Trends in Danish Transport 2004

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Preface

Transport is an important aspect of a society and it affects both individuals and industry to a large extent. A good transport system enables the industry and service sector to trade globally and increase production; it also provides individuals with better opportunities in the everyday life. A good transport system is characterized by a good interaction between the different means of transport, because it provides the best options for the industry and the citizens.

The objective of this report is to indicate and discuss the future essential challenges and trends of the transport sector in order to ensure a good basis for the political discussions in the years to come. The report therefore consists of both information about the Danish transport system and a description of the expected development in the transport sector. The ambition is to be able to analyse the challenges that the Danish transport faces. Thus, the aim of this report is to form the basis of a broad political discussion. This English version is shorter than the original one, however, it still outlines the main challenges that the Danish transport faces and thus it can also form a basis of a political discussion. It consists of chapter one of the original report and an executive summary.

Mobility adds values is the headline of Chapter 1 and is an overall description of the trends and challenges within the transport sector. Traffic congestion is identified as one of the primary challenges in the transport sector in the coming years. For many years one of the main ambitions in Danish transport policy has been to build and upgrade the transport network, but now there is a need for changing the focus more to maintenance, gradual expansion and adjustment of the infrastructure capacity in existing transport systems to avoid congestion in raising too much.

A better environment and road safety has also a high priority in the years to come. Focus on efficient freight transport as a mean of further growth in the economy is also identified as an important focal point. A more efficient public transport is another key area that is analysed in the report.

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Chapter 1. Mobility adds value

A modern society cannot work without mobility, that is, without the possibility for people to travel from one place to another, such as going to and from work, leisure activities, or holidays; or the possibility for movement of goods between companies or from companies to consumers.

A modern society cannot work without good mobility,

However, the act of transport is not an end in itself; rather it is a means to an end, such as getting to work, visiting friends, or delivering goods to shops. Therefore, it is crucial for individuals as well as for companies that Denmark has a well-functioning transport system.

Denmark has an efficient infrastructure, which is at the top of its class internationally. However, a number of considerable challenges lie ahead. We must maintain the quality of our infrastructure so that Denmark continues to have a well-functioning transport system, which can contribute to enhancing prosperity and growth in Danish society.

…it is therefore important that the relatively high quality of infrastructure in Denmark is maintained,

For industry in particular, cheap and efficient transport systems have led to goods being increasingly produced where best and cheapest. Good transportation opportunities are therefore part of the collected competitive factors applying to companies. Therefore, efforts to make freight transport more efficient will be continued.

…an infrastructure of importance to the competitiveness of companies,

Excellent transport links help making the production and distribution of goods easier by reducing storage costs, ensuring faster and more reliable delivery, etc. Excellent transport links are significant for companies' choice of headquarters and are also important as regards their recruitment and retention of employees, since travel time is significant for peoples' choice of workplace.

Nearly every Dane makes daily use of the transport system. The average Dane will spend more time on transport than on completing first to ninth grade compulsory education. Furthermore, Danish households spend on average around 15 per cent of their disposable income on transportation, which is more than they spend on e.g. food.

…and for people, who are spending more time on transport than on the time taken to complete first to ninth grade compulsory education

In other words, transport is an integral part of the way society is organised and the quality of the transport system influences people's quality of life and the 'industry's competitiveness.

1.1. A refocussing of the transport policy

Transport policy focus is changing, from building a national road and railway network,

For decades one of the key aims of Denmark's transport policy has been to build and upgrade a high-class national road and railway network. We have come a long way in realising this aim. The motorway system is the spine of the Danish road network. It forms the so-called "big H" which stretches from North to South in Western Denmark (Hirtshals and Frederikshavn to Padborg), from North to South in Eastern Denmark (Elsinore to Rødby), and across from Esbjerg in the West and to Copenhagen in the East. Similarly, Denmark is linked by a mainline railway network stretching from Aalborg in the North of Jutland to Padborg and across from Esbjerg to Copenhagen.

…to the future challenge of optimising the utilisation of our existing transport infrastructure

Emerging transport-policy challenges will not focus to the same extent as previously on connecting different parts of the country. The future challenge will be to optimise the utilisation of the existing transport infrastructure through focusing on maintenance, gradual expansion, regulation, and adjustment of the infrastructure capacity in existing traffic systems. In particular, the focus will be on better traffic management in those parts of the country where congestion problems are greatest.

Access and mobility differ depending on where in Denmark you live.

Providing all people, no matter where in Denmark they reside, with the exact same degree of mobility, is not a transport-policy objective. This would mean an inappropriately large financial investment and it would be an inappropriate way to spend society's limited resources. Similarly relevant is the fact that the accessibility to different parts of the transport systems will always vary relative to whether people live in the countryside or in an urban area. People often choose to give access to the transport system lower priority in relation to other benefits. For example, the benefit of residing in an area of natural beauty or having to pay a low housing costs. However, there is a marked uneven distribution of the benefits in the sense that people residing in small towns on Funen or Jutland on average spend less time on transport than people residing on Zealand, despite the fact that the motorway and public transport networks are better expanded on Zealand. The explanation is that congestion problems vary considerably from region to region.

Congestion is one of the reasons for differences in mobility

Despite the fact that the transport area in general contributes to social growth and wealth, this area is also connected to a number of social costs. Congestion of the road and railway networks means a significant time-loss for individuals and industry.

Time-loss due to congestion is one of the most important factors influencing people's experience of the quality of the overall transport system. Congestion is therefore one of the key parameters in political considerations about the expansion of the transport infrastructure.

1.2. Congestion - a special challenge

Time-loss due to congestion in the Greater Copenhagen Area means an annual cost for society of about DKK 5.7 bn.

Congestion is a significant problem on a number of Danish roads today. This applies not the least to the Greater Copenhagen Area where a recent study of the socioeconomic consequences of congestion estimated that we use 120,000 additional hours of transport per workday due to congestion on the roads. This corresponds to a loss of DKK 5.7 bn. each year for Danish society. However, significant time-loss due to congestion is also a problem in

other regions of Denmark, namely in the so-called Triangle Area in Jutland, across Funen, and between the cities of Aarhus and Vejle. Furthermore, the railway line between Copenhagen and Ringsted on Zealand constitutes a bottleneck, often prone to delays.

…however we will have to tolerate a certain level of congestion

It is neither realistic nor financially appropriate to solve all congestion problems all the time. One of the future policy challenges within transport is therefore to decide in more detail the level of congestion to be tolerated.

However, we have come to recognise that a number of roads and railways experience massive congestion problems to the degree that action is paramount. With the transport agreement that was entered into in November 2003 by the Government, the Christian Democrats, the Social Liberal Party of Denmark, and the Danish People's Party, a series of important steps have been made to mitigate congestion problems in Denmark. Accordingly, the transport agreement contains different investment initiatives within the road and railway area to enhance the capacity of the overall transport infrastructure.

Traffic will continue to grow; and the risk of increased congestion along with it

Such investment initiatives will be able to mitigate some of the more dire congestion problems in the forthcoming years, which will see an estimated 1.6 per cent annual increase in private-car traffic, whereas lorry traffic, according to the Danish Transport Research Institute's estimate, will grow by 1.2 per cent. The growth will not however be evenly distributed throughout Denmark. For example, the steepest growth is estimated to be on the motorways. It is estimated that large areas of the state road network will see growth rates of 2.0 to 2.5 per cent annually, which corresponds to an overall growth of about 25 to 35 per cent by 2015.

…especially in the Greater Copenhagen Area, in the Triangle Area, and in certain distinct traffic corridors,

Furthermore, traffic projections show that congestion problems are becoming ever more challenging in the Greater Copenhagen Area, in the Triangle Area, and on certain distinct traffic corridors such as the Vejle-Aarhus route.

…e.g. because the number of cars is growing rapidly in the Greater Copenhagen Area,

One of the most essential explanations for the congestion problems in the Greater Copenhagen Area, is the expected more rapid growth in the number of cars in this region of Denmark compared to elsewhere. The average growth in car ownership for the entire country was 1.5 per cent in the period 2000-2004. In Copenhagen County and Frederiksborg County the growth in the same period was almost four-times greater, namely five and six per cent respectively. But the number of cars in the two municipalities City of Copenhagen and City of Frederiksberg is still significantly below the national average.

…and increasing house prices lead to increased commuting

In addition to the expected growth in the number of cars, commuting patterns have changed, which has greatly influenced the development of traffic. Today more people commute to and from the Greater Copenhagen Area than previously. This development has gone hand in hand with increasing house prices in the area and with the fact that many new workplaces are sited in the suburbs of Copenhagen.

Over the past 10-15 years, the Danish State has instigated a number of comprehensive infrastructure projects to mitigate congestion problems in the Greater Copenhagen Area. The state has participated in e.g.: the establishment of the Copenhagen Metro; the Copenhagen Circle Line project; the ex-

pansion of the Frederikssund railway into double tracks; the establishment of a railway connection to Copenhagen Airport; and in the procurement of new trains for the Copenhagen Suburban Lines. Moreover, the state has contributed on a continuous basis to the capacity expansion of a number of the busiest motorways in the region.

There is need for special efforts to mitigate congestion problems in the Greater Copenhagen Area.

Despite these numerous initiatives, the Greater Copenhagen Area is still the region of Denmark where the greatest congestion problems are expected in the forthcoming years. Therefore, it is expected there will be need for special efforts to maintain good mobility in the region, and to ensure that Copenhagen can remain amongst the cities of Europe with the best mobility.

Several instruments for solving congestion problems, e.g.:

There are several possible instruments for mitigating congestion problems, for example the continued expansion of the transport infrastructure, better utilisation of the existing infrastructure, and measures to help reduce the growth of traffic in the traffic corridors most heavily under pressure. It is probable that the congestion problems must be solved using a combination of these three instruments. In the Greater Copenhagen Area, the range of possible solutions is somewhat greater. For example, the potential and effect of expansion of public transport is greater.

…expanding the infrastructure,

The expansion of the transport infrastructure in larger cities, including the Greater Copenhagen Area, is often significantly more costly than expansion in e.g. rural areas. By contrast, the amount of traffic is often greater in urban areas than in rural areas, so from a socio-economic point of view investments in the Greater Copenhagen Area are likely to be profitable also in future. Investments in new infrastructure should, however, always be on the basis of thorough studies of traffic-related, economic, and environmental consequences.

…ensuring better capacity utilisation and improving public transport

Better utilisation of the existing infrastructure can, for example, be achieved through increased use of so-called "intelligent roads" that use information technology to prevent queuing. Also a general improvement in the quality of public transport can help improve traffic management, providing that more people choose to travel by bus or train than by private car.

…influencing transport demand through political measures

Finally, measures can be launched to directly influence the demand for transport. A targeted location and parking policy will make public transport an even more attractive choice and can thereby contribute to reducing road traffic congestion problems. Correspondingly, congestion charges or road tolls will be able to influence transport demand. In a number of European countries congestion charges and road tolls are used as congestion-regulating measures. Increasing charges as a measure of regulating congestion, however, would entail a number of negative economic and distribution-related side effects. In addition to this, Denmark already has one of the highest levels of taxes on transport in Europe.

It is important to assess thoroughly how measures interact to ensure the best management of traffic

In step with the expected growth in traffic there will be a need in the forthcoming years to assess how the measures mentioned above interact and thereby contribute most appropriately to mitigating the congestion problems in the Greater Copenhagen Area. In this connection, it is important to assess the socioeconomic and traffic-related implications of individual measures in detail.

1.3. Better environment and road safety

It is equally important to reduce the financial costs of the transport sector, since value-adding mobility is based on an optimal balance between mobility, economy, environmental pressure, and health risks.

The external costs of the transport sector relating to climate and environmental impacts are estimated at about DKK 9-13 bn. annually,

…whereas the socioeconomic costs related to traffic accidents are estimated at about DKK 7 bn. annually

The transport sector's costs consist of public expenditure on the expansion and maintenance of the transport infrastructure but also a number of indirect, or external, expenses arising from the negative impacts the transport sector is responsible for in terms of e.g. environmental impacts and traffic accidents. A study recently published estimates that the external costs of the transport sector within road and railways in terms of the climate and the environment constitutes somewhere between DKK 9-13 bn. annually. These consist of around DKK 5-9 bn. external costs in connection with traffic noise, whereas air pollution and climate change add up to an estimated cost of around DKK 4 bn. annually. Personal costs apart, traffic accidents are assessed to cost Danish society around DKK 7 bn. annually.

Reducing the negative climate impacts from the transport sector's emissions of CO_2 has proven an especially challenging and cost-intensive task. One of the significant problems related to reducing climate change from transport, is the fact that it has not been possible to develop efficient and cheap technologies that can reduce the transport sector's energy consumption and thus the consumption of fossil fuels. The transport sector's emissions of CO_2 are, by and large, directly proportional with the level of energy consumption, and, contrary to other substances, emissions of CO_2 cannot be removed using exhaust after-treatment equipment. Neither can CO_2 be removed from diesel or petrol, as has been proven possible for a number of other substances.

It has proven socio-economically more profitable to reduce CO_2 emissions in other sectors than the transport sector

Studies have shown that it is more profitable, from a socio-economic perspective, to reduce the overall emissions of CO_2 in other sectors than in the transport sector. This does not mean that we should ignore the CO_2 problem in the transport sector. However, we must be more wary about which measures we employ in reducing the transport 'sector's negative effect on the climate.

Air pollution from transport has been reduced over recent years, however considerable work to ensure a further reduction is ongoing.

Through technological progress a reduction in the transport sector's impact on the environment has been achieved in a number of areas. Especially worth mentioning is lead pollution, but also sulphur dioxides, hydrocarbons, and carbon monoxides have been reduced successfully through improved technology. In other words, a number of aspects of air pollution from transport have been reduced significantly. However, especially in urban areas considerable work to reduce air pollution further still remains. In particular, there is some uncertainty as to the health-related consequences and the exposure to particles.

Traffic noise is another challenge that must be met. Significant work has been carried out in order to reduce noise from traffic, especially in connection with the expansion of the state road network and in connection with Rail Net Denmark's mainline network.

Comprehensive efforts are being made to reduce traffic noise in connection with new construction and rebuilding of the road and railway networks.

Thus, today a number of noise-abatement considerations are already being made in connection with the establishment and expansion of the road network. Over the last decades, about DKK 210 mill. has been spent on noise-abatement measures along Danish state roads, and about DKK 220 mill. in connection with the railway network. One example is the expansion of the Motorring 3 motorway. Here, about DKK 190 mill. of a total building and construction budget of DKK 1,800 mill. were spent on combating noise. Furthermore, an additional DKK 100 mill has been earmarked recently for measures along state roads.

It should however be noted that between five and ten per cent of the houses exposed to noise are situated along state roads, whereas the remaining percentage are situated along regional and local roads.

One of the big challenges in the forthcoming years will be to limit noise nuisance from state as well as regional and local road networks. A national road noise strategy has been prepared against this background. The strategy describes a series of possibilities for regional and local authorities to reduce noise impacts.

There has been a significant drop in the number of road deaths over the last 30 years

Reducing the number of road accidents continues to be an important task, even though the number of people killed in traffic has been falling over the past many years. We have to go all the way back to the 1950s to see fewer road deaths than in 2003. Despite a significant growth in traffic, we have succeeded in bringing down the number of people killed or seriously injured in traffic accidents by more than 30 per cent over the period 1983 to 2003.

Being able to travel safely and securely on the roads is of great value to people,

Being able to travel safely and securely on the roads has great value, not only for the individual but for society, too. Traffic accidents are often linked to great human cost, however, fortunately, by far the majority of road accidents cause only material damage or less serious personal damage.

…consequently, targeted measures aimed at those people at greatest risk of road accidents are important,

An assessment of how the number of traffic accidents can be reduced further is important in this connection. This includes assessing the need to instigate targeted measures aimed at those people who are at greatest risk of road accidents.

Moreover, it should be noted that about 90 per cent of road accidents are due to human error, and, furthermore, evidence shows that young people, between 18 and 24 years of age, are involved in traffic accidents more often than other population groups. The problem is particularly great for young men. Driving under the influence of alcohol is a further significant factor in many traffic accidents. Alcohol is involved in about one in four fatal accidents.

…as it is to adjust speed to traffic conditions,

Speed is the single, individual factor that most significantly affects the consequences following from a traffic accident. Furthermore, exceeding the speed limit is often, in itself, the cause of accidents. It is therefore important that speed is adjusted to the individual traffic situation, that is adjustment in relation to the design of the road, amount of traffic, and time of the day etc.

The challenges within the road safety area therefore involve urging continued positive development, e.g. through technological development, and through continued targeted information campaigns and ever more "self-explanatory" and "forgiving" road layouts. Forgiving in the sense that roads and road objects etc. are designed to minimise damage and injury from traffic accidents.

…and ensuring that roads are designed so that they are "self-explanatory" and "forgiving"

1.4. Growth requires efficient freight transport

Growth in freight transport is expected to continue to be greatest within the international transport of goods. A number of different factors are expected to contribute to this increased growth. The most significant factor is likely to be the increasingly international division of labour. Not only within the EU where the enlargement with new Member States is expected to promote the division of labour, but also in relation to overseas transport, where economic growth in the Far East is expected to lead to greater increases in freight transport between Europe and e.g. China.

International freight transport, in particular, is expected to rise,

Furthermore, it is expected that the continuing liberalisation of the freight transport industry in the EU, and between the continents, will lead to an increasing exposure of the transport sector to competition. The decision to establish the EU's internal market has had significant importance in this context, and it has meant new opportunities for Danish haulage companies. On the one hand, the enlargement of the EU will entail new potential markets but, on the other hand, it will mean that competition will be intensified, since pay levels are relatively low in the new Member States.

…because of the enlargement of the EU and ongoing developments in the international division of labour,

International division of labour, and increased company specialisation arising from it, impose growing demands on freight transport companies to understand the manufacturers' complex transport needs. This should be seen in connection with the fact that manufacturing companies are outsourcing their transport functions to an ever-greater extent, and, similarly, that raw materials and components are being freighted between different parts of Europe and/or globally to an ever greater extent. When, at the same time, manufacturing companies are reducing their stocks, consideration for precision and on-time-delivery becomes a decisive competitive factor for the freight transport companies.

…which imposes new demands on freight transport companies

Freight transport companies based in Denmark will not be able to compete on the basis of pay levels. The challenge for companies will be to continue strengthening and developing their knowledge and competency levels. Therefore, there will continue to be a need to enhance the use of new technology and the general level of education and competency, as well as increased use of new forms of collaboration, e.g. increased network building.

Freight transport companies based in Denmark must compete on quality

Intermodal transport, i.e. transport involving several different modes of transport, is forecast to gain greater significance in line with increasing congestion problems on Central European roads. Good and flexible alternatives are deemed advantageous for Danish industry in the long term. In this context, it is important to assess the need for improving specific ports/major traffic junctions, so that they achieve a size with regard to volume that can contribute to promoting efficiency.

Intermodal transport is forecast to gain greater significance in step with increasing congestion problems on Central European roads

In other words, there is need to strengthen the interplay between the different modes of transport and ensure flexible loading and unloading opportunities between road, railway, shipping, and aviation.

1.5. The challenge facing public transport - increasing passenger numbers

Public transport in Denmark receives in excess of one Danish krone in subsidy per passenger-kilometre

Whereas freight transport internally in Denmark and to and from Denmark is maintained without direct public funding, public transport in Denmark receives over DKK 10 bn. in public subsidies on an annual basis. It corresponds to more than one Danish krone for each kilometre travelled by a passenger in the public transport system.

…reasons for the subsidy include the fact that public transport help create mobility for people without a car at their disposal

The relatively large amount of money spent on subsidies for public transport in Denmark, and most other European countries, should be seen in connection with the fact that public transport is the only means of transport available for a large group of people who do not have a car at their disposal. Furthermore, public transport plays a major role for traffic management as a whole in urban areas and between certain of the larger cities. Phrased differently, public transport contributes to reducing the congestion problems in large cities such as Aalborg, Odense, Aarhus, and the Greater Copenhagen Area.

Despite the large public funding, public transport has had difficulties in a number of areas competing with the flexibility of private cars. A very significant proportion of the growth in passenger transport in recent decades is the growth in transport by private car. There are two general reasons for the difficult competitive conditions facing public transport. Firstly, the number of cars has increased tremendously along with increased prosperity. Secondly, public transport continues to have difficulties in competing against passenger transport by car on short and medium distances. Changing from one means of public transport to another is often time-consuming and increases the risk of delays. This is one of the explanations why many people choose the car.

Experience shows that public transport can serve as a good alternative to the car, if the product is good

However, it should be noted that recent years have seen considerable progress in railway traffic, with regard to longer journeys. This progress has particularly happened after the launch of the fixed rail links, where significantly reduced travel times in combination with more train departures have opened up for a leap in traffic by train between East and West Denmark. Experience thus shows that public transport can serve as a good alternative to the private car, if the product is good.

…and public transport has become more efficient - DSB reduced its operating costs per passenger-kilometre by 15 per cent from 1999 to 2002

The price of public transport has great significance for demand, and costs are important in terms of how much public transport can be offered for tender under a given license. It is therefore positive that Denmark has come a long way in terms of market-orientation of public transport and in making the public transport sector more efficient in recent years. The ongoing invitations for tender in the bus sector have meant that average prices per vehicle-hour for bus operations have fallen quite significantly since the early 1990s. Similarly, DSB (Danish State Railways) operating costs per passenger-kilometre have been reduced by about 15 per cent from 1999 to 2002. Had it not been

for these developments, higher prices and/or a lower supply of public transport services would have been a required.

Denmark has come a long way in liberalising e.g. Danish railway traffic,

The reorganisation process for railway traffic in Denmark has been carried through following a step-by-step market-orientation of the sector. This reorganisation has meant that Denmark, in a number of areas, belongs to the group of countries in Europe which has made the greatest progress toward greater market orientation of the railway sector.

…the greatest challenge in the forthcoming years lies in turning productivity benefits into better quality

The potential for furthering the efficiency of public transport is, however, far from fully exploited.

The greatest challenge in the forthcoming years lies in ensuring that expected continued productivity and efficiency benefits are converted into better quality, so that public transport can see a growth in numbers of passengers.

This could be achieved if the sector further enhances its customer focus. In other words, it should be better and easier to be a passenger on public transport. The future travel card is expected to ease travel by public transport. This travel card, which can be used as a means of payment as well as fare tickets on busses and trains, will make changing between bus and train easier.

The greatest challenge will be to ensure that the supply of transport is adjusted to customer demand, in the form of operating frequency, price and quality. In this context, how much should be invested in achieving a large supply of transport seen in relation to a high degree of reliability and a high journey speed should be given thorough assessment.

The problem concerning poor reliability often depends on the fact that even minor delays of 5 to 10 minutes may result in overall travel delays of maybe 20 to 25 minutes, because the subsequent train or bus connection is missed.

Continued quality developments may be ensured by enhancing the operators' incentives to focus on service and precision

Quality developments in public transport will be ensured by enhancing the operators' incentives to achieve precision and a high standard of service, as well as using modern vehicles and equipment.

In the bus area, one might consider initiating trials with contracts allowing the operator access to keep part of, or the entire, passenger income revenue, and giving them greater responsibility for, and interest in, attracting more passengers. In this way, the operators will have the closest contact to customers and will thus also have the best preconditions for assessing passenger needs and wishes. It is therefore important to maintain and develop close collaboration between the private operators and public authorities responsible for regulation of the traffic.

However, continued market-orientation is a challenge not only for public transport. The entire transport sector, along with other sectors, is facing ever more demands for increased efficiency through, for example, increased use of market mechanisms, and greater degree of orientation toward international markets.

1.6. Continued reorganisation and liberalisation of the transport sector

In order for the transport sector to be able to meet the challenges for continued efficiency, ongoing adjustment and development of management systems are a prerequisite.

The transport sector has changed primary focus from security of supply to market-orientation,

Organisation structures in the transport sector have changed fundamentally during the last 30 years. Somewhat simplified, one might say that there has been a smooth transition from security of supply and strict state control and regulation to increased liberalisation and partial privatisation of the transport sector.

Two general trends have been especially influential in this development. Firstly, focus has changed from a national to a more international level. Co-operation in the EU and the development of the EU's internal market with free movement of goods, people, services, and capital has contributed immensely to this development. Secondly, it has been a growing belief that competition can be used as a means to ensure increased efficiency.

…although not all parts of the transport sector have come equally far in the liberalisation process,

Not all parts of the transport sector have had the same preconditions, and not all parts have reached the same degree of liberalisation as elsewhere in the sector. However, Denmark is one of the countries in Europe to have come furthest in the process toward liberalisation of the transport sector. In this connection, it should be noted that change processes can often be quite complicated and take a relatively long time to implement. There is often need for a strategy in stages, involving the implementation of different stages in order to reach the final goal of liberalisation.

… but gradual reforms of e.g. the railway area have brought Denmark up to speed with leading European countries

The liberalisation of the railway area and the gradual reforms, carried out by the "old" DSB, are graphic examples of how comprehensive a process we are dealing with. The extensive changes, which in recent years have been carried out in this area have brought Denmark up to speed with the leading European countries with regard to liberalisation of the railway sector. Major tasks, however, still, lie ahead before a free and accessible European market for railway traffic has been realised.

Two key conditions have special significance with regard to assessing the effect of the liberalisation process. One condition relates to transaction costs. Typically, these are administrative costs, which necessarily follow as a consequence of changes in the terms of ownership for public companies. The other condition relates to the security of supply for people in general and for industry.

The reorganisation of the transport sector has had a positive effect for people in general and for industry - but it will be some years before effects are fully visible

The results from the reorganisation processes, which have been launched in the transport sector are hard to state with precision. However, there is no doubt that liberalisation has led to increased market and customer orientation, which seen as a whole have a very positive effect for people in general and for industry. It should, however, be noted that these are long-term reorganisation processes which will require a number of years before the reorganisation becomes fully implemented.

The reorganisation process for the railway sector in Denmark has been initiated and will continue for a number of years to come. A number of challeng-

ing tasks still lie ahead within this context and they need to be addressed. They require openness of mind toward adjustments and comprehensive changes and can ensure increased mobility, which in turn adds value to Danish society.

Summary of Trends in Danish Transport

Summary of Chapter 2, Transport – an important sector for society

This chapter describes the transport sector's significance for society through a number of illustrative examples. The chapter reasons that the transport sector has great significance at several levels of Danish society. In general, for the economy, but also to a great extent for both industry and individuals. The sector's significance for society is moreover explained by its importance for economic growth and development potentials.

The first focus is on the transport sector's importance for the economy. Here, it is pointed out that the transport sector is contributing increasingly to the growth of the Danish economy. Nearly 6 per cent of Denmark's gross added value comes from the transport sector, which is more than what is contributed by e.g. the building and construction sector, or by agriculture. Furthermore, the transport sector is important for employment, since the sector employs around 130,000 people, making it the fifth largest sector in Denmark, in terms of number of jobs.

The transport sector is also important with regard to public-sector finances. In fact, the sector contributes net revenues of about DKK 24 bn. (EUR 3.2 bn.) annually, primarily through green taxes, registration fees, and taxes on petrol and diesel.

Despite its positive influence on the economy, there are a number of external costs associated with the transport sector. That is, costs imposed on society by transport without any direct compensation. These external costs were estimated at about DKK 40 bn. (EUR 5.3 bn.) annually in a recent study.

Chapter 2 also reasons that the transport sector, through its important role within industry, has a positive impact on the Danish economy and Danish society in general. Good transportation and mobility are important prerequisites for enhancing the competitiveness of Danish industry. The chapter also states that Denmark at present has one of the most efficient transport systems in Europe.

Moreover, it is noted that increasingly more efficient transport has helped form the increased specialisation and concentration of Danish industry and, in addition to continued internationalisation, the transport sector's significance for Danish industry is growing. The degree of specialisation and the global division of labour are major drivers in economic development. Good transportation and easy access to the railway and road networks are important factors when siting companies.

Finally, the chapter addresses the significance of the transport system for people in general. It is noted that almost every Dane is in contact with the transport system on a daily basis. Between leaving home in the morning and returning home in the evening, a majority of Danes will have made use of the Danish transport system, in one way or another and often on several occasions. Whether or not they realise it, travelling in traffic takes up large part of people's daily lives. The individual Dane spends an average of around 50 minutes each day on transportation; and an average of around 15 per cent of a household's budget is spent on transport. In other words, a lot of time and money is spent on transport in Denmark.

Summary of Chapter 3, Development trends in the transport sector

Chapter 3 pivots around the subject of trends in the transport sector over recent decades. The historical trends within traffic and transport are described in order to provide an indication of future traffic and transport demands in Denmark, and to provide an indication of the challenges to be tackled in the years ahead. The chapter outlines the development in both passenger and freight transport in Denmark. It finishes by suggesting which factors will continue influencing the development of Danish traffic and transport in the future.

It is pointed out that passenger transport has risen by well over 50 per cent from 1983 to today, whereas GNP has gone up by well over 45 per cent in the same period. The growth in passenger transport has been by car but also by train for longer journeys.

The Great Belt Fixed Link has played a particularly important role in this development. Since the opening of the bridge across the Great Belt, ferry and air traffic have been cut back and rerouted. As travel time across the Great Belt has been reduced, passenger transport by car and train has increased correspondingly.

Private-car traffic has risen by about 60 per cent. The growth is greatest on the motorways, which have been expanded extensively in the period. In general, the entire EU has experienced a steep increase in travel by car. In Denmark, car traffic is slightly higher than the EU average.

The Greater Copenhagen Area has seen a change in the transport structure so that the number of train passengers on the S-lines (Copenhagen Suburban Lines) and on busses has dropped, while car ownership has increased and the Metro Line has been established.

Up through the 1990s, travel by bicycle fell, with a few exceptions, for example in Odense and Copenhagen. Odense was appointed National Cycle City of Denmark and in this context the city prioritised and aimed its efforts to improve conditions for cyclists.

Within freight transport, it is pointed out that the growth in Denmark's national freight transport has been significantly lower than the growth in passenger transport, which rose by 51 per cent. From 1983 to 2002, freight transport increased by about 27 per cent. This means, freight transport has increased significantly more slowly than GNP.

In the period from 1983 to 2002, lorries won market share from the railways and maritime transport, and today about 80 per cent of domestic freight movements are by lorry as opposed to about 67 per cent in 1983. In relation to freight transport, there was some extent of decoupling from economic growth. In the period 1985 to 2002, lorry traffic rose by only about 32 per cent.

Many of the trends described are expected to continue in the years ahead. In the Danish Transport Research Institute's forecast of developments in road traffic, car traffic is estimated to increase up to 2015 by an annual average of about 1.6 per cent, and lorry traffic by about 1.2 per cent. With regard to car traffic, the rate of increase will be lower than for the period 1983 to 2002, whereas lorry traffic is expected to increase slightly more than previously. The forecast is based primarily on the anticipation of continued economic growth.

Traffic trends are influenced by car availability and this availability has been increasing over the last decades. However, Denmark still has a relatively small total number of cars. Within the EU, only Ireland and Greece have fewer cars per capita. Therefore, there is a large potential for growth in the number of cars.

The anticipation of continued decoupling between lorry traffic and economic growth can be explained, in particular, by an increased focus on the efficiency of freight transport. Still larger lorries are being used, and movements are being planned and organised to ever-greater detail so that, for example, empty running is reduced and capacity exploited more optimally. The possible introduction of long haulage transport could reinforce this trend. Lorries as a means of transportation will continue to be the indisputably most dominant mode of transport for goods in Denmark.

Summary of Chapter 4, Mobility and accessibility in Denmark

Nearly everyone spends time on transport on a daily basis, and travel time greatly influences the freedom of movement of the individual. This applies whether the journey concerns commuting or travel in connection with other everyday activities. At the same time, the transport sector considerably influences other areas of society. The traffic situation and mobility, for example, have a great influence on Danish commerce. These conditions serve as a background for the exposition on mobility and accessibility in chapter 4. In simple terms, mobility expresses how good and fast the available transport solutions are, and accessibility expresses where the users are located relative to their different travel destinations.

The chapter also argues that it is important to include both mobility and accessibility when examining the traffic situation in Denmark. Transport conditions vary significantly between different geographical parts of Denmark.

From time to time it is asserted in general public debate that people on Zealand are better off in terms of traffic conditions since motorway stretches are longer and more well-developed relative to the geographical size of the region, and that in many areas public transport is also better. However, the quality of transport depends on other aspects than the physical conditions of roads. It also depends on conditions such as the degree of traffic pressure on the road network, the supply of public transport services, which means of transport is used, and which means are available. In addition, the distances travelled are defined e.g. by the availability of jobs and services in the local area, which influences the overall assessment of the importance of good transport conditions.

The chapter argues that there is no direct connection between the extent of the development of the transport infrastructure and recorded travel times. People in and around cities, where the infrastructure is generally well developed, have relatively low average travel speeds, and they therefore spend more time on transportation than in the areas with a less well-developed infrastructure. Although the Greater Copenhagen Area has a well-developed public transport system and a dense motorway system, it also has the lowest travel speeds in the country. The opposite can be said for rural areas or for small towns in Jutland and on Funen. Here, the relatively greater need for travelling long distances, i.e. less accessibility is compensated for by good mobility, and people therefore spend less time on transportation than people residing on Zealand.

There are different reasons for the nature of the traffic situation, for example, the fact that mobility is greatly dependent on car availability. From a transport-policy perspec-

tive, there are different opportunities for influencing mobility and accessibility, e.g. by expanding the infrastructure or public transport.

The chapter points out that providing all people, no matter where in Denmark they reside, with the exact same degree of mobility, is not a transport-policy objective. This would mean a disproportionate financial investment and would be an inappropriate way to spend society's resources. Similarly, accessibility will always be different for people residing, for example, in rural areas, compared to people residing in urban areas. Often people accept lower accessibility in return for other benefits. However, it is also relevant to examine whether marked imbalances exist between different parts of Denmark, when mobility and accessibility are seen under one.

Summary of Chapter 5, Congestion – a transport-sector challenge

In Chapter 5 focus is on congestion, of the roads as well as of the railways. Basically, there are two forms of congestion, however these are dealt with under one in this chapter. This is based on the assumption that congestion constitutes a nuisance irrespective of whether it affects railway passengers or motorists.

Congestion of the roads is a natural result of the growth in traffic throughout recent decades. In the forthcoming years, congestion will increase along with the expected growth in transport. The most disadvantaged areas are primarily in the Greater Copenhagen Area and in the Triangle Area. The time loss due to congestion experienced by individuals and industry each year costs society a billion-euro amount in the form of lost welfare and operation expenses for industry. The congestion issue is therefore a very important factor in socioeconomic analyses of new infrastructure projects.

There are several different methods and measures for limiting congestion problems on roads and railways. These include expanding the existing infrastructure, upgrading and modernising the existing infrastructure, improving capacity exploitation, and implementing new technology.

The chapter reasons that there is need for launching a range of different initiatives in order to ensure that congestion problems are not exacerbated. A number of important measures have already seen the light of day with the transport agreement entered into on 5 November 2003 between the Government, the Christian Democrats, the Social Liberal Party of Denmark, and the Danish People's Party.

Primarily these measures will include continued expansion of the road and public transport infrastructure in combination with better exploitation of the existing infrastructure. The expansion of the infrastructure will concentrate particularly on those areas that are suffering most severely from congestion problems. In other words, the roads in the Greater Copenhagen Area, the Triangle Area and on Funen, as well as the railway line between Copenhagen and Ringsted.

Apart from expanding and improving the existing infrastructure, there is mention of increased use of transport telematics in order to better exploit the capacity in the existing infrastructure, e.g. in the form of better motorway slip roads, points and side tracks in the railway area. Finally, the use of user-payment schemes as a congestion reduction measure is described briefly.

In the short term, emphasis will be kept on expanding the infrastructure and abating bottleneck problems. On the long term, the prospects of increased use of information technology and telematics are expected to play a more major role.

Summary of Chapter 6, Reduced environmental impact – a continuing challenge

Chapters 2-4 dealt with the transport sector's major role in society, not least in terms of economic and social development. However, the transport sector also imposes a number of negative, environmental impacts, which are important to take into account and limit as far as possible. These impacts can be divided into three main groups: air pollution, climate change, and noise nuisance.

Despite the prominent growth in traffic in recent decades, a number of environmental impacts from transport have been reduced. In particular, efforts have succeeded in significantly reducing air pollution. Lead pollution from transport has been nearly eliminated, and asbestos pollution arising from the brakes on vehicles has become a much smaller problem today than it was 20 years ago. Moreover, we have also been able to reduce the emissions of NOx, carbon monoxides, and hydrocarbons significantly.

The emission of particles, however, remains a challenge within air pollution. Here, attention is aimed at fine and ultra-fine particles, because health risks and exposure to these remain uncertain. Stricter EU-stipulated limit values for emissions from vehicles mean that the releases from diesel cars will be reduced considerably in the forthcoming years, as diesel cars are replaced. Particle filters on diesel-driven vehicles are also a possible reduction measure.

Climate change due to impacts from the transport sector is increasing. By and large, it has increased in step with traffic. The transport sector accounts for approximately 25 per cent of Denmark's total emissions of CO_2. Reducing the transport sector's emissions of CO_2 has proven an especially challenging and cost-intensive task. This is partly due to the fact that, unlike particles, CO_2 emissions cannot be reduced through the use of filters or other technical measures.

Another significant issue addressed by the chapter is noise nuisance from traffic. A recent survey of the number of residences exposed to noise shows that there has been no rise in the number of residences exposed to noise since 1991. This is despite the fact that, in the same period, traffic has increased significantly. However, the number of residences exposed to noise does not seem to have fallen either. The chapter describes the Government's initiative to reduce noise nuisance, including the Traffic Agreement from November 2003.

An important point in the chapter is that, even though there has been a positive development within the transport sector's environmental impacts in recent years, the future still poses the need for further efforts in this area. The most pressing challenges in the forthcoming years will therefore be to reduce noise nuisance and nuisances from small particles. This includes improving the urban environment and limiting the negative climate impacts from transport through common European initiatives, that is, first and foremost, through improved energy efficiency in cars.

Summary of Chapter 7, Road safety

Being able to travel safely and securely on Danish roads is of great value to people. Therefore, to reduce the number of road accidents is a great challenge for the transport sector. Traffic accidents are often linked to great human and social costs.

In this respect, road traffic represents the greatest challenge. Even though, on an overall scale, the number of road accidents has fallen significantly during recent decades, and, this, even during a period of considerable growth in traffic, the majority of accidents are still in this part of the transport sector.

The chapter notes that road accidents are often due to the inappropriate behaviour of people, e.g. people exceeding the speed limit or not having the proper driving experience. Young people constitute a special risk group. Young motorists (especially men) in the age group 18-24 are responsible for about 27 per cent of human injury, and in one out of four accidents with a fatal outcome, alcohol is involved. The chapter moreover argues that the use of seat belts is important in terms of the scope of the injury resulting from road accidents. Moreover, it is noted that many people still do not use seat belts. A study from 2001 shows that up to 16 per cent of all drivers of private cars do not use seat belts.

Several opportunities exist for improving road safety. One example of efforts that succeeded and still have potential, is remedial measures aimed at so-called accident black spots. Furthermore, ongoing improvements of vehicles and regulation can contribute to improving safety, not only for motorists but also for other road users, pedestrians and cyclists, in particular.

An essential point in the chapter is a description of future roads in terms of the concepts of self-explanatory and forgiving roads.

The term self-explanatory road refers to road layouts which accommodate road users in terms of geometric design, signs and road markings, lighting, equipment, vegetation, road surface, and layout of immediate surroundings and of information technology, including traffic-control and speed-adaptation systems, as an integral part of the overall traffic environment. The objective of the self-explanatory road is to make it easier to be a road user.

A forgiving road refers to the notion that the road and its immediate surroundings should be designed so they contribute to minimising damage when accidents do inevitably occur.

An important message in connection with road safety efforts in terms of road works is the adaptation of speed limits to local and to traffic conditions in order to provide road users the best possible information about the most appropriate speed.

Summary of Chapter 8, The freight transport industry

This chapter highlights that Denmark has a good freight transport industry. The freight transport industry in Denmark is a substantial factor for the competitiveness of Danish commerce, a fact which stresses the importance of keeping a continued focus on this sector.

Changes in the freight transport industry over the past 20 years are outlined in brief. Measured in tonne-kilometres, the greatest growth has been in international transport movements, whereas the growth in domestic transport has been more modest. Furthermore, these changes have resulted in greater demand for new products, and, increasingly, carriers are expected to offer total transport and logistics solutions. This includes being able to contribute, more than previously, to customers' overall logistics planning. A number of freight transport companies, especially companies with an international

profile, are already working somewhere in the grey zone between shipping and carrier services.

The professionalisation of the freight transport industry can be seen in the fact that the haulage industry has won considerable market share from companies managing their own goods transport.

Furthermore, the chapter touches upon liberalisation of the freight transport industry within the EU, and upon the significance of this process. The freight transport sector is therefore more exposed to competition than previously. The decision to establish the EU's internal market proved immensely important in this connection, and has meant new opportunities for Danish haulage companies.

At the same time, the recent enlargement of the EU will be one of the sector's key challenges in the forthcoming years. On the one hand, the enlargement of the EU will entail new potential markets but, on the other hand, it will mean that competition will be more fierce, since wage levels are relatively low in the new Member States.

Freight transport companies based in Denmark will have difficulties competing on pay levels, and therefore these companies should strengthen their knowledge and competency development. Attention should be on increasing the use of new technology, enhancing the level of education and competency, as well as increasing the use of new forms of collaboration, e.g. increased network building.

Intermodal transport movements are expected to have growing significance in a European context. It is therefore important to assess, on an ongoing basis, the opportunities available to strengthen alternatives to lorries. Good and flexible alternatives are deemed advantageous for Danish industry in the long term.

Summary of Chapter 9, Exposure to competition and efficiency improvements in public transport

Public transport plays a vital role in society, including ensuring mobility for people without access to a car, and reducing congestion on roads. Moreover, in some instances public transport can also help reduce the environmental impact from traffic.

The chapter describes the considerable market orientation and efficiency efforts which have taken place in the public-transport sector over the past 20 years.

The ongoing invitations for tender in, for example, the bus sector have meant that average costs per vehicle-hour (in the Greater Copenhagen Area in particular) have been falling since the early 1990s. Furthermore, DSB (Danish State Railways) operating costs per passenger-kilometre have been reduced by about 15 per cent from 1999 to 2002.

A key focus of this chapter is the reorganisation process within railway transport. The process followed a learning organisation strategy involving a step-by-step market orientation of the sector on the basis of broad political agreements. This reorganisation has meant that, in a number of areas, Denmark is among the countries in Europe which have made the greatest progress toward greater market orientation of the railway sector.

The chapter also points to one of the major future challenges facing public transport, namely the challenge of ensuring that future productivity benefits lead to greater pas-

senger numbers and thus to more efficient public transport. The chapter also points out that this must be brought about through the sector further enhancing its customer focus so that supply of transport, i.e. operating frequency, price, and quality, reflects passenger demands.

In the bus area, it is suggested that initiating more trials with net contracts should be considered where the structure of bus services allows for it. The use of net contracts would increase the operators' responsibility for, and interest in, attracting more passengers. This is explained by the fact that operators have closest contact to customers and will thus also have the best preconditions for assessing passenger needs and wishes. In this connection, it is important to maintain and develop close collaboration between the private operators and the public authorities responsible for regulation of the traffic.

Summary of Chapter 10, Towards more market

In this chapter, focus is on the changes in organisational structures and in the regulation of the different transport areas/sectors.

Organisational structures in the transport sector have changed fundamentally during the last 30 years. It is reasoned that this is due primarily to two trends. First of all, focus has changed from a national to a more international level. Cooperation in the EU and the development of the EU internal market with free movement of goods, people, services, and capital has contributed immensely to this trend. Secondly, it has been a growing belief that exposure to competition can be used as a means to ensure increased efficiency.

The chapter notes that, in combination, these trends have led to a change in the management of tasks in a number of organisations in the transport sector. Previously, these organisations had integrated management of the production of the service, education of the personnel, safety regulations, control etc., all placed under one institution. Now, an organisational division of and focus on individual tasks in independent units has taken place. Furthermore, there has been a gradual shift from public to private enterprise and an associated new regulation framework for performance of activities.

Not all parts of the transport sector have had the same preconditions, and not all parts have reached the same degree of liberalisation, or harmonisation of regulation, as elsewhere in the sector. Whereas aviation and marine transport have a particularly global aim and therefore have to seek solutions in broad-spanning forums, the European perspective, seen from a Danish point of view, is more important to land-based transport.

The conversion from a politically managed, state-integrated organisation to separate, business-oriented production companies is a complicated process. It requires time and, typically, it will happen in stages. The liberalisation of the railway area and the reforms, carried out by DSB, are graphic examples of how comprehensive a process we are dealing with. The extensive changes which have been carried out in recent years in this area have brought Denmark up to speed with the leading European countries in the liberalisation of the railway sector. Major tasks, however, still remain before a free and accessible European market for railway traffic has been realised.

An important point in the chapter is that the efficiency results of the reorganisation processes are difficult to ascertain. The individual operating companies will see evident improvements. However, unavoidable transaction costs also belong in the total picture and several of these will be lasting costs. Therefore sector authorities are required to establish and develop the framework for competition:

- Supervision must be carried out for all with regard to compliance with safety and environmental considerations etc.
- Complaints from the parties involved must be managed; the necessary education and training of personnel must be planned.
- Planning and coordination must be so that the level of service and prices match.
- Invitations to tenders must be carried out and contracts etc. managed. Many of these tasks have hitherto been either non-existent or they have been managed on flexible terms internally in the individual organisation.

However, division into several units and focus on economic efficiency raise new demands that cohesion is secured, especially in sub sectors where benefits from economies of scale are prominent, or where user payment does not cover all costs. There are many challenging tasks ahead to be addressed. They require openness of mind toward adjustments and comprehensive changes, which may ensure increased mobility that in turn will add value to Danish society.