Capacity Study
Hässleholm-Kristianstad

December 2010
Part-financed by the European Union
(European Regional Development Fund and European Neighbourhood and Partnership Instrument)

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Title: Capacity Study Hässleholm-Kristianstad
Publicationsno: 2011:123
Date: December 2010
Publisher: Trafikverket
Contactperson: Alain Allouko och Eva Lindborg
Production cover: Grafisk form, Trafikverket
Distributor: Trafikverket
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1 Introduction

1.1 Introduction

The need for passenger transport services and also, according to some assessments, goods services is expected to increase between Hässleholm and Kristianstad. The use of public transport services has been increasing for a long time in the region. The possibility of commuting to work and education is becoming increasingly important and is a prerequisite for larger labour market regions and regional growth. The regions of Skåne and Blekinge have the highest numbers of public transport journeys per capita in southern Sweden.

The Skånebanan line between Hässleholm and Kristianstad is a single-track line and has limited capacity despite the fact that passing loops are situated relatively close together. This conceptual study examines measures for meeting future needs for transport services and for maintaining good accessibility and high-quality transport services. The work has been carried out using a four-stage method in which smaller scale cost-effective measures are proposed as a first alternative. In the long term, it is judged that a double track is required to provide the desired goods and passenger services.

This conceptual study is part of the East West Corridor II project financed by the EU. It is included in Workpage 4 - Business Opportunities in Railway Transports. The conceptual study consists of two sub-reports for task 4G - Railway improvement Helsingborg-Blekinge. The second sub-report will study the capacity situation and traffic options throughout the corridor at a more general level.

1.2 Aim and objectives

The aim of this conceptual study is to illustrate the options for meeting the needs for rail services between Hässleholm and Kristianstad through a number of different measures. A number of subordinate objectives have been identified in order to fulfil the aim of the study:

1. To identify and evaluate desired goods and passenger services.
2. To identify and evaluate measures to improve utilization of the existing track installation.
3. To investigate the need for and location of smaller-scale conversion measures.
4. To investigate the need for and location of major reconstruction measures.
1.3 Transport policy objectives and resources

The overall objective of the Swedish transport policy is “to guarantee an economically efficient and sustainable provision of transport services for people and businesses throughout the country”. The overall objective is divided into a functional objective and an impact objective.

The functional objective is to provide people and businesses with good accessibility within and between regions and to other countries. The transport system shall be reliable, safe, comfortable, high-quality and it should contribute to gender equality in society. The transport system should be designed to enable its use by children and disabled people and the conditions for using public transport, walking and cycling shall be improved.

The impact objective focuses on safety, the environment and health. The transport system shall be designed so that no-one is killed or seriously injured, to reduce ill-health and to achieve environmental quality objectives through energy efficiency and limited use of fossil fuels, among other things.

1.4 The planning process

The planning process for railway construction is governed by law. In accordance with chapter 1, section 4 of the Swedish Railway Construction Act, a railway shall be planned and constructed in such a location and with such a design that the purpose of the railway can be achieved with the least possible intrusion and inconvenience and without unreasonable costs. The process shall provide good opportunities for observation and consultation with the parties affected at different stages. The planning process consists of a number of stages in which the work gradually becomes more detailed, ranging from overall studies to detailed project planning. The results from one stage provide the starting point for the next.

The planning process for railways normally consists of:

The conceptual stage  Alternative solutions are identified and broadly tested to see which are feasible.

Preliminary study  The feasible solutions are examined to see which can be implemented with reasonable consequences in terms of their function, environmental impact, technology, finance, etc.

Railway investigation  The feasible solutions are investigated and evaluated to see which shall be chosen.

Railway plan  The selected solution is designed in detail.
The conceptual stage, to which this study belongs, is not governed by law. Work is being carried out to simplify the planning process and shorten the time from planning to construction. It is therefore probable that the planning process will be changed in future.

1.5 The four-stage method

The four-stage method is a working method used by the Swedish Transport Administration to achieve transport policy objectives. The method is based on a comprehensive approach as far as modes of transport are concerned to identify and solve problems and deficiencies. Alternative measures and solutions are tested in four stages.

1. Measures that may affect the need for transport and the choice of transport mode.
2. Measures that provide more efficient use of the existing transport system and vehicles
3. Minor reconstruction measures
4. New investment and major reconstruction measures

Stage 1 measures include, for example, planning, regulations, influence and information to reduce the need for transport services. This study describes the need for transport services, though stage 1 measures to reduce the need for transport services have not been analyzed.

Stage 2 measures aim to achieve more efficient use of existing systems. The measures include, for example, changeover to modes of transport requiring fewer resources, improvements to timetables and responding to higher numbers of passengers with longer trains or more carriages.

Stage 3 measures include minor reconstruction measures. These may consist of, for example, of track equipment or reconstruction of level crossings. Stage 4 measures include major changes such as new passing loops or sections of double track.
2 Background

2.1 Social structure

There are five densely-populated areas close to the Skånebanan line between Hässleholm and Kristianstad; Hässleholm, Vinslöv, Önnestad, Vinnö and Kristianstad: see figure 2-1.

![Figure 2-1 Densely populated areas along the Skånebanan line.](image)

At present there are stations at which passengers may change lines in Hässleholm, Vinslöv and Kristianstad. These are the largest towns along the route: see table 2-1.

<table>
<thead>
<tr>
<th>Area</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kristianstad</td>
<td>33,083</td>
</tr>
<tr>
<td>Hässleholm</td>
<td>17,730</td>
</tr>
<tr>
<td>Vinslöv</td>
<td>3,865</td>
</tr>
<tr>
<td>Önnestad</td>
<td>1,366</td>
</tr>
<tr>
<td>Vinnö</td>
<td>496</td>
</tr>
</tbody>
</table>

Table 2-1 The population of each densely-populated area in 2005. Source: Statistics Sweden

Previously, there were railway stations at both Önnestad and Vinnö. The station at Önnestad was closed in 1978 (Municipality of Kristianstad, 2005). A new Pågatåg [Local Rail Service] station is being planned in Önnestad: see section 2.3.3. The municipality of Kristianstad has reserved several areas for building additional housing close to the planned station.
The station at Vinnö was not on the Skånebanan line but on the line that ran from Karpalund just south of Vinnö to Hästsveda on the Södra Stambanan line. There was also a railway station at Karpalund up until 1975.

In total there are about 26,500 jobs within a radius of 2 km from existing train stations in Kristianstad, Hässleholm and Vinslöv. Men generally have further to travel to work than women in Hässleholm and Kristianstad. See figure 2-2. (Skåne Region, 2006)

![Figure 2-2](image-url)

**Figure 2-2** Jobs within 2 km from the station and the relative distances that men and women must travel to and from work. Source: Skåne Region, 2006.
2.2 The need for transport services

2.2.1 Passenger services

The Skånebanan line between Hässleholm and Kristianstad connects two cities in Skåne and also forms a link between Blekinge and the Blekinge Kustbana line and Skåne and Södra Stambanan. The regions of Skåne and Blekinge have the highest numbers of public transport journeys per capita in southern Sweden and the number of journeys has been rising for a long period. (Blekingetrafiken, 2009). Hässleholm – Kristianstad is an important commuter line. Most public transport journeys are by train: see figure 2.3.

Table 2.2 shows the proportion of train passengers between Kristianstad and Hässleholm, Lund, and Malmö. 17% of all journeys between Hässleholm and Kristianstad are by train. The market share of train services from Lund and Malmö to Kristianstad is higher than between Hässleholm and Kristianstad – 28% as opposed to 35%. This is despite the fact that the travelling time by car on the E22 between Kristianstad and Malmö is shorter than the travelling time by train.
The most frequent train journeys are to and from work, followed by journeys to and from education centres. The largest passenger group (27%) are women travelling to and from education centres. The second-largest passenger group (23%) are men travelling to and from work. Figure 2.4 shows the distribution of travel purpose among train passengers between Hässleholm and Kristianstad. Women account for approximately 59% of travellers and men account for 41%.1

Table 2.2 Proportion of train passengers on selected links. Processed data from Resvandeundersökning Syd [Travel Survey South], Trivektor 2007.

<table>
<thead>
<tr>
<th>Link</th>
<th>Market share of train services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kristianstad-Hässleholm</td>
<td>17%</td>
</tr>
<tr>
<td>Kristianstad-Lund</td>
<td>28%</td>
</tr>
<tr>
<td>Kristianstad-Malmö</td>
<td>35%</td>
</tr>
</tbody>
</table>

Figure 2-4 Purpose of travel for train passengers between Kristianstad and Hässleholm. Processed data from Resvandeundersökning Syd [Travel Survey South], Trivektor 2007.

2.2.2 Goods transport

The Swedish Transport Administration’s basic forecast predicts that the number of goods trains between Hässleholm and Kristianstad will decrease between now and 2020. Region Blekinge considers that the basic forecast underestimates the number of goods trains. They claim that goods transport in Blekinge will increase, since trade with eastern Europe has increased a great deal in recent years and south-east Sweden is a strategic location for eastbound transport.

1 It should be noted that the distribution of reason for travel and gender of train passengers between Hässleholm and Kristianstad is only based on 133 observations.
According to the East West Transport Corridor, trade with the Baltic area will increase by 54% between 2003 and 2020. Region Blekinge wishes to develop the county’s infrastructure to enable this increase in transport and to prevent any future capacity problems. The System Analysis for South-East Sweden presents several alternative transport routes for goods by rail to the ports of Karlshamn and Karlskrona. These analyses predict considerably more trains on the Skånebanan line between Hässleholm and Kristianstad than at present.
2.3 Related projects and investigations

The conditions for transport services between Hässleholm and Kristianstad may be affected by several related projects.

2.3.1 The Blekinge Kustbana line

Work is ongoing in the Swedish Transport Administration on a railway plan for a passing loop on the Blekinge Kustbana line between Karlshamn and Bräkne-Hoby. The passing loop is being built to enable changes in the traffic structure that will reduce the travelling time from Blekinge to Skåne and Copenhagen. When the passing loop is complete, it will mean that the planned crossing places will be moved to passing loops other than those used at present.

Figure 2-6 New passing loops (marked in red) on the Blekinge Kustbana line. The passing loops marked in blue have no embarkment/disembarkment at present. Source: Preliminary study for a passing loop between Karlshamn and Bräkne-Hoby 2010.
2.3.2 **Sydostlänken [the South-East Link]**

The South-East Link is the name of the proposal to extend the railway line between Älmhult and Olofström down to the Blekinge Kustbana line. The need for goods transport between Hässleholm and Kristianstad will probably diminish if the South-East Link is built. The South-East Link would make it possible to travel by train from the Blekinge Kustbana line via Olofström and north to the Södra Stambanan line. The Swedish Transport Administration has set aside funds to carry out a railway investigation of the South-East Link as part of its planning of measures.

2.3.3 **Pågatåg Nordost [North-East local rail service]**

The North-East local rail service is an initiative to start up local rail services in Northern Skåne, Southern Småland and Blekinge. As part of the initiative for the North-East local rail service, the passing loop in Önnestad must be extended and adapted for embarkment/dismarkment. The current passing loop is located outside the community and must therefore be extended into the community so that the new platforms are in a more central location.
Figure 2-7 The passing track is extended into the community and a new station for passengers is planned in connection with the North-East local rail service project.
2.3.4 The Kristianstad - South-West Skåne Diagonal

In 2005, a conceptual study was commissioned by the then Banverket [Swedish Rail Administration] on a rail link for passenger transport services between Kristianstad and South-West Skåne: see figure 2-8. The anticipated positive effects of the “Skåne Diagonal Line”, besides its contribution to improved travelling times, regional enlargement and environmentally friendly travel, included relieving pressure on the Södra Stambanan line and the Skånebanan line between Karpalund and Hässleholm. The conceptual study also considered a double track between Hässleholm and Kristianstad. Neither the alternatives relating to the Skåne Diagonal Line nor the double track between Hässleholm and Kristianstad were socio-economically profitable.
2.3.5 **EU projects**

East West Transport Corridor II is an EU-financed project that aims to create a green, environmentally friendly and efficient transport corridor in the southern Baltic area. The project aims to stimulate economic growth and meet the existing need for transport. Motorways of the Sea is an EU project in which the port of Karlshamn has received co-financing for a new railway station and a combi-terminal, among other things. This EU project shows that rail services in North-East Skåne and Blekinge are not only of local and regional significance but are also included on the international logistics map.

![Figure 2-9 The railway between Hässleholm and Kristianstad forms a potentially important part of the international transport network. Source: East West Transport Corridor II.](image)

2.3.6 **Designated ports**

Karlshamn and Karlskrona have both been designated as one of ten strategic ports in Sweden. (Hamnstrategiutredningen [Port Strategy Investigation], 2007). Karlshamn is well equipped to accommodate large vessels since the port has a depth of 10 metres (see figure 2-10).
Hamnar med 10 meters leddjupgående

Figure 2-10 Karlshamn is well equipped to accommodate large vessels. Source: Sjöfartsverket [Swedish Maritime Administration]

Figure 2-11 Ten category A ports 1999. Over 1.5 million tonnes of goods and/or over 200,000 passengers are transported from these ports.
2.4 Current infrastructure

The Skånebanan line between Hässleholm and Kristianstad is a single-track, electrified line operated with CTC (Central Traffic Control). The line is just under 30 kilometres long and there are four passing loops which all have simultaneous entry. These are Karpalund, Önnestad, Vinslöv and Attarp. The distance between the loops is approximately 40 to 60 km. The section between Hässleholm and Attarp is the determining section for Öresund trains, where it takes the longest time for a train to travel between crossing facilities. The section between Vinslöv and Önnestad takes the longest time for the Pågatågen [Local Rail Service]. In Attarp and Önnestad full-length goods trains of 750 metres are able to pass, whereas the loops in Karpalund and Vinslöv are somewhat shorter. See table 3.1

<table>
<thead>
<tr>
<th>Station</th>
<th>Obstacle-free length in metres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attarp</td>
<td>755</td>
</tr>
<tr>
<td>Vinslöv</td>
<td>700</td>
</tr>
<tr>
<td>Önnestad</td>
<td>754</td>
</tr>
<tr>
<td>Karpalund</td>
<td>659</td>
</tr>
</tbody>
</table>

Table 2-3 Obstacle-free length.

The maximum permitted speed between Hässleholm and Kristianstad is 160 km/h, through the speed is reduced to 140 km/h between the station at Vinslöv and 120 km/h from Karpalund to Kristianstad.

The level crossings and their design may affect the maximum permitted speed. There are several level crossings on the section with varying degrees of protection, from full gate facilities to unprotected crossings.

<table>
<thead>
<tr>
<th>Section</th>
<th>Number of level crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hässleholm - Attarp</td>
<td>3</td>
</tr>
<tr>
<td>(Attarp) - Vinslöv</td>
<td>3</td>
</tr>
<tr>
<td>(Vinslöv) - Önnestad</td>
<td>5</td>
</tr>
<tr>
<td>(Önnestad) - Karpalund</td>
<td>2</td>
</tr>
<tr>
<td>(Karpalund) - Kristianstad</td>
<td>1*</td>
</tr>
</tbody>
</table>

Table 2-4 Level crossings between Hässleholm and Kristianstad. Source: Bis. * Level crossings have no protection.
3 Traffic volumes and line capacity

3.1 Capacity utilization on railways

The capacity utilization on a single track depends on the distance between passing loops and how fast the trains are travelling. If all trains travelled in the same direction one after the other in a so-called convoy, several trains could use the track at the same time. This is illustrated in figure 3-1. The grey diagonal lines represent the trains’ route between Hässleholm and Attarp.

![Figure 3-1](image1.png)

*Figure 3-1* Many trains can travel on a single track when in convoy. The grey lines represent trains travelling from Hässleholm to Attarp.

How closely after one other the trains can leave depends on the signalling system. In terms of signal technology, the track is divided into block sections. For safety reasons only one train at a time may be on a block section. When block sections are short, trains can travel with shorter distances between them: see illustration in figures 3-2 and 3-3.

![Figure 3-2](image2.png)

*Figure 3-2* With shorter block sections trains can travel closer together.
Figure 3-3 With shorter block sections trains can travel closer together.

In reality, trains run in both directions. A passenger train running from Hässleholm towards Kristianstad takes approximately 4 minutes to reach the first passing loop, Attarp. Another train from Attarp cannot begin to run westward before the train from Hässleholm reaches the passing loop in Attarp. A third train from Hässleholm cannot begin to run eastward before the other train from Attarp has reached the station at Hässleholm. This is illustrated in figure 3-4.

Figure 3-4 Only one train at a time can run when the trains are going in different directions.

If it takes less time for the trains to run between the passing loops, the capacity of the track increases. The running time between passing loops can be shortened by several methods. One variant is to build a new passing loop so that the section between the passing loops becomes shorter. Another method is to increase the speed. This is illustrated in figure 3-5 by the fact that the diagonal lines are steeper, in other words the train covers a longer section in the same time.
A shorter running time between passing loops increases the capacity of the track.

A double track can be seen as two single tracks where the trains run in the same direction. The capacity of the double track is therefore more than double the capacity of a single track. The capacity utilization on a single track can be reduced by trains running one after the other. This can be seen as a stage 2 measure according to the four-stage method. However, it is hardly realistic to run all passenger trains in one direction in the morning and then in the other direction in the afternoon.

### 3.2 Current traffic

#### 3.2.1 Current traffic volume

In 2009, approximately 85 trains a day ran on the Skånebana line between Hässleholm and Kristianstad, see table 3-1. Two different passenger lines used the line, a local rail service between Helsingborg and Kristianstad and the Öresund to Karlskrona train. Both the Öresund train and the Pägatägen local rail service operate hourly services, which means two trains per hour in each direction: see table 3-1. Some Öresund trains are operated as extra long trains with three train sets in order to meet the demand for passenger services. Using additional train sets means that track space is used more efficiently. This can be seen as a stage 2 measure according to the four-stage method. The passenger rail service has planned meetings with other passenger rail services in Önnestad. The planned meetings with passenger rail services will mainly take place in Vinslöv and Attarp, but also in Karpalund.

In addition to passenger rail services, the line carries approximately 8 goods trains per 24-hour period. The average length of the goods trains is approximately 250 metres. Running longer goods trains would be one way of making more efficient use of existing track capacity. Longer goods trains can be seen as a stage 2 measure according to the four-stage method.

<table>
<thead>
<tr>
<th></th>
<th>Trains per 24-hour period in 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Goods trains</td>
</tr>
<tr>
<td>Hässleholm - Kristianstad</td>
<td>8</td>
</tr>
</tbody>
</table>
The present capacity situation

The capacity utilization on the determining section between Hässleholm and Attarp was 62%, which is a relatively high level. When capacity utilization is below 60%, the track is considered to be in balance and there is room for more trains. Capacity utilization between 60% and 80% is considered to be a problem and involves trade-offs between numbers of trains and service quality requirements. With over 80% capacity utilization, the system is unstable and sensitive to disruptions. Figure 3-6 shows capacity utilization in southern Sweden in 2009. The figure shows that the section between Kristianstad and Hässleholm is a bottleneck in the east-west direction.

Figure 3-6 Capacity utilization per 24-hour period in southern Sweden in 2009. On green tracks the capacity utilization is under 60% whereas on yellow tracks the capacity utilization is between 60% and 80%. Red tracks represent capacity utilization of over 80%.

Current situation with regard to delays

Just under 2,000 delays occurred between Hässleholm and Kristianstad between January and July 2010. Most of these delays were reported from Attarp, almost 800, and Önnestad, just over 500: see figure 3-7. In Vinslöv and Karpalund the number of delays is somewhat lower at approximately 300.
Figure 3-7 The number of delays per junction in spring 2010.

Figure 3-8 The delay period per junction in spring 2010.

Figure 3-8 shows the delay time. The total delay time between January and July 2010 was approximately 210 hours. That corresponds to approximately 360 hours per year. If the delay time of 360 hours is divided equally among all trains running on the section, it works out at
approximately 50 seconds per train. Approximately 21 of these seconds are due to cumulative delays. A cumulative delay is when a train is late due to another train. For example, a train may be forced to wait for a passing train or run slower because another train is running in front of it.

The median time per train delay is 5-6 minutes at all passing loops, but the average delay per train is significantly longer in Karpalund. Attarp is the worst station for delays, the average time being 5 minutes.

The most common reason for delays is cumulative events, which account for 57% of delays: see figure 3-9. Cumulative delays account for 42% of total delay time. The median delay for cumulative events is 8 minutes. Cumulative delays may be assumed to represent those most affected by the utilization of track capacity. Statistics do not include delays occurring in Hässleholm and Kristianstad. It is possible that the distribution of delay causes would be different if Hässleholm and Kristianstad were included in the material.

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**Figure 3-9** Distribution of delay causes between Hässleholm and Kristianstad in spring 2010.

### 3.3 Future Traffic

#### 3.3.1 Future traffic volume

Skånetrafiken considers that the need for transport services between Kristianstad and Hässleholm is sufficient for the range of services to be increased. Beginning in December 2010, Skånetrafiken has been granted a permit to operate an additional transport service on the Skånebanan line between Hässleholm and Höör. The Pågatågen local rail service from Malmö to

---

2 For this estimate, 320 days of traffic were assumed at a frequency of 85 trains per 24 hours.
Höör will be extended to Kristianstad. This means that the passenger rail service will increase from 74 trains to 115: see table 3-4. This is equivalent to 3 services per hour in each direction.

<table>
<thead>
<tr>
<th></th>
<th>Trains per 24-hour period in 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Goods trains</td>
</tr>
<tr>
<td>Hässleholm - Kristianstad</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3-4 Trains per 24-hour period in 2011.

When the Pågatågen local rail service is extended from Höör to Kristianstad, the Öresund train to Karlskrona will not stop in Eslöv and Höör. This will reduce the travelling time from Blekinge and north-west Skåne to Malmö and Copenhagen. The travelling time between Kristianstad and Malmö will be shorter by train than by car. When the travelling time on trains becomes more attractive compared to cars, there is likely to be some changeover of traffic from road to rail. Changes in stops can be seen as a stage 2 measure in accordance with the four-stage method since they lead to more efficient utilization of existing track and increase the usage of a safer, more environmentally friendly mode of travel.

When the Pågatågen local rail service from Malmö to Kristianstad has started up it will hardly be possible to increase the number of trains during the daytime between Hässleholm and Kristianstad without modifying infrastructure. Skånetrafiken’s vision is to have two more train systems operating on the Skånebanan line between Hässleholm and Kristianstad by 2030. These will consist of one train system from Gothenburg/Halmstad running via Markarydsbanan to Hässleholm and on to Kristianstad, and an express train from Helsingborg to Kristianstad. Blekingetrafiken’s plans for services will not involve more trains between Hässleholm and Kristianstad, but Blekingetrafiken wishes to increase traffic to 2 double services per hour on the Blekinge Kustbana line in the future.

The proposed train plan for 2011 includes scheduled train passing movements for passenger trains in Attarp, Vinslöv and Karpalund. Scheduled train passing movements with goods trains exist at all four passing loops.

In the Swedish Transport Administration’s basic forecast for 2020, the number of goods trains will not increase and the number of passenger trains is fewer than the number applied for in 2011: see table 3.5. It is probable that the number of trains has been underestimated in the basic forecast.
In a system analysis for south-east Sweden (see under heading 2.2.2), it is assumed that up to 14 goods trains per 24-hour period may use the Skånebanan line between Hässleholm and Kristianstad. There are several planned or ongoing projects that may be assumed to increase the demand for goods transport by rail.

- The port at Karlshamn will be extended with a new terminal.
- An ethanol factory is to be established in Karlshamn with by-products that could possibly be used for gas installations at the port of Malmö. If the gas installation at the port of Malmö is built, it will significantly increase the need for transport.
- A study is ongoing into the possibility of changing the transport of bottles to the Absolut factory in Åhus from road to rail.
- The port of Åhus intends to attempt to increase its share of container transport by rail.

3.3.2 Future capacity and delay status

The capacity utilization on the determining section with 3 double services per hour and 7 goods trains per 24-hour period will rise to 85%. It will be difficult to make space for more goods trains on the track. Figure 3-10 shows the capacity situation in 2020 according to the basic forecast. The section between Kristianstad and Hässleholm is red and risks becoming a difficult bottleneck.
The capacity utilization in the train plan for 2011 is very high. This means that it will be extremely difficult for trains that become delayed to make up time. It is also likely that delayed trains will affect the other trains on the section, resulting in more cumulative delays. There is an imminent risk that the number of delays between Hässleholm and Kristianstad will rise.

3.4 Project-specific objectives

A response to the first two objectives in the conceptual study is contained in chapters 2 and 3:

1. To identify and evaluate existing requirements for goods and passenger services.
2. To identify and evaluate measures that could provide more effective utilization of the existing track installation.

Passenger services on the Skånebanan line between Hässleholm and Kristianstad will soon increase so much that there will be a shortage of capacity on the line and a growing risk of disruptions and delays spreading between trains. After the increase in services in December 2010, it is not possible for passenger services to expand. There are clear indications that goods traffic between Hässleholm and Kristianstad will increase. One prerequisite for this increase is sufficient capacity on the tracks.

Efficient rail transport is an important condition for achieving transport policy objectives. Rail transport is safer and has less adverse impact on the environment than other land transport. A greater proportion of transport by rail will therefore help to fulfil national environmental and
safety targets. It is assumed in this study that the need for transport will not be met by a transfer from rail to road.

The increase in passenger services will mean that the Skånebanan line between Hässleholm and Kristianstad will in principle be utilized to the maximum. Stage 2 measures in accordance with the four-stage method, such as longer passenger trains and the closing of stops for embarkment/disembarkment, have already been adopted in order to satisfy the need for transport services.

Chapters 2 and 3 also address the first part of the third and fourth objectives of the conceptual study: to investigate the need for measures. The most important measures to satisfy the need for transport and fulfil transport policy objectives are to increase capacity in order to reduce sensitivity to disruptions and ensure that there is space for goods traffic on the line. This conclusion can be summarized in three project-specific objectives, to which measures must contribute:

1. Greater capacity
2. Space for more goods trains
3. Less sensitivity to disruptions

Reducing sensitivity to disruptions helps to fulfil the transport policy objective of good accessibility with a reliable, high-quality transport system. The space for goods traffic on the track helps to fulfil the transport policy objective of higher quality for transport for businesses, safety and the environment. There is a reduced risk of accidents and emissions of airborne pollutants and greenhouse gases from rail than from road traffic. Improved capacity on the Skånebanan line between Hässleholm and Kristianstad can help reduce sensitivity to disruptions and increase the space for goods trains, thereby helping to fulfil transport policy objectives.
4  **Comparison alternative**

The comparison alternative involves a description of the situation if the existing standard of the track is retained. In the comparison alternative, capacity utilization on the Skånebanan line and on Kristianstad C will be extremely high with the extended services from and including December 2010. All the platforms at Kristianstad C will be used at the same time once every hour. If a train has an operational problem or if any of the platform tracks cannot be used, it will lead to extensive disruptions. This means services which are extremely sensitive to disruptions and where delays are passed on from one train to another. In the event of disruptions, there is a risk that passenger trains must wait on the line prior to entering Kristianstad C if all platform tracks are occupied.

The total number of delays will probably be significantly higher than at present. If the number of passenger services remains at the 2011 level, it will be virtually impossible to increase the number of goods trains during the daytime on that section.

The passing loop at Önnestad is likely to be extended and will be equipped with platforms for embarkment/disembarkment as part of the Pågatåg Nordost [Local Rail Service North-East] project. This means that train passing movements in Önnestad will be somewhat more flexible. New stops for embarkment/disembarkment in Önnestad will lengthen the time the train is on the track and will therefore increase capacity utilization. The adverse effects on sensitivity to disruptions caused by the increase in traffic and new train stops for embarkment/disembarkment will be greater than any benefits from an extended passing loop in Önnestad.
5 Measures to increase capacity

5.1 UA1, UA2 and UA3 - higher speed

The utilization of capacity on single tracks can theoretically be reduced by higher speeds since it takes less time for trains to reach the passing loops. There are a number of alternatives that can increase track capacity through increased speed.

5.1.1 UA1 - Higher speed through Vinslöv station

The speed through Vinslöv station is 140 km/h, whereas the speed both eastwards and westwards of Vinslöv is 160 km/h. This means that Öresund trains that do not stop at Vinslöv must reduce speed and then accelerate up to 160 km/h again. This results in a loss of approximately 7 seconds of running time. Running time is the time it takes if the engine driver drives the train perfectly. In reality, the loss of time is probably greater. If the reduction in speed were removed, all Öresund trains would gain at least 7 seconds.

In order for the speed to be increased to 160 km/h the infrastructure must be able to cope with the increase and the installation must meet Trafikverket [Swedish Transport Administration] safety regulations. Besides the track itself, infrastructure consists of other technical elements such as signals, electricity and telecommunications. The track geometry through Vinslöv may need some minor adjustment to permit speeds of 160 km/h. Higher speeds also require minor changes to signals.
Storgatan crosses the railway at Vinslöv station. See figure 5-1. The level crossing has a full barrier installation and is approved for 160 km/h. This means that the barriers are equipped with break protection that detects any break in the barriers.

5.1.2 **UA2 - Higher speed between Karpalund and Kristianstad**

The speed on the line between Karpalund and Kristianstad is 120 km/h. If the speed is increased to 160 km/h, both the Öresundståg and the Pågatåg [Local Rail Service] would gain approximately 9 seconds. Shortening the running time between Karpalund and Kristianstad would enable cumulative delays to be reduced.

The track geometry permits a speed of 160 km/h but ground conditions around the track may mean that the track bed needs to be strengthened to permit a higher speed.

There is an unprotected level crossing between Kristianstad and Karpalund. This must be removed or else it must be equipped with a new road protection installation if the speed on the section is to be increased to 160 km/h. A nature reserve on both sides of the railway begins approximately 1 kilometre outside Kristianstad. Where the nature reserve begins there is an unlawful path over the railway: see figure 5-3. The path is probably a shortcut to the gravel road in the nature reserve on the southern side of the railway. If the speed is increased, it will mean a greater safety risk for people taking an unlawful shortcut over the railway.
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Figure 5-3 There is an unlawful path over the railway approximately 1 km outside Kristianstad station.

5.1.3 **UA3 - Higher speed through the passing loop in Karpalund and into Kristianstad**

The speed reduction to 120 km/h begins at Karpalund station. If the speed is increased to 160 km/h at the station in Karpalund and on the line into Kristianstad, the Pågatågen service would gain 22 seconds and the Öresund train would gain 21 seconds. The fact that the time-saving is greater in UA3 than in UA2, where the speed is only increased on the line between Karpalund and Kristianstad, is since it takes time for the train to first reduce speed to 120 km/h and then accelerate.
Increasing the speed through Karpalund requires, among other things, easing a curve and moving points to the passing track. Easing the curve will mean that the eastern points to the passing track are moved about 200 metres to the east. The track from Hanaskog runs parallel to the existing passing track and makes easing the curve more difficult in Karpalund. The connection points to Hanaskog need to be moved and the track needs to be shortened so that it no longer runs parallel to the Skånebanan line to enable the curve to be eased. Figure 5-5 shows a diagram of the track work in Karpalund. Besides the work on the track, ducting, signals and electricity will be affected.

![Figure 5-4 Karpalund connects to a line from Hanaskog.](image)

**Figure 5-4** Karpalund connects to a line from Hanaskog.

**5.2 UA4 – New passing loop between Hässleholm and Attarp**

The section between Hässleholm and Attarp is the determining section of the line. That means that this is where the longest time is taken between passing loops. A new passing loop means that the determining section will be moved to the section between Vinslöv and Önnestad.
A new passing loop can either be used for scheduled train passing movements or as a reserve point if a train is delayed. At present, trains running towards Kristianstad must wait in Hässleholm until a passing train from Attarp comes into the station at Hässleholm. If the train from Attarp is delayed, the train towards Kristianstad will also be delayed. The train towards Kristianstad may in turn delay other trains. If there were an additional passing loop between Hässleholm and Attarp, the train from Hässleholm could begin its journey and pass the other train at the new passing loop. Then the train from Hässleholm would not be delayed so long.

A new passing loop could be located directly east of Hässleholm: see figure 5-6. The passing track would then be on a curve, but the points would be on straight track. It is preferable for points to be located on straight track because they are less expensive to maintain than points on a curve. To the west of the proposed location of the passing track there is an electricity safety zone where trains do not have permission to stop. Building the passing track closer to Hässleholm will therefore incur high costs.

It is better to have the passing track on the northern side of the existing track since there is a water protection area with a dam and a pumping station on the southern side of the railway. The northern side of the track consists mainly of industrial land. From the industrial area there is a pedestrian and cycle tunnel to the green area south of the railway: see figure 5-7. If a new passing track is built, the pedestrian and cycle tunnel would need to be lengthened. Long tunnels are often
perceived to be unsafe. It is therefore important to take particular care with the design of a longer pedestrian and cycle tunnel.

![Figure 5-7 Lamellvägen; pedestrian and cycle tunnel between Hässleholm and Attarp.](image)

**5.3 UA5, UA6 and UA7 – three-train passing loops**

Three-train passing loops can be used when three trains need to pass each other at the same time. This occurs if there is a passenger train running in each direction and a goods train. A traditional three-track point consists of three parallel tracks: see figure 5-8.

![Figure 5-8 A traditional three-track passing loop.](image)

A somewhat different design for a three-train passing station is proposed in UA5, UA6 and UA7, see the diagram in figure 5-9. The three-train passing loop is designed as a partial double track at least 1,600 metres long with a points connection between the tracks. A three-train passing loop with this design is better for both passenger services and goods services. It is easier to include goods trains in timetables and two passenger trains can pass at the three-train passing loop.
without needing to reduce speed so much. This means that passing movements become more flexible and trains are somewhat less dependent on each other. In this way, all the new track is used even if only two trains pass. A three-train meeting point may be seen as the beginning of an extension to a double track.

![Diagram of the proposed three-train passing loop.](image)

**Figure 5-9** Diagram of the proposed three-train passing loop.

### 5.3.1 UA5 Three-train passing loop in Attarp

A three-train passing loop in Attarp is an alternative to a passing loop between Hässleholm and Attarp. In the case of small delays, a long passing track may work better than moving the passing of trains to another passing loop. When the passing loop is moved, large cumulative delays are likely to occur.

The 2011 timetable schedules three train passing movements involving passenger trains per hour in Attarp. A three-train loop makes it possible for goods trains to run directly after one of the passenger trains. If no goods train is running, that increases flexibility for passenger trains.

Because the determining section is between Hässleholm and Attarp, it is better from the point of view of traffic to extend the passing loop in Attarp westwards towards Hässleholm to create a three-train passing loop. That will be shorter than the determining section of the track. There is a level crossing and some houses directly north-west of Attarp. There is also a communal water catchment area north-west of Attarp. The level crossing and the water catchment area make it less suitable and more expensive to extend the passing loop to the north-west. For that reason, the overall recommendation is for a possible extension of the passing loop to the south-east.

### 5.3.2 UA6 Three-train passing loop in Vinslöv

Vinslöv is the passing loop with the shortest delay time caused by cumulative delays. At present, there are no scheduled passing movements between passenger trains in Vinslöv. In view of this traffic situation, it is less likely that three-train passing movements involving two passenger trains and one goods train will arise in Vinslöv. Nevertheless, the traffic situation may change over time.
and a three-train passing loop would provide flexibility for the two-train passing movements that take place at the station.

In order to achieve efficient three-train crossing, the goods train would need to stop on the extended part of the passing loop outside Vinslöv, and the passenger trains would run on the existing part of the passing track where the platforms are located, at least if the passenger trains were carrying passengers changing lines. This means that the passing loop needs to be extended so that the new section has an obstacle-free length of at least 750 metres. Both from the point of view of traffic and space, the existing passing loop should be extended eastwards towards Önnestad. The section between Vinslöv and Önnestad has, in principle, an equally long running time as the determining section between Hässleholm and Attarp.

5.3.3 **UA7 Three-train passing loop in Önnestad**

The current passing loop in Önnestad lies to the west of the town and has no facilities for passengers changing lines. During the implementation of the Pågatåg Nordost [Local Rail Service North-East] project, the passing loop will be extended into the town and new platforms will be built to enable passengers to get on and off. The extension is estimated to be approximately 700 metres. That is sufficient to enable a three-train passing loop to be built without extending the passing loop. The investment in the track can therefore be limited to two new points between the main track and the side track.

The train plan for 2011 includes 2 passing movements involving passenger trains per hour in Önnestad. More delays occur in Attarp and Karpalund than in Önnestad, but the number of cumulative delays is second-highest in Önnestad. A three-train passing loop in Önnestad would enable passing movements between two passenger trains and a goods train and would increase the flexibility in two-train passing movements. A longer passing loop in Önnestad could help to reduce cumulative delays.
There is a level crossing with Skolgatan in Önnestad. If this level crossing is retained when the passing loop is extended it will worsen access between the north and south sides of the railway because the barriers will be down for longer. A three-train passing loop would probably mean that the barriers would be down for longer than with an ordinary passing loop.

5.4 UA8 and UA9 – measures at Kristianstad C

There are 3 platform tracks in Kristianstad at present. Three trains can stop inside the station at the same time. With the increase in traffic from December 2010, the need for platform tracks will increase. Platform tracks are used both for trains turning round in Kristianstad and for trains travelling on eastwards or westwards. The Öresund train to Karlshamn often runs with more wagons between Malmö and Kristianstad than between Kristianstad and Karlskrona. This means that train units are often coupled together or separated at Kristianstad station. At night the station at Kristianstad is also used as a depot where trains are parked overnight.

5.4.1 UA8 New/~ moved main dwarf signals in Kristianstad

The platforms at Kristianstad are relatively long, between 250 and 330 metres. The full length of the platform is one signal section. Because it is only one signal section, only one train can stand at the platform even though the platform is long enough for two trains. When two trains are coupled at Kristianstad station, the train arriving last must first stop before the platform and then

Figure 5-10 There is a level crossing with Skolgatan in Önnestad.
drive towards the stop signal. When the train stops before the platform, the train blocks the track outside the platform.

Figure 5-11 Main dwarf signals that regulate entry to and exit from the platforms at Kristianstad.

At present there are main dwarf signals just before the start of the platforms. These regulate entry to and exit from the platforms. In UA8, the entry signals are moved further in on the platform and new exit signals are installed, see the diagram in figure 5.12. This enables trains to move forward to the new signals in the middle of the platform before they have to stop. The fact that the train can move further forward means that the track outside the platform becomes free and can be used by other trains. With two signal sections on the platform it is also possible to have two different trains standing at the same platform. That could, for example, be necessary if there are trains at all the platforms and another train arrives. The train arriving can then stop in front of one of the other trains.
5.4.2 **UA9 New platform at track 4 in Kristianstad**

In Kristianstad, besides the 3 platform tracks, there is a fourth track that continues towards Åhus. A new platform can be built beside this track. This function in UA9 would mean greater capacity at Kristianstad station, like UA8.

There is space for a new platform between track 4 and Barbackavägen: see figure 5-13. It is possible that existing posts for overhead contact lines need to be moved. Directly south of the existing platforms there is a level crossing over the railway to Åhus. This level crossing could be used to access a new platform on track 4. The level crossing is not directly connected to the platforms. This means that there is a risk that people will try to take a shortcut over tracks 3 and 4 to reach the new platform.
There is room for a new platform between track 4 and Barbackavägen.

The platform on track 4 should be at least 250 metres long so that triple-coupled Öresund trains can use the platform. There is a siding for work vehicles on the western side of track 4. In order to make room for a 250 metre-long platform, the siding must be shortened by approximately 60 metres.

### 5.5 UA10 Double track from Kristianstad

At present, when two trains need to pass in Kristianstad, one train must wait in the station until the other train arrives. If a new track is built from Kristianstad, the first train can begin its journey and will be less affected by delays affecting the other train. It takes a little while before a train can leave a platform when it receives a signal to depart. All the doors must be closed, among other things. With a double track, trains can leave the station earlier and wait to pass on the double track instead. This increases flexibility and reduces the risk of cumulative delays.

With a new double track, goods trains coming from the triangular track that connects the Skånebanan line with the Blekinge Kustbana line can move further forward and wait for a passing train. The triangle track is approximately 280 metres long. If a double track is built, the goods train can move approximately 300 metres further. That will enable the goods train to reach the passing loop in Karpalund faster, which reduces the risk that later passenger trains will be delayed by the goods train.

Suitable conditions exist for building a new double track out from Kristianstad. There is an old embankment west of the existing track. The bridge over Härlövsängaleden is 10.5 metres wide and is prepared for a double track: see figure 5-17. The safety fence needs to be moved to the
outside of the concrete beams in order for the bridge to comply with Swedish Transport Administration standards. The Swedish Transport Administration owns the land required.

Directly to the west of the bridge over Härlövsängaleden there is a nature reserve on both sides of the track: see figure 5-15. The nature reserve limits the length of the double track and means that points must be situated on a curve. Points on curves lead to higher maintenance costs. The double track will be approximately 900 metres long, from the edge of the platform in Kristianstad to the beginning of the nature reserve. There is an unlawful path over the track at the beginning of the nature reserve: see figure 4.3. The risk of accidents on the unlawful crossing could increase if a double track is built and trains from different directions pass at approximately the same time.

**Figure 5-14** The bridge over Härlövsängaleden is prepared for a double track.
Directly west of Kristianstad there is a nature reserve on both sides of the railway. It is desirable for the new track to be built so that all platform tracks in Kristianstad are accessible: see the example in figure 4-16. If less than all of the platform tracks can be reached from the new track, the flexibility and use of the new track will be limited.

5.6 UA11 Intermediate block signals

One way to make capacity for several trains is to run trains in the same direction one after another. In terms of signal technology, the track is divided into block sections. For safety reasons, only one train at a time can be on a block section. See also section 3.1. At present, the full section between the passing loops is a block section. If two trains are running in the same direction, the first train must have reached the next passing loop before the other train can start its movement.

The block sections on the line can be divided in two by linking in new intermediate block signals between the passing loops. The block sections thus become shorter and trains can run closer to each other. Intermediate block signals facilitate the incremental movement of goods trains.
towards the next passing loop. Intermediate block signals are even more useful if they are combined with three-train passing loops. Two trains travelling in the same direction can then pass one train going in the opposite direction at the same time. Four new intermediate block signals are required to enable trains to run sequentially on the whole section (between Hässleholm and Attarp, Attarp and Vinslöv, Vinslöv and Önnestad and between Önnestad and Karpalund). The line between Karpalund and Kristianstad is already divided into several signal sections.

### 5.7 Alternatives not studied

#### 5.7.1 Raising speed to 180 km/h

If the speed on the entire track is increased to 180 km/h per hour, the Öresund train would save approximately 1½ minutes compared to the current time. The track would need to be slewed to enable the speed to be raised to 180 km/h. Slewing means that the track position is moved slightly to achieve better track geometry. Certain fixed objects along the track would need to be moved so they would not be inside the safety zones. Between Karpalund and Kristianstad there is a complex curve that cannot be slewed to permit 180 km/h.

If the speed is increased to 180 km/h a number of measures will be required to maintain traffic safety. These include obstacle sensors on level crossings that detect the presence of any road vehicle on the track and protection points at the passing loops. These safety measures mean that increasing the speed to 180 km/h is relatively costly.

One alternative to increasing the speed on the entire track between Hässleholm and Kristianstad is to increase the speed only between the stations in order to avoid costs for protection points. The time gain would then be between 4-8 seconds per section, or a total of approximately 25 seconds between Hässleholm and Karpalund. However, the cost for slewing tracks and level crossings would remain. Since the costs would be relatively high in relation to the gain in time, speeds above 160 km/h have not been studied in more detail.

#### 5.7.2 Double track out of Hässleholm

A double track out of Hässleholm was proposed as a measure at an early stage of the study. A double track out of Hässleholm would mean that passenger trains could leave the platform and wait for a passing train on the double track. The train could then start its movement and there would be less risk of cumulative delays.

The alternative was dismissed at a relatively early stage when a double track out of Hässleholm was considered to be a complex, expensive measure. The railway passes under two large road flyovers and traverses a level crossing. In between, the railway lies somewhat lower than the
surrounding land. These circumstances make a double track more difficult and expensive, and the alternative has therefore not been studied in more detail.

5.7.3 **Removal, alignment or rebuilding into separate levels of the crossing between Brogatan and the railway**

There is a level crossing directly east of Hässleholm. When the study began, there was an issue relating to whether the level crossing could delay the departure of trains from Hässleholm. If that were the case, the removal, alignment of rebuilding into separate levels could improve the punctuality of trains departing from Hässleholm. An investigation of the circumstances showed that the level crossing was not perceived as a problem by the operational management centre. In the event of a disruption, there is a greater risk of car travellers being subjected to longer waiting times than of trains being delayed. Since the measures do not affect the capacity of the railway, the alternative has not been studied in more detail.

5.7.4 **New passing loop between Önnestad and Vinslöv**

The determining section between Hässleholm and Kristianstad is between Hässleholm and Attarp. It takes almost as long for a train to pass the section between Vinslöv and Önnestad as it does between Hässleholm and Attarp. An alternative to UA4 (new passing loop between Hässleholm and Attarp) could consist of a new passing loop between Vinslöv and Önnestad. However, a new passing loop between Vinslöv and Önnestad is considered to give less benefit than a new passing loop between Hässleholm and Attarp. The reason why a passing loop between Vinslöv and Önnestad is considered to be of less benefit than a passing loop between Hässleholm and Attarp, besides the fact that the latter alternative would make new train passing movements possible, is that it would also facilitate trains departing from Hässleholm on time and waiting at the new passing loop instead. If a train waits at the new passing loop without passengers changing lines, the train can depart immediately after receiving the start signal. If the train is forced to wait in Hässleholm, it will require a certain length of time to close the doors and prepare the train for departure. This will risk delaying the train further. A new passing loop between Vinslöv and Önnestad has not been studied in more detail.
6 COSTS

The costs of the study alternatives have been routinely assessed: see table 6-1. Since there is a relatively large amount of uncertainty in the early stages, the costs have been given in brackets. The costs are given at 2010-10 price levels.

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Table 6-1 Costs in MSEK.

UA7, a three-train passing loop in Önnestad, is considered to cost considerably less than UA6, a three-train passing loop in Attarp, and UA5, a three-train passing loop in Vinslöv. This is due to the fact that the passing loop in Önnestad will be extended within the framework of the Pågatåg Nordost [Local Rail Service North East] project. The cost in Önnestad therefore is only for new points.

UA10, a double track out from Kristianstad, is considered to be somewhat less expensive to implement than UA4, a new passing loop between Hässleholm and Attarp. The costs are assessed as lower because ground conditions are better in Kristianstad.

The process of phasing out the line from Karpalund to Hanaskog has started. If the track is closed and the track and points are removed in Karpalund, the cost of UA3, higher speed between Karpalund and Kristianstad, may be somewhat lower.
7 FULFILMENT OF OBJECTIVES

7.1 National objectives

7.1.1 Cost effective and long-term sustainable public transport

The overall objective of the Swedish transport policy is “to guarantee an economically efficient and sustainable provision of transport services for people and businesses throughout the country”. Sustainable in the long term means that measures must be ecologically, socially and economically sustainable. Economically efficient means that the benefits of measures must be greater than their costs. In order to evaluate the benefit of a measure, its effects must be quantified. It can be difficult to quantify effects when the connection between cause and effect is not always fully known. Greater capacity in itself has no socio-economic value. The benefit only emerges when this increase in capacity brings about fewer delays or more goods trains running on the track.

The benefit from a measure must be compared to its socio-economic cost. This is not the same thing as the actual cost of an investment. It is assumed that government consumption will push aside private consumption, which is subject to VAT. For that reason, public income is reduced and investment costs are adjusted upwards by 21% - in principle, corresponding to the reduced VAT revenue.

The value of the average delay between Hässleholm and Kristianstad, with traffic at the level in the Basic Forecast (see chapter 3), amounts to just over 80 MSEK. This means that a measure that removes all delays is socio-economically efficient if its cost is below this amount. However, it is not likely that any single measure can remove all delays. A measure that removes all cumulative delays can cost up to 40 MSEK and still be socio-economically beneficial. Since traffic will increase in 2011, the average delay is also likely to increase, as will the number of passengers affected by each delay. This means that the total value of the delays will increase, and that any measure that removes all delays could cost over 80 MSEK and still be socio-economically beneficial. The value of one minute’s reduction in delay on the track is greater than the value of one minute’s reduction in travelling time.

It is more difficult to carry out a generalized assessment of the value of running more goods trains. The socio-economic value depends on whether there is any demand for running more goods trains. The value of an increase in goods traffic consists of possible reductions in costs for shippers/purchasers of the goods and reductions in the external effects of road traffic (emissions, wear and tear, risk of accidents) minus the reduction in tax revenue (including fuel tax). Several
of the measures in this study help to reduce sensitivity to disruption/delays as well as increase the capacity for running goods trains on the track.

For UA1, UA2, UA3 and UA4, the benefit from the measures has been generally estimated: see table 7-1. These figures have a great deal of uncertainty. The measures proposed in UA1, UA2 and UA3 all involve time gains for trains. The time gains are so small that it is not likely that the timetables for the trains will be modified. Instead there will be greater margins in the timetables, which will reduce the risks of cumulative delays. In UA1, UA2 and UA3, the entire gain in running time has been estimated as a reduction in delay time. Nevertheless, it is unlikely that all of the running time will be converted into reductions in travelling time or delay time. This means that the benefits claimed for UA1, UA2 and UA3 are exaggerated. On the other hand, the benefits have been estimated using the Swedish Transport Administration basic forecast, where the number of trains is too small and thereby underestimates the benefits. UA1 and UA2 are likely to be socio-economically profitable even if only a small part of the running time gain is converted into reduced delay time. UA3 requires a relatively large part of the running time gain to be converted to reduced delay time if the socio-economic gains are to be greater than the cost.

The benefit from UA4 is estimated in terms of better utilization of capacity between Hässleholm and Attarp with a new passing loop. When timetables are drawn up, time is added depending on capacity utilization. A new passing loop means that the added time is reduced by about 0.6 minutes. This has been valued as a reduced delay in table 7-1. If the time gain is evaluated as reduced travelling time instead, the value amounts to just over 40 MSEK. The benefit in UA4 is also estimated using the Swedish Transport Administration basic forecast, which states too little traffic. The benefit of UA4 may be slightly underestimated for that reason. The calculated benefit of UA4 is just on the borderline of being socio-economically favourable. UA5-UA11 have not been estimated socio-economically since there is no currently accepted method for making such estimates for these alternatives.

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<tr>
<th>UA1</th>
<th>UA2</th>
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</tbody>
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Table 7-1. Socio-economic benefits and socio-economic investment cost at 2006 price levels. The figures are only generally estimated and are very uncertain.
7.1.2 **Functional objectives and consideration objectives**

The overall transport policy objective is divided into functional objectives and impact objectives. Functional objectives and impact objectives have been specified in a number of different areas. Below is an evaluation of investigation alternatives related to these specifications.

7.1.2.1 **Functional objectives**

All investigation alternatives are expected to improve people’s travelling through better reliability. Greater capacity leads to reduced sensitivity to disruptions/delays, and leads to greater reliability. UA4, a new passing loop, and UA10, a double track from Kristianstad, are assessed to be the measures that best reduce sensitivity to disruptions/delays. UA4 and UA10 are considered to have the greatest effect because they not only involve new passing possibilities, but it will be possible to prepare trains departing from Kristianstad and Hässleholm and they will be able to wait for passing trains at the new passing loop/double track. This will reduce the risk of further cumulative delays.

UA4 and UA9 are considered to have a small negative effect on passengers’ safety and comfort. In UA4, a pedestrian and cycle tunnel must be extended. Long tunnels are sometimes perceived as unsafe. It is possible that UA9, a new platform on track 4 in Kristianstad, may also be perceived as slightly less safe and less comfortable since the track is slightly more remote than the other tracks.

Quality can be seen as the ability to choose the most suitable mode of transport. Increasing capacity increases the opportunity of shipping goods by rail instead of by road. UA4, a new passing loop, UA5, a three-train passing loop in Attarp, and UA7, a three-train passing loop in Önnestad, UA10, a double track out of Kristianstad and UA11, intermediate block signals, are assessed as helping to improve the quality of transportation for business since they improve the capacity for running goods trains on the track. UA4, UA5 and UA7 are judged to contribute most to making space for more goods trains on the track since they involve new passing possibilities. UA6, a three-train passing loop in Vinslöv, is not judged to provide the same effect since there are no scheduled passenger train passing movements in Vinslöv. This means that goods trains can already pass passenger trains in Vinslöv at present.

Accessibility is affected only marginally in all study alternatives. The measures do not result in new train stoppages or increased traffic, except possibly for goods trains. Greater reliability could reduce inconvenience for passengers and make train services marginally more accessible.

The working methods and implementation of the study are considered to conform to gender equality since the project management and consultation group was made up of 50% women and 50% men. However, the project group consisted of 71% men and 29% women. A slightly larger
The measures are not considered to affect accessibility for people with disabilities. The reduced risk of late changes in departure track could make travelling easier for disabled people. It is possible that more reliable services would make travelling easier for people who need to rest or take medicine, food or drink at regular times. The measures are not considered to affect children's use of the transport system by themselves.

The measures are considered to increase the likelihood that people will choose public transport because of its reliability.

7.1.2.2 Impact objectives

It is judged that marginally fewer people will be killed or seriously injured in transport services. Since the measures help to achieve a more reliable transport system, leading to passengers choosing to travel by train instead of by car, the risk of accidents is reduced since the train is generally a safer mode of transport. The same applies to any changeover of goods from road to rail. UA2 and UA3 are considered to improve safety slightly since an unprotected level crossing needs to be removed or be better protected.

The measures are considered to make a marginal contribution to limiting the impact on the climate. Since the measures lead to more people choosing trains instead of cars or lorries, they reduce emissions of greenhouse gases and airborne pollutants. Table 7-2 summarizes the fulfilment of objectives by all alternatives.
### Functional Objectives

<table>
<thead>
<tr>
<th>Objective</th>
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<th>UA3</th>
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<th>UA6</th>
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<td>++</td>
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</tbody>
</table>

**Table 7-2** Fulfilment of functional objectives and impact objectives.
7.2 Project-specific objectives

Three project-specific objectives were defined for the proposed measures:

1. Greater capacity
2. Space for more goods trains
3. Less sensitivity to disruptions

The project-specific objectives help fulfil the overall national transport policy objectives. Less sensitivity to disruption means a reliable transport system. More space for goods traffic on the track helps improve the quality of transport for businesses, safety and the environment.

UA4, a new passing loop, is considered to be the alternative with the greatest impact on capacity. UA4 enables new passing movements and facilitates the punctual departure of passenger trains from Hässleholm. If a train is forced to wait to depart from a station where passengers can change lines, it often takes longer for the train to depart when it receives start clearance. UA10, a new double track out of Kristianstad, has a similar function to UA4. UA10 improves passing capacity and enables passenger trains to leave the platform, which reduces the risk of further delays. UA4 is considered to provide better improvement of capacity than UA10 since UA4 introduces completely new passing opportunities. UA9, a new platform in Kristianstad, provides greater capacity at Kristianstad C. The increase in capacity in UA9 is considered to be greater than that in UA8, new and moved dwarf light signals, because a new platform track provides greater flexibility. UA8, new and moved main dwarf signals, also increases capacity at Kristianstad C. Nevertheless, the train that stands furthest out and arrived last at the platform must depart first. In UA9, trains can depart independently.

UA4, a new passing loop, UA5, a three-train passing loop in Attarp, and UA7, a three-train passing loop in Önnestad, are considered to have the greatest effect on running more goods trains on the track. UA4 and UA5 are considered complement each other. If UA4 is built, it reduces the benefit of UA5, and vice versa. UA11, intermediate block signals, is considered to be most beneficial if the signals are combined with a three-train passing loop. If there are no intermediate block signals, a goods train cannot depart from the passing loop before the passenger train in front has reached the next passing loop. This means that the goods train loses time and risks not having time to depart before the next passenger train arrives. Intermediate block signals are most beneficial in connection with a three-train passing loop. Four intermediate block signals are included in UA11, one between each existing passing loop. It is possible to invest in just two intermediate block signals and still obtain an effect on capacity.

UA4, a new passing loop, and UA10, a new double track, are considered to provide the greatest effect on reduced sensitivity to disruptions/risk of delays. This is because they increase the capacity on the track and enable passenger trains to depart from platforms, which reduces the
risk of further delays. UA8 and UA9, which improve capacity at Kristianstad C, UA5 and UA7, three-train passing loops in Attarp and Önnestad and intermediate block signals, are also considered to reduce sensitivity to disruptions/delays. Table 7-3 provides a summary of the assessment of project-specific objectives.

<table>
<thead>
<tr>
<th>UA1</th>
<th>UA2</th>
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<th>UA11</th>
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<tbody>
<tr>
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<td>Kristianstad</td>
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<td>Karpalund - Kristianstad</td>
<td>Karpalund - Kristianstad</td>
<td>New passing loop</td>
<td>Attarp</td>
<td>Vinslöv</td>
<td>Önnestad</td>
<td>Main dwarf signals</td>
<td>New platform</td>
<td>Double track</td>
<td>Intermediate block signals</td>
</tr>
<tr>
<td>Greater capacity</td>
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*Table 7-3* Summary of the assessment of project-specific objectives
8 OVERALL ASSESSMENT

8.1 Cost-effective measures with good fulfilment of objectives

UA1 (higher speed through Vinslöv station), UA7 (a three-train passing loop in Önnestad) and UA8 (new and moved main dwarf signals) are all considered to provide good fulfilment of objectives at a relatively low cost.

UA1 (higher speed through Vinslöv station) is not considered to fulfil all project objectives but will have a considerable effect in relation to its cost. It is therefore recommended that UA1 be implemented.

It is considered that UA7 (a three-train passing loop in Önnestad) will have a good effect for goods trains and it costs less than half of UA4 (a new passing loop between Hässleholm and Attarp) and UA5 (a three-train passing loop in Attarp), which are considered to have a similar effect on goods transport services. If improvements for goods trains at the lowest possible cost is prioritized, UA7 is recommended. It would be beneficial to combine UA7 with UA11 (intermediate block signals) to obtain the best effect. It is not necessary to extend intermediate block signals to all sections at the same time. In the first stage, intermediate block signals can be installed east and west of Önnestad.

UA8 (new and moved main dwarf signals) increases capacity at Kristianstad C. If improvements for passenger trains at the lowest possible cost is prioritized, UA8 is recommended. UA9 (a new platform track at Kristianstad C) is considered to fulfil the project objectives to a greater extent than UA8, but the cost of UA9 is higher. The difference in cost between the alternatives is considered to be greater than the difference in benefit. Taking this into consideration, UA8 is recommended over UA9.

8.2 Measures with high fulfilment of objectives

UA4 (a new passing track between Hässleholm and Attarp), UA10 (a double track out from Kristianstad) and UA9 (a new platform track at Kristianstad C) are considered to provide high fulfilment of objectives but are more expensive than the measures recommended in section 8.1. UA4, UA9 and UA10 should be implemented only at a secondary stage when the measures in section 8.1 have been implemented.

UA4 (a new passing loop between Hässleholm and Attarp) is considered to be the study alternative that best fulfils the project objectives. UA4 provides greater capacity, reduces the risk
of disruptions and delays and improves running conditions for goods trains. UA4 involves a new passing loop, which is a large investment. UA4 is one of the more expensive study alternatives.

UA10 (a double track out of Kristianstad) is considered to be the second-best alternative in terms of fulfilling project objectives. UA10 is, like UA4, among the more expensive measures.

UA9 (a new platform track at Kristianstad C) is considered to fulfil the project objectives to a great extent but is also considered to be relatively expensive. Despite the fact that the effects of UA9 are considered to be very good, UA8 is recommended over UA9 in the first stage since the cost of UA8 is significantly lower.

### 8.3 Other measures

UA2 (higher speed between Karpalund and Kristianstad), UA3 (higher speed from Karpalund into Kristianstad), UA5 (a three-train passing loop in Attarp) and UA6 (a three-train passing loop in Vinslöv) fulfil the objectives to a lesser extent than the measures recommended in sections 8.1 and 8.2.

UA2 (higher speed between Karpalund and Kristianstad) is not considered to fulfil all the project objectives but its effects are relatively good in relation to its cost. UA8 (new and moved main dwarf signals) is considered to have more effect than UA2 at a similar cost. For that reason, UA8 is recommended over UA2.

UA5 (a three-train passing loop in Attarp) is considered to have a similar but smaller effect than UA4 (a new passing loop). The cost of UA5 is somewhat higher than the cost of UA4. For that reason UA4 is recommended over UA5. UA2 and UA5 should be implemented only in the third stage, when the measures in sections 8.1 and 8.2 have been implemented.

UA3 (higher speed from Karpalund into Kristianstad) and UA6 (a three-train passing loop in Vinslöv) only provide a limited contribution to the project objectives at a relatively high cost and are therefore not recommended.

### 8.4 Overall assessment

The Swedish Transport Administration’s assessment is that, in the first stage, UA1 (higher speed through Vinslöv station), UA7 (a three-train passing loop in Önnestad) in combination with UA11 (intermediate block signals) and UA8 (new and moved main dwarf signals) should be implemented. This assessment is based on weighing the cost of the alternatives against how well they fulfil the objectives. If only alternatives that provide high fulfilment of objectives are considered, UA4 (a new passing loop between Hässleholm and Attarp), UA10 (a double track out of Kristianstad) and UA9 (a new platform track at Kristianstad C) would be recommended at a first stage. Taking into account the costs of the alternatives, UA4, UA10 and UA9 are only
recommended in the second stage. In the third stage UA2 (higher speed between Karpalund and Kristianstad) and UA5 (a three-train passing loop in Attarp) are recommended. It is desirable, if possible, for the different measures to be coordinated in order to minimize the number of closures and traffic disruptions during the construction stage. In the long term, it is judged that a double track is required to provide the desired goods and passenger services.