

# Future market for freight transport by rail

- Market, competition, technical development and future potential in Sweden and Europe
  - Summary in English

BO-LENNART NELLDAL

LARS AHLSTEDT



Report to Transportanalysis

Stockholm

2024-03-15

## Preface

Freight transport by rail is a high-capacity and efficient means of transport that also requires little energy and has minimal emissions. Freight traffic by rail can therefore be seen as an important mode of transport in the ongoing climate transition in Sweden and within the EU. Both within the EU and in national transport policy, there are targets that a larger proportion of goods should go by rail and sea instead of trucks. But the development has gone in the other direction.

The Swedish Transport Analysis Agency is tasked with supporting the Swedish government with decision-making data and evaluating measures in transport policy and monitoring developments in the transport area. Transport Analysis has therefore procured this analysis of the development of rail freight transport and to investigate what is required to reverse the trend.

The purpose of this report is to describe why the development has been the way it has become and what the conditions look like for the development of the railway in the future in Europe and Sweden. The description is based partly on reports and data from the EU, as well as on research and analyses of the technological development conducted at the KTH Railway Group at The Royal Institute of Technology in Stockholm.

The development has been described from 1990 after the transport policy with a separation between the operation (SJ – Swedish state Railways) and the infrastructure manager National Rail Administration (later the Swedish Transport administration). This was also the start of the deregulation in Sweden and Europe. The time perspective ahead is about 15 years up to the year 2040.

A special interview survey has been conducted with 25 representatives of transport customers, railway companies and other industry representatives. The aim has been to gain a deeper understanding by capturing how they view rail freight traffic today and the potential tomorrow. It was a valuable contribution and, together with our analyses, forms the basis for 10 different proposals for measures to improve freight transport on rail.

The project manager and author of this report has been Bo-Lennart Nelldal, formerly active at KTH, with the participation of Lars Ahlstedt, former European Rail Consulting, who also conducted most of the interviews. The contact person at Transport Analysis has been Pia Bergdahl. The authors themselves are responsible for the conclusions of the report.

Stockholm, March 2024

*Bo-Lennart Nelldal*

Professor Emeritus KTH

## Future freight transport by Rail in Sweden and Europe Summary in English

The evolution of freight transport is closely associated with economic growth. Total transport mileage increased rapidly up until the 2007–2010 financial crisis, after which freight transport grew more slowly, in part because the services sector accounted for an ever-growing share of GNP.

Lorries have accounted for the bulk of the increase since 1985. This means that the shares accounted for by rail and maritime shipping have decreased, which is contrary to the objectives of the EU and those at the national level in many countries. However, the trends differ from country to country.

Switzerland and Austria have enjoyed the most positive growth in terms of their railways, which account for a large and stable market share. This is due both to investments in these railways and a deliberate transport policy which includes policy instruments for lorries. Switzerland is the only country to implement the EU transport policy, despite not being in the EU. Austria and Switzerland also have the largest market shares for passenger transport, which shows that there need not be any conflict between passenger and freight transport.

Sweden and Germany are also well positioned, with relatively large market shares in terms of railways. They are one of the most deregulated countries, with a relatively high number of new railway companies. In contrast to Sweden, Germany has seen positive growth in recent years. One explanation is that there is a kilometre tax on lorries in Germany, and the lorries there are smaller than in Sweden, i.e. 18 m versus 25 m in Sweden (34 m as of 2024), which impacts both competitiveness and price levels. Germany has also reduced track access charges for freight trains and subsidizes wagonload traffic. In Sweden we are paying fairly high environmental compensation while at the same time increasing track access charges for freight trains.

The market shares for rail transport in large, transport-intensive countries such as France and Spain have declined and are small. Deregulation there has not occurred in practice, because of resistance from the national companies and trade unions.

The railway monopolies in Eastern Europe vanished after the countries there were freed from the Soviet Union, and the market share for the railways is currently in the process of sinking to the same levels as in Western Europe. Once they became EU members, Eastern European countries also began exporting low-price vehicles to Western Europe, where they were competitive thanks to their lower wages. This is a consequence of the freedom of movement within the EU, and one that arrived at the same time as the EU 2011 White Paper, which provided that more transports should go by rail and sea rather than by road. This affected the Swedish railways severely, and some intermodal lines had to be shut down.

The deregulation of the railways is an important part of EU railway policy. The purpose of such deregulation is not only to create new railway companies but, not least importantly, to put pressure on the old ones to become more efficient and customer-oriented. The railways are thus to become more attractive, so that more people will choose to travel or ship by rail. Railways constitute the most energy-efficient and environmentally friendly mode of transport, with the result that energy consumption and emissions would decrease if they were to gain a larger share of the market.

Freight transport by rail still faces major obstacles. Deregulation has resulted in the creation of new agencies, so a neutral party handles matters previously dealt with by the old national railways. This has, however, led to an extensive bureaucracy that brings with it both higher costs and difficulties in

establishing new services. New rolling stock can take several years to gain approval, at high cost. This ultimately affects the railway's customers. The differences in terms of bureaucracy between operating freight trains and lorries are at present sometimes almost insurmountable.

Passenger traffic has grown rapidly in many European countries in recent decades as a result of a commitment to increased regional transport and long-distance train service. With higher speeds, railways have become the fastest mode of land transport, creating new regional markets and taking market share away from aviation. This means that the rail system has become more heavily congested, resulting in insufficient capacity and neglected maintenance.

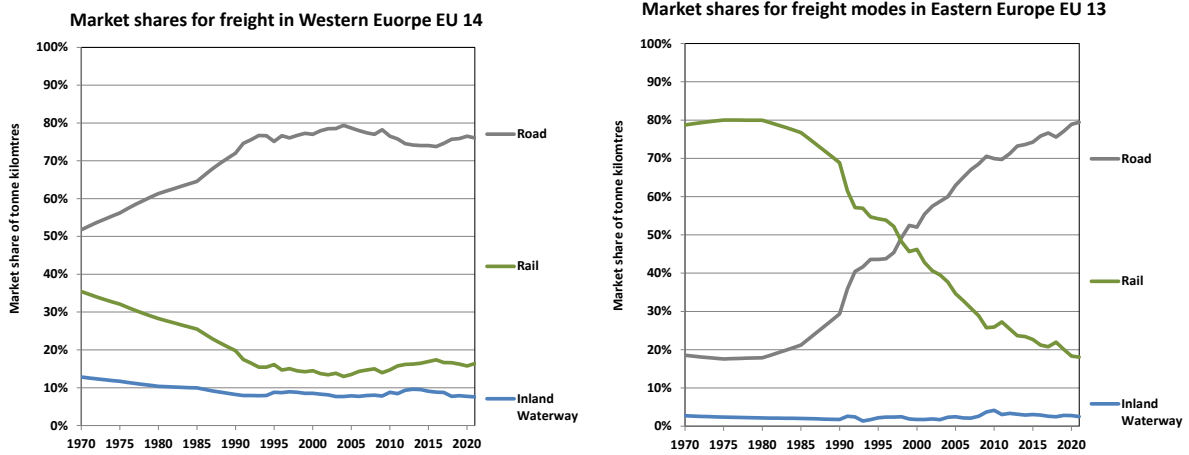


Figure 1: Evolution of market shares accounted for by modes of transport in Western and Eastern Europe, 1970–2021. Source: Processing of statistics from ‘EU Transport in figures 2023’ plus older statistics.

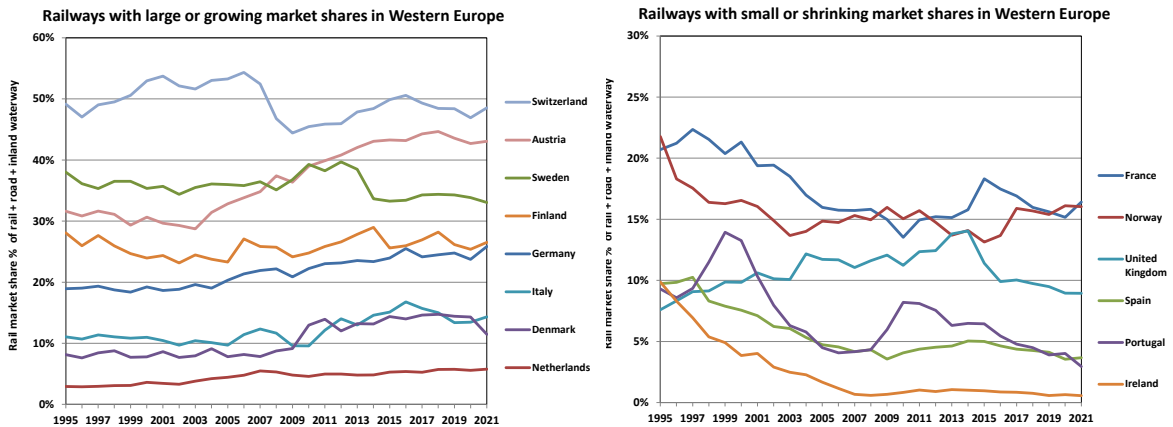


Figure 2: Evolution of market shares accounted for by modes of transport in various countries in Western Europe, 1995–2021. Left: Countries with large or growing market shares. Switzerland and Austria have the largest shares, while Sweden and Germany as well as Finland are also well positioned. Right: Shrinking market shares are noted in France and Spain, despite heavy transport volumes and long distances. Source: Processing of statistics from ‘EU Transport in figures 2023’.

Difficulties in financing and building new railways are making it hard to keep pace and achieve the objectives in terms of gaining a higher share of rail traffic and, in turn, our environmental goals. The trend has been more positive for passenger service than for freight transport, which faces difficulties in finding its place among more and more passenger trains. Delays have increased, in combination with neglected maintenance and an inability to tackle shared problems in a deregulated market.

One way of expanding the capacity of freight transport on the existing system is to run faster freight trains. If freight trains in Sweden could run at 140 km/h rather than 100 km/h, as is currently the case, we would be able to double the number of freight trains on our main lines during daytime hours. This would require new wagons, although the existing locomotives could still be used. This could be achieved by 2030 with a conscious commitment.

The other measure that would both expand capacity and reduce costs is running longer trains. In Sweden we have shorter freight trains than in Germany or Denmark, i.e. 630 m rather than 750 m, although we do have longer lorries. Running longer trains would require longer crossing tracks and bypass sidings, but it should be possible to run longer trains at night on double tracks, when passenger trains do not need to pass freight trains. Trains as long as 835 m run between Denmark and Germany, and it would be efficient to run them from Hallsberg in conjunction with the opening of the connection through the Fehmarn Belt Tunnel in 2029.

The industry has pointed out the need for achieving greater redundancy in the rail system through more triangular junctions and better diversion lines. This is something that is also needed for Sweden's new military defence system, and could be utilized in connection with major maintenance work and service disruptions.

Larger and more efficient freight wagons offer another means of making freight trains more efficient, and are perhaps more important than having a common signal system in Europe. It is possible to switch locomotives at borders, but not to reload the cars. And it is the wagons that are to reach the customer, not the locomotive. A higher loading profile in Europe would enable increased intermodal transport, while a bigger container would make it possible to integrate the wagonload traffic with the intermodal traffic. We have a high loading profile in Sweden compared to Europe, making this an issue which should be addressed at the EU level.

The railways constitute a complex system that is well suited for automation and digitalization. However, progress to date has been relatively slow. There is also a risk that some new systems, such as ERTMS, are making transport more expensive. Projects are ongoing within the EU with a view to increasing automation and digitalization, such as the development of automatic coupling. This entails added costs but, if properly implemented, could offer better brakes, and possibly lower costs and increased productivity as well.

Automated intermodal terminals, which have not been prioritized to date, offer another means of improving freight transport. Because the new storage facilities being built are adapted for lorries while industrial tracks are being closed down, it is important to expand intermodal transport operations. Achieving smoother transshipments will require the development of a system for the automated horizontal transfer of containers under contact lines. This will enable the terminals to be located on sidings, with the train running like a conveyor belt, loading and unloading en route. There will be regularly scheduled service involving numerous small terminals rather than endpoint traffic involving just a few large ones. The freight train can then cover a bigger market, and no switching or

shunting will be needed. Such trains can also be combined with long electric lorries in an energy-efficient and fossil-free transport chain.

What then is the potential for rail transport in the market of the future? Railways constitute an efficient and high-capacity mode of transport, one that also requires little energy and generates minimal emissions. Electric trains have been in existence for over 100 years and are constantly developing. The rolling resistance between steel wheels and steel rails is extremely low, and trains can be run safely at high speeds. We do not need high-speed trains for freight, but freight trains that travel up to 160 km/h already exist, and their further development could make transports faster and expand the industry's market in the future.

Many customers have pointed out that the railways are essential to basic industry shipments of timber, steel and ore. Given faster freight trains and more advanced intermodal transport, freight trains could also play a role in shipping high-value freight. Railways could also find a market in the area of smaller consolidated shipments if shipping companies can organize for them appropriately, and if the railways can maintain sufficiently high quality.

Railways will obviously come to both cooperate and compete with lorries and maritime shipping. Maritime shipping is essential for long-distance foreign trade and can also serve as an efficient mode of transport for coastal industries. The lorry currently reigns supreme in terms of short-haul shipping, while dominating at longer distances as well. Lorries will continue to be indispensable for short-haul shipping in the future, and for feeder shipments to rail terminals. Lorries will also be used in future for long-haul shipping and for more dispersed goods, albeit likely more in combination with railways and maritime shipping.

Electric lorries will gradually replace fossil fuel-powered vehicles, although their energy consumption will always be high. The rolling resistance of rubber tyres on asphalt is roughly 15 times higher than that of steel train wheels against steel rails. Road transport also generates high levels of particulate emissions, which pose a health problem. In addition, heavy lorries cause wear on roads and contribute to the road system suffering from a maintenance backlog.

It is possible to 'platoon' lorries close together, thereby reducing air resistance. It will certainly be possible to run self-driving lorries, at least on the major roads. One freight train with one driver is equivalent to 40 lorries, and it can also be self-driving or remote-controlled. The development of autonomous vehicles, both cars and trains, will no doubt occur gradually, but some form of supervision will always be necessary. However, the work performed by lorry drivers in connection with loading and unloading must not be underestimated.

Maritime shipping could also be developed further. There is a long-term trend toward bigger and bigger vessels, a trend which may be enhanced by international conflicts. Maritime shipping is energy-efficient but generates heavy emissions at present. Electric propulsion is not a realistic option for large boats and long distances, although biofuels are a possibility, and sailing could at least serve as auxiliary power.

The future development of the total transport market is presently uncertain because of wars and conflicts. There is a trend towards fewer goods needing to be transported. Digitalization entails that fewer papers are needed while, on the other hand, e-commerce requires more shipping boxes. Less shipping will also be needed as petroleum is replaced by wind and nuclear power. The need to transport rubbish will also grow in the short term.

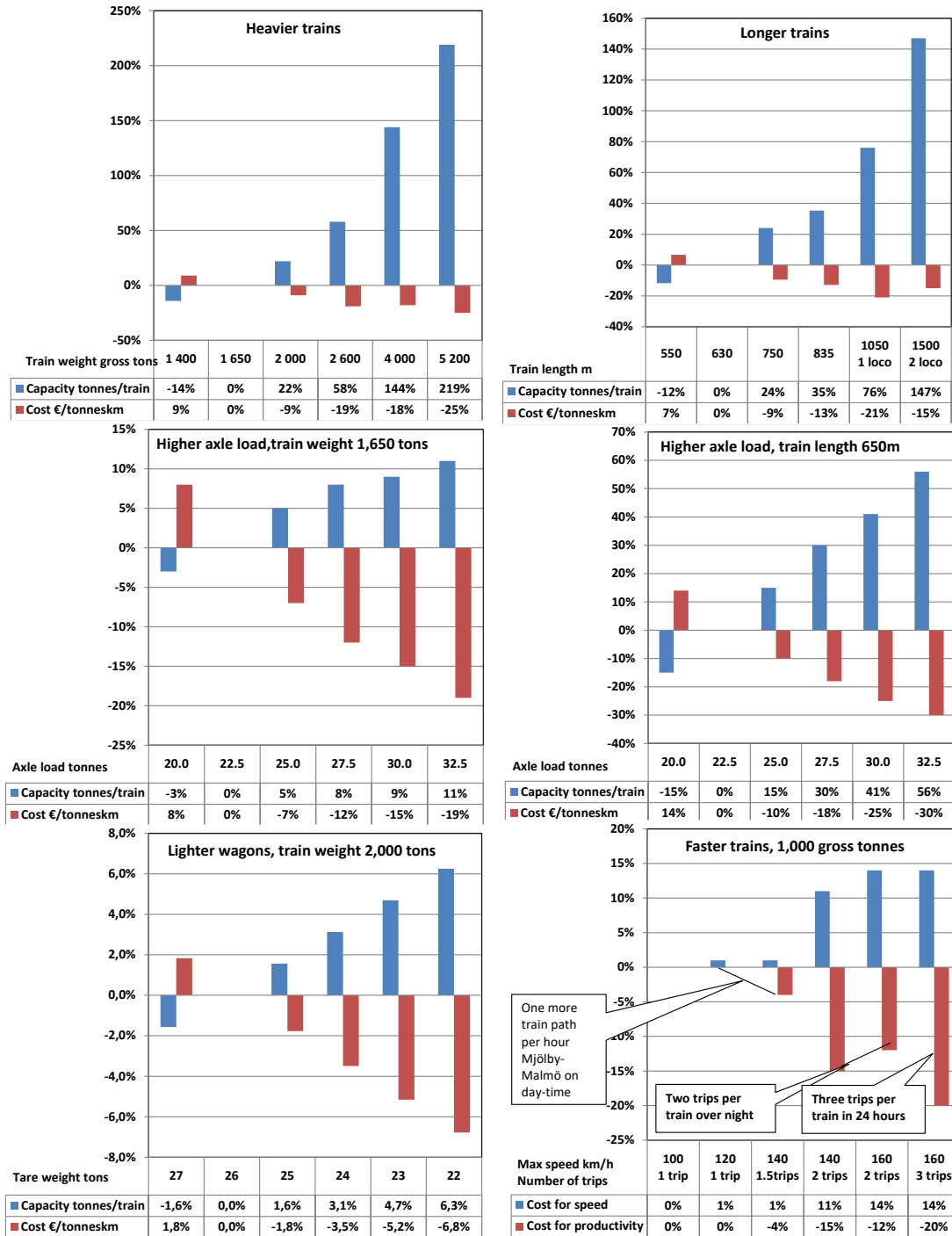


Figure 3: Assessment of measures in terms of capacity and cost. Note that the scales differ. Source: Royal Institute of Technology

More transport will be needed if all the world's inhabitants are to enjoy the same standard of living as we do in the industrialized world. The question is whether the climate will tolerate that, and there are those who advocate for a circular economy that would minimize the need for transport. All of this is uncertain, nor is it likely that we will stop transporting goods entirely in the future, but transport must be carried out in a way that gives greater consideration to the environment. We will consequently need lorries, ships and especially railways in the future, but they could also be combined more efficiently.

## **What measures are needed to ensure that freight trains play a bigger role in the future?**

To start with, we will propose measures that would not cost money, or at least not much. We know that new railways need to be built to expand capacity, and we also know that more maintenance is needed to improve the quality of our rail service. These problems are well known and discussed a great deal within the industry and politically, but we do not believe that we can find any new solutions in this area. In this analysis we are consequently concentrating on other measures which have perhaps received less attention heretofore. Many of these proposals are based on views obtained through interviews with 25 industry representatives.

### **1. Create a concentrated effort for freight transport by rail in Sweden**

Freight transport has had to take a back seat in terms of investment planning, timetable planning and operational control. A pooling of resources is needed for freight; the Swedish Transport Administration is too scattered, and a comprehensive approach is needed. Appoint a freight Commander for railways and form a working group comprising the freight transport companies and customers. Create a programme with a timetable and a special fund, and get the ministry, the customers and the railway companies on board.

### **2. Deregulate the deregulation**

An overly extensive and cost-intensive bureaucracy has built up that is working counter to the aims of facilitating transnational freight transport by rail and achieving an international market for rolling stock. There is, simply put, a need to deregulate the deregulation. A moratorium should be imposed on new regulations for the railways. The EU should try out new regulations and levies on maximum amounts, and require a trial period in which licensing may not take more than a set amount of time.

### **3. Implement the deregulation process fully in all countries**

The trends in those countries where the deregulation process has been carried out fully are, as a rule, more positive for the railways than is the case in countries where deregulation has not been implemented in practice. It is consequently important for the EU to put pressure on those countries that are slowing down the process. The EU should be able to apply pressure through sanctions, so that those countries do not delay new transport solutions unnecessarily. The option of using EU funding for investments in the TEN-T network could offer one means of stimulating deregulation.

### **4. Create more capacity through simpler measures**

It is generally known that there is a capacity shortage in the rail system and a need for major investments in the long term, but also that they are difficult to finance and take far too long to implement. Consequently, prioritize measures in the traffic pattern that can yield major capacity gains in the short term, such as running longer trains at night on main lines when freight trains do not need to be circumvented, running faster trains by updating the brake weight percentage tables, and creating a virtual double track from two single tracks. A trial in which an 835 m-long freight train is run between Hallsberg and Hamburg should be conducted in order to exploit the potential of the fixed link through the Fehmarn Belt Tunnel. The needs of the military can also be met with better diversion lines.



### **5. Develop new maintenance methods and organize maintenance better**

New methods could be developed to reduce both times when tracks must be closed and the total maintenance costs. A method has been developed in Germany in which a lengthier closure is imposed over a continuous period instead of multiple small closures. The total closure time is then just one-quarter of the usual duration. Track work should also be better coordinated with the industry's maintenance periods. Urgent track faults could also be better organized via longer contracts and incentives for preventive maintenance, or by performing it either entirely or partly independently. The Swedish Transport Administration could also provide a collective machinery pool.

### **6. Create a commonly shared information system and a database for freight transport by rail**

A commonly shared information system could be created between customers and transport companies so that new customers could also find out about the options available for transporting freight by rail, as could a means of selling idle capacity in the existing rail system. Such a service could be achieved with Swedish Train Companies [*Tåg företagen*] taking the initiative in creating it, and it could then be run by operators and freight companies as a joint enterprise.

### **7. Facilitate intermodal transport via stimulus measures**

Track access charges, climate compensation and the taxation of lorries need to be changed in order to stimulate the expansion of intermodal transport. A portion of these levies could then be used to guarantee a set minimum volume for new transport arrangements, or to organize industry-specific trains, such as food trains between Southern Sweden and greater Stockholm Region. Bottlenecks in the loading profile should be eliminated, and Sweden should work to ensure that a higher loading profile is prioritized within the EU.

### **8. Let the Traffic Control Centers take customer's needs into account**

Let the Traffic Control Centers [*Trafikledningen*] stimulate new rail transport by abandoning the five-day rule (this rule constitutes that it will take at least five days to get a timetable for a new ad hoc train). It should be possible to construct a timetable in a day using MPK [Market-adapted capacity planning]. Codifying obstacles in the rail system's loading profile in a database would enable the operators to search out shipping routes themselves. The Traffic Control Centers could also ensure access to industrial tracks. The Traffic Control Centers could assume a strategic role during crises and in wartime by fostering readiness during peace time.

### **9. Develop new technologies for more efficient transport**

The funds that are committed to develop the railways must go towards projects that create more efficient railways that offer lower costs and promote competition between manufacturers. ERTMS should be overhauled so that costs can be radically reduced. Develop rolling stock for higher speeds, which is one key to achieving better rail capacity utilization while also creating a bigger market for the industry. The digital automatic coupling system is on the verge of being developed, but the development of automated container reloading for intermodal transport is at least as important. Relatively simple measures that could be implemented gradually include installing sensors on freight cars to prevent derailments and using RFID technology to track freight cars. The financing of the development of intermodal transport should be reviewed.

## 10. Establish an effective Railway Administration

Our interviewees both from transport companies and their customers voiced strong criticism of how the Swedish Transport Administration functions. It may be summarized by saying that the Swedish Transport Administration [Trafikverket] is insufficiently customer-oriented. The Swedish Transport Administration is there for the customers, and its customers are the train companies, while its end customer is the industry. There is no reason for timetable planning for trains and for roads to reside within the same organization; after all, no timetables are planned for road traffic. The expertise required for the railways would be better utilized if railway-specific functions were housed in a separate agency. Sectoral responsibility could also be established for railways. A new Railway Administration [Järnvägsverk] could be created by consolidating the railway-related functions in a new organization. The Swedish Transport Administration can be responsible for road traffic. The forecasts and joint planning could be taken over by another agency.



*Figure 4: Long and faster freight trains offer the best means of expanding capacity and reducing the cost of transporting freight by rail. It is especially important to introduce longer, faster freight trains in order to exploit the fixed link through the Fehmarn Belt Tunnel, and to bolster rail use in connection with shipments abroad.*

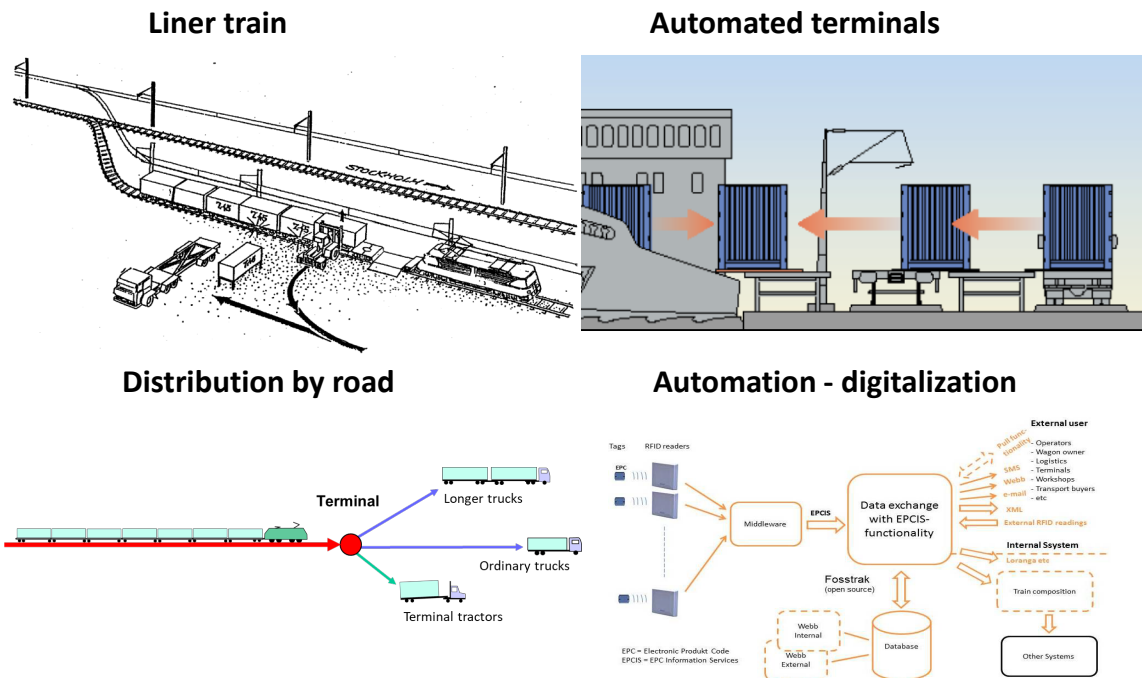


Figure 5: Intermodal transport must be developed so that trains and trucks are combined in a better way. Doing so will require fully automated terminals where trains can be loaded and unloaded under contact lines. This will enable trains to make regularly scheduled runs and stop at terminals on a siding to load and unload containers. Source: Capacity4Rail, Royal Institute of Technology Railway Group KTH.