 100 vehicles heavier than anything fielded by the lighter brigade and around 450 tracked vehicles which need to be transported by truck/trailer or train complicates the logistics.[127] It is also important to recognise that in each step in the organisation, additional supporting units are added. As such a single division not only have two to five brigades in a typical setup[128], but also a dedicated divisional up to

[125] E.g. a spontaneous movement of people leaving Trondheim for cottages may see significant number of people fleeing north from the city, ostensibly towards the fighting taking place on the border, in an attempt to move away from what they deem are possible targets for Russian air and drone strikes

[126] Widlund, Oscar, Sunil Nair, and Jon Hawkes. Jane's Land Warfare Platforms: Artillery & Air Defence 2019-2020. 2019th–2020th edns. Jane's Land Warfare Platforms. IHS Markit, 2019, p. 74

[127] Source for the number for the ABCT: Talaber, Adam. The U.S. Military's Force Structure: A Primer, 2021 Update. With David Mosher and Edward G. Keating. Congressional Budget Office, 2021

[128] Four being the standard in a US Army context. All brigades in a division are rarely equal, but a division can e.g. have a mix of armoured and mechanised brigades to ensure the heavier hitting power of the tank units while still retaining enough infantry to effectively hold ground or conduct urban operations

brigade-size artillery unit, engineering assets, divisional support units including everything from military police to logistics and sustainment, and even helicopter brigades in US divisions[129]. In addition to organic units, division and corps level formations also often can see specialised assets such as additional sustainment and support units or electronic warfare/signals intelligence units as required by the planned operations[130].

	Light Infantry Brigade (Brigad Serval)	Armoured Brigade (ABCT)
Main Battle Tank		87
Wheeled armoured fighting vehicles	34	
Artillery (tracked)		18
Artillery (wheeled and towed)	12	
Infantry fighting vehicles/Armoured personnel carriers (tracked)		272
Infantry fighting vehicles/Armoured personnel carriers (wheeled)	252	
Support vehicles	8	71
Medium/heavy trucks	195	231
Light trucks	354	184
Utility vehicles	447	360
Trailers		352

Table 3: Difference in vehicles between light and heavy brigades, the examples being the French ad-hoc Brigad Serval and a US Army Armored Brigade Combat Team

As such, it is important to understand both the difference in size it means when we shift the discussion from a number of brigades arriving to a number of divisions doing so, but also to understand the difference

[129] Aviation brigade, in US Army terminology

[130] A report by the Swedish Defence Research Agency FOI uses 4.5 as the factor when between levels, i.e. a division is 4.5 times larger than a brigade, and a corps is 4.5 times larger than a division. Source: Ekeskär, Andreas, Anna Svensson, Herman Andersson, and Erik Lundberg. Förutsättningar för transitering av militära förband genom Sverige - En översikt av infrastruktur, administrativa processer och finansieringsmöjligheter. FOI-R--5907--SE. FOI, 2026

in logistical needs moving a modern heavy division constitute compared to shifting a light brigade where one of the requirements for the light brigade has been for it to be expeditionary.

As an example, a road march for an armoured brigade would see the unit divided up into road convoys. These would be of different size and equipment, but for this example let us look at the impact of using relatively large convoys to keep the total number of convoys down. Having an average convoy size of e.g. 100 vehicles and each convoy stretching approximately 15 km[131], moving at an average speed of 70 km/h[132], would see each armoured brigade create 10-15 convoys. Preferably these would spread out either geographically and/or temporally. For a total force of 150,000 soldiers, a very rough estimate means we would see approximately 400 different convoys moving from their ports of debarkation towards their eventual area of responsibility[133]. In other words, there would be a total of almost 6,000 km covered by these 400 convoys, to compare with the distance of around 450 km from Mo i Rana to Umeå[134] or Trondheim[135] to Sundsvall[136].

How exactly the convoys would be spaced when travelling on the same road is a key question. In essence the 450 km distance would be at least one day of effective driving[137]. In a real-life situation with numerous convoys on the move and the friction that comes into the picture, this estimate might be overly optimistic. It is also notable that these two roads are some of the shortest distances available between ports on major roads. The alternatives routes which area able to provide dispersion would in all likelihood be slower – significantly so in winter or if hit by detrimental weather[138].

As an example for the purpose of this exercise, using six ports of debarkation among the alternatives available in the Trondheim Fjord[139] with each assigned its own route over the mountains would achieve an amount of dispersion, and line up roughly with the available infrastructure as described in the upcoming chapter[140]. However, as we

[131] @riksforbundermsverige. 'Militärkolonn ute på vägarna'. Social media. Instagram, Riksförbundet M Sverige, 9 March 2023. https://www.instagram.com/riksforbundetmsverige/p/CpkiusKt0Kk/

[132] Lundmark, Fredrik. 'Tre frågor om: Vad gäller när du stöter på en militärkolonn?' SVT Nyheter, SVT Nyheter Jämtland, 17 April 2023. https://www.svt.se/nyheter/lokalt/jamtland/tre-fragor-om-vad-galler-nar-du-stoter-pa-en-militarkolonn

[133] In other words, a total of almost 6,000 km of road convoys

[134] Sa. Ubmeje

[135] Sa. Tråante

[136] Sa. Sjädtavallie

[137] Just under seven hours, not including the time it takes to form up the convoy, any stops for refuelling, food, or similar

[138] Or enemy action

[139] See next chapter for a discussion on the available alternatives

[140] Again, which routes over the mountains area available rests to a large degree on the weather conditions and time of year, as well as the kind of vehicles involved in the convoy

will see, a number of roads are funnelled back to key locations such as Östersund[141], limiting the dispersion and putting pressure on those key nodes and raising question about the capacity of the network of planned Convoy Support Centres. If each route would see two-three convoys daily, it would take 3-4 weeks to get all convoys through Norway and Sweden and then shipped over to Finland. A road march is also more manpower intensive, as a significant number of the soldiers attached to the unit will need to link up with the unit already at the port of debarkation to ensure there are enough people to maintain, drive, and protect the vehicles. It should also be noted that with all parts of the Study Region seeing a significant number of rivers of different sizes, engineering capability to repair and replace bridges would be a key factor in ensuring the smooth flow of road and rail traffic[142].

On the positive side, in Scenario 3 the authorities should be able to better coordinate and provide for refugee streams, which while still adding friction, on the whole should be easier to separate from other critical traffic flows. As discussed in the description for Scenario 3 and Scenario 4, the same can however not be said for trade flows.

Note that it is entirely possible to see a combination of scenarios, where a sharp crisis leads to the deployment of high readiness units followed by a significant force buildup over time. This combined Scenario 2+3 would likely see increased inefficiencies in the force buildup, as resources needed for planning and executing the deployments of the units in the first wave (i.e. Scenario 2) would also be in high demand simultaneously for handling the more complex and resources intensive planning and execution of the deployment of the second wave of forces (i.e. Scenario 3). These heavier units would also arrive into a theatre where the transport infrastructure had already been in heavier usage than normal for some time, and would encounter a higher degree of friction compared to if they were the first wave of forces to use these resources.

Alternatives to Road Transports in the Study Region

If we compare this to the effectiveness of rail transport, using a freight train with 30 large cargo wagons as the baseline example[143], the vehicles of an armoured brigade could fit on roughly 25 trains. Similarly, a modern ConRo-vessel trading on the ports of the study region may

[141] Sa. Staare

[142] The Swedish Cold War setup with dedicated engineering and railway battalions to facilitate quick repair and RBS 70-equipped surface-to-air missile units to provide air defence situated at the river crossings expected to be targeted by enemy air strikes serve as a good example of the organisation and number of units needed to ensure traffic flows on the main roads and railroads in the Study Region. See BGen Jan-Gunnar Isberg. 'Gränsförsvaret i norr - efter det kalla krigets slut'. In Möta, hejda, slå. Så skulle Sverige försvaras, 1st edn, vol. 56, edited by Bo Hugemark. Försvaret och det kalla kriget. Medströms Bokförlag, 2019, p. 315-317

[143] Using the 'one TEU per soldier'-rule of thumb (Listou and Ekström, 2022), and calculating with roughly two TEU per wagon, or two vehicles. For containers, trains are able to load up to three TEU per wagon, but there is a loss in efficiency when dealing with vehicles instead of containerized loads

feature 1,000 TEU and almost 6,000 lane meters of Ro-Ro capacity[144], meaning two vessels could lift all the vehicles of the brigade and a significant amount of additional equipment[145]. This in turn directly explains the issue with Scenario 4a and 4b, where under peacetime circumstances vessels can go directly to Finnish ports to deliver their cargo. Even a disturbance of limited effect, say eight ConRo-vessels which instead of being able to unload their cargo in Ostrobothnian ports are forced to use Norwegian ports – including those in the Trondheim Fjord as well as in Helgeland – will cause a significant burden on the Norwegian and Swedish transport system[146]. In this case, 170 additional heavy cargo trains, or almost 500 km of extra total convoy length for road convoys[147].

	Soldiers (numbers of)	Vehicles in the units (numbers of)	Length of road covered during movement (km, not including equipment)	Additional vehicles needed to move equipment (numbers of)	Trains needed to move the vehicles (numbers of)	Trains needed to move the vehicles and equipment (numbers of)	ConRo-vessels needed to move the vehicles (numbers of)	ConRo-vessels needed to move the vehicles and equipment (numbers of)
Scenario 1	25,000	6,500	975	12,500	108	110	11	20
Scenario 2	55,000	14,300	2,145	27,500	238	850	24	43
Scenario 3	150,000	39,000	5,850	75,000	650	2,300	65	120

Table 4: Scenarios as transport mode equivalents

Moving up to the strategic level, the 150,000 soldiers of Scenario 3 would represent 150,000 TEU[148] in addition to the roughly 39,000 vehicles of the units. In other words, it would see traffic corresponding to 114,000 trucks, 2,300 trains, or 120 ConRo-vessels[149] in the most simplified terms. While this is a crude representation of a complex logistical operation, it does underscore the need to maximise the efficiency of different parts of the transport network. The ability to load heavier vehicles on trains, use standardised containers to the largest

[144] The Enabler-class of Wallenius SOL is used as a benchmark, with 1,000 TEU and 5,800 lane meters. Source: Martiala, Kari. 'Korkean jääluokan monipolttoainealus Botnia Enabler Perämerelle'. Navigator Magazine, 16 May 2022. https://navigatormagazine.fi/uutiset/korkean-jaaluokan-monipolttoainealus-botnia-enabler-peramerelle/

[145] This is a simplified calculation based on length of vehicles and lane meters. In practice the size and weight combination of the vehicles found in an armoured brigade may create inefficiencies and bottlenecks

[146] See next chapter for a discussion on the available roads and railroad connections

[147] Which in turn would increase the amount of diesel being needed, which either would have to come from the civilian network or from additional tanker trucks and trailers accompanying the road convoys

[148] This can be compared to all ports sorting under Trondheim Havn handling 24,000 TEU during 2024, of which Orkanger handled 20,000 and Trondheim 3,700. Trondheim Havn IKS. Årsrapport 2024 - Styrets beretning. Trondheim, 2025

[149] If the loads actually were containerised, container vessels such as Maersk's V-class of ice-reinforced container vessels designed for the conditions of the Baltic Sea has a capacity of 3,500 TEU, dropping the number of vessels needed down to 43 and further underlining the efficiency of modern container-based logistics. Source: Maersk. 'Maersk Line Orders Seven Ice-Class Container Vessels'. Accessed 30 April 2026. https://www.maersk.com/news/articles/2015/03/26/maersk-line-orders-seven-ice-class-container-vessels

degree possible, move lighter utility vehicles driven by units with mountain experience on the smaller roads while keeping the larger trucks on the main roads, and flying or ferrying the soldiers of the units as close to the eventual area of responsibility as possible and doing the marrying up of soldiers and equipment there are all factors that would come into play to ensure the most efficient deployment possible.



Figure 16: While Ro-Ro vessels in many ways offer the most efficient method of loading and unloading vehicles from a vessel, it is still not a completely straightforward operation, as demonstrated by this USMC LVSR manoeuvring between the upper and lower vehicle decks on the Ro-Ro vessel M/V NEW AMSTERDAM while disembarking in Norway. Credit: U.S. Marine Corps photo by Lance Cpl. Christian Salazar

Notable is that the figures above are strictly dealing with the units themselves. A unit deploying would come with a limited number of supplies able to sustain itself for a limited time – exactly how long depending on the nature of the operations conducted[150] – but relatively soon the units deployed will need to be resupplied with everything from food, fuel, munitions, and spare parts, as well as reinforced to cover losses suffered. At the same time, wounded soldiers and vehicles in need of deep repair[151] will travel in the other direction. These flows will continue throughout the operation, and while they are smaller in scale, and can rely to some extent on civilian logistics solutions, their load on the transport network is still significant. As such, it is important to recognise that the need for military transports does not disappear once the units are past the Study Region and deployed in the field. In particular in Scenario 4a and 4b which have seen significant parts of the civilian supply lines diverted away from the southern parts of the Baltic Sea, this will have a significant impact.

[150] In essence, sitting still in a location where it is easy to stay warm and dry require significantly less resources compared to active combat operations in complex terrain during poor weather

[151] Or scrapping for recycling/cannibalisation for spares

The Transport Infrastructure

Summary

Norwegian Atlantic Ports and their Infrastructure

The Norwegian coastal infrastructure allows high capacity in many cases, but is also geographically constrained. Fjords, coastal flats, mountains, and valleys channels transport flows into limited corridors, with in particular the E6 highway and Nordlandsbanen railway feature few parallel alternatives.

While ports such as Mo i Rana, Mosjøen, and a number of facilities in the Trondheim Fjord have significant capacity, their effectiveness depends heavily on inland connectivity. Bottlenecks often arise not in the ports themselves, but in road and rail links leading inland.

Environmental disruptions such as landslides and tunnel closures highlight the vulnerability of single-corridor systems. The E6 is a critical but fragile backbone for Norwegian logistics.

Rail infrastructure is similarly constrained, with long single-track segments and limited redundancy increasing vulnerability to disruptions.

The Routes over the Norwegian-Swedish Border

When crossing into Sweden, the Scandinavian mountain range is a major barrier that channel transports into a limited number of crossing routes. E12 and E14 are the primary east-west corridors, supported by a number of smaller routes of varying quality.

Common for all routes is that they are heavily dependent on weather conditions and seasonal variability. Snow, landslides, and terrain constraints significantly affect reliability and throughput.

Rail connectivity is particularly limited, with the Meråkerbanen/Mittbanan the critical but fragile link between Norway and Sweden. Its single-track configuration creates a major capacity constraint, and it has proved to be vulnerable to disturbances.

Overall, the border region is one of the most vulnerable segments in the entire Study Region.

Central Sweden and the Coastal Region

Central Sweden constitute a sparsely populated but strategically important transit zone in this study. The region's transport system is characterized by parallel north-south corridors and key east-west connectors.

Rail redundancy is stronger along the coast, but remains vulnerable to simultaneous disruptions from weather events or hostile activity. The inland rail network around Inlandsbanan provides partial redundancy but with lower capacity.

Road infrastructure is generally robust but includes bottlenecks in urban areas such as around Östersund. A number of nodes are found where several critical corridors intersect, creating strategically important locations as well as potential bottlenecks.

Ports and industrial hubs along the coast provide significant logistical capacity but depend heavily on rail and road integration to function effectively in crisis conditions.

Finnish Coastal Region

The Finnish coastal region is characterized by shallow waters, fragmented archipelagos, and strong seasonal constraints due to ice. Despite these limitations, it hosts several key ports and industrial hubs.

Road and rail networks are well-developed, with E8, E12, Vt 13, Vt 16, and Vt 23 forming key corridors. The Päärata railway provides national integration, although branch lines and secondary connections vary in quality and availability.

Ports such as Vaasa, Kokkola, and Jakobstad are strategically important but vary in infrastructure maturity and multimodal integration. Some ports, such as Kaskinen, lack robust rail connections or face infrastructure limitations.

The region is also a major industrial and agricultural production zone, increasing the importance of maintaining civilian supply chain continuity under crisis conditions.

Central Finland

Central Finland is a major logistical hub, with Jyväskylä functioning as a central node connecting multiple national road and rail corridors. It serves as a key distribution point for both north-south and east-west flows.

Rail infrastructure is varied and includes a mix of electrified and non-electrified segments, creating operational complexity. Jyväskylä's rail junction status makes it a critical bottleneck and distribution point.

Air transport capacity is anchored by Jyväskylä-Tikkakoski and Halli, both of which have significant military relevance in addition to civilian roles.

The region's geography and infrastructure make it a key region for both civilian logistics and military mobilisation movements.

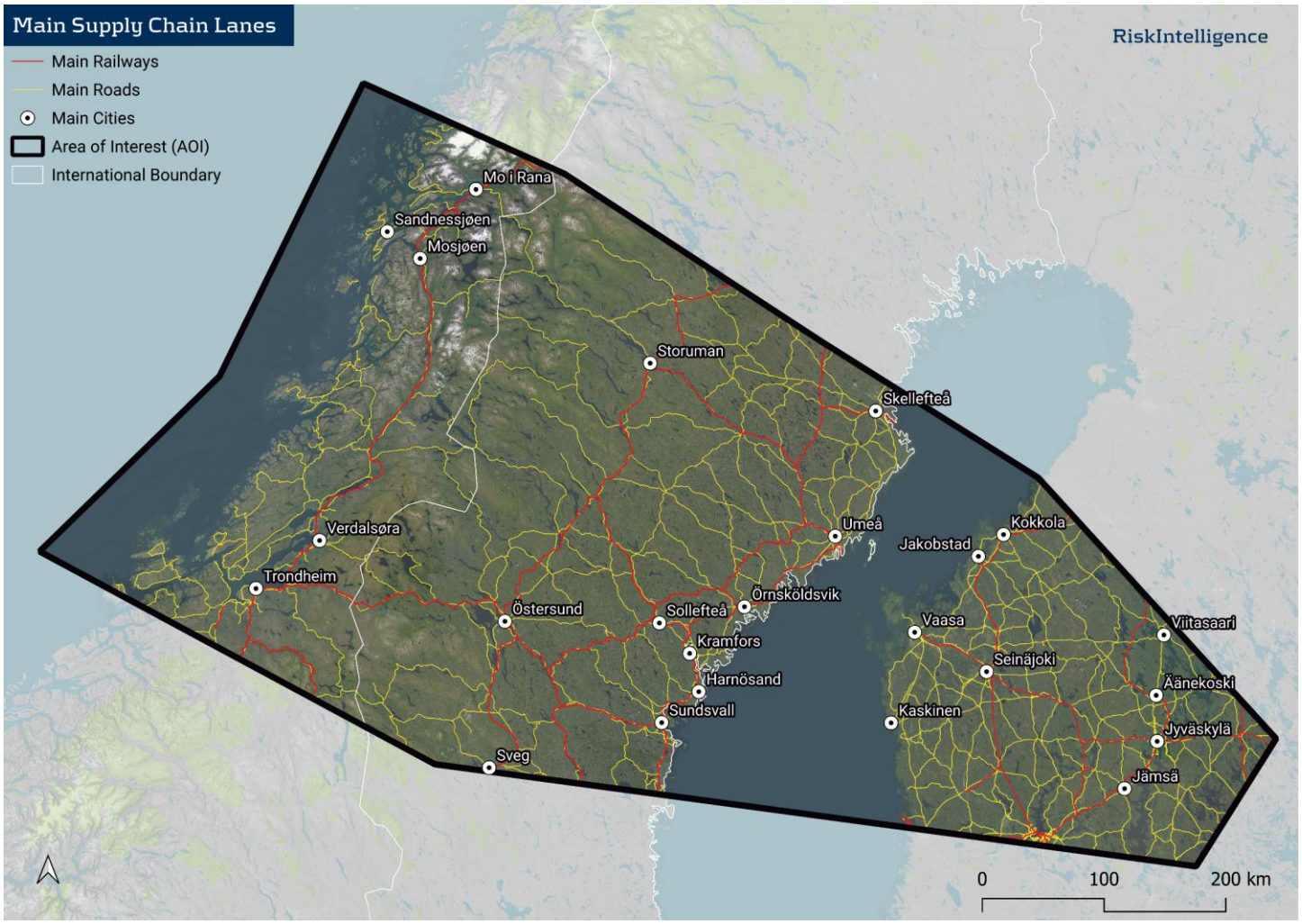


Figure 17. An overview of approximately where the Study Region is situated, and the major transport infrastructure arteries and nodes featured in it

Norwegian Atlantic Ports and their infrastructure

The coastal parts of Trøndelag and Helgeland are a mix of coastal flats[152] and wide valleys, contrasted with hills and mountains rising sharply above the surroundings. The coast sees a number of differently sized islands, and a large number of fjords. The most important of these are with some margin the Trondheim Fjord which is home to the majority of the major ports in Trøndelag, including Trondheim. In Helgeland the most important facilities are also located in fjords, with Mosjøen[153] at the end of the Vefsnfjord and Mo i Rana at the end of the Ranafjord. This has an effect in that it canalises the movement taking place on the ground to a relatively limited number of roads.

The most important road on the immediate coastal stretch is the E6 running the length of Norway and in the Study Region connecting almost all-important ports with each other, and with the possible routes east over the border to Sweden. For significant stretches the road lack suitable parallel routes, funnelling both civilian and military traffic to a single suitable road, the only alternative being the use of ferries that run between a number of the coastal communities at regular intervals. While the E6 in general is in good condition in the Study Region, it is also clear that a significant increase in traffic due to the movement of military units would have an impact on civil society. Relying on a single road is also a demonstrated vulnerability, with Norway having been 'cut in half' on a number of different occasions due to either traffic accidents or due to environmental causes, as happened with the landslide in August 2025 which cut both the E6 and the Nordlandsbanen in Levanger[154] and again most recently with the bus fire in the Raudhammartunnelen in March of 2026[155].

The situation is similar for the railway, where the key link parallel to the coast is the Nordlandsbanen stretching from Trondheim north to Bodø[156]. From Trondheim the railway network fork south to the Dovrebanen and east towards the Swedish border over the Meråkerbanen/Mittbanan[157]. The routes are largely single-track and a major part of Nordlandsbanen is not electrified. With the exception of a short stretch around Trondheim where the Stavne–Leangenbanen provide a shortcut to bypass central Trondheim by passing through the Tyholttunnelen, the route lacks any parallel alternatives. The railway

[152] No. Strandflate

[153] Sa. Mussere

[154] Rosell, Rikard, and Vilma Strömberg. 'Stort ras utanför Trondheim – en person befaras död'. SVT Nyheter, SVT, 30 August 2025. https://www.svt.se/nyheter/utrikes/stort-ras-utanfor-trondheim-e6-avskuren

[155] See Statens vegvesen. 'Raudhammartunnelen på E6 i Sørfold blir stengt i lengre tid'. 27 March 2026. https://www.vegvesen.no/om-oss/presse/aktuelt/2026/03/raudhammartunnelen-pa-e6-i-sorfold-blir-stengt-i-lengre-tid/

[156] Sa. Bådåddjo

[157] The crossing between the north-south stretching Nordlandsbanen and the east-west Meråkerbanen/Mittbanen is 30 km north of Trondheim in the small village of Hell in Stjørdal

connects most major port facilities and urban centra in the study region, as well as passing via the Trondheim-Værnes airport.

With Norway's challenging geography, the study region is well-served by airports of different sizes and capabilities. The largest by a significant marginal is Trondheim-Værnes[158] with three runways, the main being a 3,000 m one followed by two secondary ones of 1,500 m and 1,275 m respectively. A new airport is as of the time of writing of this report being built in Fagerlia near Mo i Rana, which will replace the current airport in Røssvoll as the main hub for Helgeland and provide a modern international airport with a 2,700 m runway to the region when it opens in 2027[159]. In addition a number of smaller airports also see regular traffic, these in falling order being Brønnøysund/Brønnøy[160], Mo i Rana/Røssvoll[161], Sandnessjøen[162], Mosjøen/Kjærstad[163], Rørvik[164], Namsos[165], and Røros[166]. Crucially, the most important fighter base of the Norwegian Air Force is also found in the region in the form of Ørland flystasjon (Ørland AFB) in Brekstad on the northern side of the inlet to the Trondheim fjord. The air force base is home to a number of units, the most important of which is the 132 luftving[167] and its F-35 squadrons[168]. Ørland is a joint military-civilian airport, although outside AVINOR's ownership, and sees limited service by DAT to Evenes[169] and Oslo[170].

[158] Seeing a total of almost 4.2 million passengers during 2025, or 8.1 % of the total passenger movements of all AVINOR airports. Source: Avinor. 'Traffic Statistics'. Accessed 14 April 2026. https://om.avinor.no/en/about-us/traffic-statistics/

[159] Source: Kristoffersen, Kai Jæger, and Frank Nygård. 'Avinor vil utsette åpningen av ny flyplass i Mo i Rana på Helgeland'. NRK, Mo i Rana, 15 February 2023. https://www.nrk.no/nordland/avinor-vil-utsette-apningen-av-ny-flyplass-i-mo-i-rana-pa-helgeland-1.16299224.

[160] 144,832 passengers in total in 2025, ibid.

[161] 112,417 passengers in total in 2025, ibid.

[162] 90,814 passengers in total in 2025, ibid.

[163] 74,639 passengers in total in 2025, ibid.

[164] 43,626 passengers in total in 2025, ibid.

[165] 32,270 passengers in total in 2025, ibid.

[166] 18,505 passengers in total in 2025, ibid.

[167] 132 Air Wing

[168] The TTT test and evaluation squadron, as well as the operational squadrons 331 and 332

[169] Harstad/Narvik lufthavn

[170] Source: Ørland. 'Planlegg reisen'. Accessed 14 April 2026. https://www.orland.no/planlegg-reisen

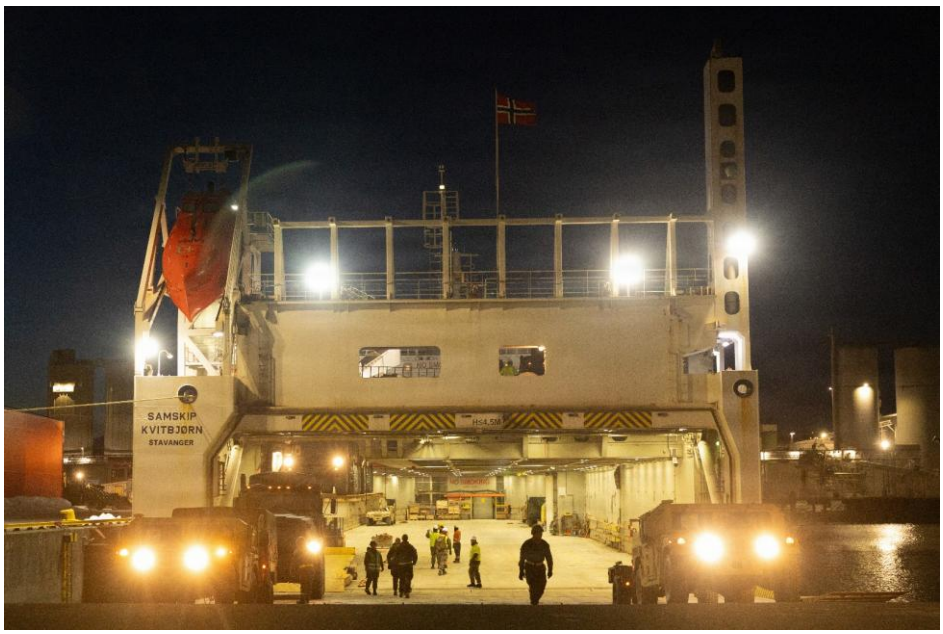


Figure 18: The Norwegian ConRo vessel KVITBJORN loading US Marine Crops vehicles at the port in Verdalsøra. A good example of a smaller flexible vessel, she is able to carry 120 TEU worth of containers in addition to having a Ro-Ro deck with a wide stern ramp, while the 5.12 m draught allow for access to most ports and Ro-Ro ramps in the Study Region. Credit: U.S. Marine Corps photo by Lance Cpl. Franco Lewis

The Norwegian ports in the region are numerous and varied. The port of Trondheim sits in the centre of the city, with the benefits and drawbacks that bring. The port is a hub for both passenger traffic – including the famed Hurtigrutten – and goods, and is connected to the railways. It feature both significant Ro-Ro capacity, as well as being a major container hub. It is a key node for traffic over the North Sea to British and continental European ports. The main issues facing the port is a lack of suitable open storage spaces and room for development, as well as anyone coming or going having to pass through the streets of Norway's third most populous city. While the port has capacity and sits at the direct route east over E14 and Meråkerbanen/Mittbanan, the question of whether this capacity in a crisis is best used for military needs or for security of supply and civilian purposes should be asked[171].

Trondheim Havn[172] also operate a number of other ports[173] in and around the Trondheim Fjord. Of these, Orkanger and Verdal are the most interesting from the point of view of this study. Orkanger is situated to the west of Trondheim, and while it has solid Ro-Ro facilities it is currently hampered by a lack of space in the port – there is a suitable yard that has been used for project loads, but it sits on the opposite bank of the river Orkla from the Ro-Ro-ramp – and the complete lack of a railway connection. There are concepts for an expanded quay and associated storage areas, though the lack of a railway will continue to be a limiting factor. On the other hand, the road network offers a few different options to get to the E14, which might prove useful in limiting the additional traffic this would bring to the E6. Verdal is of particular interest thanks to the heavy industry, including the Aker Solutions AS

[171] A somewhat unique detail in the layout of the port of Trondheim is its two large submarine bunkers, Dora 1 and the unfinished Dora 2, which were built as a base for the German 13. Unterseebootsflottille during the Nazi-German occupation of Norway 1940-1945

[172] The Trondheim Port Authority

[173] Frøya, Hitra, Orkanger, Stjørdal, Indre Fosen, Verdal, Steinkjer, Namsos

yard, which means there are Ro-Ro facilities, heavy-duty industrial cranes, as well as significant open spaces available (though they may be occupied by dry bulk or industrial products, and as such may require pre-planning to be used for military mobility purposes). There is a railway connection, and the E6 passes close to the port.

A particular port is that of Muruvik, which is mainly built as an oil and fuel depot. The original purpose was as a Swedish security of supply hub during the Cold War[174], but due to a number reasons – including the planned pipeline to Sweden never being built[175] – it eventually diminished in importance from a Swedish point of view.[176] It is now fully Norwegian-owned, and is seen as a key for securing the supply of aviation fuel to Værnes[177]. The port has a railway connection, but the road connection is in poor shape, and in its current form is of interest from a security of supply point of view, but less so as a potential port of debarkation for military reinforcements.

In Levanger the port of Fiborgtangen is used largely by the forestry industry, which means there is ample space for the storage of dry bulk or vehicles and equipment. There is a railway connection which is based on a drop-shaped layout allowing the train to turn around in the port, although to head south there is no triangle track but the train needs to change direction at the railyard in Skogn. The port has been used for shifting cargo around stoppages on the E6 in recent times as well as seeing usage as a port of debarkation during exercises, providing a confirmed proof of concept when it comes to using the port for shifting cargo between ships and land-based transport modes[178].

The port of Mo i Rana is the largest of the Norwegian ports in the study region measured in tons of goods handled[179], and has long been dominated by the needs of the steel industry in the city, but is currently undergoing significant expansion. The key part of which is a new deep water quay with associated heavy-duty open spaces to facilitate container and project cargo. The layout has in simulations allowed for

[174] Source: Ntb. Svenskene hadde hemmelig bensinlager i Norge. (Stavanger), 24 January 2000. https://www.aftenbladet.no/i/Lj8Kq

[175] The reasoning behind the pipeline, planned to supply aviation fuel to the Swedish Air Force bases (primarily F 4 Jämtlands flygfottilj in Frösön outside Östersund), not being built is not fully clear. In addition, the political twists and turns surrounding it are sometimes mixed up with those of another unbuilt pipeline, planned to run from southern Norway to Bohuslän, though in hindsight they seem unrelated

[176] Source: Hugemark Malmström, Louise. Garderad neutralitet: förberedelser för svenskt västsamarbete i krig: en kommenterad forskningsöversikt. FoKK, nr 35. Medströms Bokförlag i samarbete med Forskningsprojektet Försvaret och kalla kriget (FoKK), 2014

[177] Source: Thobroe, Grete. 'Bruker ikke nytt tankanlegg – kjører fortsatt flydrivstoff gjennom Trondheim sentrum'. NRK, 21 October 2021. https://www.nrk.no/trondelag/forsvarets-nye-drivstofflager-i-malvik-er-fortsatt-ikke-tatt-i-bruk-av-flyene-pa-vaernes-1.15616635

[178] Source: Norske Skog. 'Norske Skog recognized for social responsibility after the E6 landslide'. LinkedIn, 5 September 2025. https://www.linkedin.com/posts/norske-skog_traeondelag-norskeabrskogabrskogn-socialabrresponsibility-activity-7369755059523452932-Dsb0?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAtmB0YBpwTyQfjLeL_taYglKDnfdQBodPo

[179] 4.38 million tons in 2025. Source: Statistisk sentralbyrå. '10916: Godsmengde, etter havn, retning, opprinnelse/destinasjon og lastetype (tonn) 2013-2025'. ssb.no, Statistisk sentralbyrå. Accessed 1 July 2026. https://www.ssb.no/statbank/table/10916

the movement of up to 70,000 TEU annually and the storage of up to 3,600 TEU in the port itself, though currently there is not yet equipment to perform the movements at the rates it would require. A mobile harbour crane to cater to vessels lacking cranes is one of the missing pieces, but so far there is not a commercial case for acquiring one. The port sits right on the E6 and the railway, though there are questions regarding the connections for both, with better connections having been planned but so far not funded. In addition to the currently expanded parts, the port has a number of other facilities, largely dealing with dry bulk as well as having a Ro-Ro capability. Notable is that most of these facilities are connected to the railway, which is double-track throughout Mo i Rana with additional tracks to specific facilities, allowing efficient movement of cargo and loading/unloading of full length trains without holding up traffic on the Nordlandsbanen. Currently the port mainly serves the industrial park nearby, which also has a concentration of companies able to overhaul and maintain heavy vehicles, as well as the possibility to use facilities in the Vestre Mofjellet mountain next to the industrial park for additional protection.

Mosjøen is a major port situated in the centre of the community with a number of different capabilities, including Ro-Ro, container, bulk, general cargo and LNG. A major part of it is the Alcoa quay, operated by the aluminium production facility at the heart of the port – itself a key factory from a defence industry and security of supply point of view. Both the railroad and E6 passes right next to the port area, with the railway including a depot and freight terminal. There are some limitations when it comes to storage area available in the port due to the aluminium facility and the urban area of the town which sits close to the port. However, a number a smaller quays are also operated by the port authorities in the vicinity, including Halsøy and Holandsvika which may provide alternative options. Close to the town is also found Drevjamoen leir[180], one of the few military garrisons in the northwestern corner of the Study Region and home to Sør-Hålogaland heimevernsdistrikt (HV-14) as well as a detachment from FLO, the Norwegian Defence Logistics Organisation. This allows for staging operations to be held within the facilities, with easy access to the E6 and the ability to cross over to Sweden either on the E12 or the Rv73/Lv AC 1116 further south.

The routes over the Norwegian-Swedish border

Moving inland, the border region between Norway and Sweden is dominated by the Scandinavian Mountains[181], in the Study Region reaching over 1,500 meters for individual peaks with numerous peaks on both sides of the 1,000 meter mark. While the mountain range is not at its highest levels in the Study Region, the steep nature of the young mountains means that the terrain is heavily canalising, leaving valleys

[180] Forsvaret. 'Drevjamoen'. Accessed 18 May 2026. https://www.forsvaret.no/om-forsvaret/tjenestesteder/drevjamoen

[181] Also known as the Scandes

and mountain passes as the natural routes. The routes over the mountains are also heavily affected by weather and environmental issues, including significant amounts of snowfall in the winter and being vulnerable to landslides. Part of this has been addressed through the use of tunnels in particularly demanding locations, which from a military mobility perspective is notable[182]. All taken together, this makes the region the most challenging part of the study region from a logistics perspective, in particular in case of hostile action toward the available infrastructure.

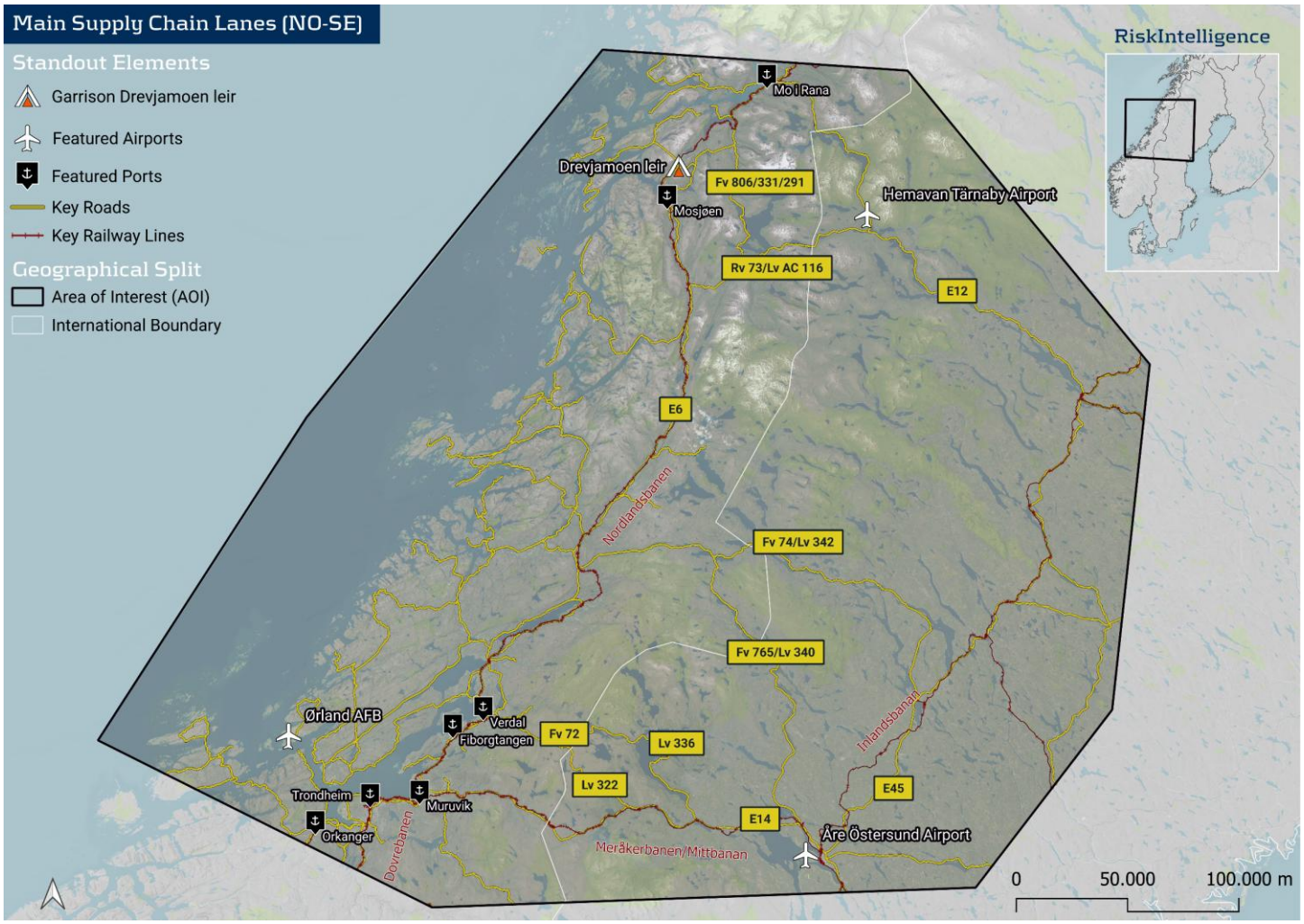


Figure 19. An overview of the main supply routes between Norway and Sweden

There are two main routes over the border in the form of the E12 and E14. The E12 is located in the northern parts of the Study Region, stretching east from Mo i Rana, until it curves around the Raudvatnet lake and enters Sweden on a roughly north-south axis, which also include the 3,670 meter long Umskartunnelen through the Umskaret mountain just north of the border. The Umskartunnelen is a good example on the challenges with the cross-border roads, having been

[182] Tunnels bring their own risks, such as the issues with clearing accidents or blockages in confined spaces, but also offer protection from weather and most kinetic actions. Notable that the E14 does not feature tunnels

built as a replacement for the older road[183] which was deemed unsuitable for heavy road transports and suffered from poor availability during the winter months, something the tunnel has mitigated. On the Swedish side of the border, the E12 road similarly follows the shores of lake Överuman and the waters that eventually form the Ume river in the valley. A key location immediately across the border is Hemavan[184], which together with Tärnaby[185] just downstream are one of the most important winter tourist destinations in Sweden. These are also served by Hemavan Tärnaby Airport, which sees regular traffic to Stockholm from a single 1,500 m runway located next to the E12 road.

There is no railway accompanying the E12 between Mo i Rana and Storuman, a stretch of approximately 250 km following the route of the road[186]. There are however a few smaller alternative roads over the mountains, the main one being the Norwegian Rv73/Swedish county road Lv AC 1116 which connects to E6 in Trofors, 40 km south of Mosjøen, and then passes through the mountains south of Krutvatnet and through the Swedish village of Joesjö until it connects to the E12 approximately 10 km south of Hemavan. It is also possible to access Rv73 via the Korgen-Hattfjelldal road (Fv 806/331/291), which reduces the distance when coming from Mo i Rana.

Continuing south, a number of other smaller roads also cross the border. These include Fv 74/Lv 342 which connect E6 in Formofoss to E45 in Strömsund – the Swedish part of the road largely being the southern leg of the Vildmarksvägen[187], a tourist road notable for its remoteness and being above the treeline in several locations, though the stretch from Gäddede to Strömsund is a somewhat lower part, largely following the Faxälven river valley[188].

E14 is the second major artery and stretches east from Trondheim[189] over Meråker and Storlien, before reaching Östersund where it meets E45 and Rv 87, while E14 in turn continues south-east towards Sundsvall. In this region, there are a larger number of connecting routes branching away to the north from the E14 on the Swedish side and continuing over the border. The northernmost one on this stretch comes from Sandvika where Fv 765 branches away from Fv 74 and heads south to lake Rengen on the shores of which it crosses the border and

[183] Parts of which have been removed and rewilded following the opening of the tunnel

[184] Sa. Bïerke

[185] Sa. Dearna/ Deärnná

[186] Or around 190 km in a straight line

[187] En. The Wilderness Road

[188] Faxälven constitute the right (secondary) fork of the Ångerman river (Swe. Ångermanälven), being one of its main tributaries

[189]

continues south towards Östersund as part of Lv 340[190]. The Fv 765/Lv 340 is of particular interest as it offers the shortest route from Helgeland to Östersund, while also offering an alternative route from the northernmost parts of Trøndelag, while connecting to a primary county road on the Swedish side[191].

From Verdalsøra at the very northernmost tip of the Trondheim Fjord in turn Fv 72 branches of east from the E6. Just west of the border in Sandvika the road splits into a northern branch – going north of lake Kallsjön along Lv 336 and down to E14 in Järpen – and a southern branch – which follow Medstuguån along Lv 322 before connecting to E14 west of Duved – offering two potential routes to Östersund and beyond[192].



Figure 20: With a significant number of rivers large and small being found in the Study Region, movement – in particular along a north-south axis – will always rest on the ability to cross waterways. While bridges are the preferable method, the ability to cross on ferries or to lay temporary bridges to cover for battle damage is crucial. While this capability can to some extent be improvised, for best efficiency prepared positions at key crossing points is crucial. Note the Swedish soldier from Fältjägarbataljonen, which is the battalion of the home guard responsible for Jämtlands län, an area of responsibility covering 12 % of Sweden's total area while being home to just over 130,000 persons. Credit: U.S. Marine Corps photo by Sgt. Christian M. Garcia

The final road crossing in the study region is Fv 31/Rv 84 which stretches from Røros to Sveg, crossing the border in Vauldalen. While the Swedish stretch of the road connects to E45 in Sveg. The Norwegian connection is of more limited value, as there are no obvious routes from potential ports of debarkation that lead to Røros.

However, while E14 offer a larger number of available secondary crossings compared to E12, the most important difference is the railway track. As mentioned, the Meråkerbanen/Mittbanan stretches east from Trondheim, and roughly follows the route of the E14 until it reaches

[190] Lv 340 is also known as Fiskevägen (Eng. The Fishing Road), due to its popularity in recreational fishing as it lead to several popular waters

[191] The Swedish Lv-coded country roads are divided into primary (Swe. primära) and other (Swe. övriga), of which the primary are those in the number series 100-499. The Norwegian system also includes primary and secondary county roads (No. primære and sekundære), with the primary roads being national roads that were downgraded in a reform in 2009 and now numbered in the 17-890 series

[192] The routes to Verdalsøra have also been used for several historical cases of military movements, variants of it being used as the invasion route to get to Trondheim in the failed Swedish attacks of both 1658 and 1718, to mention the two most notable examples

Östersund. The railroad has proven very vulnerable to environmental effects, including landslides, and with a single track in a relatively remote location, maintenance and repairs are proving difficult. While the railroad has been electrified in recent times, it still suffer from capacity restrictions including limits on trains meeting imposed by the relatively low capacity of the sidings. Notable is that this is the northernmost railway connection – the only one North of Oslo – between the main Norwegian railway network and the Swedish one[193], the other two connections being in Innlandet (Kongsvingerbanen/Värmlandsbanan) and Østfold (Østfoldbanen/Dalslabdsbanan).

Central Sweden and to the coast

The Swedish inland parts of the Study Region are dominated by vast areas of sparsely populated regions. While much is forest, there are also numerous fells as well as rivers and lakes, all adding to a somewhat challenging environment from a logistics point of view. There are only a handful of major urban centra, the most important of which is Östersund which hold roughly half of the whole population of Jämtland[194]. A number of the other urban centra are major tourist destination, and despite a growth in summertime wilderness tourism[195] there are significant differences in the number of people found in the region during the alpine skiing season compared to the rest of the year. Östersund as the main hub of the region has also had long traditions as the centre of military activity in the region. During the time leading up to the post-Cold War cuts, the city hosted, among other units, a fighter wing, an artillery regiment, an infantry regiment, and a divisional staff[196]. Following the cuts, only the Hemvärnet remained in the form of Fältjägargruppen and the Fältjägarbataljonen[197] it supports. However, with the establishment of I 21 Västernorrlands regemente med Jämtlands fältjägarkår with its headquarters in Sollefteå and a detachment in Östersund, an Army presence was reestablished as an effect of the defence bill of 2020[198]. The unit was created as an unique unit, with the aim of setting up two wartime local defence infantry battalions[199], for the stated purpose of protecting the route from Trondheim through Sweden, and onward to ports of embarkation on the Swedish east coast which would allow for reinforcements to the Baltic

[193] The Ofotbanen between the port of Narvik and the Swedish border is not connected to any other Norwegian tracks, and is just a single 40 km long line. The only other Norwegian railway track north of this is the 8.5 km long Kirkenes–Bjørnevatnbanen which connects the port of Kirkenes to the mines in Bjørnevatn, and as of the writing of this report has not seen regular traffic since the mine was closed in 2015

[194] In addition to which a significant part of the rest of the population of the county is found in the greater region close to Östersund, the so called Storsjöbygden

[195] E.g. hiking, fishing, and mountain biking

[196] The F 4 Jämtlands flygflottilj, A 4 Norrlands artilleriregemente, I 5 Jämtlands fältjägarregemente, and 12. arméfördelningen

[197] Also designated 14:e hemvärnsbataljon

[198] Totalförsvaret 2021–2025, 2020/21:30 (2020)

[199] Totalförsvaret 2021–2025, 2020/21:30 (2020)

states.[200] It is unclear to which extent the unit as of the writing of this report actively train soldiers for these planned battalions, and to which extent they instead train infantry to allow for the rapid creation of the key manoeuvre brigades of the Swedish wartime Army as well as for the needs of the wartime division.

Östersund is a logistical hub, in part thanks to its size and importance, and in part due to the terrain around Storjsön canalising key routes to the region[201]. The two key roads are the E14 which as mentioned stretches from Trondheim east to Sundsvall, while E45 runs on a north-south axis from Alta in Norway to Siciliy in Italy, connecting such Swedish cities as Gällivare[202], Arvidsjaur[203], Mora, and Gothenburg. The roads are generally relatively good, although some issues related to crossings and connections are found. The major issue in the region is that both roads run through the urban area of Brunflo, which is less than ideal from a military mobility point of view – both with regards to traffic having to slow down, creating a bottleneck, but also due to the risk of accidents involving military vehicles and local civilians. A reroute has been studied, but has so far not progressed in planning[204]. There are also individual connections to current and planned military facilities that may need upgrading to achieve smooth traffic flows in case of major increases in military traffic compared to the current situation.

Similarly, the city is a railway hub connecting Meråkerbanen/Mittbanan and Inlandsbanan, which stretches from Mora to Gällivare[205]. Inlandsbanan has a number of crossing and connecting lines throughout, some of which has been disbanded and are in various stages of disrepair. The most important current connections are Dalabanan (Uppsala-Mora, south of the Study Region), Meråkerbanen/Mittbanan (Trondheim-Sundsvall), and the Ofotbanen/Malmbanan (Narvik-Luleå). In addition, the tracks Arvidsjaur-Jörn[206], Storuman-Hällnäs, Forsmo-Hoting, and Bollnäs-Orsa connect the Inlandsbanan to the coastal tracks[207]. Of these, Storuman-Hällnäs and Forsmo-Hoting are in use as of the writing of the report, while the other

[200] Source: SVT. 'Så vill regeringen utöka försvaret – höjd budget och nya regementen'. SVT Nyheter, 12 October 2020. https://www.svt.se/nyheter/inrikes/regeringen-och-c-och-l-overens-om-forsvaret and Olsson, Jonas. 'Analys: "Återupprättade regementen – logisk följd av ökat Nato-samarbete"'. SVT Nyheter, SVT, 12 October 2020. https://www.svt.se/nyheter/inrikes/analys-forsvarsuppgorelsen-logisk-foljd-av-nato-samarbete

[201] The latter of which naturally has played a key role in the creation of and growth of Frösön and Östersund, leading to the city acquiring the regional importance it currently has

[202] Sa. Jiellovárre

[203] Sa. Árviesjávrrie/Árvehávvre/Aerviesjaevrie

[204] Source: Trafikverket. E14 Lockne-Optand/Förbi Brunflo, VM059. Väg-/järnvägsplan - Inför val av lokaliseringsalternativ/Typfall 4 TRV 2016/59617, VM059. Trafikverket, 2015

[205] Originally Inlandsbanan stretched all the way to Kristinehamn in the south, but following the Mora-Filipstad part of the line being disbanded, the southernmost part Kristinehamn-Filipstad is now run as part of the national track and not by Inlandsbanan AB. For the purpose of this report, when referring to Inlandsbanan, it is the northern part of the active track beginning in Mora that is referred to

[206] Sa. Jyörra

[207] Norra stambanan in Orsa, Stambanan genom övre Norrland for the other three

two are disbanded. It is notable that there is no major freight terminal in Östersund, although the possibility of building one in Brunflo near the E45 and E14 road crossing has been discussed, something which would be highly beneficial from a military mobility point of view.[208]



Figure 21: The Östersund locomotive depot houses the workshops of Inlandsbanan AB, and include a planned but not completed drive-through track at one end to better facilitate overhaul of complete train sets including carriages. Note the older Nohab Di3 diesel-electric locomotive, a surplus locomotive doing service on the Inlandsbanan track long after the original user Norges Statsbaner (now Vygruppen AS) has retired the type. Credit: Håkan Wike/Inlandsbanan AB

Inlandsbanan is unique in a Swedish context in that it encompasses approximately 10 % of the total Swedish national railway system, but instead of sorting under the national transport agency Trafikverket it is controlled by Inlandsbanan AB, a company owned by the municipalities in the region, having been set up to counter the plans on a national level to disband the whole line. The company also feature the subsidiary Inlandståg AB[209] which operates trains on the line. These include both fully owned as well as leased rolling stock. The Inlandsbanan also being one of the last significant stretches on the Swedish railway system not having been electrified means that the company rely to a significant degree on older diesel locomotives. This has in turn meant that the workshop operated by Inlandståg Ab has become something of a centre of excellence when it comes to maintenance of diesel locomotives in Sweden, though the workshop also handles electric and hybrid locomotives, as well as other rolling stock, both for Inlandståg AB and for other companies. Specialising in the maintenance of a varied fleet of mainly older systems also means that it operates its own forge to manufacture spare parts no longer found on the open market due to obsolescence issues[210].

Inlandsbanan is also one of the last major parts of the Swedish railway system to rely on traditional train dispatchers for traffic control, referred

[208] Forslin Rail Consulting 2.0 AB. *Teknisk Förstudie Omlastningsterminaler Brunflo*. 2024

[209] As well as a second subsidiary in the form of the travel agency Destination Inlandsbanan AB

[210] A capability that play a part in the workshop also seeing historical train sets from museums and heritage railways among its customer basis, although the most important work is done for regular train operators

to as System M in Sweden. This gives a system that has a high level of redundancy, although for higher levels of traffic – such as during the surge in traffic levels seen when heavy rains cut both coastal railway lines in the autumn of 2025[211] - the system requires significant levels of specialised personnel, which makes keeping the track operating at capacity for prolonged periods of time difficult with current levels of personnel.

The Inlandsbanan is also suffering from age as well as low levels of maintenance. This is visible in the inability to have modern full-long trains meet on the track, as the length of the sidings are too short, as well as significant restrictions in the weight and speed of the trains, in particular in the northernmost part of the track. During the writing of the report it was announced that a significant part of a 30 Bn SEK (2.75 Bn EUR)[212] package to improve infrastructure designated as critical for the Swedish Armed Forces will go to the Inlandsbanan[213]. The exact details are still open, but reopening the Arivdsjaur[214]-Jörn track and strengthening the axle load capacity of the northernmost stretch of the track are items expected to be on the shortlist.

Storuman is the corresponding transport node in the northern half of the Study Region, where the E45 and E12 (Mo i Rana – Umeå – Vaasa[215] – Helsinki) roads cross, and Inlandsbanan have the operational Storuman-Hällnäs sidetrack. However, while the connections are similar to those of Östersund, Storuman is a significantly smaller town, with just over 2,000 inhabitants in the urban center. Storuman does however have a modern railway freight terminal which proved valuable during the earlier mentioned surge in traffic when a number of trains were diverted from the coastal tracks to the Inlandsbanan. From a military point of view, a loading ramp and more space for vehicles and equipment would be ideal, but there are various levels of plans for these, and the expectation is that they could be solved relatively quickly if funding was made available. Storuman has also seen the local airfield Gunnarn, originally built as an air force base for dispersed operations[216] by F 15 Hälsinge flygflottilj, being bought by the Swedish Armed Forces in 2023.[217] The

[211] Source: SVT Nyheter Västernorrland. 'Efter Skyfallen – Krisåtgärden För Att Få Igång Godstrafiken'. SVT Nyheter, SVT, 11 September 2025. https://www.svt.se/nyheter/lokalt/vasternorrland/efter-skyfallen-krisatgarden-for-att-fa-igang-godstrafiken

[212] The exchange rates at the time of writing in the first half of 2026 are such that SEK and NOK can in essence be used interchangeably at approximately 1.00 SEK to 1.02 NOK, while the EUR to SEK/NOK rate is approximately 1.00 EUR to 11.20 SEK/11.35 NOK. As such, sums in this report are first given in the currency in which they are found in the sources they stem from, and then converted to either EUR or SEK/NOK. In case of the latter, for SEK and NOK only one currency is used at any given location, the choice of which depending on the geographic location of the topic discussed

[213] Source: Sandblad, Tobias. 'Regeringen satsar miljarder på Inlandsbanan för försvaret'. SR Ekot. Sveriges Radio, 16 April 2026. https://www.sverigesradio.se/artikel/regeringen-satsar-miljarder-pa-inlandsbanan-for-forsvaret

[214] Home to the Swedish Army ranger unit K 4 Norrlands Dragonregemente

[215] Swe. Vasa

[216] A so-called O-bas

[217] Source: SVT Nyheter. 'Försvarsmakten köper flygplatsen i Storuman – betalar 18 miljoner'. SVT Nyheter, 3 September 2023. https://www.svt.se/nyheter/lokalt/vasterbotten/18-miljoner-for-flygplatsen-i-storuman-vantat-lange-pa-forsvaret

main runway is a paved 2,300 m one, though as usual for Swedish wartime bases a number of shorter secondary ones were built to complement it. The current state of these is unclear.

Of the other airports in the region Åre Östersund Airport on Frösön is by far the most important one, also being the former home of F 4 Jämtlands flygflottilj, having seen 246,941 passengers during 2025[218] and being the only one in the region operated by Swedavia. The main runway is 2,500 m, while a parallel secondary runway of 1,200 m has been closed. Other airports with regular traffic include Hemavan Tärnaby with 1,400 m of runway and 13,133 passengers, and Vilhelmina with a 1,500 m runway and 11,636 passengers.[219] However, besides Åre Östersund the most interesting airport from the point of view of this report is Härjedalen Sveg Airport. Situated in the southern parts of the Study Region, the airport has a single 1,700 m runway, and sits next to Inlandsbanan and a large open space which is used as a freight terminal for timber. The airport has ample parking space, as well as being in regular use by a number of different authorities, both fixed- and rotary wing. The town of Sveg also hold a major marshalling yard for the Inlandsbanan, as well as key crossing points over the river Ljusnan, as both the E45 and the railway crosses the river here, before both turn east to pass by the airport before once more turning north.

Swedish Coastal Region

The Swedish coastal region is characterised by a developed infrastructure connecting a number of significant cities and industrial clusters. These are in most cases located at the mouths of a number of major rivers coming down from the Swedish inland. While the coast is not exactly mountainous compared to the Swedish inland or the Norwegian coast, it is still hilly and in many locations feature tall cliffs and distinct valleys.

[218] Source: Swedavia. '1.02 Flygplatsstatistik'. Antal landningar och passagerare och procentförändring per flygplats i december. Swedavia, January 2026. https://www.swedavia.se/contentassets/40c868cfca874b1e8fe5d20c22cbbc97/fpl_202512.pdf

[219] Passenger figures from Sektionen för analys. Flygtrafikstatistik - Utvecklingen under 2025. TSL 2026-597. Transportstyrelsen, 2026

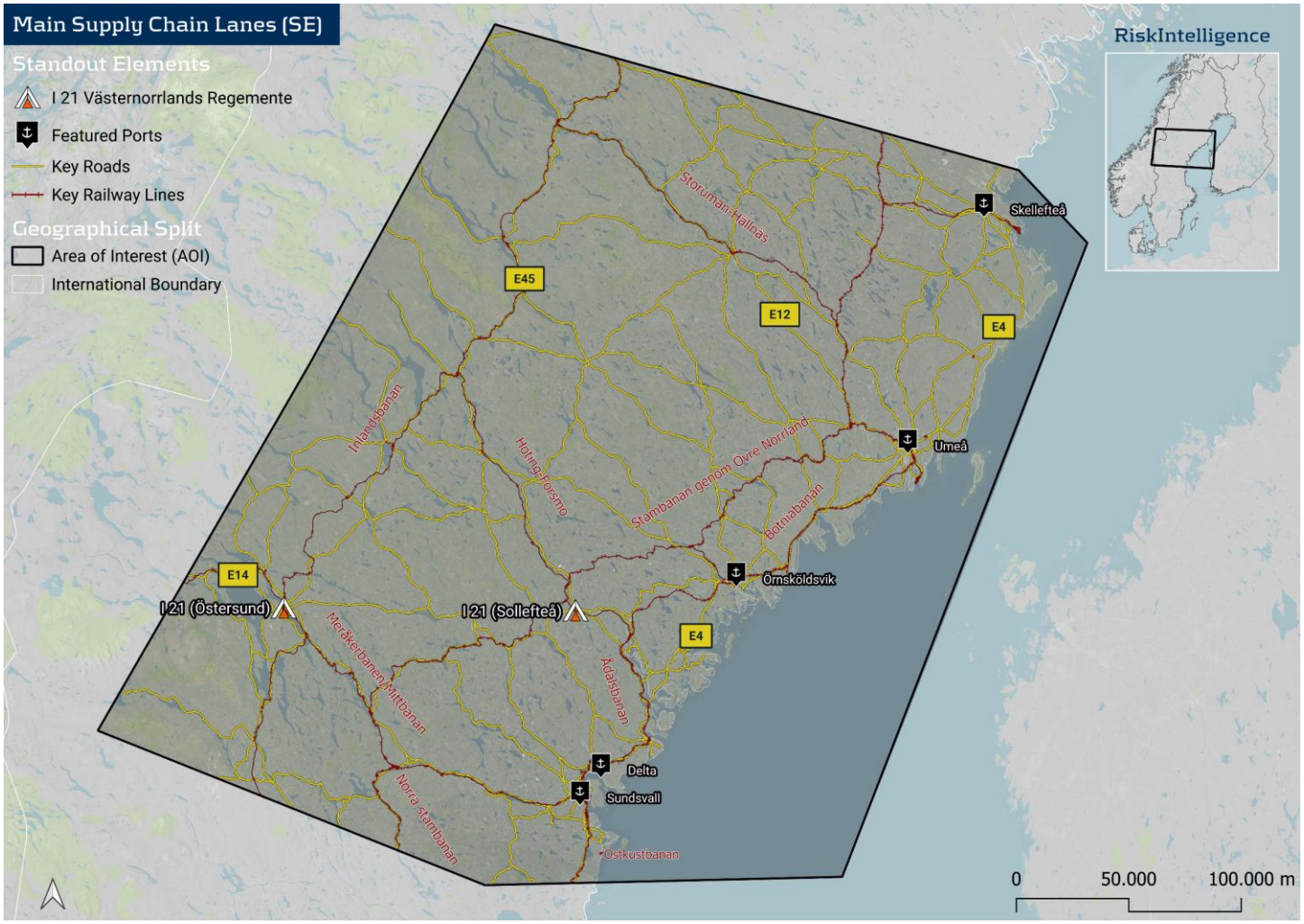


Figure 22. An overview of the main supply routes towards the Swedish coast

A significant feature from the viewpoint of military mobility is that up to level of Umeå there are two railway tracks running roughly parallel to the coast, the Ostkustbanan, Ådalsbanan, and Botniabanan coming from Gävle and running along the coast, connecting the major coastal cities of Sundsvall, Härnösand, Örnsköldsvik[220], and Umeå. Norra stambanan and Stambanan genom övre Norrland in turn pass further inland[221], and together make up the historical railway route. The addition of a track closer to coast has opened up capacity and creates a level of redundancy for any traffic parallel to the coast that is unmatched in the Study Region. However, it is notable that the continuation of the track north from Umeå in the form of Norrbotniabanan is still struggling with a poorly defined timeline for its completion, meaning that north of Vännäs it is again down to a single line. This again raises the question of the number of connecting lines between the two coastal lines as well as between Norra stambanan/Stambanan genom övre Norrland and the Inlandsbanan. For the better part the railways are single-track and

[220] Sa. Orrestaare

[221] The small towns of Bräcke and Ånge being the crossing locations between Mittbanan and Stambanan genom övre Norrland (heading north) and Mittbanan and Norra stambanan (heading south) respectively, while between Ånge and Bräcke the trains running north-south follow the Mittbanan

electrified, though a number of connecting lines offer some redundancy through the capability to shift trains between the two parallel routes. The capacity of the lines might however be an issue, and crucially as experienced during the heavy rains in the autumn of 2025, their relatively close proximity to each other can lead to the same extreme weather cutting off both[222].



Figure 23: Even for some of the larger wheeled vehicles, in particular ones with significant protection and/or off-road capability such as this US Marine Corps MTVR, longer road transports may be preferable to perform on trailers rather than on their own wheels. Credit: U.S. Marine Corps photo by Sgt. Christian M. Garcia

The most important road in the region is E4, which runs parallel to the coast and connects all the larger cities there. The road is well-maintained and for much of its length is built with separated carriageways and grade-separated junctions. It is, however, also in significant usage, meaning that in particular during rush hour traffic close to the major cities bottlenecks can occur. The major roads discussed in the earlier chapters E14 continues from Östersund to Sundsvall, while E12 passes through Umeå from where it continues by ferry to Vaasa. A number of roads connect E4 and E45, these being from north to south Rv 95 (Skellefteå[223]-Jörn, and onwards to Bodø via Rv 77), Rv 92 (Umeå-Dorotea[224]), Rv 90 (Härnösand-Sollefteå-Vilhelmina[225]), and Rv 86 (Sundsvall-Bispgården). Rv 87 goes from Sollefteå to Östersund, which offer an alternative route to either Sundsvall or Härnösand in case E14 is not available, while Rv 84 goes from Hudiksvall through Sveg to Røros.

Similarly to the Norwegian coast, the network of ports is diverse and comprehensive. The main ports in the Study Region include Sundsvall, Örnsköldsvik, Husum, Umeå, and Skellefteå. Of these, Husum just

[222] Source: SVT Nyheter Västernorrland. 'Efter Skyfallen – Krisåtgärden För Att Få Igång Godstrafiken'. SVT Nyheter, SVT, 11 September 2025. https://www.svt.se/nyheter/lokalt/vasternorrland/efter-skyfallen-krisatgarden-for-att-fa-igang-godstrafiken

[223] Sa. Syöldate/Skillehte

[224] Sa. Kraapohke

[225] Sa. Vualtjere

outside of Örnsköldsvik is home to Metsä Board Husum mill, a significant board and pulp mill with its own port facilities.[226] A number of smaller port facilities are also found throughout region, of varying quality and capability.

The southernmost port of significant interest is the port city of Sundsvall. As mentioned Sundsvall is a key transport node, with railways as well as road networks crossing and fanning out parallel to coast and in different directions towards the inland. As such, it is no surprise that the port is a major multi-cargo one, including two Ro-Ro ramps, dry bulk, project cargo, and container facilities in the main port of Tunadalshamnen, the majority of the traffic as of the time of the writing of this report being related to the forestry and paper industry. Notably, the connections both in Sundsvall and between the port facilities and road and railway are recently modernised, and include triangle railway crossings in several directions, modern freight terminals and tracks within the port, and since the rerouting of the E4 road neither the road nor the railroad lines north, west, or to the port[227] passes through the immediate city centre.

In addition, one of the two major oil ports in the Swedish part of the Study Region is situated in Sundsvall. This handles different products for the southern half of the Swedish part of the study region. The port is situated to the east of the city centre, on the southern shore of the Sundsvallsfjärden, with Tunadalshamnen on the northern shore of the bay. There is currently no passenger traffic to Sundsvall, although the city has been a prolific port for passenger traffic for decades up until the mid-1990's. There is interest in renewing regular Ro-Ro traffic with passengers from Sundsvall in some form[228], though the question is whether this would be closer to the traditional route with a car ferry to Vaasa, or whether a vessel tailored more towards the need of heavy vehicles and possibly aiming for another port would provide a stronger case when it comes to the economic considerations.

Of the smaller privately operated ports, Delta in Söråker next to Sundsvall-Timrå airport is of interest. The area traces its roots back to the 19th century and the forestry industry, and the company Delta

[226] Source: Metsä Board. 'Husum Board Mill'. Husum Board and Pulp Mill, Metsä Group. Accessed 24 April 2026. https://www.metsagroup.com/metsaboard/about-us/production-units/husum-board-and-pulp-mill/

[227] The crossing between Mittbanan going west and Ådalsbanan running North parallel to the coast is situated west of Sundsvall, while the crossing between the track to the port Tunadalshamnen is on Ådalsbanan north of the city, meaning trains travelling between the port, Mittbanan, or any location on Botniabanan north of Sundsvall never have to enter the city. However, any traffic to Ostkustbanan will have to go through Sundsvall station which include numerous level crossings in the city centre

[228] Björkqvist, Ida-Maria, and Jakob Lillas. 'Ny färjelinje planeras mellan Vasa och Sundsvall: "Det finns ett intresse på båda sidor"'. Svenska Yle, Yle Österbotten, 18 August 2023. https://yle.fi/a/7-10039978

Terminal AB today owns the majority of the port and industrial park, which also has direct connections to the passing railway line.[229]

North of Sundsvall the next major port city is Örnsköldsvik. Compared to Sundsvall, a major difference is that the port facilities are significantly more dispersed, with a number of important industries handling cargo through dedicated port facilities spread out in the region. Project cargo, for the time being mainly wind farm components, are handled through Köpmanholmen 10 km south of the city, while in the city much of the port activities are centred around the outlet of the Moälven river, where the large industrial area Alfredshem with its port facilities are found north of the inlet while on the south bank is the Domsjökajen timber port.[230] As such, there are significant areas available for storage and the ability to handle Lo-Lo cargo in significant number, but that would require the usage of facilities where the capacity might be in demand by the forestry industry. There are railway lines and freight terminals in the port in Alfredshem, making the Hörneborg quay the most interesting facility from the point of view of this report[231]. Hörneborg is also seen as the key area to be developed, but a string of delays since the decision to launch a modernisation project in 2022 means that these developments have yet to take place[232]. The road connections for most of the different port alternatives are acceptable, and the railway also provide access to the Stambanan genom övre Norrland through the Mellansel-Örnsköldsvik route. However, it is notable that the E4 in Örnsköldsvik passes directly through the city centre, without separated carriageways or grade-separated junctions. This creates a potential bottleneck, in particular in case of convoys with heavy vehicles.

Notable is that Örnsköldsvik is home to the main factory of BAE Systems Hägglunds, one of the most important production facilities for armoured vehicles in Europe. The company is famous for its articulated all-terrain vehicles – including the classic Bv 206 – as well as the CV 90 infantry fighting vehicle.

East of Örnsköldsvik is Husum, which as mentioned is home to a significant board and pulp mill with its own port facilities and railway connection.

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[229] Delta Terminal AB. 'En intermodal hamn i Söråker, Timrå mitt i Sverige'. Delta Terminal AB. Accessed 13 May 2026. https://deltaterminal.se/

[230] Due to historical reasons, the naming of the different ports and factories are somewhat contradictory. Domsjö is a village situated on the south bank, and home to the smaller timber port. Domsjö has however also lent its name to the factories on the opposite bank, which over time has developed into the Domsjö fabriker ethanol refinery and the Domsjö industrial park which contrary to their name are situated in Alfredshem and not Domsjö

[231] Örnsköldsviks Hamn o Logistik. 'Örnsköldsviks Hamn o Logistik - Hörneborg'. Accessed 4 May 2026. https://www.ornskoldsvikshamn.se/horneborg

[232] Holmström, Viktor. 'Inte ens nära start'. Allehanda.se, Örnsköldsviks allehanda, 18 August 2025. https://www.allehanda.se/naringsliv/inte-ens-nara-start/

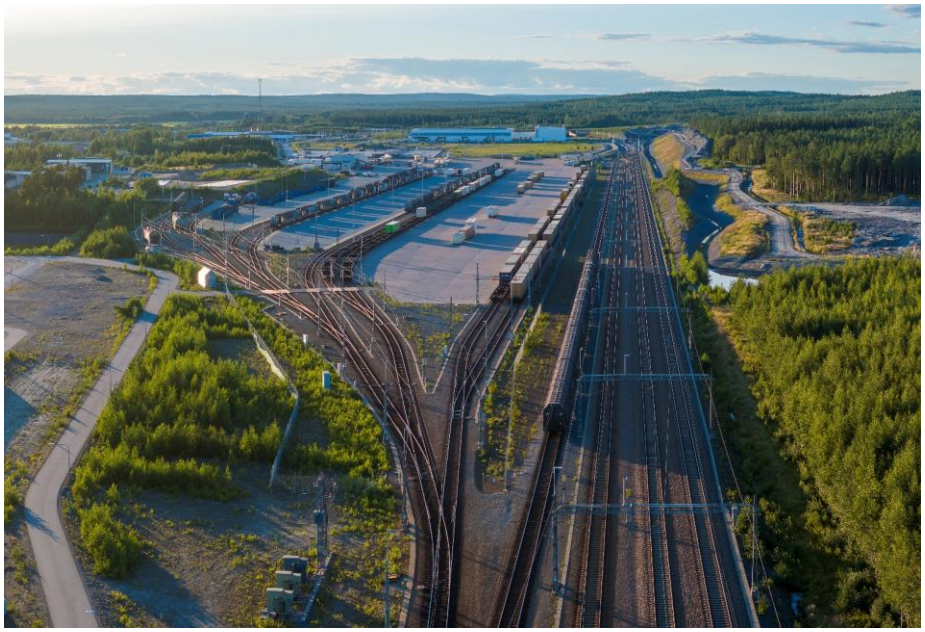


Figure 24: The new main railway freight terminal in Umeå is already operating at capacity at 100,000+ TEU moved annually, and that is despite the delays to the Norrbotniabanan which means the versatility of and by extension the demands placed on the railway network in the city is only expected to grow in the coming decade. Credit: Fredrik Larsson, courtesy of INAB

Umeå is the second major connection point within the Study Region on the Swedish coast, where E4 and E12 crosses at the outlet of the Umeälven river. Umeå has experienced significant growth in size in recent decades, driven by a combination of industry, trade, and education opportunities as one of the major university centres in Sweden. The port has always been a major factor for the city, and is diversified in a way few other Swedish ports in the Study Region are. This includes Lo-Lo, Ro-Ro, energy[233], container traffic, project cargo, and passengers. The port is situated 15 km south of the city centre at a protruding peninsula south of the village of Holmsund. This allows for port facilities on both sides of the narrow land part, which include six different Ro-Ro ramps. The port has its own railway and road connection, the latter being part of the E12 which uses the ferry connection to Vaasa. The port has undergone numerous modernisation and expansion projects in the last decade, which aims to upgrade the ageing infrastructure, including improving the current quays which are relatively short. The connections to and from the port and in general for Umeå has been significantly improved over the last years, with the Botniabanan and Norrbottniabanan – when opened – making the city a true intermodal crossing point with three railway tracks and the port facilities to accompany the road network. As part of this, two major freight terminals have been built, of which the larger one is already approaching capacity with current traffic levels at 100,000+ TEU annually, and there are plans for expanding the capacity further. The main bottleneck currently is the railway track out to the port, as well as the questions regarding the timeline for the Norrbotniabanan. However, even with these issues, Umeå has been able to capitalise on the connection with Finland, having found a niche as a railway head for Finnish goods to be loaded onto the continental European railway track,

[233] Umeå being the other fuel depot on the coast together with Sundsvall

while similarly it is a node for Swedish goods heading towards the Baltic states over the Finnish section of E12.

North of Umeå is Skellefteå. For the purpose of this report, the city is somewhat hampered by the lack of an obvious east-west road, while the delays to Norrbotniabanan means that the only connection to the railway network is the Bastuträsk-Skelleftehamn line which connects the port of Skellefteå with Stambanan genom övre Norrland. However, the port itself is one of the most important ones on the Swedish east coast, featuring modern facilities and handling significant amounts of bulk (both dry and liquid), energy products, containers, Ro-Ro, and project loads[234]. The port, like the city in general, has been hit by the bankruptcy of the Northvolt factory, which frees up capacity in the port in the near-term. As is common for much of the study region, industry related to forestry and paper are key customers of the port, but the port is also home to the Boldien Rönnskär smelters, which produces a number of different metals[235] and sulphuric acid from recycling and mined ore[236].

Like the port infrastructure, the airports are of varied size and capacity. All of the mentioned coastal cities have access to their own airports, including Sundsvall-Timrå Airport[237] north of Sundsvall with significant facilities and a single 1,940 m runway, Örnsköldsvik Airport[238] with a single 2,000 m runway, Umeå Airport[239] which has a single 2,300 m runway and is the largest in the Swedish part of the Study Region and fifth largest nationally[240] , and Skellefteå Airport[241] with a 2,500 m runway. The lengthening of the runway which was finished in 2019 provides the airport with one of the longest runways in the Study Region, after Trondheim-Værnes and Kauhava[242]. In addition Kramfors and Sollefteå share Höga Kusten Airport[243] with a 2,000 m runway. The old air force dispersal base in Åmsele has also been bought back to the Swedish Armed Forces[244].

[234] Port of Skellefteå. 'Port of Skellefteå - här skapas norra Sveriges logistikcenter'. Accessed 5 May 2026. https://portofskelleftea.se/

[235] Cupper, zink, lead, silver, and gold

[236] Boliden. 'Boliden Rönnskär'. Operations - Smelters, Boliden. Accessed 5 May 2026. https://www.boliden.com/operations/smelters/boliden-ronnskar/

[237] 56,965 passengers in 2025, also known as Midlanda

[238] 26,971 passengers in 2025

[239] 721,355 passengers in 2025

[240] Measured in annual passengers, ranking behind Stockholm Arlanda, Göteborg-Lanvetter, Luleå, and Malmö

[241] 312,357 passengers in 2025

[242] Skellefteå Airport. 'Om flygplatsen'. https://skellefteaairport.se/. Accessed 5 May 2026. https://skellefteaairport.se/om-flygplatsen/

[243] 12,713 passengers in 2025

[244] SVT Nyheter Västerbotten. 'Försvaret köper flygbasen i Åmsele'. SVT Nyheter, 13 December 2024. https://www.svt.se/nyheter/lokalt/vasterbotten/forsvaret-koper-flygbasen-i-amsele

Finnish Coastal Region

The Finnish coastal part of the study covers over 250 km of coastline, roughly corresponding to the three southernmost Ostrobothnian Counties[245]. The region is relatively flat, dominated by farmland and forests. The coast is notoriously shallow and cluttered, featuring numerous islands and navigational hazards. The sea is frozen during several months each winter, as the water is brackish and lack strong currents[246]. A number of population centra are spread throughout the region, including Vaasa and Seinäjoki urban areas as well as the historical port cities of Kokkola[247], Jakobstad[248], and Kaskinen[249]. The region is one of the main food producing regions of the country, including both agriculture and the processing of food all the way up to consumer levels, as well as being a noted industrial hub with a significant amount of manufactured goods being exported.

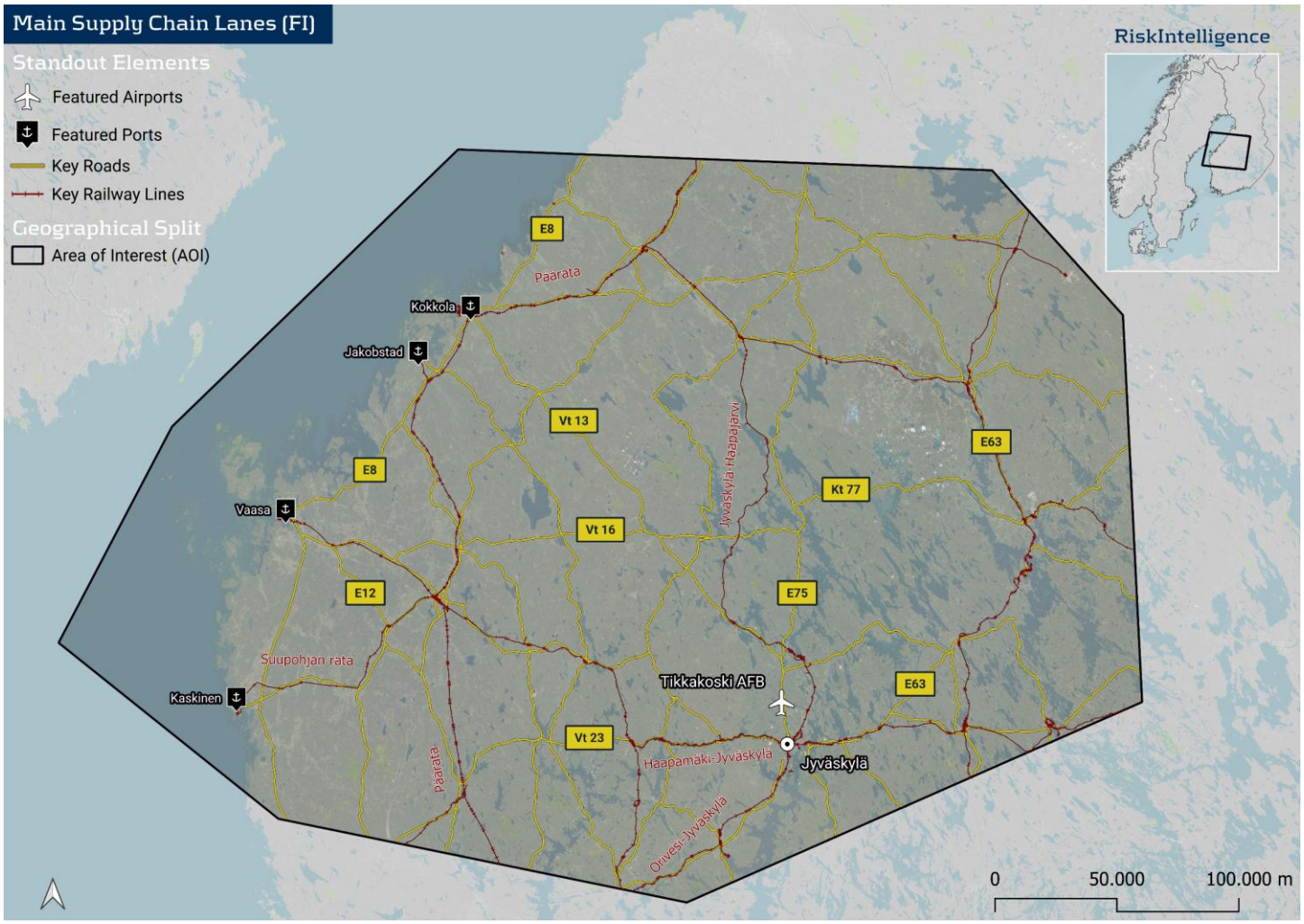


Figure 25. An overview of the main supply routes in the Finnish part of the Study Region

[245] Ostrobothnia, Central Ostrobothnia, and Southern Ostrobothnia

[246] There are no discernible tidal waters, the prevailing current (travelling north along the coast) is weak, and the rivers in the region are modest in size

[247] Swe. Karleby

[248] Fi. Pietarsaari

[249] Swe. Kaskö

The region has a well-established transport network, including European roads E8 parallel to the coast, E12 coming over the sea and continuing from Vaasa onwards to Helsinki, as well as national roads Vt 13 going south-east from Kokkola towards Jyväskylä and beyond, Vt 16 and Vt 18 heading east from Vaasa, Vt19 going north-south through Seinäjoki, and Vt 28 going east from Kokkola.

The Päärata[250] railway line connecting Helsinki and Oulu passes through Seinäjoki and Kokkola within the region, with additional tracks to the ports of Kaskinen[251], Vaasa, Jakobstad, and Kokkola, as well as having a connection from Seinäjoki to Haapamäki where it splits towards either Tampere[252] or Jyväskylä.

The region also holds a number of airports of differing quality and traffic amounts. Vaasa Airport and Kokkola-Pietarsaari Airport both belong to the national operator Finavia with national as well as limited international traffic, with both featuring 2,500 m long runways[253]. Of those, Vaasa has significantly more traffic, including a much higher share of international passenger traffic[254]. In addition Seinäjoki Airport has a 2,000 m runway and is privately owned by the public company Seinäjoen lentoasema Oy, and while currently there is no regular traffic, development plans are in place. The former air force base at Kauhava is currently uncontrolled but preserved in working order with a single 2,700 m runway. A number of smaller uncontrolled fields are also found in the region, of which Menkijärvi is the most important one[255]. Just north of the region Kalajoki uncontrolled field is regularly used by the Finnish Air Force's Tukilentolaivue[256] for exercising rough field operations.

The Finnish part of the Study Region holds four major ports, from south to north these being Kaskinen, Vaasa, Jakobstad, and Kokkola. The port of Kaskinen is the second newest in Finland[257] having become operational at the start of the millennia. This allowed the port to move further away from the city centre, giving it ample space and a good connection to the road network. The main road out is Kt 67, which passes both E8 and E12 before ending up in Seinäjoki, where in turn it connects to Vt 18 Vaasa-Jyväskylä and Vt 19 Jalasjärvi[258]-Nykarleby.

[250] Swe. Stambanan

[251] Not in service since September 2024

[252] Connecting to the Tampere-Jyväskylä line in Orivesi east of Tampere

[253] Kokkola-Pietarsaari also having a secondary 700 paved runway

[254] Vaasa: 169,431 passengers in 2025, of whom 66,972 flew internationally. Kokkola-Pietarsaari: 32,131 passengers, of whom 3,230 flew internationally. Source: Finavia. 'Liikennetilastot'. Accessed 14 April 2026. https://www.finavia.fi/fi/tietoa-finaviasta/tietoa-lentoliikenteesta/liikennetilastot

[255] The field played an important part in Finnish Air Force flight training during WWII, but has for decades been a general aviation field with an important glider presence. Of the two paved runways available, one is in poor conditions and not in regular use

[256] Supporting air operations squadron, part of Satakunta Air Wing

[257] After Vuosaari/Nordsjö outside Helsinki

[258] Vt 19 and E12 in turn connect to each other in Jalasjärvi

The main drawback of the port as of the time of writing is that the Suupohjan rata[259] railway line which connect the port to the Päärata in Seinäjoki has been closed for traffic since 2024 due to the unsafe condition of the track – in particular relating to a number of bridge crossings – following years of limited investment in its maintenance. The port itself handles varied loads, including Ro-Ro traffic with two ramps, dry bulk, chemicals, and containers. There is also considerable experience with project loads, related to windfarms. The young age of the port also means that the infrastructure is new and well-built, including modern high-strength quays.

The port of Vaasa situated on the island of Vaskiluoto[260] is the only Finnish port in the Study Region which handle passenger traffic, thanks to its connection to Umeå. As such, it is one of only two[261] true omni-capable ports in Finland, which handle both passengers, fuel, and cargo. Currently the port does not have regular container traffic, but it has the capability to handle containers. The port is continuously being developed, with dredging increasing the size of the channel into the port, a new wider Ro-Ro ramp coming, and expansion of the port area out towards the sea with the soil dug up as part of the dredging. The port is also able to handle very heavy loads – including up to 300-400 tons – thanks to the requirements of local export industry. This also means that there are a number of companies in the region with experience of special transports, as well as the necessary infrastructure to repair and maintain heavy vehicles in the region, while the port itself has significant crane capacity. The port has a railway connection through the city centre and onwards to Seinäjoki. The Vaasa-Seinäjoki route is electrified since 2011, though currently the 3 km stretch from Vaasa station and onwards to the port is not. The port is connected to the road network through two routes away from the island, the E12 goes east from the port and passes through the city centre and connecting with E8 there, allowing for the fastest route - in particular for traffic going north or east – while the southern connection over the Yt 6741 and St 673 gives the ability to reach E8 and E12 east of Vaasa near the airport without having to pass through the city centre. The location on the island of Vaskiluoto comes with benefits in the form of the port being relatively easy to monitor and protect against outside threats, but it also limits the available space and creates growth issues. Currently there are free land areas which can be used for storing vehicles and equipment, but there is pressure from local industry as real estate close to the port facilities is sought after. Similarly, the marshalling yard for the railway connection is adequate but on the smaller side. A potential development opportunity is as a base for offshore windfarms, which could see the port expanding. From the point

[259] Swe. Sydbottenbanan

[260] Swe. Vasklot

[261] Fi. Pännäinen

of view of this report, the potential inclusion of a heliport is the most interesting aspect were this to take place, and dual-use possibilities of such infrastructure need to be taken into account during the planning and building phase.

The port of Jakobstad is focused on the forest and paper industry and its needs, which means it handles dry bulk, chemicals, and Ro-Ro, as well as a smaller number of containers. The road connections are adequate, while there is an electrified railway connection to Bennäs[262] where it connects to the Päärata through a triangle track. The port has two Ro-Ro ramps, one of which is in need of overhaul, and while space is somewhat limited, there are options that can be used for the storage of vehicles and equipment. Due to the age of much of the port infrastructure, main battle tanks or other very heavy vehicles might be an issue. The port has significant spare capacity as of the time of writing.



Figure 26: The Rauma-class fast attack craft FNS PORVOO inside the All-Weather Terminal in Kokkola while deployed to the region as part of air defence exercises in 2010. Credit: Robin Häggblom/Risk Intelligence A/S

The port of Kokkola is made up of three distinct parts, including a CAPESIZE[263] deep port. The port handles chemicals, dry bulk, project loads, as well oil products. The port has lacked a Ro-Ro capability, but a ramp is being installed as of the time of writing this report, to be opened for traffic later this year. Of particular note is that the port area is home to a significant concentration of chemical industry, and a major fuel

[262] Fi. Pännäinen

[263] CAPESIZE denote the largest sizes of dry cargo ships, the name coming from them being too large to fit through the Suez or Panama Canals, forcing them to go round the capes at the southern tips of South America and Africa when transiting to and from the Atlantic

depot[264]. The port also has good railway connections to the Päärata and has a sizeable marshalling yard in the port in addition to that found in the city centre. This allows for loading directly from ship to railway. Up to the full-scale invasion of Ukraine in 2022 the port also saw significant transport of Russian ore arriving by rail, but with this traffic having disappeared, there is currently significant spare capacity both on the railway and in the port generally. There are sizeable fields that can be used for project loads, including military needs. A unique feature is Europe's largest All Weather Terminal (AWT), which allow for vessels up to 9,500 DWT with a draught of 8.3 m to dock at a 122 m long quay indoors[265], offering loading and unloading with a 50 ton overhead crane while protected from the weather and most methods of surveillance.[266] The AWT is the only one found in the Nordics, and is kept ice-free throughout the winter months. It is able to handle both containers and project cargo. From a military and security of supply, it is notable that the port company owns all equipment, including cargo handling equipment and cranes. The road network is good, with E8 passing through Kokkola and the city being the northern terminus of the Vt 13 to Jyväskylä and onwards to the southeast. The connections are however only adequate. For normal trucks the connection to E8 is relatively straightforward, while the connection to Vt 13 is less than optimal for the scenarios envisioned, as is the case when moving outsized cargo to the E8.

Central Finland

Central Finland is a key hub for the road and rail network of Finland, with Jyväskylä as the largest node and city by some margin. Situated in the south-eastern corner of the Study Region, Jyväskylä is the fifth largest urban area in Finland[267] and home to important industry, military garrisons, and centres of higher education and research. The city is the crossing of point of five national roads. Two of these are the European roads E75 covering the Helsinki-Rovaniemi axis and the E63 on the south-west to north-east axis connecting Turku via Tampere and Kuopio[268], while the others are Vt 13 which runs from Kokkola in the north-west to Mikkeli and Lappeenranta in the south-east, the Vt 18 which goes through Seinäjoki to Vaasa, and finally the Vt 23 which runs from Pori and onwards through Pieksämäki to Joensuu. In addition Vt 16 and Kt 77 passes through the northern part of Central Finland on a roughly west-east axis, stretching from Vaasa through Kyyjärvi and Viitasari, before ending at the E63 in Siilijärvi north of Kuopio, where it is

[264] The depot was also the site of one of the largest industrial fires in Finnish history, when 11 million litres of fuel and other flammable liquids literally went up in smoke in 1973. Source: Möller, Sari. 'Esson suurpalo 50 vuotta sitten oli show, jota tultiin katsomaan kaukaakin – Arto Junttila istui pöllipinon päällä ja söi makkaraa'. With Juha Kemppanen and Asmo Raimoaho. Yle Uutiset, 23 May 2023. https://yle.fi/a/74-20032269

[265] Vessels can enter completely if they fit the air draught of 23.5 m, though the usual method is to dock with the superstructure left outside and the cargo holds inside the terminal

[266] Ekoluoma, Jenni. 'Kokkolan Sataman AW-terminaali'. B.Eng., Satakunta University of Applied Sciences, 2007

[267] After Helsinki, Tampere, Turku, and Oulu

[268] These have the parallel designations Vt 4 for E75 and Vt 9 for E63

possible to either head north-east to Kuhmo via Kt 75 or south-east to Joensuu on Vt 9.

Similarly, Jyväskylä is a railroad crossing with several lines serving the city. The Haapamäki-Jyväskylä-rata heading west to link up with the Seinäjoki-Haapamäki-Tampere-route in Haapamäki. The Orivesi-Jyväskylä-rata[269] heads south-west to link up with the Tampere-Haapamäki-rata to offer a direct route between Tampere and Jyväskylä. The Jyväskylä-Pieksämäki-rata heads east to the major railway crossing in Pieksämäki[270], and finally the Jyväskylä-Haapajärvi-rata heads to the north and eventually connects to the Päärata in Ylivieska. Of these, the route Tampere-Jyväskylä-Pieksämäki is fully electrified, while the routes towards Orivesi and Haapajärvi[271] are not.

Besides Jyväskylä, the second node of significance for the purpose of this report is Viitasaari with surroundings, as it sits at the crossing of the west-east Kt 77 and the north-south E75, while also seeing the Jyväskylä-Haapajärvi-rata pass roughly 20 km west of the town. The town is currently investing in a shared-use terminal for heavy vehicles, aiming to ensure users of either route is able to find necessary support services without having to go to Jyväskylä.

Although it is possible to cover significant distances through the use of natural connections and man-made canals in the lake systems in the region, there is currently not any commercially significant usage of the inland waterways which would be of interest to this report.

The major airport is Jyväskylä-Tikkakoski, which saw 28,321 passengers in 2025[272], and is home to the air force's headquarters, the Ilmavoimien Esikunta[273], and the Ilmasotakoulu[274] which handle basic and advanced flight training as well as specialty training in the fields of ground-based air defences, aircraft maintenance, communications, surveillance, and force protection, and for fighter controllers.[275] The single runway is 2,600 m.

The other major airport in the region is Halli in Kuorevesi at the very southern edge of the Study Region, next to the border to Pirkanmaa. While Halli no longer is home to the technical schools of the Finnish Air

[269] Also known as Jämsän rata

[270] Which from a military mobility point of view is of interest, as it allows trains to Kouvola/Mikkeli in the south, Joensuu to the east, and onwards north to Kajaani

[271] The Jyväskylä-Haapajärvi-rata is electrified between the Jyväskylä and Äänekoski, approximately 40 km north of Jyväskylä

[272] Of which roughly a tenth, or 2,810, flew internationally

[273] Air Force Command

[274] Air Force Academy

[275] The garrison is also home to certain joint-functions, including from the PVLOGL/Logistics Command

Force, it still plays an important role in the Air Force's activities, in particular from a security of supply-angle as it is home to key facilities for Patria, including the F-35 forward fuselage production line[276]. The airfield is also in regular military usage, seeing on average over a thousand take-offs and landings by military aircraft on an annual basis[277]. There are no regularly scheduled civilian flights to Halli.

In addition, a small paved landing strip of 900 meters is found in Kivijärvi close to Viitasaari[278].

[276] Kaski, Heli. 'F-35-hävittäjien eturunkotehdas Jämsän Halliin – Patria neuvottelee myös osavalmistukseen ja moottoreihin liittyvästä tuotannosta Suomessa'. Yle Uutiset, Yle, 19 June 2023. https://yle.fi/a/74-20037445

[277] Otavamedia. 'Hallissa juhlistettiin 80-vuotiasta ilmailupitäjää'. Patria, 16 October 2020. https://www.patriagroup.com/patria-in-finland/media/patria-magazine/patria100/hallissa-juhlistettiin-80-vuotiasta-ilmailupitajaa

[278] Lentopaikat.Fi. 'Suomen Lentopaikat'. Accessed 15 April 2026. https://lentopaikat.fi/?doing_wp_cron=1774531209.8992249965667724609375

Identified issues

Summary

At a high level, while the region's transport infrastructure is generally functional and allow the Study Region to play a key role as a strategic enabler for military mobility in all of our scenarios, it is not without issue. There are critical structural weaknesses in resilience, redundancy, and civilian-military coordination, both when it comes to individual modes of transport but also for the transitions from one mode of transport to another.

In general, it is notable that the infrastructure network is often maintenance-heavy and unevenly funded, with investments frequently driven by specific industrial or local needs rather than broader societal or strategic benefit. This can lead to corridors that are optimised to work for individual flows, but show flaws when looked on as part of the larger network.

A major concern is the lack of redundancy, especially in Norway and parts of Sweden, where geography forces reliance on single corridors like the E6 road and key rail lines. These become bottlenecks as well as being vulnerable to disruptions, both from natural disasters as well as from hostile action.

It needs to be recognised that multi-modal logistics (road, rail, sea, air) is not seamless, and as such bottlenecks often occur at transition points such as ports, railheads, and convoy staging areas. The need for staging areas and marshalling yards which require significant space and supporting infrastructure should not be underestimated.

A recurring issue is the tension between civilian planning and military requirements. Stakeholders often mentioned a lack of clarity with regards to potential military use of infrastructure, making it difficult to ensure that upgrades properly support dual-use needs. This can result in missed opportunities or misaligned investments.

There are also specific infrastructure risks that deserve to be highlighted, including:

Single-track railways and limited alternative routes.

Vulnerability of railway signalling modernisation (ERTMS/ETCS) without fallback systems.

Seasonal and terrain-related disruptions (snow, landslides, mountainous geography).

Port congestion and limited flexibility in cargo transfer points.

The Gulf of Bothnia as both an opportunity and a challenge: it offers flexible maritime routing between Finnish and Swedish ports, but is constrained by port facilities of varying capabilities, shallow and narrow waterways, and the lack of fixed connections.

The understanding of the requirements for convoy support centres (CSCs), and crucially their reliance on civilian supporting infrastructure, varies significantly among stakeholders. There is a worry that planning assumptions may be overly optimistic when it comes to civilian capacity and resource availability (e.g., sanitation, water, lodging services).

An important planning factor is the rapid increase in vehicle and equipment weight, especially for main battle tanks (the Leopard 2 has increased in weight from 55 tons to approximately 70 tons between the Leopard 2A4 and the current Leopard 2A8), increasing strain in particular on roads and rail infrastructure not originally designed for such loads.

Finally, transport infrastructure is inherently multi-purpose, and a key unresolved challenge is how to fund and coordinate transport infrastructure that is strategically important at national or alliance level, but not prioritized locally or commercially.

In general the state of the transport infrastructure in the Study Region has excess capacity in many locations, though at the same time key parts of the network are showing signs of wear and tear coupled with instances of dated infrastructure. The availability of funding for maintenance and upgrades have varied greatly, and has often been tied directly to major investment by industry. While this is natural and related to immediate priorities by the authorities and municipalities involved, it has not always directed funds towards projects that provide the most benefit for society as a whole, and has at times led to too narrow scopes of projects as the improvements have been tailored towards the needs of one specific cargo flow. Transport flows in their hunt for efficiency are in many ways the quintessential example of the adage ‘build it and they’ll come’, as improvements to transport infrastructure reshape existing flows and creates new ones in ways not always recognised at

the outset of planning, meaning there are significant opportunities where dual-use infrastructure based on either civilian or military needs will prove highly beneficial for the other side as well once built. A prime example of these dynamics can be seen around the Øresund Bridge which has not only created changes in traffic pattern across the strait, but also societal changes in the communities surrounding it[279].

Connections between ports and land-based logistics

As the transports looked at in this report by their very nature are multimodal ones, it has become clear that in many cases the bottlenecks are found in the connections, where cargo is moved from one mode of transport to another. This is in particular the case for a number of port facilities. In general, the issue seems more common for Norwegian port facilities compared to Swedish and Finnish ones.[280]

Airlift capacity

In general the aviation facilities of the region are up to the demands placed by the scenarios, with the bottleneck for airlift largely coming down to the number of available aircraft and personnel, including base protection and ground handling units where relevant. In case of an ongoing conflict, air defences as well as hardened facilities and revetments for aircraft and stores will become a higher priority, though it is notable that most airlifters try to stay on the ground for as short a time as possible before turning around and flying back to their bases further from the frontline. This puts a focus on the protection of the storage and staging areas for the equipment that is unloaded, which is a topic more closely related to the general need for hardened facilities and increased ground-based air defence capabilities rather than a question of transport infrastructure.

Remote air traffic control solutions raise new questions from a resilience point of view, where it is still unclear whether the net effect of the technology will be positive or negative from a total defence point of view.

Exchange of information between military and civilian stakeholders

A significant issue encountered in many locations is the lack of information. Stakeholders note that defence forces have expressed an interest in a certain facility, but it remains unclear to stakeholders why exactly that is, and when the facility could be called upon to be used for military purposes. Crucially, as the nature of the usage is unclear, so are the requirements, meaning that it is difficult when planning

[279] These include e.g. growth related to the creation of a common labour market, increased innovation, as well as increased urban development when the desirability of nearby district increase. See e.g. Alm, Fayme. 'The Øresund Bridge: 25 Years in a Region That Creates Dynamics'. Nordic Labour Journal (Oslo), 30 April 2025. https://www.nordiclabourjournal.org/the-oresund-bridge-25-years-in-a-region-that-creates-dynamics/

[280] In part this discrepancy can likely by explained by locations suitable for port construction being more readily available in Norway compared to the shallower waters found in the Swedish and Finnish part of the Study Region, leading to Norwegian ports on average being more specialised while several of the Finnish and Swedish ports looked at were multipurpose facilities. This is reflected in the infrastructure of the connections of these larger multipurpose facilities being developed to handle a variety of cargo, often including both road and rail transport, as well as well-developed routes for outsized or heavy cargo

modernisation projects to know whether they will improve the facility from a dual-use perspective, or whether they even might hurt the possible military usage. There might also be cases where improving the dual-use capabilities of a civilian facilities could be done as part of a civilian improvement project at relatively limited additional cost and resources[281], but where these possibilities are overlooked due to lack of information.

Storage areas

The multi-modal nature of military transports means that vehicles and equipment often arrive at the end of one mode of transport, and then need at least a temporary regrouping before continuing on. This can take the form of vehicles being unloaded from a Ro-Ro vessel waiting for the soldiers of the unit to arrive and marry up with their vehicles again, or trains being unloaded at a rail head. In either case, mismatching travel times and schedules between the different modes of transport used by personnel and vehicles or equipment, as well as the need to overhaul vehicles and ensure they are safe for continued transport, will cause the unit to stand still for some time. With the movement of large units at the scope of the scenarios described in this report, this requires significant storage areas. In their most simple form these are just open fields with ground hard enough to handle the pressure from the vehicles involved, but in particular during winter times and in case personnel is waiting in an area for any prolonged time, other services such as covered facilities to ensure the ability to overhaul equipment away from the elements, or services related to food, sanitation, lodging, and medical issues will be required. In a number of locations where changes of mode of transport can be expected to take place, access to storage were either limited or rested upon stakeholders such as local industry clearing out potential locations before they could be put to use by the military.

E14 and the general Norwegian road and rail network

In general, the terrain in Norway creates significant issues, as achieving redundancy through parallel routes is difficult. Similarly, the state of the road and railway network crossing into Sweden is identified as a weak link, and need further improvement to improve the resilience. This is an issue both for the smaller roads, including many of which experience significant periods of either planned or unplanned closures during the winter months, but also main arteries such as E14 suffer from limited capacity and regular disturbances.

E6

The role of E6 as the sole road artery along the Norwegian coast is difficult to overlook, and creates serious bottlenecks and risks. The situation would become further more complex and vulnerable in case of a major crisis that would see refugee streams moving north-south in

[281] A good example is that the additional costs created by dual-use requirement for a projected civilian freight terminal in Brunflo near Östersund were calculated at 1.4 million SEK (130,000 EUR) as part of an overall project cost of 72-98 million SEK (6.6-9.0 million EUR). Source: Forslin Rail Consulting 2.0 AB. Teknisk Förstudie Omlastningsterminaler Brunflo. 2024

Norway, and any scenarios need to take into account the possible additional pressure from rerouted civilian trade goods and traffic related to security of supply requirements depending on the situation in the Baltic Sea taking up capacity on the E6.

Redundancies for the rail network, including Meråkerbanen/Mittbanan

Similar to the E6, the rail network is suffering from a lack of both resilience and redundancy in a number of key locations within the Study Region. In particular this is evident for Nordlandsbanen in Norway, as well as for Meråkerbanen/Mittbanan to Östersund. Throughout the railways are almost exclusively single-track and lacking any alternative routes. Nordlandsbanen is the most extreme case, as it ends in Bodø with the only option to get past any kind of blockage north of Hell[282] being to move the train set by sea.

In particular on the stretches where there is a lack of alternative routes, such as Meråkerbanen/Mittbanan, the limited capacity of the available route is a major issue. The route is both in need of increased max capacity, as well as being hit by frequent disruptions due to landslides and winter conditions. The availability of heavy-duty equipment to clear disruptions and keep traffic flowing in the face natural (and in case of war, man-made) disruptions is another key.

Vulnerability of the rail and road network

In general the rail and road networks of the study region are maintenance intensive, due to significant temperature differences experienced throughout the year, soft and unsteady ground due to the prevalence of wetlands and, for the Norwegian and Swedish part of the Study Region, mountainous terrain. To this come demands such as clearing snow during the winter months.

Redundancy in Railway Signalling

The issue of redundancy and resilience in railway signalling has risen to the forefront with the planned introduction of ERTMS[283] into widespread service, providing significant increases in safety and upgraded capacity, as well as for interoperability between countries, via the ETCS[284] which through onboard and trackside equipment ensure information is automatically passed between train and traffic control. This means that traditional optical signalling can be completely removed, which is the current plan for the Study Region[285], something that the Swedish Armed Forces has raised as a concern due to the vulnerability of the system. The Swedish Armed Forces has instead called for retaining the current

[282] Where Meråkerbanen/Mittbanen meets the Nordlandsbanen

[283] European Rail Traffic Management System

[284] European Train Control System

[285] BANE Nor. 'Kort om nytt signalsystem ERTMS'. Accessed 18 May 2026. https://www.banenor.no/prosjekter/alle-prosjekter/ertms-fremtidens-signalsystem/kort-om-ertms/, Rylander, Robert, Anders Ellström, Olof Kjellström, Anders Friberg, and Stefan Nohrénius. Yttrande över Trafikverkets förslag till nationell plan för transportinfrastrukturen 2026-2037. LI2025/01587. Edited by Per-Ove Norell. With Claes Isoz. Response to referral of a proposal for consideration. Försvarsmakten, 2025, and Fintraffic Raide Oy and Väylävirasto. 'Tietoa Digiradasta'. Digirata, n.d. Accessed 18 May 2026. https://digirata.fi/tietoa-digiradasta/

ability to use optical signals as a back-up, while simultaneously ensuring the ability to do traditional manual train dispatching if needed. As part of this, the creation of a volunteer force[286] trained to ensure that the railway network remains in operation in a serious crisis or wartime is called for.[287] This can be compared with the findings presented by reports looking at the remarkable success of the Ukrainian railway system, which note the importance of the ability to use older technology which provide a higher degree of resilience.[288]

Crossing the Gulf of Bothnia

The Gulf of Bothnia is one of the unique features of the region, both offering significant flexibility in using Finnish ports as ports of debarkation in case the Baltic Sea is open, but also in that as opposed to road and railroads which by and large follow set corridors, the Gulf of Bothnia offer the opportunity to seamlessly switch between different corridors such as a vessel being loaded in Gävle unloading in the port of Kemi.



Figure 27: The current literal end of the road of the E12 and the Swedish railway network in the form of the port of Umeå. From here, the E12 continues over the water with the ferry MS AURORA BOTNIA, seen here at its ferry terminal. The port of Umeå uses its location at the tip of the peninsula to its advantage, allowing vessels to dock on both sides, and is currently in the process of undergoing significant modernisation and expansion programs. Credit: Lars Lindh, courtesy of INAB

However, the Gulf of Bothnia is also a challenging operating environment, with many of ports being situated in locations surrounded by cluttered archipelagos with narrow sea-lanes leading in. In addition, despite the current trend of warmer winters, large parts of the sea still encounter heavy ice during much of the winter. This limits the number of vessels which can operate in the area year-round, as well as making shipping dependent on assistance from ice breakers during part of the season. The flexibility offered by the ability to sail cargo to different ports of debarkation also comes at the cost of two changes of mode of

[286] Frivilliga järnvägskåren, or the Volunteer Railway Corps

[287] Rylander, Robert, Anders Ellström, Olof Kjellström, Anders Friberg, and Stefan Nohrénius. Yttrande över Trafikverkets förslag till nationell plan för transportinfrastrukturen 2026-2037. LI2025/01587. Edited by Per-Ove Norell. With Claes Isoz. Response to referral of a proposal for consideration. Försvarsmakten, 2025

[288] MSB. Developing Sweden's Civil Defence: Lessons from Ukraine - Summary of Report to the Swedish Government. Fö2023/01325. Myndigheten för samhällsskydd och beredskap, 2025

transport[289], increasing friction and adding time due to additional steps in the transport process.

Convoy Support Centres

A key part of the ability to move large military units are convoy support centres (CSC), which in essence are the military equivalent of motorway service areas where the travelling unit is provided with services that may typically include "vehicle refuelling, maintenance, recovery support, force protection, accommodation and messing facilities"[290]. Depending on the national preferences, these can either be handled by dedicated military units, ordered as services to be provided by one or several civilian suppliers, or a combination of military and civilian services.



Figure 28: Convoy operations in sub-zero conditions with heavy vehicles will put particular demands both on the drivers, but also on the equipment used at Convoy Support Centres as well as on the maintenance routines employed, underscoring the importance of the units slated for possible deployment to the Nordics actively training in the local conditions. Credit: Robin Häggblom/Risk Intelligence A/S

The plan for the CSCs which in case of Scenario 2 and 3 would be created in the Study Region are not known to the authors of this report. However, a number of people spoken to have expressed concern regarding whether there is an unrealistic picture of which services can be provided for by civilian authorities and service providers in what are relatively sparsely populated areas. In particular there is a question of whether multiple military planners are counting on the availability of the same limited resources, such as e.g. portable water and sanitation solutions for which there are a limited number of service providers with significant capacity in the Nordics. Whether the plans for the CSCs are coordinated at a level where 'double-booking' does not happen remains unclear.

[289] The switch from train or road transport to ship in the port of embarkation, and the switch back at the port of debarkation

[290] NATO. AJP-4.4 Allied Joint Doctrine for Movement. C Ver. 1. Allied Joint Publication, 4.4. NATO Standardization Office, 2022, p. 1-6

Growth in the weight of main battle tanks

When the final Leopard 1 main battle tank rolled off the production line 1976, the heavyweight of the West German army[291] tipped the scale at 42.4 tons when in combat load.[292] The replacement arrived in the form of the Leopard 2, which by the end of the 1980's had been standardised in the form of the Leopard 2A4, with a combat weight of 55.15 ton.[293] Continued modernisation of the basic Leopard 2 has seen the Leopard 2A7V enter service at a combat weight of 66.5 ton in 2021[294], while the latest version as of the writing of this report is the new-built Leopard 2A8 "weighing nearly 70 metrics ton"[295].



Figure 29: The growth in weight of modern main battle tanks, such as the latest members of the Leopard 2-family seen here in the form of a German Leopard 2A7V from Panzerbrigade 12, is putting pressure on transport infrastructure. Credit: U.S. Army National Guard photo by Pfc. Israel Fernandez

It needs to be stressed that the majority of vehicles and equipment in a military unit are no larger than civilian heavy vehicles which are using the transport network every day. However, the main battle tanks are the exception, and does rely on specialised transport solutions to move longer distances. The growth in weight by 65 % in the case of the Leopard-family since the Cold War – and crucially by 10+ tons since the Leopard 2A4 which was the unofficial European standard for quite some time during the post-Cold War years, means that there is a very real risk that dual-use or military infrastructure built to be able to accommodate the needs of all military units – including armoured ones – might not be able to perform their original mission when faced with modern main battle tanks. The issue is largely one that concerns road- and rail-transports, as port facilities in many cases are built to be able to handle extremely heavy project loads.

[291] And a number of allies, including Norway and Denmark

[292] Lobitz, Frank. Gesamtwerk Leopard 2. 2022. 1st edn. Tankograd Publishing, 2022. Hardback, p. 13

[293] Lobitz, Frank. Gesamtwerk Leopard 2. 2022. 1st edn. Tankograd Publishing, 2022. Hardback, p. 623

[294] Lobitz, Frank. Gesamtwerk Leopard 2. 2022. 1st edn. Tankograd Publishing, 2022. Hardback, p. 623

[295] Sprenger, Sebastian. 'KNDS Unveils the Leopard 2A8, First New Battle Tank Build since 1992'. Defense News, Sightline Media Group, 20 November 2025. https://www.defensenews.com/global/europe/2025/11/20/knds-unveils-the-leopard-2a8-first-new-battle-tank-build-since-1992/

Contradictory needs

This report has been focused on the theatre-wide question of how to get a major military force – in Scenario 3 one of the largest military force build-ups in the post-Cold War era – into the Nordics and onwards to the east where the potential battlefield is situated. This looks at the current and future transport infrastructure from a particular set of circumstances, and the requirements are formulated based on these. At the same time, were one to assess the transport infrastructure from another point of view – be it at a lower, more regional or local level – or looking at another defining societal need – such as peacetime tourism – the requirements and priorities would look different.

This creates conflicts. Transport infrastructure tend to be large and permanently alter the location where it is built in significant ways. It not only alter the purely physical aspects of the environment where it is built, but it also changes how people and goods move. While the general question of this report can be summed up as 'How to move large numbers of people, vehicles, and equipment as fast as possible through the Study Region', there are many instances where people affected by the proposed changes might not be universally appreciative of this. The creation of a Nordic 'flyover country' through which traffic flows but rarely stops may hurt local businesses, more efficient transport infrastructure may divert flows away from current service providers, and in many cases major infrastructure projects will have at least some amount of negative impact on biodiversity and environmental protection.

Contradictory funding

The question of contradictory needs is most clearly seen when the stakeholders that are responsible for – and funding – certain parts of the infrastructure network are not the same ones as those seeing a need to improve that part. In the most extreme case, many of the improvements suggested in this report can be argued to benefit Finland and Norway more in peacetime[296], while significant parts of the investments would take place in the Swedish parts of the network in the form of projects that are not necessarily those the Swedish government puts the highest priority on. Similarly, infrastructure maintained and developed by regional or local stakeholders, or by private industry, may hold an outsized importance from a national or international point of view.

[296] In wartime, a more effective defence of the Nordics as close to the border as possible will benefit all three countries, both with regards to how the battle develops, but crucially with regards to how efficient a deterrent the conventional combat capability of the western allies provides



Figure 30: Timber is one of the main types of goods transported on the Inlandsbanan, and is a key driver behind the development and maintenance of transport in many of the more sparsely populated parts of the study region more generally. Credit: Håkan Wike/Inlandsbanan AB

How to be able to properly identify and fund infrastructure improvements where the responsible party does not see the benefit for their purposes is a key higher-level question that was encountered in numerous interviews throughout the making of this report. The specific cases most frequently encountered where:

- National interest in infrastructure projects that fall under local jurisdiction, where the local authorities see little to no value in allocating land management planning resources or funding to projects that would be significant undertakings relative to the size of the budgets and resources available to them, as the majority of the benefits would be reaped by other parties. A case that is notable due to its size and importance is Inlandsbanan, which is operated by the joint-stock company Inlandsbanan AB owned by the municipalities along the track,

- Privately owned infrastructure of national interest, where national funding is difficult to implement as it can be considered to skew competition on the free market. This is of particular interest for the purpose of this report in places where the military want to be able to use industry-owned ports and railway connections, or warehouses and staging areas,

- Planned military usage of civilian infrastructure, both in times of crisis but also as part of needs stemming from the general expansion of the armed forces and the increased training amount that we have seen in the last decade. While all countries have some branch or related authority responsible for military infrastructure, their jurisdiction seldom include provisions for investing in civilian or privately-owned infrastructure even when there is a clear need. Regulations vary between countries, and

implementation may be tricky due to the need to ensure that state-sponsored investment in privately owned infrastructure does not provide the owners with a competitive edge. There are in many countries certain provisions available for defence forces to invest in supporting services and products, but transport infrastructure may easily end up in a grey zone where it is the civilian national authorities who are responsible. In those cases, whether the funding is available depends on the ability of the ministry of defence and the armed forces to successfully get their requirements across to the relevant ministries and authorities.

Additionally, status within the TEN-T network[297] was an often raised item on the agenda, as it is currently seen as a divider between the 'haves and the have-nots'.

[297] The Trans-European Transport Network. See: Directorate-General for Mobility and Transport. 'Trans-European Transport Network (TEN-T) - Mobility and Transport'. European Commission. Accessed 8 May 2026. https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t_en

Envisioned solutions

Summary

The study wishes to highlight a combination of targeted infrastructure upgrades and systemic improvements in coordination and planning processes. No single intervention is sufficient to resolve mobility constraints, but there are a number of actions that can be taken at different levels of budget and effort which would improve the situation.

Key measures include improving port-road-rail integration, increasing rail capacity on existing lines, and enhancing redundancy in critical corridors such as E6, E12, and E14.

Major strategic projects include reopening closed railway lines, construction of bypass roads, and potentially constructing new cross-border connections such as a Mo i Rana–Storuman railway connection and the Kvarken fixed link.

The importance of improved institutional coordination between military and civilian stakeholders to ensure infrastructure investments align with dual-use requirements also needs to be stressed.

Case Study: Suupohjan rata

The rail connection from the Päärata railway to the port of Kaskinen is a critical example of underutilized infrastructure, with the railway as of the writing of the report is closed due to lack of maintenance. Its reopening would significantly enhance port utility and regional resilience.

Cost estimates vary widely depending on scope, ranging from basic repairs to full electrification and modernisation. The economic case depends heavily on future freight demand assumptions. However, from a military mobility point of view, the port of Kaskinen has several promising features, which a reopening of the railway would unlock.

Case Study: Mo i Rana to Storuman railway

All rail traffic from the Norwegian railway network north of Oslo across the border to Sweden is dependent on the single-track railway connection between Trondheim and Östersund, which has proven vulnerable to weather and external action. This means that traffic eastwards from Helgeland by rail requires a detour towards Trondheim, and disturbances north of the junction between Nordlandsbanen and

Meråkerbanen/Mittbanan would make rail transport from Helgeland and the northern ports of the Trondheim fjord towards either Sweden or southern Norway impossible.

The logical answer is a railway that roughly follows the E12 between Storuman and Mo i Rana, ensuring that not only would transports eastwards from Helgeland become more efficient, but it would also create an alternative for the ports in Trøndelag in the event of disruptions on the Nordland Line or the Meråkerbanen/Mittbanan. The cost for such a project could realistically be in the 40-100 Bn NOK span (3.7-9.2 Bn EUR).

Case Study: Meråkerbanen/Mittbanan

There are only four railway lines that cross the Swedish-Norwegian border, and the other three – two south of Oslo and Ofotbanen/Malmbanan – suffer from limited spare capacity and/or lack of relevance for transports from Trøndelag, Helgeland, Møre og Romsdal, and the southern parts of Nordland.

The problem with the line is a combination of lack of maintenance as well as limited repair capacity in the event of interruptions, a combination that has led to repeated and long disruptions in traffic on the Östersund-Trondheim route.

Increased investment in the railway line is one of the most effective single measures for improved military mobility in the Nordic region that does not require the construction of completely new infrastructure.

Case Study: Inlandsbanan

The Inlandsbanan is a key redundancy corridor running through sparsely populated inland Sweden. It provides a parallel alternative to coastal rail routes and has high strategic resilience, in part thanks to its geographic separation from the coastal railway lines.

However, it suffers from limited capacity, ageing infrastructure, and operational constraints due to non-electrified operations and signalling systems. These factors limit scalability under surge conditions, while at the same time paradoxically increasing its robustness and flexibility when facing disturbances. Increased investment in the railway line, and in the connecting lines, could increase capacity significantly.

Case Study: Nordic Connector (Kvarken Fixed Link)

A potential fixed link between Finland and Sweden would be a transformative infrastructure project. It would significantly reduce dependence on maritime crossings and improve east-west mobility for both civilian and military needs.

The main advantages include a more than tenfold increase in capacity (from ~300 vehicles per day to ~4,160 vehicles per day), reduced transfer complexity due to removing the loading and unloading processes in the ports, and enhanced resilience compared to ferry-based systems. It would also in case of a dedicated standard gauge rail freight terminal enable direct rail transport to Vaasa from not only the rest of the Nordics, but from the allied nations on the continent as well.

It should also be recognised that somewhat counterintuitively, historical experience from World War II and on to today's war in Ukraine shows that bridges are rather resilient to hostile activities, and that the proliferation of drones has not significantly increased the threat to fixed transport infrastructure.

The cost estimates for the Nordic Connector varies between 4.9 Bn EUR and 30 Bn EUR (53.4-347 Bn SEK), the significant span depending on whether a bridge or tunnel is chosen as the best solution, the exact route, and whether it is solely a road connection or a combined road and railway solution.

Of the issues discussed, a number of them relate to processes, highlighting topics such as the need for closer cooperation between different stakeholders – in particular between the armed forces and smaller civilian actors holding key pieces of the puzzle – or a focus on cybersecurity to ensure information is available as needed to those that are privy to it, or resource management to ensure that both the equipment and the people needed to operate it are available in sufficient numbers at the appropriate locations. These are largely left outside the scope of this report, though it deserves to be noted that the overall efficiency of the system in addition to the actions suggested below rests on the development and improvement of a number of factors, including:

- Cross-border cooperation between authorities and companies, both across national borders but also across regional and municipality borders, as well as cooperation over sector borders

such as between companies and municipal service providers or between military and civilian actors,

- Efficient processes to ensure that people with critical roles in their civilian life are not mobilised in uniform in case of war. Here there are significant differences between the countries in the study region when it comes to national legislation and processes, and a number of people interviewed expressed uncertainty about how to ensure that they have their people available to be able to perform the functions expected from them in case of war. A possible information gap was also encountered, where the appropriate processes may be available, but individual stakeholders were unsure about how to implement them,

- Clearer communication between the armed forces and civilian stakeholders. While the armed forces are highly structured and hierarchical organisations with clear responsibilities, to civilian stakeholders it often was seen as unclear whether their contacts represented a particular unit, a branch of the armed forces, or the joint services as a whole. It was further unclear in a number of instances who to contact in case of questions or comments.

However, from the viewpoint of this report, a number of transport infrastructure projects would significantly enhance the military mobility for the Study Region, either directly through increasing the efficiency and lowering travel times between locations, or through increased resilience and redundancy. Of the improvements discussed, some are relatively small and straightforward, while others are major projects which would take significant time and resources to complete. Some of them are already in different stages of planning, while others are largely concepts for the time being, or even old plans which have been shelved but which might deserve a second look in the changed security environment. Key examples will be discussed below, but include smaller projects such as investing in railroad ramps and better connections between ports and road or railroads, through investing in increased capacity in existing arteries (including the E6, E12, and E14, as well as key parts of the railroad network such as the Meråkerbanen/Mittbanan), and all the way to major new projects such as the Mo i Rana-Storuman railway line or the Nordic Connector (Kvarken Fixed Link) connection.

Increased focus on the connections between ports and road/rail networks

For a number of ports looked into, there are significant capabilities in the ports themselves, while the connections to other modes of transport are of a more varied nature. This often comes down to lack of proper rail access, or poor connections from the port area to the main road network. In particular when moving larger road convoys or loading several trains in sequence the risk for bottlenecks, or alternatively the

need to halt civilian traffic flow, increases. Locations such as Mo i Rana, Fiborgtangen, or Muruvik as possible ports of debarkation would benefit significantly from relatively limited investment in better road connections and/or railway freight terminals.

Case study: Suupohjan rata

A particular case is the port of Kaskinen, which sits at a favourable location near the border between Satakunta and Ostrobothnia, with road connection to both north and south in the form of the E8 as well as via Seinäjoki to Jyväskylä. The port is also newbuilt and modern, with a somewhat secluded location making it suitable for military movements and relatively easy to isolate. However, the Suupohjan rata railway line which is the sole railway track to the port and provides a connection to the Päärata in Seinäjoki has been closed for traffic since 2024 due to the unsafe condition of the track. Getting the track back in operation would open up the port as a significantly more interesting option compared to the current situation, in particular for transports to the southern half of Finland. The latest as of the writing of this report is that the planning process for an overhaul have been funded, though not the overhaul itself[298]. The estimated price tag for reopening the track varies, with a recent external report putting it at 60 million EUR (665 million SEK) for the minimum viable works to get the track reopened, while envisioning a larger 200+ million EUR (2.2 Bn SEK) investment in the 2030's which would see the track completely overhauled and electrified[299], while a 2021 report by Väylävirasto in 2021 estimated two different alternatives at 36 million EUR (400 million SEK) for simply reopening the track with a 20 year technical lifespan, and a more thorough upgrade which would also see an increase in speed to 80 km/h for cargo trains and a 30 year lifespan would come in at 141 million EUR (1.6 Bn SEK)[300]. In particular as the reopening of the second west coast-track, the Pori-Parkano-Haapamäki-rata, appears to have been shelved following the recent report coming up with a cost of 1-1.3 Bn EUR (11.1-14.4 Bn SEK) for its reopening[301], investing in Suupohjan rata would be highly beneficial from a military mobility point of view[302].

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[298] Rintamaa, Tuomo. 'Käyttökiellossa olevan Suupohjan radan korjaus nytkähti eteenpäin – suunnitelmissa mukana nyt myös tasoristeyksiä'. Yle Uutiset, Yle, 30 December 2025. https://yle.fi/a/74-20200719

[299] Destia Oy. *Suupohjan rata mahdollistajana.* 2026

[300] Iikkanen, Pekka, and Tuomo Lapp. Seinäjoki-Kaskinen-radan peruskorjaus - Hankearviointi. No. 75/2021. Väyläviraston julkaisuja. Väylävirasto, n.d. Note that the cost index of civil engineering works has in fact come down since the report was published. As such, and considering the uncertainties stemming from using older estimates, the numbers quoted are not adjusted for inflation. Source: Official Statistics of Finland (OSF): Cost index of civil engineering works [online publication]. Helsinki: Statistics Finland [Referenced: 7.5.2026]. Access method: https://stat.fi/en/statistics/maku

[301] Rekola, Maija, and Janne Kojo. 'Pori–Parkano–Haapamäki-radan tarveselvitys valmistui: hyödyt jäävät selvästi kustannuksia pienemmiksi'. Väylävirasto, 17 March 2026. https://vayla.fi/-/pori-parkano-haapamaki-radan-tarveselvitys-valmistui-hyodyt-jaavat-selvasti-kustannuksia-pienemmiksi

[302] The port of Pori does have a railway connection through the Tampere-Pori-rata, which however also shares the final 100 km of the track with traffic to and from the port of Rauma, leaving the two major ports to share a single railway connection, which connects to

Increased railroad capacity on current lines

While many parts of the Study Region are served by rail, it is also the case that a number of these are not among the most important or highly prioritised stretches of rail in their respective countries. As such, there is significant span to increase the capacity on them with relatively modest resources. This includes projects such as more meeting locations, as well as in certain cases longer meeting sidings to cater to modern full-length cargo trains[303]. Other features that would increase the capacity on current lines include higher allowed speeds and greater allowed axle load[304], as well as a lack of triangle tracks in certain key crossings. In particular on the stretches where there is a lack of alternative routes, such as Meråkerbanen/Mittbanan, increasing the capacity is of critical importance.



Figure 31: Marshalling yards and rail freight terminals are key enablers to ensure that railway traffic flows efficiently, including by providing meeting points as well as the ability to rearrange different parts of the trainset to address changing priorities and destinations. Credit: Håkan Wike/Inlandsbanan AB

Case study: Inlandsbanan

The Inlandsbanan offer a number of key benefits from a military mobility point of view. This include the location, offering true redundancy to the coastal routes, as well as steering clear of most major population centres[305]. It also allows for an efficient method of transporting heavy loads from Trondheim to northern Sweden while avoiding the coastal routes which are more heavily trafficked. In addition, the track is highly resilient to outside action and weather conditions, operating with diesel locomotives and traditional dispatchers as well as retaining key capabilities[306] for operations in cold weather. However, while the remoteness and spare capacity are seen as benefits from a military

the Päärata in Tampere, one of the busier railway hubs in Finland. Pori-Parkano(-Haapamäki) similar to Kaskinen-Seinäjoki would offer a significantly more direct option to the Päärata, in particular for traffic going north or east from the ports, but this option now seems to be shelved

[303] 750 m being a standard requirement for longer military transports

[304] 22.5 t

[305] Östersund being the exception

[306] Such as operating the last heater car in Swedish service

mobility point of view, these are issues when it comes to making the railway profitable[307]. The differences compared to the majority of the Swedish train network when it comes to it being non-electrified and using dispatcher rather than automatic traffic control also means that the operations rely on skill sets and equipment that are becoming increasingly rare, making surging to the theoretical maximum capacity of the track more difficult, as shown by the situation during the autumn rains of 2025 cutting both coastal lines. This incident also highlighted the value of having a railway freight terminal at the northern terminus in Storuman (further underscoring the fact that there is currently not a major freight terminal at the terminus in Östersund), as well as the differences in how comfortable different operators were with handling the logistics around train sets needing to switch from electric to diesel and back to electric locomotives as part of their journey.

While we are seeing the first steps in the right direction with the investment announced during the spring of 2026[308], it is also clear that even this package will not cover all issues that decades of underinvestment have created. Further investment in the track to ensure an increased axle load, longer sidings to ensure that trains do not have to be cut down to size to be able to meet, and larger items such as opening the disbanded connecting tracks to Stambanan genom övre Norrland, a freight terminal in Östersund/Brunflo[309], and ensuring a drive-through capability at the Östersund workshop for the maintenance of carriages would also add to the capacity.

Railroad ramps and platforms



Figure 32: The movement by rail of prepositioned USMC vehicles at the railway crossing node in Hell in the Trøndelag-part of the Study Region, showcasing the size of modern military vehicles and the need for railway transports to accommodate for the transport of even units that are expeditionary in their nature. Credit: U.S. Marine Corps photo by Lance Cpl. Franco Lewis

[307] One interviewee summed up the situation as ”The line opened in 1937, and has been in a headwind since”

[308] Sandblad, Tobias. ‘Regeringen satsar miljarder på Inlandsbanan för försvaret’. SR Ekot. Sveriges Radio, 16 April 2026. https://www.sverigesradio.se/artikel/regeringen-satsar-miljarder-pa-inlandsbanan-for-forsvaret

[309] Forslin Rail Consulting 2.0 AB. Teknisk Förstudie Omlastningsterminaler Brunflo. 2024

As discussed earlier, one of the major changes to the requirements for military mobility in the last few decades have been the growth in size and crucially in weight for the main battle tanks in operation. As the main battle tanks are poorly suited to long road marches, they rely to a higher degree than many other military vehicles on transport by rail. This create a situation where dedicated military or dual-use transport infrastructure such as loading platforms or ramps may no longer be able to handle the loads required. Ensuring that loading facilities in locations of interest for heavy mechanised units are up to task, and if not either modernising these and/or ensuring the availability of mobile ramps of suitable capacity, is crucial to ensure an appropriate number of locations where heavy mechanised units can be loaded onto or unloaded from trains.

Redundancy in Railway Signalling

The ability to continue railway operations in the face of issues with the wireless automated signalling and control system need to be ensured. The technical question of how this issue is tackled and what is an acceptable level of resilience is outside of the scope of this report, but the request by the Swedish Armed Forces[310] to retain the optical signals as a back-up, while simultaneously ensuring the ability to do traditional manual train dispatching if needed through a trained force of professionals and volunteers deserve serious consideration throughout the Study Region, with the details of the implementation of the volunteer force differing between the three countries to allow for the national differences in their solutions for handling volunteers within the framework of total defence.

Redundancy for railway lines – Mo i Rana-Storuman

As discussed earlier in the report, one of the main issues facing railway transports in Norway is the lack of redundancy, best exemplified by the lack of alternative tracks over the border to Sweden north of Meråkerbanen/Mittbanan. From a military mobility point of view, this creates vulnerabilities if using ports north of Stjørdalen, including Fiborgtangen, Levanger, and all the ports in Helgeland. The obvious solution, which has been the topic of studies a number of times[311], is to connect the Nordlandsbanen with Västerbottenbanan/Inlandsbanan in Storuman. This would avoid the issue of any train caught on Nordlandsbanen north of a disturbance being stuck there, while also opening up significant opportunities when it comes to making routes from possible ports of debarkation more efficient, as well as creating redundancy for the Meråkerbanen/Mittbanan which has proved to be vulnerable to disturbances. In case of the Nordic Connector (Kvarken

[310] Rylander, Robert, Anders Ellström, Olof Kjellström, Anders Friberg, and Stefan Nohrénius. Yttrande över Trafikverkets förslag till nationell plan för transportinfrastrukturen 2026-2037. LI2025/01587. Edited by Per-Ove Norell. With Claes Isoz. Response to referral of a proposal for consideration. Försvarsmakten, 2025

[311] See e.g. Høgseth, Viktor Leeds. 'Vil knytte Mo mot Kvarken'. Rana Blad, Rana Blad AS, 3 January 2013. https://www.ranablad.no/1-93-6423451 for a pre-Crimea initiative, or Berg, Geir. COMCAP - Communication and Capacity in MidtSkandia. Rambøll, 2024 for a later one. The idea is however significantly older than either of these projects, having been made famous by a proposal by Norwegian railway pioneer (and lecturer, priest, politician, and folklorist) Ole Tobias Olsen in 1872

Fixed Link) being implemented, the value would further rise, as it could offer a direct railway line via Umeå to Vaasa.

It is recognised that building a new railway in the terrain of the border region would include both engineering challenges as well as environmental concerns and issues affecting the local inhabitants[312]. If we compare to recent studies for the costs of other new railway line in the High North, such as the Norrbotniabanan extension from Skellefteå to Luleå[313] or the Nord-Norgebanen[314] we find that covering the 200 km gap between Mo i Rana and Storuman would be in the 40-100 Bn NOK span (3.7-9.2 Bn EUR), the lower span stemming from the cost estimates for the Norrbotniabanan while the higher is for the significantly more complex Nord-Norgebanen.

More Ro-Ro/Ro-Pax capacity in the Study Region

While the only Ro-Pax ferry currently in operation between Finland and Sweden in the Study Region is the MS AURORA BOTNIA on the Umeå-Vaasa route, traditionally a number of different routes have seen traffic. These included Gävle-Kaskinen, Sundsvall-Pori, Sundsvall-Vaasa, Umeå-Kokkola, Umeå-Jakobstad, Skellefteå-Kokkola, Skellefteå-Jakobstad, Örnsköldsvik-Jakobstad, and Örnsköldsvik-Vaasa[315].

The flexibility of Ro-Pax vessels for military mobility needs is difficult to match, with their ability to load both vehicles, containers, and soldiers effectively. However, with the current fleet in the Study Region consisting of a single vessel, there is a lack of redundancy. Recent developments have again raised the interest in renewing one or several of the old routes, with in particular Sundsvall-Vaasa being of interest thanks to the ability to combine passengers and cargo[316]. It is however questionable whether there is enough of a market for two ferries trading on Vaasa, and alternatives such as a simpler vessel more clearly tailored towards goods and heavy vehicles on an alternative route such as Sundsvall-Kaskinen could be an alternative, which would ensure that there is a redundancy in the available Ro-Ro capacity in the Study Region, with vessels suitable for year-round operations and crews familiar with the local conditions.

To get an example of the size of investment involved, MS AURORA BOTNIA as built cost around 140 million EUR (1.6 Bn SEK) adjusted for

[312] From a number of angles, including reindeer herding and tourism

[313] Eriksson, Urban. Samlad effektbedömning Norrbotniabanan Skellefteå-Luleå. JN2201/TRV 2024/35446. Trafikverket, 2025

[314] Jernbanedirektoratet. Ny jernbane Fauske – Tromsø (Nord-Norgebanen) Oppdatert kunnskapsgrunnlag. Hovedrapport 21 007 105. 2019

[315] Some of these routes were well-established, while others have seen only occasional traffic

[316] Björkqvist, Ida-Maria, and Jakob Lillas. 'Ny färjelinje planeras mellan Vasa och Sundsvall: "Det finns ett intresse på båda sidor"'. Svenska Yle, Yle Österbotten, 18 August 2023. https://yle.fi/a/7-10039978

inflation[317], in addition to which port infrastructure would need to be built and/or modernised. However, for vessel operations, the old truth still stands that acquiring the vessel is relatively cheap and simple compared to operating it in a commercially successful way. It also should be noted that a significant part of the reason for the popularity of the Umeå-Vaasa route is that it is significantly shorter than all competing alternatives, where travel time for something like Sundsvall-Vaasa is more than double that of Umeå-Vaasa.

Ensuring availability of equipment

In general, regardless of the mode of transport, a common denominator is the reliance of some form of specialised equipment. These may take the form of heavy-duty snow ploughs for clearing the mountain passes in the winter, or cargo handling cranes in ports or freight terminals, but also ice breakers and suitable rolling stock for the railways. Much of the needed equipment is highly specialized and/or only available in limited numbers. Crucially, in many cases capacity needed in peacetime does not line up with the envisioned needs in a crisis, nor is there available spare capacity in the form of equipment (and personnel capable of operating these). This also include adequate repair and maintenance capabilities available locally in times of crisis. Processes need to be developed and implemented to ensure that the equipment needed is available, crewed, and fit for purpose.

Case study: Trøndelag-Jämtland crossings - E14, Meråkerbanen/Mittbanan, minor routes

A particular area of interest for this comes in the Trøndelag-Jämtland/Härjedalen area, where the capacity is limited and the routes are vulnerable due to both the mountainous geography as well as the weather conditions. There is a clear division between the main route of E14 and the accompanying Meråkerbanen/Mittbanan railway compared to the smaller roads in the region when it comes to their ability to handle large-scale movements of vehicles, goods, and people. As such, while there are alternative routes and the opportunity to implement dispersion for tactical and/or logistical reasons[318], it needs to be recognised that all roads are not created equal. As such, while the road network provide valuable redundancies, depending on the exact nature of the scenario investing more heavily in keeping the main route (or choosing a limited number of routes) open may be more beneficial and efficient, at the cost of potential bottlenecks and increased vulnerabilities to enemy action due to less dispersion.

[317] Rauma Marine Construction. Car and Passenger Ferry Aurora Botnia, Built at Rauma Shipyard, Will Be Christened Today in Vaasa, Finland - Rauma Marine Constructions. Media Release. 25 August 2021. https://rmcfinland.fi/car-and-passenger-ferry-aurora-botnia-built-at-rauma-shipyard-will-be-christened-today-in-vaasa-finland/

[318] Or to assign civilian traffic and military traffic to different routes to ensure smoother flows

The fact that there is a single railway line crossing the border between Sweden and Norway for a large stretch of the border underscores the importance of the Meråkerbanen/Mittbanan, and ensuring as little down-time as possible for the track through adequate investment in the upkeep of the track as well as sufficient repair and maintenance capability to quickly take care of natural[319] or man-made disturbances is from a military mobility point of view a relatively limited investment that still would reap significant benefits. Increasing the capacity of the line would also yield significant benefits, including focusing on the sidings of the railway, see earlier section.

Rerouting the main roads around Brunflo as well as building a major intermodal freight terminal for the road and rail transports would also provide a significant boost to both capacity and flexibility.

Airport facilities and connections



Figure 33: Dedicated units able to repair combat damage to transport infrastructure are a key capability, although sometimes an overlooked one. Due to the nature of transport infrastructure, realistic training opportunities can sometimes be difficult to find, but here the French Air and Space Forces' 25e régiment du génie de l'air (25 RGA, the 25th engineering regiment) has gotten the opportunity to repair holes blown in the tarmac of Halli airport. Credit: Robin Häggblom/Risk Intelligence A/S

As noted, the capacity of the aviation facilities in the region are generally at an adequate level, but verifying the ability of airports to accept military transport aircraft and then move the equipment out form the airport areas in a rapid and orderly manner would be prudent. This can best be ensured through exercises involving both the civilian authorities and service providers at the airports in question training together with the military units which would be responsible for different parts of the operation[320], something that can be arranged as part of normal peacetime movements or in dedicated exercises. This is already done to

[319] In particular landslides have proved an issue

[320] Depending on the situation, this can include force protection, refuelling, maintaining the aircraft, loading/unloading the cargo, as well as moving the cargo onwards

some extent, see e.g. Atlantic Trident 25[321], but could be increased in scope and complexity to better correspond to the flows envisioned in Scenario 2. In particular, exercising the whole chain including the staging and onwards movement would add clarity to where the bottlenecks are.

Case study: Nordic Connector (Kvarken Fixed Link)

By some margin the most significant transport infrastructure project currently being looked at within the Study Region is the Nordic Connector, a fixed link between Umeå and Vaasa over the Kvarken. This would have a significant effect on not only the immediate region, but on the transport network in the Nordics as a whole. At the same time, it needs to be recognised that the project does come at a significant cost, and questions remain over the exact nature of it in the face of environmental concerns.

A fixed link over the Kvarken has been discussed dating back more than half a century, based on trade and frequent travel which had continued to blossom after Sweden and Finland parted ways in 1809. Studies by Finnish authorities have shown that a fixed link is technically possible, including both as a bridge and/or a tunnel, and that this could include both road and railway connections.[322]

From a military mobility point of view, the possibility of including a railway link is of particular interest. Railway transports are as demonstrated a key part of military mobility thanks to their efficiency, and for any Nordic scenario an issue arises when discussing cross-border movement between Finland and Sweden as there is a gauge-break[323], forcing any train arriving at the border to unload its cargo. For northern Finland studies have investigated the possibility of extending a standard gauge track in parallel to the current track on the network[324], which would come with a price tag of 3.11 Bn EUR (33.7 Bn SEK).[325] A fixed link with a European standard gauge railway over the Kvarken to a dedicated freight terminal in an industrial area outside of Vaasa[326] would offer significant benefits in the possibility of moving trains directly from Norwegian ports of debarkation to Vaasa. It should also be noted that while outside the scope of this report, it would open up the opportunity

[321] Häggblom, Robin. 'Atlantic Trident 25 – You're All Invited'. Corporal Frisk, 14 July 2025. https://corporalfrisk.com/2025/07/14/atlantic-trident-25-youre-all-invited/

[322] Jounila, Risto, Aapo Halminen, Petteri Somervuori, Katja Ojala, Ollipekka Pakkanen, and Sami Niemelä. Utredning av genomförbarheten av en fast förbindelse över Kvarken. Trafikledsverkets publikationer 60sve/2025. Väylävirasto, 2025

[323] Finland employing the 5 ft, or 1,524 mm standard, while Sweden uses the 1,435 mm standard gauge

[324] In essence north from Haparanda/Tornio towards Kolari along the border, and north-east via Rovaniemi to Kemijärvi, and south on the route Tornio-Oulu-Raahe

[325] Haapamäki, Taina, Christoph Krause, and Veeti Kuivalainen. Eurooppalaiseen raideleveyteen siirtyminen Pohjois Suomessa, pääselvity - Eurooppalaisen raideleveyden ulottaminen Haaparannan/Tornion kautta Suomeen. No. 85/2025. Väyläviraston julkaisuja. Väylävirasto, 2025

[326] As discussed in Jounila, Risto, Aapo Halminen, Petteri Somervuori, Katja Ojala, Ollipekka Pakkanen, and Sami Niemelä. Utredning av genomförbarheten av en fast förbindelse över Kvarken. Trafikledsverkets publikationer 60sve/2025. Väylävirasto, 2025

for units to load their trains at their home garrisons in e.g. France or Italy, and by employing the Øresund Bridge come directly by train to Vaasa, without the need for changing mode of transport or moving from one train set to another.

There are preconceived notions about the vulnerability of fixed connections when faced with enemy actions. The historical experience, however, indicate that in particular bridges are surprisingly difficult to destroy, requiring a combination of pin-point accuracy and large warheads. It is also clear that even when suffering significant damage, bridges are relatively easily reparable[327].

The British Royal Air Force's No. 617 Squadron 'The Dambusters' achieved recognition for their precision raids that brought down the hydroelectric dams at Möhne and Eder, and followed it up by flying a number of raids against the German battleship Tirpitz, eventually sinking her. What is less widely recognised is that the squadron, known for its "unbelievable accuracy"[328], was involved in attacking strategically important viaducts and bridges for the last two years of the war, as conventional bombing raids proved unable to cause significant damage. Of the five major special operations against bridges and viaducts, the Nienburg brigde was destroyed and the Schildescher viaduct[329] was partially collapsed using the best crews and heaviest weapons[330] available. In particular the Schildescher viaduct had withstood some 3,000 tons of bombs dropped in earlier raids[331], before the No. 617 Sqn hit it in the final months of the war using the heaviest air-dropped weapons to see combat use before the GBU-43B was employed in 2017[332] against the so-called Islamic State[333].

Following World War II, bridges continued to prove challenging targets. The most famous example is the Thanh Hóa Bridge over the Song Ma river, which saw 871 sorties spread out over seven years during the Vietnam War before the US forces eventually destroying the bridge

[327] For tunnels, in particular sub-sea ones, it can be noted that in general terms the repair work will be more difficult, though the issues associated with targeting and achieving desired effects are significantly harder. The historical examples focus on bridges, as the general publics understanding of the vulnerability of bridges in all likelihood vary more, and there are relatively few examples of attacks on deep tunnels throughout history

[328] Mason, Francis K. 'The "Dambusters" - No. 617 Squadron, RAF'. In Wings of Fame, Hardback, vol. 6. Aerospace Publishing Ltd, 1997, p. 121

[329] Also known as the Bielefeld viaduct

[330] Originally the form of the 12,000 lb (5,440 kg) HC bomb, later the 12,000 lb DP 'Tallboy' and 22,000 lb (9,980 kg) DP 'Grand Slam' bombs

[331] Newman, Alan. 'Bielefeld Viaduct'. Atlas Obscura, 5 May 2026. http://www.atlasobscura.com/places/bielefeld-viaduct

[332] BBC News. 'US Military Drops "mother of All Bombs on IS" in Afghanistan'. Asia. 13 April 2017. https://www.bbc.com/news/world-asia-39595989

[333] Mason, Francis K. 'The "Dambusters" - No. 617 Squadron, RAF'. In Wings of Fame, Hardback, vol. 6. Aerospace Publishing Ltd, 1997

through the use of precision-guided weapons in the 2,000 lb (925 kg) and above class[334].

While air campaigns since have shown that the proliferation of precision-guided munitions have made bridges viable targets at scale, as an example Operation Allied Force[335] saw 68 bridges targeted among the 421 fixed targets struck[336], the physical nature of bridges mean they still require large warheads accurately placed to do more than superficial damage.[337] As an example, the Kerch strait bridge has been hit a number of times by Ukraine during the ongoing war, including with significant amounts of explosives both targeting the underwater structures and the deck of the bridge[338], but the bridge has been back in operation within days even following some seemingly dramatic damage.

The most significant aspect when it comes to the vulnerability of the fixed link relates to the proliferation of precision deep strike as seen in the War in Ukraine, where strikes on strategic targets deep in the rear of the adversary have now become commonplace.[339] However, it is still notable that the very features that make the one-way attack drones available at scale to the Ukrainian forces – being relatively simple and light, and through that cheap and easy to mass-produce – also make them poor choices against hardened targets such as bridges due to the lack of warhead mass and penetrating capability. Ukraine has also developed heavier systems, but when it comes to these, development have been protracted and facing the kind of technical shortcomings that are not uncommon in cruise missile programmes. The Fire Point 'Flamingo' is the most famous example, and while it has significant warhead mass, it still lack the pinpoint accuracy and advanced fusing needed to be an effective 'bridge killer'.[340] As such, the proliferation of long-range strike in itself does not in its current state create an environment where bridges are more vulnerable than the historical data suggests, although the use of conventionally-armed ballistic missile[341] in larger numbers could potentially be a disruptor. However, at the same

[334] Boyne, Walter J. 'Breaking the Dragon's Jaw'. Air Force Magazine (Arlington), August 2011. The bridge was destroyed in 1972, and with the US winding down its participation of the war, it was back in operation again the following year

[335] The NATO bombing of Yugoslavia in 1999

[336] Lambeth, Benjamin S. NATO's Air War for Kosovo: A Strategic and Operational Assessment. RAND Corporation, 2001

[337] When discussing Operation Allied Force and the effect of the air campaign, it also needs to be reiterated how much of an outlier it was, as the allied forces enjoyed significant air superiority, not only through technology, but crucially in number as it saw around 1,000 allied aircraft stacked against an air force equipped with 79 fighters in total, 15 of which were somewhat modern MiG-29, with the rest being outdated MiG-21. Lambeth, Benjamin S. NATO's Air War for Kosovo: A Strategic and Operational Assessment. RAND Corporation, 2001, p. 17 and 35

[338] 'Ukraine Says It Hit Crimea Bridge with Underwater Explosives'. 3 June 2025. https://www.bbc.com/news/articles/cz708lpzgxro

[339] Risk Intelligence. The Expansion of the Russia-Ukraine War into the Baltic Sea. White Paper. Copenhagen, 2026. https://www.riskintelligence.eu/white-papers

[340] See Hoffmann, Fabian. 'Beggars Can't Be Choosers: Three Pathways for Europe to Acquire Deep Strike Quickly'. Missile Matters, 9 May 2026. https://missilematters.substack.com/p/beggars-cant-be-choosers-three-pathways?r=20hc6&utm_medium=email and Hoffmann, Fabian. 'Flamingo Finds Its Target'. Missile Matters, 25 February 2026. https://missilematters.substack.com/p/flamingo-finds-its-target?utm_medium=email

[341] In particular intermediate-range systems such as the Orsehnik

time developments in missile defence have shown great advances in recent years, seeing a number of systems prove capable of intercepting targets they originally were not optimised for.[342]



Figure 34: The presence of a large number of rivers throughout the Study Region will create additional issues in case of enemy action directed against the transport infrastructure. Credit: John Nilsson/Inlandsbanan AB

Regardless of how the ballistic missile threat develops, it remains clear that a bridge of this scale would remain a more difficult target to take out compared to individual vessels, or indeed compared to the smaller bridges spanning the Tornio river[343]. It is also notable that there currently is a very limited number of bridges spanning the Tornio river and the Muonio river, the vulnerabilities of which was demonstrated in June 2026 when a planned bridge overhaul forced heavy traffic crossing between Tornio and Haparanda to take a 150 km detour for four days[344]. As such, in particular considering developments in the recent war in Ukraine which already has seen a significantly increased threat picture for military units on the move far behind the line of contact[345], while at the same time the threat picture against hardened parts of the transport infrastructure remains noticeably smaller, it is difficult to see a potential bridge-based Nordic Connector – or the units using it – as being any more vulnerable than other parts of the transport infrastructure[346].

[342] See Hoffmann, Fabian. 'How Did Israel's Missile Defense Perform in the "12-Day War"?' Substack newsletter. Missile Matters, 29 June 2025. https://missilematters.substack.com/p/how-did-israels-missile-defense-perform and Hoffmann, Fabian. 'IRIS-T SLM Reports Successful Ballistic Missile Intercepts'. Substack newsletter. Missile Matters, 31 July 2025. https://missilematters.substack.com/p/iris-t-slm-reports-successful-ballistic

[343] Or any other major waterway in northern Sweden or Finland, for that matter. The issue of river crossings was a major consideration in Swedish wartime planning during the Cold War, due to the need of north-south movement of several units mobilised in the southern parts of the country but with wartime missions in the north

[344] Tiedote, 4 6 2026 09:17:43 EEST | Lapin elinvoimakeskus |. 'Tornion silta suljetaan kokonaan liikenteeltä 9.6. klo 6'. STT Info (Rovaniemi), 4 June 2026. https://www.sttinfo.fi/tiedote/72104873/tornion-silta-suljetaan-kokonaan-liikenteelta-96-klo-6?publisherId=69821607&lang=fi

[345] Due to the earlier mentioned proliferation among lighter precision-guided systems able to strike moving targets at range

[346] The same also being true for the units using it. The threat level is more or less the same compared to when they are in transit on other parts of the east-west transport corridors

While Ro-Pax connections provide flexible and versatile solutions, it is also clear that they impose a limit. MS AURORA BOTNIA has 1,500 lane meters[347], and makes the crossing in three and a half hours. In scheduled traffic, she makes up to two return trips each day, in other words providing 3,000 lane meters of vehicles in one direction every 24 hours. If we assume that with the inefficiencies brought by real-world military vehicles every vehicle would require 10 lane meters on average, that gives the capability to transport 300 vehicle each day. Compared to a fix link where the scenarios envision that up to 4,160 vehicles[348] could pass the bridge on a daily basis[349], to which could be added a significant number of trains in case of a railway connection being included[350], the efficiency of the fixed link shines through for both military mobility and security of supply needs (in particular as one or two work steps are removed by removing one complete mode of transport from the equation).

The cost estimates for the Nordic Connector varies between 4.9 Bn EUR to 30 Bn EUR (53.4-347 Bn SEK), the significant span depending on whether a bridge or tunnel is chosen as the best solution, the exact route, and whether it is solely a road connection or a combined road and railway solution.[351]

[347] *Our Ferry Aurora Botnia.* Wasaline. n.d. Accessed 8 May 2026. https://www.wasaline.com/en/our-ferry/

[348] The majority being passenger cars

[349] Jungar, Anders (PBI). 'Work Package 1'. FLINC – Financing large-scale cross-border infrastructure – case Nordic Connector, Stockholm, 21 January 2026.

[350] The number of trains varies significantly depending both on the installed capacity of the link, as well as the ability to handle the traffic on the parts of the rail network leading to the connector. In theory significant number of trains are able to use infrastructure of this kind, with e.g. the Gotthard Base Tunnel using a 1+1 track layout able to handle up to 260 freight trains and 65 passenger trains per day (Bundesamt für Verkher BAV, SBB CFF FFS, and AlpTransit Gotthard/San Gottardo. 'The Gotthard Base Tunnel'. n.d.), while the Øresund Bridge saw 35 freight trains each day in 2019, with a forecasted rise to up approximately 50 per day (Cech, Lubomir. 'Swedish Transport Administration Forecasts 30–40% Freight Growth via Öresund by 2045'. Rail Market News, 14 January 2026. https://railmarket.com/news/infrastructure/48590-swedish-transport-administration-forecasts-30-40-freight-growth-via-oeresund-by-2045)

[351] Jounila, Risto, Aapo Halminen, Petteri Somervuori, Katja Ojala, Ollipekka Pakkanen, and Sami Niemelä. Utredning av genomförbarheten av en fast förbindelse över Kvarken. Trafikledsverkets publikationer 60sve/2025. Väylävirasto, 2025.

Summary

	Cost[352]	Impact on Scenario 2	Impact on Scenario 4a	Impact on Scenario 3	Impact on Scenario 4b	Impact on security of supply	Comment
Improved port connections	€€	+	++	++++	++++	++++	Per port
Case study: Suupohjan rata	€€[353]	+++	++	+++	++	+	
Increased railroad capacity on the current lines	€€ – €€€	+	++	+++	+++	+++	Depending on how significant an increase is targeted
Case study: Inlandsbanan	€€€	+	++	++++	+++++	++++	Partly funded
Railroad ramps and platforms	€	+	+	++	++	-	Per ramp
Railway line Mo i Rana-Storuman	€€€€	+	++	++++	++++	++++	
More Ro-Ro/Ro-Pax capacity in the Study Region	€€€	+	++	-	++++	+++	Note continuous operating costs
Ensuring availability of equipment	€[354]	+	+	+	+	+	
Case study: Trøndelag-Jämtland crossings - E14, Meråkerbanen/Mittbanan, minor routes	€€€	+	++	+++	++++	+++	
Airport facilities and connections	€[355]	+	+	+	+	-	Training and preparations (connections similar to ports)
Case study: Nordic Connector (Kvarken Fixed Link)	€€€€€	++	++++	++	+++++	++++	See earlier discussion

Table 5: Impact of envisioned solutions

[352] Given roughly as an increase in the order of magnitude. €€€€€ denotes a project with a price tag likely in excess of 10 Bn EUR, €€€€ indicate a project costing in the 1-10 Bn EUR range, €€€ a project costing hundreds of millions, €€ a project in the up to a 100 million EUR range, while € denotes a project achievable for less than 10 million EUR

[353] To simply reopen the track the cost would be in the 40-150 million Euro range (435 million SEK to 1.6 Bn SEK). In addition more ambitious projects have been looked into, which would come with a price tag in the 1-1.5 Bn EUR price range (10.9-16.3 Bn SEK)

[354] Highly dependent on scale and readiness. As is common when it comes to preparedness, basic improvements are possible at low costs but would yield significant advantages in a crisis

[355] Increased exercises and stored equipment and raw materials

Sources

Summary

The report is based on extensive open-source material, including official government documents, NATO doctrine, transport statistics, academic literature, and industry reports, combined with 37 stakeholder interviews across Finland, Sweden, and Norway. Sources cover military doctrine, infrastructure data, transport economics, and crisis scenario modelling. The methodology emphasizes transparency while maintaining operational security considerations, and integrates both civilian and military perspectives.

Interviews

As discussed, much of the information for this report has been gathered through interviews and other exchanges with stakeholders and subject matter experts. The number of people contributing their time and expertise to this project is broken down as follows:

Total persons interviewed: 37

Format:

- In-person: 20
- Teams/phone: 17

Per country:

- Finland: 11
- Sweden: 18
- Norway: 8

Per field/role:

- Academia/researchers: 5
- Authorities: 7
- Local development organisations: 6
- Military: 4
- Transport: 15

Written sources

The written sources include published reports, news items, as well as official documents. Where these have been used for individual figures or similar, their inclusion is noted in the footnotes.

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