

FIRST PLANNING STAGE

- *Improved Availability on the
Stockholm - Oslo Line*



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Summary

This document is a translation and summary of the Swedish Transport Administrations (Trafikverket) First planning stage - Improved Availability on the Stockholm - Oslo Line made by Oslo-Sthlm 2.55. The entire report can be retrieved from the Swedish Transport Administration's website:

https://www.trafikverket.se/contentassets/7570ec1764514c9d82ff12ebf3392a59/avs_stockholm_oslo_signerad_slutrapport.pdf

The Stockholm – Oslo line is heavily trafficked and there are strong indications that both passenger and freight transport will continue to grow relatively rapidly. There will be capacity and traffic safety issues. The railway system has capacity problems as well as punctuality problems and very poor availability, as shown, among other things, by the long train travel times between the Stockholm and Oslo end-points as well as in several of the regional sub-markets.

It has been assessed that continued development of the existing route within the existing infrastructure is not in compliance with transport policy goals or goals to significantly reduce greenhouse gas emissions, as established by the Climate Act. In order to meet future developments, actions must be taken to strengthen the capacity and availability of the transport system, as well as limit its impact on the environment and climate.

The Swedish Transport Administration, with the support of the Värmland Region and the Örebro Region, have initiated this study of proposed measures. The Swedish Transport Administration plays a coordinating role with regards to the form, contents and focus of the study. The study has been carried out with the support of the engineering consultancy company Sweco.

The study has been conducted in close cooperation with municipalities, regional associations, the authorities, operators and interested parties in both Sweden and Norway. The purpose has been to involve the operators in describing problematic situations, establishing route-specific goals for the development of the transport system and to propose measures.

It became apparent in the early stages of the study of proposed measures that the greatest failures in today's transport system are generally assumed to be found in the railway system. Additionally, the railway system is viewed as having the greatest potential when developing the route's transport system in compliance with the overall, long-term goals. The focus of the study of proposed measures has therefore been on failures, goals and proposed measures for the railway.

The national transport policy goals have been adopted as guidelines for the study. Route-specific goals have been established in collaboration with the operators along the route. With regards to the railway, the long-term goals can be summarised as follows:

- Increased competitiveness
- Maximum travel time of three hours between Stockholm and Oslo.
- An attractive transport system for daily commuters between selected hub cities.

The proposed measures for the railway have been developed using a goal pyramid compiled in an expansion strategy for the route. The purpose of the goal pyramid is to clarify in a comprehensive manner the developmental steps of the railway along the route. It is estimated that by 2030, it will be necessary to expand existing railways between Västerås - Örebro and Kristinehamn – Karlstad – Arvika to restore the railway's level of functionality and to meet market demand for expanded traffic volumes. By 2040, additional expansion of the existing railways will be necessary, and two entirely new railway lines, the Nobelbanan track and the Gränsbanan track, will be needed. These expansions will facilitate an increase in traffic while simultaneously significantly reducing travel times between Stockholm and Oslo, as well as between several of the regional sub-markets. Proposed measures for the railway will benefit both freight and passenger transport.

The study of proposed measures reflects early planning stages. The impact of the proposed measures on future freight transport and travels has not been analysed in greater detail. This means e.g. that socio-economic benefits have not been estimated.

A cost estimate has been carried out for building expansions already included in the railway system. The cost has been estimated based on general presumptions and should be viewed as indicative. There are several alternative routes for the new Gränsbanan track. The estimated cost is therefore presented as ranging from SEK 48,4 to 57,4 billions.

I. Introduction

I.1. Why are Measures Needed?

The Stockholm – Oslo route is heavily trafficked, and indications are that passenger and freight transports will continue to grow relatively quickly. There will be capacity and traffic safety issues. The railway system has capacity problems as well as punctuality problems and very poor availability, as shown, among other things, by the long train travel times between the Stockholm and Oslo end-points as well as in several of the regional sub-markets.

It has been assessed that continued development of transport and travels using the current infrastructure is not in compliance with the transport policy goals requiring significantly reduced greenhouse gas emissions, as stipulated by the Climate Act¹. In order to meet future developments, it is necessary to implement measures to increase capacity and availability of the transport system as well as limit its impact on the environment and climate. The need for measures is deemed to be greatest in the railway system.

I.2. Work Processes and Previously Conducted Work

Work on the study of proposed measures began in May 2016 and was completed in December 2017.

The study of proposed measures represents the first stage in a project aimed at analysing failures in the transport system, to define project-specific goals and to test measures that may contribute to resolving failures and reaching agreed-upon goals. The ensuing plans for measures and the physical planning process is then based on the results of the study of proposed measures.

One of the purposes of the studies of proposed measures is to allow individuals affected by the problems and any effects of related measures to participate in designing and guiding the study of proposed measures. Four workshops have been held for 300 participants from municipalities, regional associations, authorities, operators and interested parties in both Sweden and Norway. The purpose of the workshops was to reach agreements on existing prerequisites, failures, goals and actions.

I.3. The Existing Railway

Current railways have inconsistent standards. Modern railways are mixed with elements of old, winding railways and capacity problems. The Kongsvinger track on the Norwegian side of the border and Värmlands track are single tracks. There is no railway between Kristinehamn and Örebro, which means that trains are forced to take a long and time-consuming detour via Laxå and Hallsberg. The Mälars track and Svealand track, expanded at the end of the 1990s, have a relatively high standard. Long-distance train traffic currently runs via the Western Main Line (Västra stambanan) between Laxå and Stockholm. The railway is of high standard but is also heavily trafficked.

¹ The Climate Act covers regulations for the government's climate policy efforts.
(<http://www.regeringen.se/pressmeddelanden/2017/06/riksdagen-antar-historiskt-klimatpolitiskt-ramverk/>)

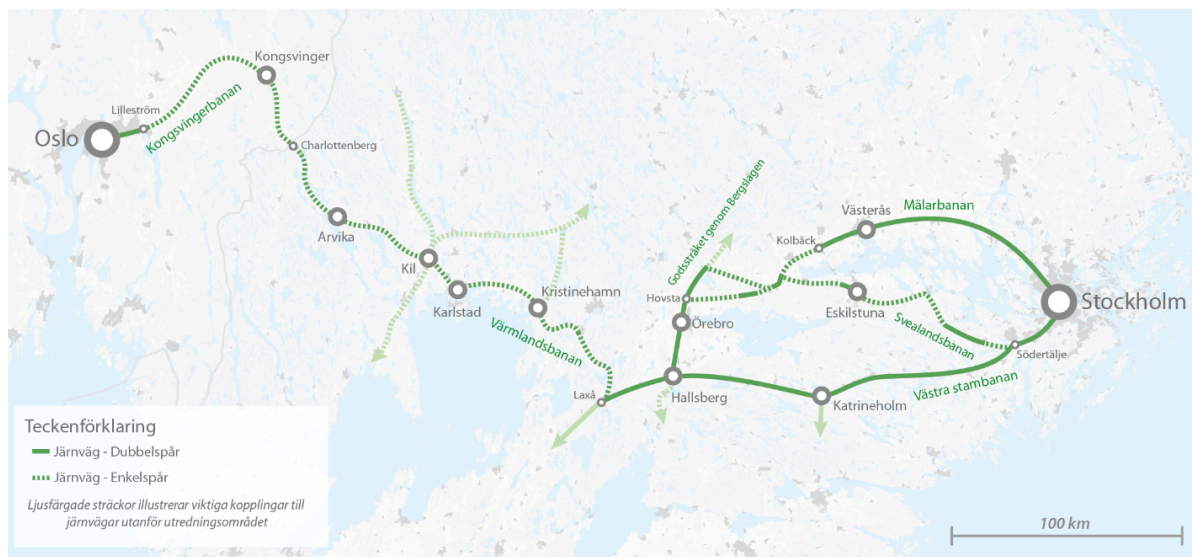


Figure 1: Existing railway between Stockholm and Oslo

1.4. Focus on the Railway

It became apparent in the early stages of the study of proposed measures that the greatest failures in today's transport system are generally assumed to be found in the railway system. Additionally, the railway system is viewed as having the greatest potential when developing the route's transport system in compliance with the overall, long-term goals.

The main focus of the study of proposed measures has therefore been to establish measures for developing the railway system. Measures related to roads have only been considered at a general level.

2. The Route's Business Environment

2.1. Population, Labour Market and Commuting

There are almost 3.4 million residents in the municipalities along the route. These are mainly concentrated to the capital cities, the Mälardalen region and Oslo's surrounding areas. On the Swedish side, the population has been on the increase with the exception of West Värmland. The population has also been on the increase on the Norwegian side, especially in Oslo's neighbouring municipalities.

There are seven, local labour markets on the Swedish side of the route and two on the Norwegian side. On the Swedish side, commuting has generally increased between 2004–2014. The route from Västerås and Eskilstuna to Stockholm has seen the greatest increase in commuters. The Örebro-Karlskoga route has also stood out as having increased significantly. These routes share in common the fact that major investments have been made in public transport.

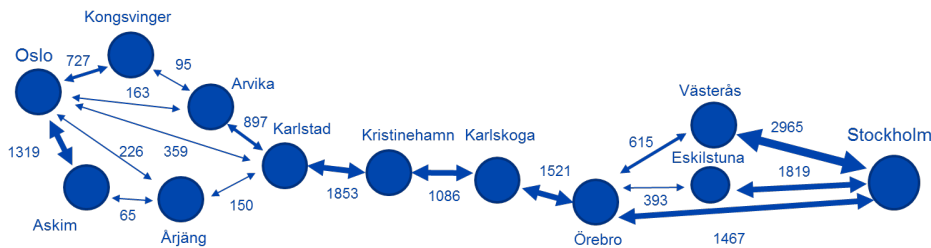


Figure 2: A selection of connections with number of daily commuters (total of both directions). (Source: SCB, SSB)

2.2. Air Transport

The study of proposed measures has mainly focused on roads and railways, but today, air travel also plays an important role in the link between Stockholm and Oslo. Travel time including connecting journeys from hub to hub is roughly 3 hours, which is significant faster than by train or car. Approximately 1.4 million travellers travel by air between the capitals each year. The largest operators are SAS and Norwegian which together provide approximately 20 departures in both directions everyday. However, in order to reduce the transport system's impact on the environment and climate it is important to reduce dependency on air transport. To do this, train transport availability must be improved significantly.

2.3. Comparison of Travel Times

The figure below is a comparison of travel times from city centre to city centre using different modes of transport and a number of connections. Train travel time and transfer waiting time has been excluded from estimates of train travel time, and departures are based on average travel time. Congestion, congestion charges, parking issues, etc., have been excluded from estimates of car travel time. Air travel time includes connecting journeys from/to central Stockholm and Oslo as well as transfer time at the airports.

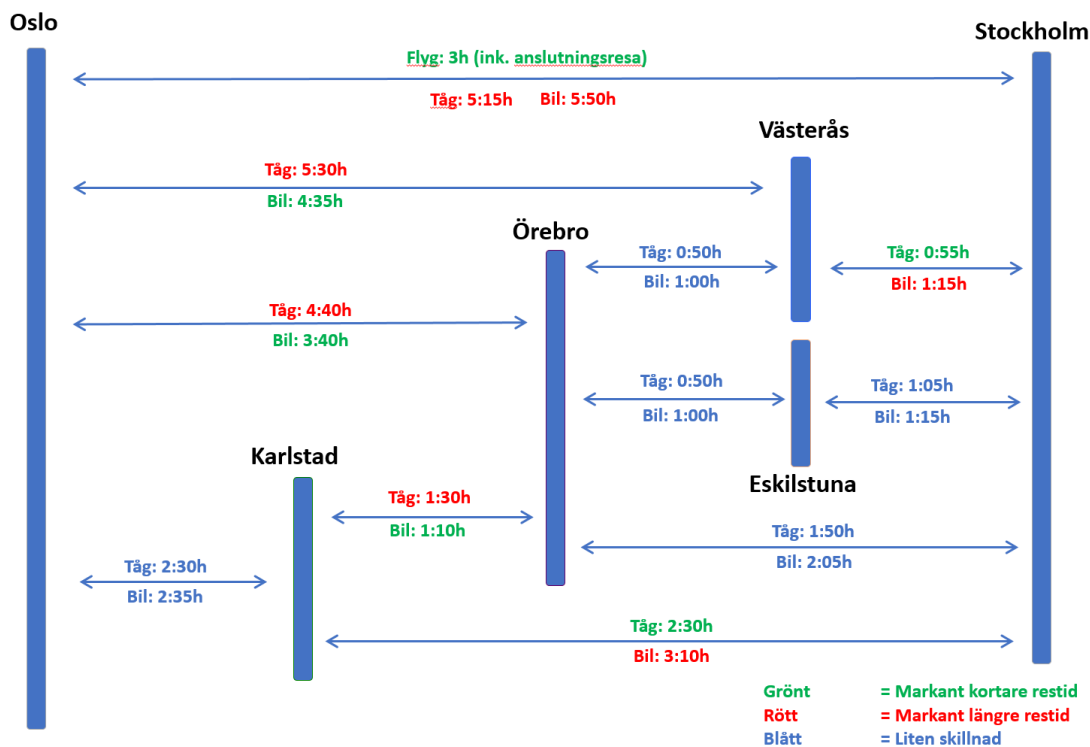


Figure 3: Comparison of travel time between planes, trains and cars for a number of connections along the route.

3. Specific Goals for Developing the Railway

The target goals of this study of proposed measures have been guided by transport policy goals. Based on these, applicable goals for expansion of the route's railway have been developed.

3.1. Specific Goals for the Railway by 2030

Short-term goals (by 2030) for developing the route's railway include:

- The railway system must be reliable.
- The current railway shall be effectivized.
- Railway capacity shall be continuously adapted in order to meet traffic developments.

Existing railway functionality shall be restored and railway capacity shall be increased as transport demand increases. Functionality refers to punctuality and travel times. Capacity, in brief, refers to the railway's capacity to cope with certain traffic loads. The short-term, specific goals for the railway are therefore based on punctuality, travel times and traffic.

3.2. Specific Goals for the Railway by 2040

The long-term goal (2040) for the development of the route's railway is to:

- The railway's competitiveness versus air, passenger and freight transport must be strengthened and its market shares in passenger and freight traffic be increased.
- The railway should facilitate:
 - A maximum travel time of three hours between Stockholm and Oslo.
 - Competitive travel times between selected hub cities. Selected hub cities are: Stockholm, Eskilstuna, Västerås, Örebro, Karlskoga, Karlstad and Oslo.
 - Trip frequency corresponding to an attractive transport system.

Regional representatives and representatives from SJ AB have discussed the future of passenger traffic along the route based on the goals and development strategy for the railway². Individual operators have been able to express their thoughts about conducting traffic operations as single operators as well as the interactions related to other traffic proposals along the railway line. Based on these discussions, a traffic target goal has been developed, as shown in the figure below. Since no corridor has been elected for a future railway between Karlstad and Oslo, we have not considered new stations along the line. The existing railway between Karlstad and the Norwegian border shall continue to be regarded as the border regardless of choice of corridor and will be trafficked by regional train traffic.

² Fredrik Eliasson - Region Örebro County, Margareta Berg – Region Västmanland, Mattias Landin – Region Värmland, Tomas Ahlberg – MÅLAB, Tomas Weibull and Lise Lotte Schmidt – SJ AB

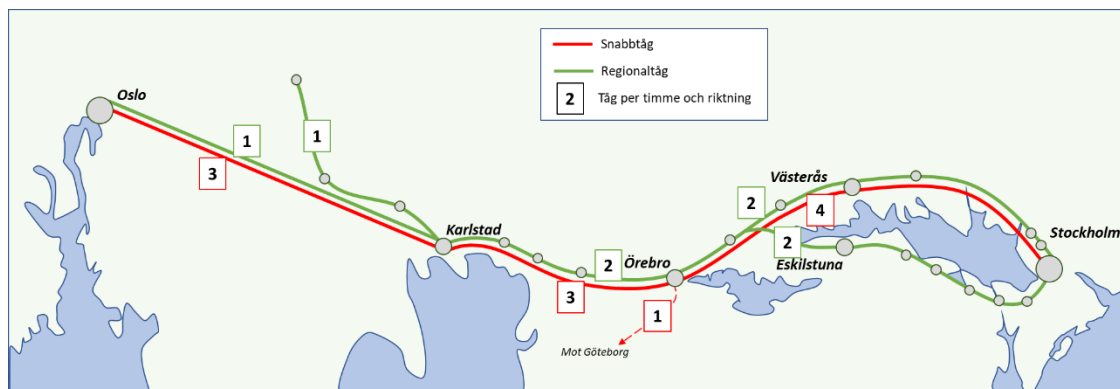


Figure 4: The route's traffic goal for passenger traffic during peak hours by 2040

The goal is to have three long-distance trains running per hour and direction during peak hours, covering the entire Stockholm – Oslo stretch. Long-distance trains are used for longer trips where speed is a priority. The trains stop at three intermediate stations, Karlstad, Örebro and Västerås. This scenario also includes one to three regional trains an hour and in each direction. The regional trains complement the long-distance trains by providing a more concentrated rest period. From a labour market perspective, this is important and contributes to developing and strengthening relationships between different regions. In all, railway traffic is presumed to comprise, at minimum, four trains per hour and direction.

4. Railway Expansion Strategy

The expansion strategy for the route's railway is based on a so-called goal pyramid. The pyramid shows what kind of measures are required to achieve certain goals. As the requirements placed on the railway system are gradually increased, the extent of the required measures will also increase.

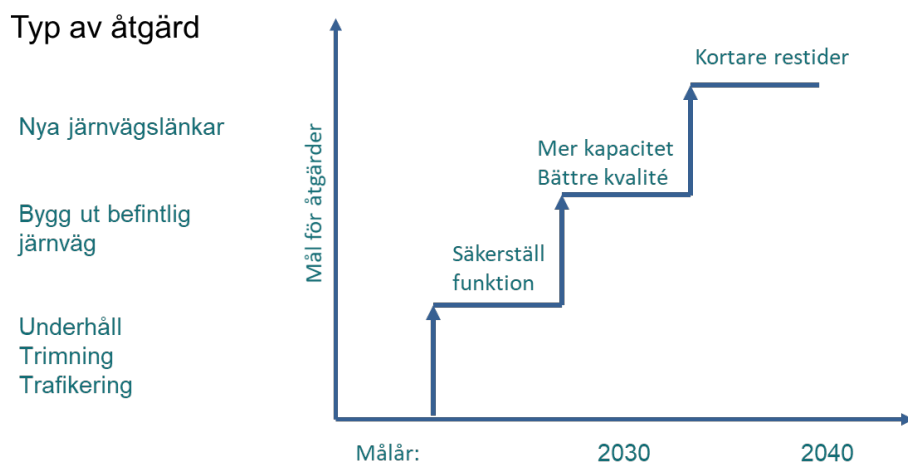


Figure 4: The goal pyramid shows specific goals coinciding with the extent of the measures.

The goal pyramid has been adopted to clarify the railway expansion strategy. In order to meet the long-term goal (by 2040) for the development of the route's railway, extensive expansions will be needed to develop system capacity and allow for significantly reduced travel times. The selection of hub cities (Stockholm, Eskilstuna, Västerås, Örebro, Karlskoga, Karlstad and Oslo) also shows the extent to which these expansions should be made. Identifying where long-term measures should be implemented has also clarified where short-term measures (2030) should be implemented. Therefore, a part of the strategy is to ensure that short-term measures harmonise with long-term goals.

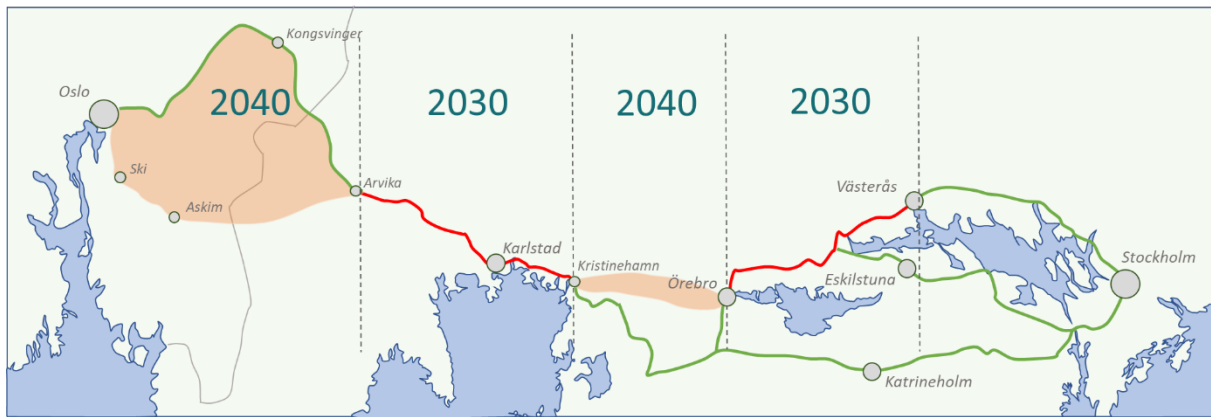


Figure 5: Railway expansion along the Stockholm – Oslo route. The red lines indicate existing infrastructure that should be developed to meet both short-term and long-term goals. The orange fields indicate where new railway links should be built to fulfil long-term goals. The numbers refer to the set year for the goal

5. Proposals for Developing the Railway

5.1. Decisions already made

The national plan for investments in infrastructure between 2014 – 2025 includes the successive implementation of a new signalling system (ERTMS) in the Swedish railway network. This means that for the Stockholm – Västerås section of the Mälmarbanan track, existing track geometry can be used and speeds of up to 250 km/h can be allowed. This will affect travel times in both regional sub-markets as well as in the Stockholm – Oslo end-point markets. ERTMS will also be implemented in Norway and is planned for the Kongsvingerbanan track by 2030–2032.

A number of measures for maintaining the functionality of the railway as well as improving its capacity have already been decided for the Västerås - Örebro and Kristinehamn - Karlstad – Arvika stretch. These measures include replacing railway tracks and increasing the number of sidings.

5.2. Proposals for the Year 2030

By the year 2030, additional proposals will be added resulting from the proposed measures analysis. These measures are intended to ensure punctuality, travel times equal to contemporary train travels, technical performance and continual developments of railway capacity in order to meet increasing traffic loads. These measures shall be implemented along the Västerås - Örebro and Kristinehamn – Karlstad – Arvika journey sections.

5.3. Proposals for the Year 2040

Timetable analyses show that a double-track railway will be required along the entire Oslo – Stockholm route in order to cope with the traffic load as envisioned for the year 2040. Analyses also show that it is possible to achieve the travel time goal of three hours between Stockholm and Oslo using a railway standard that allows a maximum speed of 250 km/h. Choice of route for the new Gränsbanan track and the possibility of raising the speed limit along the existing railway route (Västerås - Örebro and Kristinehamn – Karlstad – Arvika) will, however, be a deciding factor with regards to fulfilling the target goal.

The remaining single-rail stretches along the existing railway will be replaced by a double-track railway by 2040. These measures are necessary to enable traffic increases that meet the route's traffic target goals by 2040. Additionally, new railway links will be built between Örebro and Kristinehamn (Nobelbanan track) as well as between Arvika and Oslo (Gränsbanan track).

5.3.1. Nobelbanan Track, a New Railway Link between Örebro – Kristinehamn

These specified goals for the long-term development of the route's railway clarify that a new railway link will be necessary between Örebro and Kristinehamn, the so-called Nobelbanan track. The route proposed for the new link, new stations and connection points with the current infrastructure have not been studied in detail in the study of proposed measures. Previous studies, however, have pointed out two possible corridors. One corridor passes south of the river Möckeln and via Degerfors. The other corridor runs over a longer bridge that crosses the river Möckeln. A new station, therefore, is indicated between Karlskoga and Degerfors on the west side of the lake. A stretch located north of the lake, through or in the proximity of Karlskoga has been discussed but rejected due to its intrusive urban impact and problematic geometric and geological conditions.

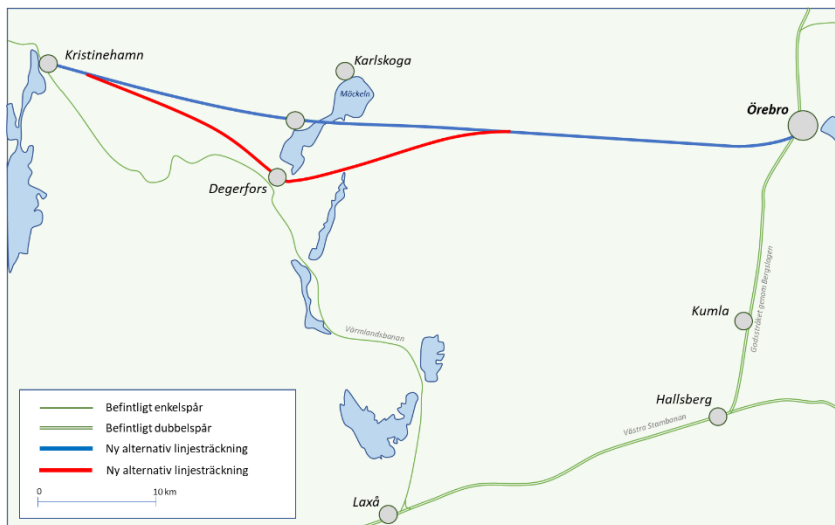


Figure 7. Shows previous alternative route proposals for a new railway between Örebro and Kristinehamn.

5.3.2. Gränsbanan Track, a New Railway Link between Karlstad – Oslo

In order to meet the goal of travelling between Stockholm and Oslo in three hours, a new railway link between Karlstad and Oslo will be required. Connection points with the existing infrastructure and potential positioning of stations will vary depending on the route of the new link. The study of proposed measures has not studied other potential stretches in detail. The Norwegian high-speed study carried out in 2011³ studied three alternative railway links. The difference in distance was obvious and will have an effect on travel times, among other things.

³ Høghastighetsutredningen 2010–2012, Jernbaneverket. 26 May 2011

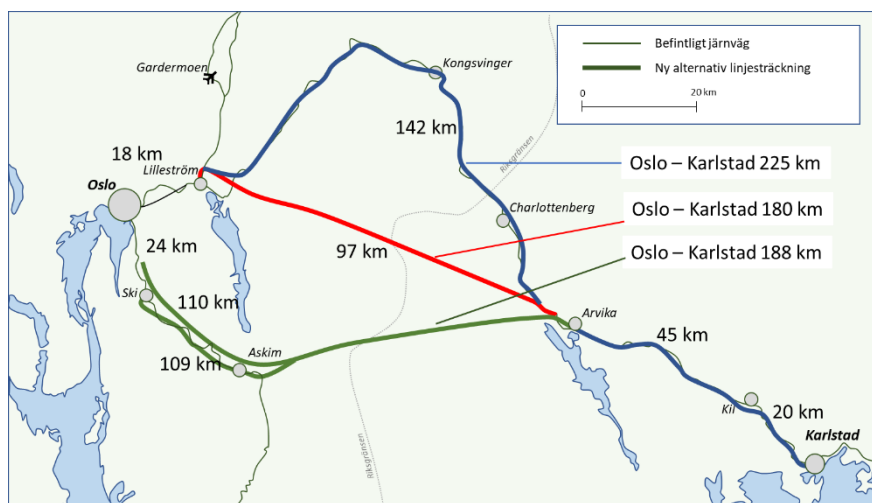


Figure 8. Previously proposed alternative routes for a new Gränsbana track and distance between Karlstad and the other alternatives in kilometres.

6. Cost Estimates for the Proposed Measures

6.1. For proposed measures for the railway system

Construction costs are based on estimates and should be seen as indicative. Account of the costs for five partial section along the Stockholm – Oslo route. Account of the costs for said measures by 2030 and 2014 respectively for each, individual partial section.

With regards to partial sections, where existing single-rail railways have been proposed to be replaced by double-tracks (Västerås - Örebro and Kristinehamn – Karlstad – Arvika), it is assumed for these estimates that said expansions will take place along existing railway stretches.

With regards to partial sections where new double-tracks have been proposed (Oslo – Kil and Kristinehamn – Örebro), cost estimates are based on a approximated cost of SEK 200 million per kilometer of double-tracks. This estimate is based on a summary of costs for Swedish railway expansions during 1989 – 2009⁴ and is relatively high in comparison. The cost range noted in the memorandum is at a comparative level to costs for corresponding railway objects included in the Swedish Transport Administration's proposals for national plans for infrastructure investments 2018-2029.

A similar, Norwegian summary⁵ of the cost of completed expansions indicates, however, a significantly higher figure, at between 300 – 380 million Norwegian crowns per kilometre of newly laid railway.

Table 1: Cost estimates for expansion of the railway system. *Cost for replacing Kil – Karlstad single-tracks with double-tracks between Kil and Skåre, has been estimated at approximately SEK 170 million. This investment is not deemed to be necessary for the new Gränsbana track alternative.

	Oslo – Kil	Kil – Kristinehamn	Kristinehamn – Örebro	Örebro – Västerås	Västerås – Stockholm	Oslo – Stockholm
Total	SEK 28,400 - 37,400 million	SEK 3,900 million	SEK 13,000 million	SEK 3,200 million	SEK 0	SEK 48,400 – 57,400 million

⁴ KTH, PM, Oskar Fröidh, 18/1/2010

⁵ https://www.regjeringen.no/contentassets/975608dc49fc40b0a25b38ab5e5fd227/ks1_ostre-linje.pdf (Page 79.)

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