The Danish Road Directorate
Evaluation of test with European Modular System

Midway Report

Grontmij | Carl Bro A/S in cooperation with Tetraplan

May 2010

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planning connecting
respecting
the future

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[1] Kindly note that not all master files are translated into English.

1 SUMMARY

During the period from autumn 2008 to autumn 2011 a test with the European Modular System (EMS) vehicles is performed on selected parts of the road network in Denmark. Parallel with the test an evaluation is performed with the purpose of registering the spread and use of EMS vehicles and to evaluate the direct and indirect effects.

The evaluation was opened with a pre-test situation report giving status of the goods transport on the Danish road network at the end of 2008. The purpose of this report, which is a midway report, is to give status of the test progress one year after start that is at the end of 2009. Finally a final report will be published in a year's time which will give a total status of the test and at the same time give an evaluation of the effects of the test, direct and indirect, intentional and unintentional.

The purpose of the midway report is to give an interim status of a number of conditions in relation to construction investments, EMS transports, traffic safety and environmental aspects. A number of these conditions has proven to be difficult to throw, even an interim, satisfactory light on due to the fact that a number of data can either not be provided or will not be published before at a later time.

The interim results of the test with EMS vehicles are marked by the financial crisis, which has hit Denmark as well as our nearest commercial partners hard. The financial recession has also hit the transport sector as there are simply less goods and commodities to transport. This situation has an effect on the use and spread of EMS vehicles as well. Through a special run of the driver's log, sent out to 61 companies, using EMS vehicles, 17 have indicated that the financial recession has had a positive effect on the use of EMS vehicles, as it has made heavier demands on enhancing the efficiency of the transport. At the same time 24 have replied that the financial recession has had a negative influence on the spread of EMS vehicles due to a reduced amount of goods resulting in over-capacity.

The interim results of the test illustrated and documented in the midway report can be summed up as follows:

- With regard to constructions the estimation is that the Danish Road Directorate alone has invested almost DKK 114m in constructions during 2008 and 2009. To this can be added investments of approx DKK 16m made by ports and transport centres in the same period. The total investments in various reconstructions then sums up to DKK 130m.
- At the end of 2009 a total of 316 EMS vehicles were registered in Denmark grouped into the following EMS combinations: Type 1, " Dollies", with 105 units; Type 2, "semi-trailers," 4 units; Type 3, "link-trailers", with 207 units. With regard to type 4, "long trailer", it has not been possible to identify these in the Danish Central Register for Motor Vehicles.
- Among the 316 registered units, 61 companies disposing of a total of 99 EMS vehicles were contacted through a special run of the driver's log.

- The mentioned special run of the driver's log has revealed that to a large extent EMS vehicles have to been applied for transport of foods and general cargo. The total goods transport on trucks has primarily been distributed on gravel, stone, clay, etc.: agricultural and fishery products, earth and waste; construction materials and foods.
- The general capacity utilization in relation to freight traffic seems to have decreased from 2007 to 2009 with approx. 5 % especially applying to international transports and haulage.
- On the basis of the material from the special run of the driver's log the estimate is that in 2009 EMS vehicles transported approx. 0.8 % of the national goods quantity. Furthermore EMS vehicles are estimated to account for 0.9 % of the traffic work in Denmark in 2009.
- With regard to traffic safety no accidents involving EMS vehicles have been noted. On going through the accident figures for the 150 locations having been reconstructed in connection with the EMS test, a modest rise in the amount of accidents particularly involving passenger cars has been noted in approx. 10 cases during 2009. Whether this has any connection with the reconstruction of the locations in question is still too early to say. So far these locations have been selected as "focus locations".

2 INTRODUCTION

2.1 Purpose of midway report

The Danish Parliament (Folketinget) has passed a decision to carry out a test with the European Modular System (EMS) in Denmark. The test will be performed over a 3-year period from 2008 to 2011. In connection with the test an evaluation will be performed with the purpose of registering the spread and use of EMS and to assess the direct and indirect consequential effects. The evaluation will comprise examination and assessment of a number of various consequences of physical, traffic safety and economic nature including a number of consequences for the goods transport. The evaluation is performed during the period from November 2008 up to and including October 2010.

The evaluation comprises a pre-test report, a midway report and a final report

In April 2009 a pre-test report was prepared describing the situation for a number of the parameters to be investigated before starting up the EMS test. The pre-test report is the basis to which the evaluation with midway report and final report is compared. The present report is the midway report.

Pursuant to the tender documents for the evaluation of the EMS test the midway report should contain the following:

Preliminary statements of the following effects (the numbering follows the tender documents):

1. The transport extent and capacity utilization with focus on the effects of the test and its distribution on vehicle types including distribution on empty journeys and volume goods.

3. Infrastructure costs: Investments in and types of reconstruction, resulting operation costs and changed maintenance costs as a consequence of road wear.

5. Traffic safety in which connection risk statements and accident statements should be studied.

6. Environment with focus on fuel consumption, emissions, noise and vibrations.

In addition to the above the tender documents request preliminary descriptions of the following conditions (numbering according to the tender material):

a. EMS transports with focus on sort of transport, nationality, applied routing, destinations, trip distances, interchange patterns, etc.

b. Construction investments related to EMS vehicles: Costs, localisation, location and type of reconstruction must be indicated.

c. Accidents with EMS vehicles: Accidents involving EMS vehicles must be described.

The midway report has been drawn up taking a follow-up of the pre-test report into account and at the same time assuring that the above requirements on the midway report are accomplished to the extent possible.
As stated below, some data have been difficult to provide for the midway report. The data quality, data quantity and data access have great influence on the possibility of reporting the evaluation. It can e.g. be mentioned that a number of the data is calculated on an annual basis and the final calculations for 2009 have yet not been finished resulting in the fact that a number of data could not be incorporated in the report at the present time.

Not all data could be provided

Particularly within three areas the lack of data has influence on the reporting requirements set forth for the midway report:

- It has turned out that there may be errors in the registered weight data[2] from Weigh-in-motion devices (WIM devices). This circumstance also applied at the time of the pre-test report, but the uncertainty was not known at the time of preparation of that report. The extent of this issue is being clarified in collaboration with the Danish Road Directorate.
- Equally, large challenges with regard to collection of traffic data from the WIM devices of the Danish Road Directorate have turned up. So far it has not yet been possible to collect data from a number of the WIM devices having registered EMS vehicles. Among other things this has had the effect that a number of the WIM devices selected in the pre-test situation have not registered as expected during the period up to the midway evaluation. Therefore it has been necessary to make some changes with regard to the WIM devices originally included in the pre-test situation. In fact some of the WIM devices are no longer included in the midway report, as the required data is not available.
- In order to update the data from the pre-test situation, the intention in connection with the midway reporting was to update the figures from the pre-test report. This would have made a comparison of the development between 2007 and 2009 possible, that is a situation with and without EMS vehicles where year 2008 would have been an “in-between” year, where the test with EMS vehicles was about to start up. For a number of areas it has turned out to be impossible to get updated figures covering all of 2009. This particularly applies to the areas for freight traffic and accident statistics. The picture of both areas is therefore not complete.
- Finally it has turned out to be too early to collect information on the costs for the induced operation costs for the performed reconstructions of the network, due to the fact that reports on the changed operation costs are still not available.

Operation costs not yet quantified

All in all the mentioned lack of data means that e.g. road wear and maintenance costs cannot be calculated at the present time and thus the induced operation costs cannot be quantified.

[2] Understood as statements of the vehicle’s total weight calculated through registrations on the road network.

2.2 Data collection methods

The evaluation of the European Modular System test has required collection of data from a number of various sources to allow cross-checking of data validity.

In principle data has been collected for the period from the test start-up to and including 31 December 2009. If material of special importance has been available, which could not be collected before after 31 December 2009, then this has been included and remarks have been made in the text.

Data sources

Sources to various data applied throughout the report can be outlined as follows:

Statistical material: This material comprises material accessible to the public and material which is in principle not public, but has been made available to the evaluation team. The statistical material included in the report is grouped under Appendix 1.

The statistical material comprises:

Ferry traffic

- Ferry statistics applied for elucidation of traffic with various vehicle types and on various lines.

Bridge traffic

- Bridge statistics: The Oresund Bridge has made data on the monthly EMS vehicle traffic directly available. This data is sent automatically at the end of a month. With regard to The Great Belt Bridge it has been more difficult, since Storebælt A/S does not separate the amount of EMS vehicles. However Storebælt A/S managed it by going through its data and made the result available for the evaluation.

Service and rest area occupancy

- The capacity statement for the use of service and rest areas: in connection with other investigations of this subject the Danish Road Directorate is in these years collecting data on which vehicles use the national service areas. At the suggestion of the evaluation team this collection now comprises classification of truck types as well.

Material on freight traffic: This has been grouped under Appendix 2. The material is grouped as follows:

Data from CRM

- Data from a number of runs at fixed intervals during the evaluation period from the Danish Central Register for Motor Vehicles (CRM) made by Statistics Denmark upon the evaluation team's request. This material is presented in Appendix 2 A.

Special run of Driver's Log

- In addition to the above a special run of the driver's log has been performed in which Statistics Denmark has upon the evaluation team's request sent out a detailed questionnaire about the use and spread of EMS vehicles, which comprised a driver log especially designed for this purpose. The results from the special run are presented in Appendix 2 B, where the applied questionnaires are included as well.

Interviews and surveys: Appendix 3 contains the results of 3 different kinds of interviews and surveys. These are:

Interview of DCF

- At the annual meeting of Danish Cyclist Federation in October 2009 all participants had an opportunity to answer a questionnaire about EMS vehicles and the use of EMS. The results from the survey have been compiles in part A of the Appendix.

Survey at ports and transport centres

- A questionnaire was sent out to all ports and transport centres taking part in the Test with the European Modular System. The primary purpose with the questions was partly to have quantified the extent of the infrastructure investments taken care of by locations in questions partly to clarify whether any conditions at the locations in question needed special attention in connection with the EMS vehicle traffic. Part B of the Appendix contains the questionnaire and reporting on the results.

Interview with haulage contractors and drivers

- Appendix 3 C gives an account of a number of interviews with haulage contractors and drivers applying EMS vehicles in their daily day. The interviews are presented directly in the interview guide applied for the interviews. The companies and drivers in question have been selected in consultation with representatives from the trade. First part of Appendix 3 C is a survey of all planned interviews with companies and drivers. In the Appendix the interviews are accounted of anonymously.

Master file for survey of data

Master files with traffic and accident data as well as construction costs per partial section and per construction location have been included in Appendix 4 and 5 respectively. To the extent possible all data is updated up to and including 31 December 2009.

The results from the various sources are used across the report and therefore relevant appendices will be referred to throughout the report.

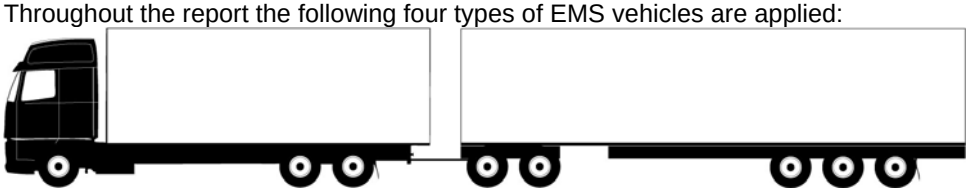
2.3 Definitions

A number of terms are applied in the report and these are defined as follows:

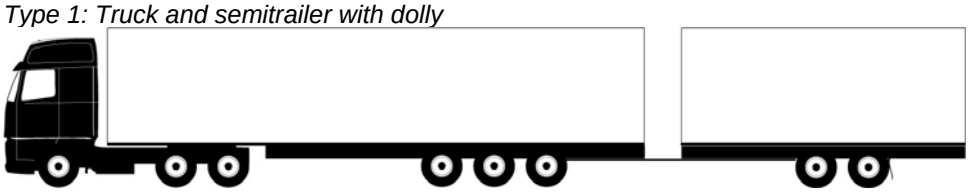
Traffic work:	Performed vehicle-kilometres
Transport work:	Performed tonne-kilometres
Destination:	The final destination where EMS vehicles are loaded, unloaded and/or interchanged for further transport. Destinations can be transport centres, ports, etc.
Road network:	The road network is the part of the Danish road network, where EMS vehicles are allowed.
Road types:	The road network on which EMS vehicles are allowed to drive is divided into the following road types: • Motorway > 4 lanes • Motorway = 4 lanes • Expressway • Rural road • Urban road (road in urban zone) As the urban roads being part of the EMS vehicle test are few and relatively short, it is often difficult to identify urban roads on the maps included in the report. In some cases expressways and rural roads are mentioned commonly as main roads (superior).

Phases:	The EMS vehicle road network has been extended gradually when ready for being put into service. Phase 1, the main test, was started on 24 November 2008. Then followed phase 2 consisting of two parts: Phase 2A, started on 1 September 2009 and phase 2B started on 1 December 2009. Finally there is a phase 3 called Company arrangements, which is currently being extended. Phase 3 is, however, not included in the evaluation of the EMS vehicle test which is why this phase is not treated further in the midway report.
Area:	A geographically bounded area where it may be a question about one or more locations within the bounded area.
Location:	For each turning manoeuvre which an EMS vehicle must be able to perform on a given road, a location has been defined. This may be a roundabout, a crossroads or the like. At a single location more turning manoeuvres may occur. For each location where reconstructions have been performed in connection with the EMS vehicle test, a master file has been prepared cf. Appendix 5 as well.
Turning manoeuvre:	Each turning manoeuvre is categorised within a number of location and manoeuvre types, such as a left turn in a traffic light controlled road crossings or a right turn in a roundabout. A given turn or a given manoeuvre will be registered as one turning manoeuvre.
Partial section	The road network where EMS vehicles are allowed to drive, has been divided into 64 partial sections. The partial sections have been selected with the purpose of giving an as precise as possible picture of the traffic conditions, as on each partial section at least one WIM device has been set up. For each partial section a master file has been created, as appears from Appendix 5.

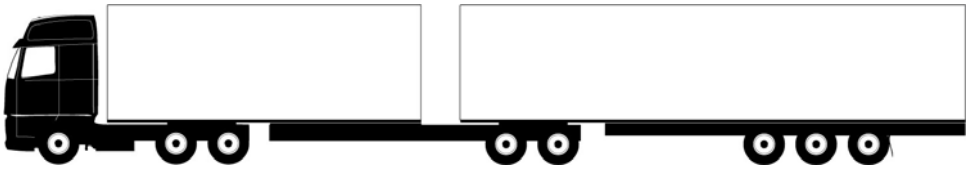
Throughout the report the following four types of EMS vehicles are applied:



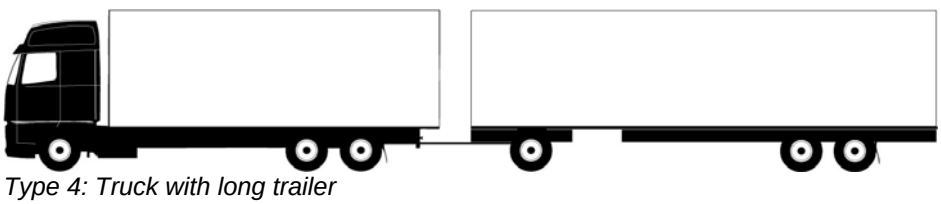
Type 1: Truck and semitrailer with dolly



Type 2: Tractor with ordinary semitrailer and centre axle trailer



Type 3: Tractor with link-trailer and ordinary semitrailer



Type 4: Truck with long trailer

3 ROAD NETWORK

3.1 Road network extension in phases

EMS road network

In accordance with the ”The executive order on the road network, etc. where EMS vehicles are allowed to drive” of the Danish Road Directorate which came into force on 1 December 2009, the locations and road sections where EMS vehicles are allowed to drive appear from Figure 1.

Figure 1 The road network on which EMS vehicles are allowed to drive

In addition to the marked locations and road sections, EMS vehicles can also be applied for a number of individual companies where it is permitted to drive shorter sections on roads outside of the roads indicated in figure 1 – an arrangement which is often referred to as “the company arrangement”. These locations are, however, not comprised by the evaluation and therefore not treated further.

3.2 Construction investments

Up to the start of the EMS vehicle test in November 2008 the Danish Road Directorate performed reconstructions of a number of locations in order to ensure that the EMS vehicles could manoeuvre on the road network. On a few of these locations there were still minor works to be finished during 2009.

The reconstructions have continued in 2009 and as they are finished, the sections and locations in question have been included in the test through the two executive orders passed in 2009.

During 2010 less expenses for finishing of the works started in 2009 are expected to be paid. In addition to this there may be expenses for new construction works which will be started during 2010.

The Danish Road Directorate has invested DKK 114m.

A preliminary statement of the total construction expenses until today (the end of 2009) for various reconstructions appears from Figure 2.

Phase descriptions:	Year	DKK
Phase 1. The sections included from November 2008. Main expenses:	2008	50,274,617
Additional expenses for phase 1 (var. finishing works):	2009	5,030,000
Total phase 1:		**55,304,617**
Phase 2A. The sections included from September 2009	2009	30,765,286
Phase 2B. The sections included from December 2009	2009	27,803,041
Total phase 2:	**2009**	**58,568,327**
Total construction costs of the Danish Road Directorate:	**2008 & 2009**	**113,872,944**

Figure 2 Complete survey of the reconstruction expenses of the Danish Road Directorate [3]

The DKK 114m applied for reconstructions so far should be seen in connection with the total construction allocation of DKK 128.7m.

The expenses for reconstructions at the various locations appear from the master files included in Appendix 5.

In addition to the construction costs which are the responsibility of the Danish Road Directorate, a number of ports and transport centres have been responsible for reconstructions which have been caused by the EMS vehicle test.

[3] All prices mentioned are exclusive of VAT. The total figures for the construction costs include costs for projecting, supervision and project management, costs for traffic safety revision and the actual construction costs including costs for planting, lighting, etc.

The ports and transport centres participating in the test have in a survey indicated the construction costs they have had in 2008 and 2009 respectively. Finally, they have been asked, whether they expect further reconstructions out of consideration for the EMS vehicle test at a later time.

22 ports and transport centres have indicated that they had construction costs

Out of 39 potential replies a total of 22 have replied to the questionnaire, which gives a reply percentage of 56. Among the replies returned the assessment is that we have to a large extent received replies from the ports and transport centres where the largest amount of EMS vehicle will drive as well as the ports and transport centres assumed to have made an effort with the reconstructions.

The result of the returned replies has been assessed and indicated together with the questionnaire in Appendix 3 C. Only some ports and transport centres are planning further infrastructure investments as a consequence of the EMS vehicle test which would in that case have to be made in 2010 or later.

Ports and transport centres have invested DKK 16m.

As it appears from Appendix 3 C, the construction costs for 2008 and 2009 amount to the following amounts (all amounts are exclusive of VAT):

Year:	DKK:
2008	12,800,000
2009	3,025,000
Total:	**15,825,000**

Figure 3 Operation costs of ports and transport centres

Total investment in 2008 and 2009 DKK 130m.

This means that all in all the construction costs amount to almost DKK 130m for reconstructions or more precisely DKK 129,697,944.

4 TRAFFIC

4.1 EMS vehicle units in Central Register for Motor Vehicles

Since the month of August 2008 Statistics Denmark has registered the amount of EMS vehicles with Danish number plates. The information has been collected through the Central Register for Motor Vehicles and the detailed information appears from Appendix 2 A.

Extracts from the Central Register on Motor Vehicles reveals a current increase in the amount of vehicles which can enter into a EMS vehicle.

At the end of 2009 there are potentially 316 EMSs in Denmark

From
Figure 4 the development in EMS vehicle units in the Central Register for Motor Vehicles appears. The figure illustrates the development in registered dollies (EMS vehicle type 1), semi-trailers for centre axle trailers (EMS vehicle type 2) and link-trailers (EMS vehicle type 3). At the end of December 2009 105 dollies, 4 semi-trailers and 207 link-trailers, a total of 316 EMS vehicle units.

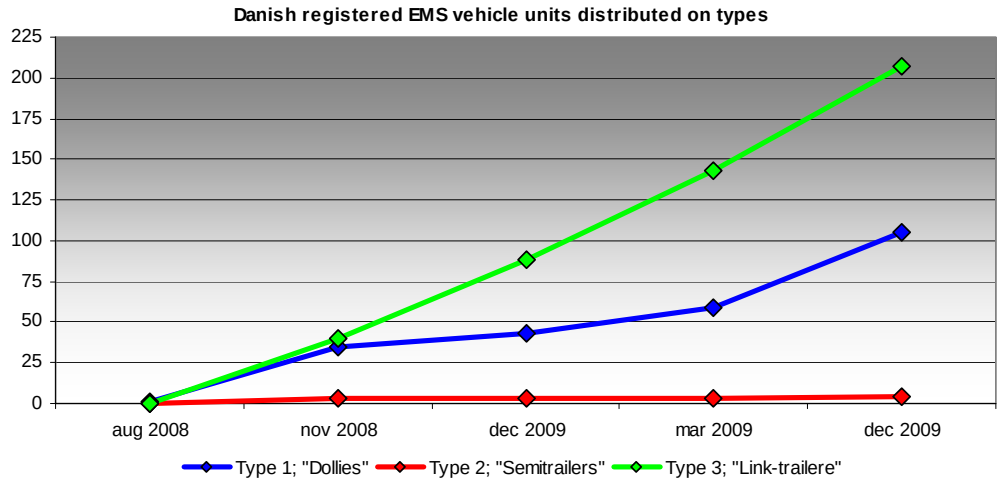


Figure 4 Development in EMS vehicle units in the Central Register for Motor Vehicles

In addition to this it is registered how many trucks and tractors have been approved for driving with EMS vehicle types 1 and 4 respectively and EMS vehicles types 2 and 3. From August 2008 until the end of December 2009 the amount of approved trucks for EMS vehicles types 1 and 4 has increased from 491 to 4,054 while the amount of approved tractors for EMS vehicles types 2 and 3 have increased from 613 to 5,315.

It should be mentioned that this type of trailers which form part of EMS vehicle type 4 cannot be extracted separately from the Central Register of Motor Vehicles.

4.2 Traffic development

Generally the car traffic has decreased over the latest five quarters (3rd quarter 2008 – 3rd quarter 2009) by 1-2% compared to the same quarters in the previous years.

Road transport has decreased with 18% from 3rd quarter 2008 to 2nd quarter 2009.

However the picture is considerably different for the freight traffic. Figure 5 shows the freight traffic development with Danish trucks from the end of 2nd quarter 2001, where it peaked, to the end of 3rd quarter of 2009. The freight traffic with Danish trucks in this period has decreased with 30 % distributed with approx. 25 % on national transport and approx. 40 % on international transport. Alone in the period from 3rd quarter 2008 to 3rd quarter 2009 the freight traffic with Danish trucks has decreased with approx. 20 %.

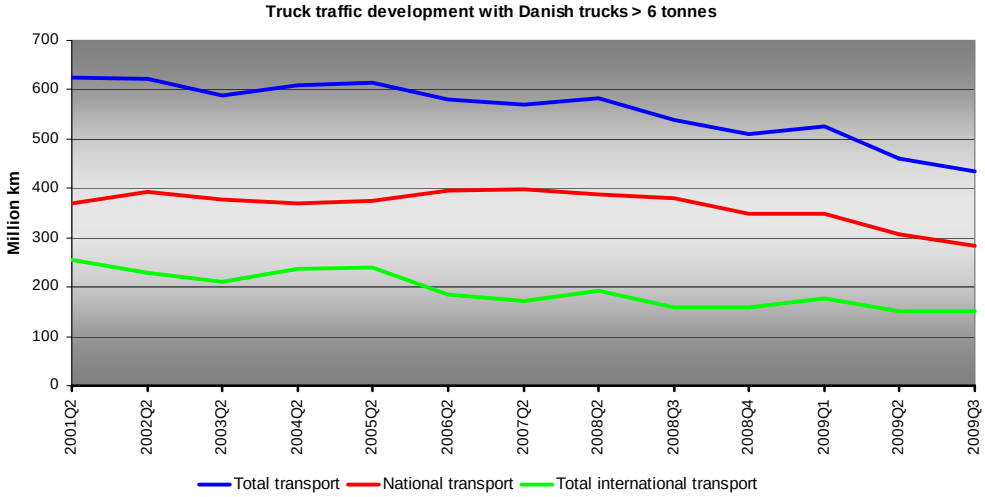


Figure 5 Freight traffic development since 2nd quarter 2001 of Danish trucks [4]

4.3 Traffic counting

The EMS traffic is registered via the permanent WIM devices of the Danish Road Directorate

Currently the Danish Road Directorate collects traffic data from a number of locations partly by means of permanent weigh-in motion (WIM) devices partly by means of mobile WIM devices. In the evaluation primarily data from the permanent WIM devices is applied. Traffic data has been collected on 64 partial sections.

Various types of equipment are applied for registration of traffic and the registration of vehicle types is calculated by means of various methods. The Danish Road Directorate has informed that at present only one type of equipment is capable of counting EMS vehicles and therefore only traffic data from this type is applied.

The motorway in Eastern Jutland north of Vejle has the highest amount of trucks

The traffic load on the test road network varies from partial section to partial section. On the partial sections of the road network the amount of trucks vary from 338 daily south of Hanstholm (road 26) to 13,077 near Vejle. The road sections most loaded with freight traffic in 2009 are:

[4] Source for figures is data from Statistics Denmark, StatBank Denmark.

- Motorway E45 north of the Vejlefjord Bridge on the Motorway in Eastern Jutland with more than 13,000 trucks per day (14,500 in 2008).
- The motorway in Eastern Jutland, E45, north of Kolding at Kolding Motorway crossings with approx. 8,300 (9,800 in 2008) trucks per day.
- The West Motorway, E20, between Ringsted and Køge with approx. 7,200 (7,400 in 2008) trucks per day.
- The Funen Motorway, a little east of Odense with approx. 8,000 trucks per day (new WIM device as of 2009). From the pre-test report it appears that 4,700 trucks per day were driving on almost the same partial section. These traffic figures are not comparable as the counting in the pre-test report was made between the ramps of exit 48. Therefore the traffic to and from Tietgenbyen is not included in the counting in the pre-test report.

Development in freight traffic on the individual partial sections from 2004 to 2009 is stated in Appendix 4.

The traffic load is calculated for the various forms of trucks and road trains driving on the road sections included in the test. The statement of freight traffic in the years 2004 to 2009 on the individual partial sections grouped in truck types appears from the master files in Appendix 4, which comprises all the partial sections of the road network expected to be included in the EMS vehicle test.

When summing up, the freight traffic measured in annual average daily traffic (AADT) in 2009 can be stated as illustrated in Figure 6 [5].

[5] The WIM devices of the Danish Road Directorate register vehicles between 22 – 28 m as EMS vehicles.

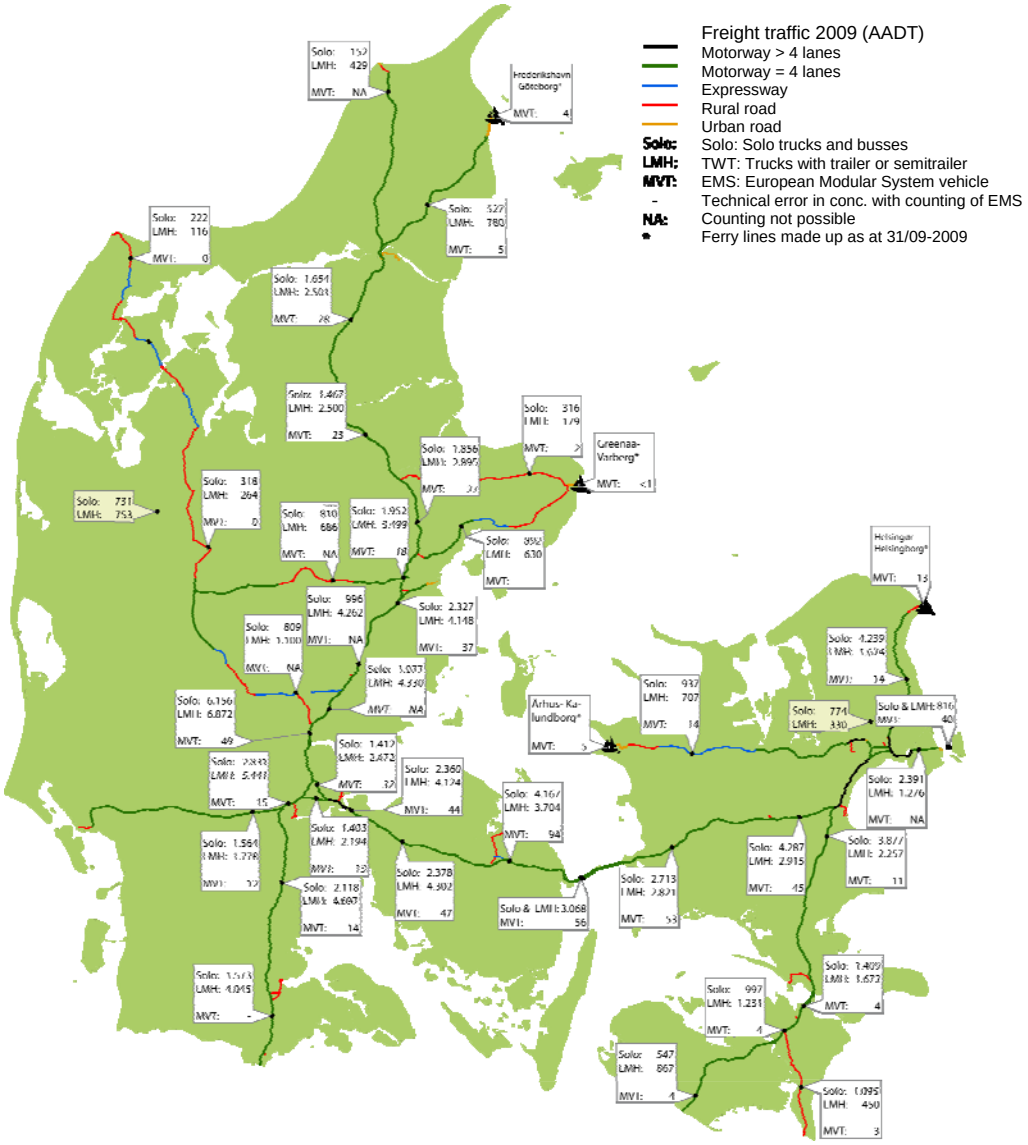


Figure 6 Freight traffic in 2009 (AADT) on the total test road network

An AADT figure of slightly above 90 EMS is the highest figure at the end of 2009

In addition to the statements on the parts of the road network where EMS vehicles can drive, traffic figures for two control locations outside the EMS vehicle road network have been included. Both locations have been included in order to be able to compare the development in traffic where the EMS vehicles can drive with the ordinary development in the freight traffic. The two control locations have been selected because at these locations quite some freight traffic can be expected. A location near Holstebro and a location at Ring 4 near Ballerup have been selected. Both WIM devices are located on rural roads.

Compared to 2008 the freight traffic has generally decreased all over the country. There are, however, some exceptions, as the freight traffic has increased slightly at some locations. Figure 7 shows the difference between the traffic values (AADT) for 2008 and 2009[6].

[6] In Figure 7 only data for the WIM devices where data is comparable between 2008 and 2009 has been included. In practice the WIM devices where EMS vehicles are included have been the primarily selected WIM devices and thus also had an influence on the choice of where the differences can be calculated.

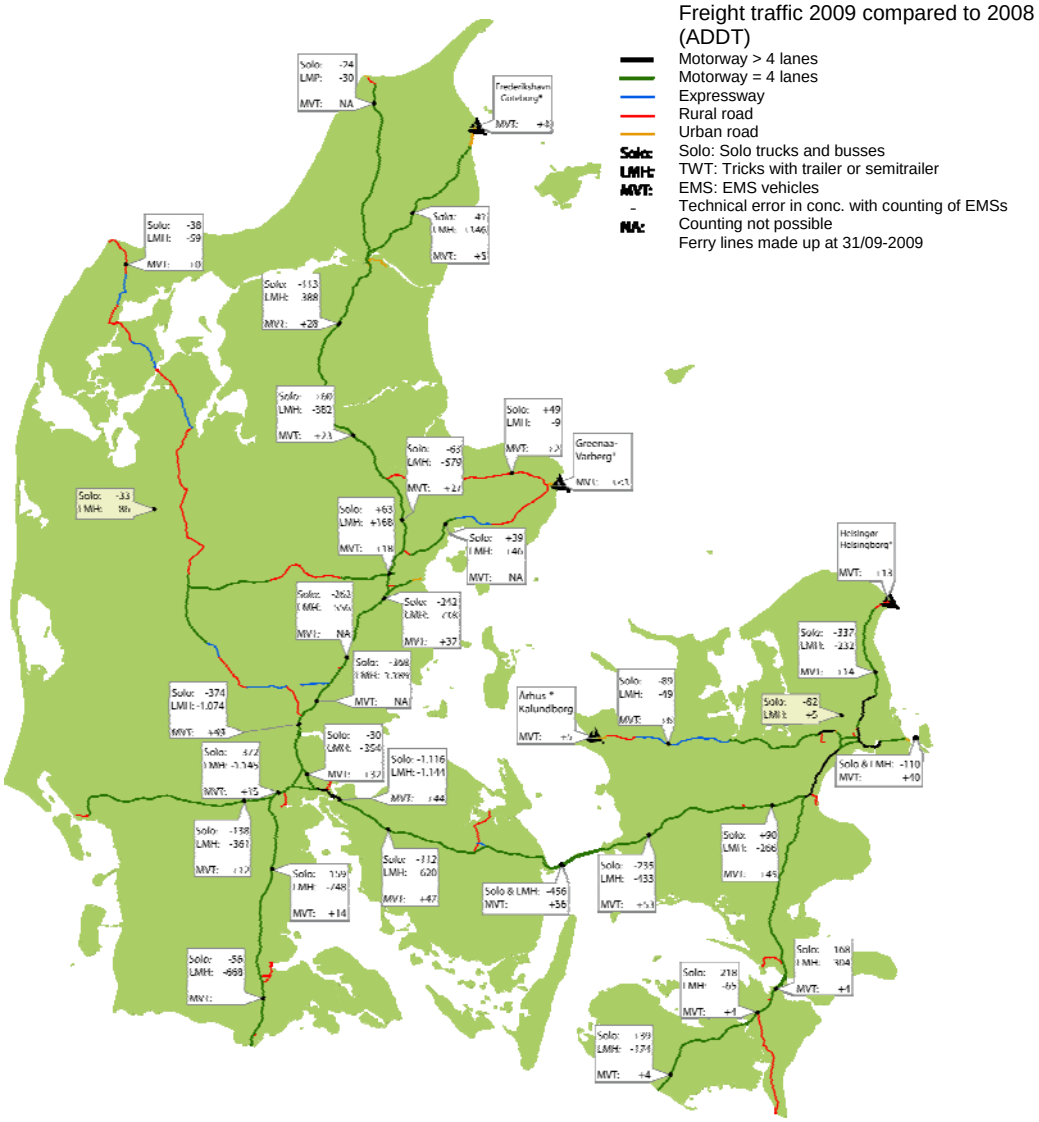


Figure 7 Difference in AADT between 2008 and 2009

4.4 The Great Belt Bridge

56 EMS passages the Great Belt daily at the end of 2009

Since January 2009 the Great Belt Bridge has registered the amount of EMS vehicles passing the bridge. In 2009 more than 93,000 trucks passed the Great Belt Bridge per month (AADT 3,100). Of these an average of approx. 1,700 EMS vehicles per month (AADT 56)[7]. A more detailed statistic statement appears from Appendix 1 B.

[7] The figures for the passage at the Great Belt have been extracted manually by A/S A/S Storebælt. In connection with the presentation of the material, A/S Storebælt has given the following information about the figures:

- Only passages in BroBizz lanes are included.
- Only vehicles higher than 3.9 m and 21.0 m long are included.
- Only vehicles which both classification systems classified as belonging to the new class are included.
- Auto-transporters have been removed if they apply with a special BroBizz. Test runs have been removed.
- Length and height are connected with some uncertainty. However data has been analysed and video pictures have been watched and it has been found

More EMS headed towards Korsør than towards Nyborg

The amount of EMS vehicles passing the Great Belt Bridge per month in 2009 appears from Figure 8. It appears that since the month of March more EMS vehicle combinations drove to Korsør than to Nyborg[8].

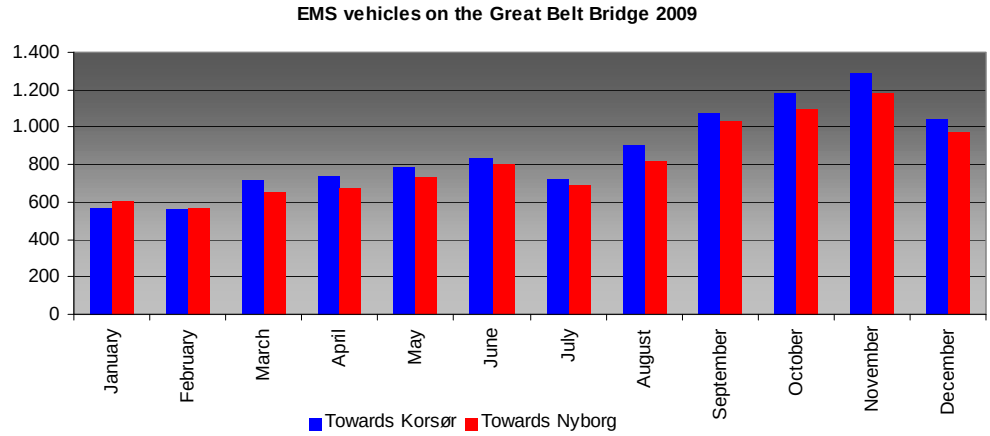


Figure 8 EMS vehicles on the Great Belt Bridge 2009

Generally the freight traffic has decreased less on the Great Belt than in the country as a whole

In January 2009 the EMS vehicles amounted to 1.3 % of the total freight traffic on the Great Belt Bridge while in December 2009 it amounted to 2.4 %.

Compared to 2008 the freight traffic as a whole, has decreased with approximately 11,300 passages per month on average. This corresponds to a decrease of 10.8 %, which is less than the decrease in the traffic generally stated for the freight traffic on a national basis.

If it is presumed that 2 EMS vehicles have replaced 3 semitrailer road trains, then 1 percentage point[9] of the total decrease of 10.8 % can be ascribed to the introduction of EMS vehicles. The remaining decrease can be caused by the financial crisis which has generally reduced the activity level in Denmark. The total freight traffic on the Great Belt Bridge in 2008 and 2009 appears from Figure 9.

that especially the driver's cabin and the trailer height are the best means for separating EMS vehicles from exceptional transports.

- During the period the VDC system (one of the classification systems) has undergone a number of adjustments in order to be able to classify the new limit of 19 and later 20 m. Specifically a software upgrade in March 2009 showed significant results. Since the summer of 2009 no important changes have been made in this system.
- The OCS system (The other classification system) was placed 19 m from the start and was moved to 20 m during April - May. However, this should not be of any importance. Generally the analysis seems to give a true and fair view of the development. Whether the level was this high at the beginning is not easy to assess.

[8] These permanent flow imbalances which are also known from the Oresund Bridge and the ferries cannot be explained immediately. Thus the question will be discussed further with the haulage contractors at a later time.

[9] 1/3 of the EMS vehicles passing the Great Belt Bridge in 2009 corresponds to 1 percentage point of the total decrease in the freight traffic on the Great Belt Bridge from 2008 to 2009.

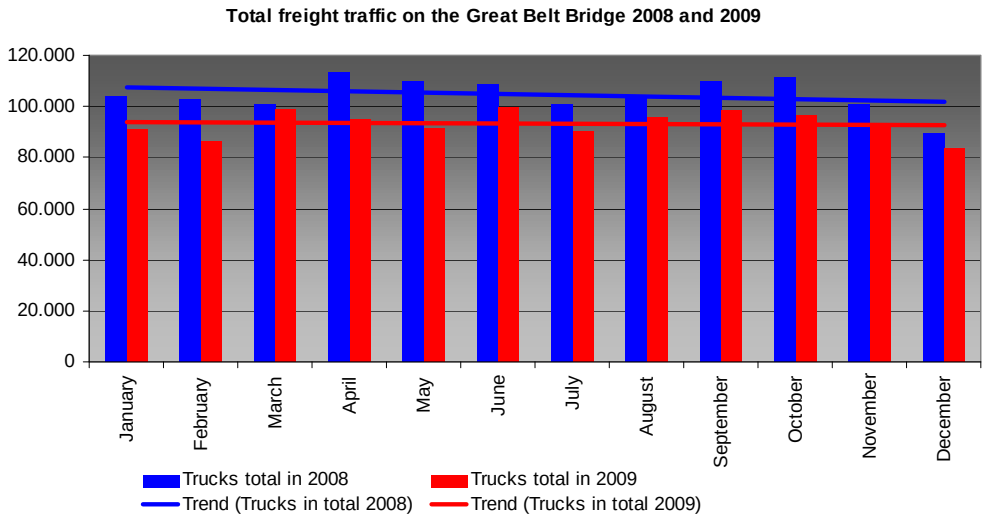


Figure 9 Total freight traffic on the Great Belt Bridge 2008 and 2009

4.5 The Oresund Bridge

40 EMS a day passed the Oresund at the end of 2009

Since January 2009 the Oresund Bridge has registered the amount of EMS vehicles passing the bridge. In 2009 an average of more than 26,000 trucks passed per month (AADT 856), of these an average of approx. 1,200 EMS vehicles per month (AADT 40)[10]. In Appendix 1 B a more detailed statement of the bridge traffic can be found.

More EMS are headed towards Denmark than towards Sweden

The amount of EMS vehicles passing the Oresund Bridge per month in 2009 appears from Figure 10. Generally it appears that significantly more EMS vehicles are driving to Denmark than to Sweden.

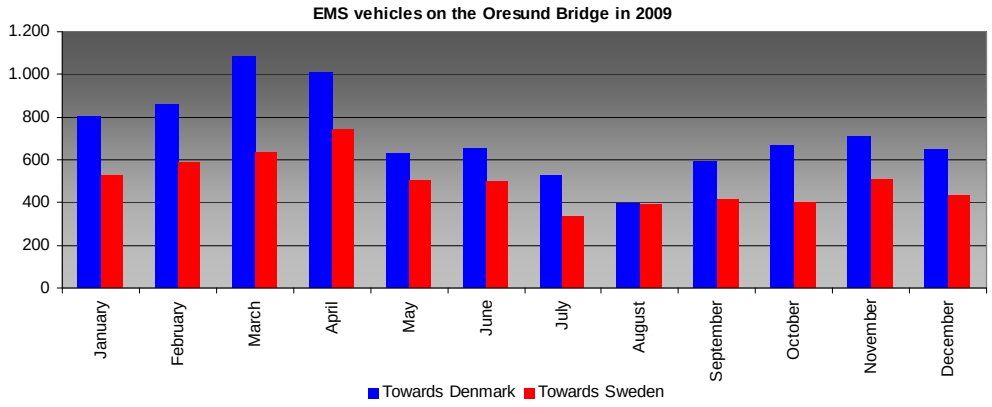


Figure 10 EMS vehicles on the Oresund Bridge in 2009

In January 2009 the EMS vehicles amounted to 5.1 % of the total freight traffic on the Oresund Bridge, while in December 2009 the amount was 4.5 %.

[10] According to information from the Oresund Bridge, vehicles longer than 20 m are registered as EMS vehicles. The figures should not include exceptional transports. The Oresund Bridge has been asked to verify this as well as the Bridge has been asked about whether the difference in amount of registered passages from east and west respectively could have a technical explanation. Both issues are still being examined by the Oresund Bridge (April 2010).

Compared to 2008 the freight traffic has decreased by approx. 2,400 passages per month (average). This corresponds to a decrease of 8.4 %.

Provided that 2 EMS vehicles have replaced 3 semitrailer trains, 2 percentage points[11] of the total decrease of 8.4 % can be ascribed to the introduction of EMS vehicles. The remaining decrease could be caused by the financial crisis which has generally reduced the activity level in Denmark. The total freight traffic on the Oresund Bridge in 2008 and 2009 appears from Figure 11.

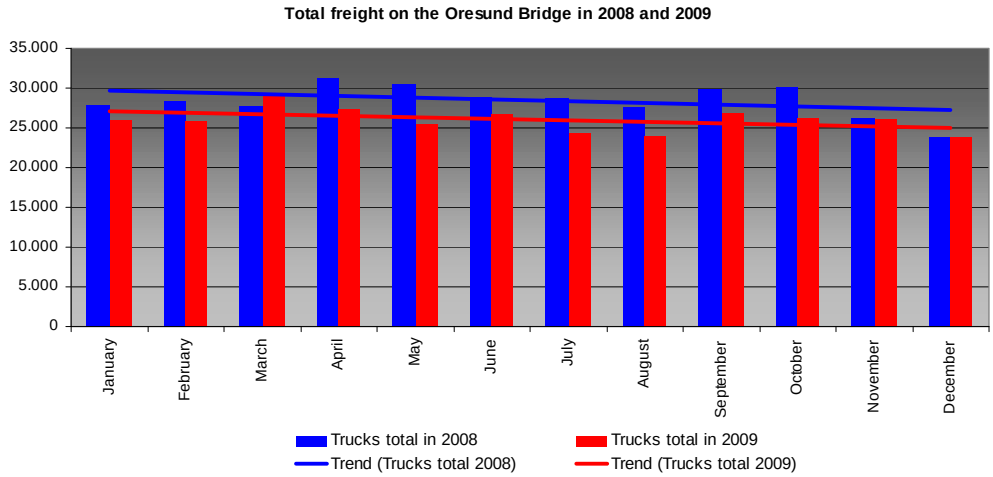


Figure 11 The total freight traffic on the Oresund Bridge in 2008 and 2009

4.6 Ferry traffic

Since January 2009 the ferry lines in Denmark and between Denmark and Sweden have registered the amount of EMS vehicles ferried in January 2009. The more detailed statistic statements can be found in Appendix 1 A.

Elsinore-Helsingborg is the ferry line ferrying most EMSs

The ferry line between Elsinore and Helsingborg is the line ferrying most EMS vehicles. From the start in January to the end of September the total amount of ferried EMS vehicles increased from 259 (AADT 9) to 507 (AADT 17) per month. For the entire period it can be enumerated to AADT of 13 [12].

From Figure 12 the amount of ferried EMS vehicles between Elsinore and Helsingborg appears. A slightly higher amount of EMS vehicles are ferried to Elsinore than to Helsingborg.

[11] 1/3 of the EMS vehicles passing the Oresund Bridge in 2009 corresponds to 2 percentage points of the total decrease in the freight traffic on the Oresund Bridge from 2008 to 2009.
[12] At the present time (March 2010) only figures for the ferry passages up to and including the end of 3rd quarter of 2009 are available.

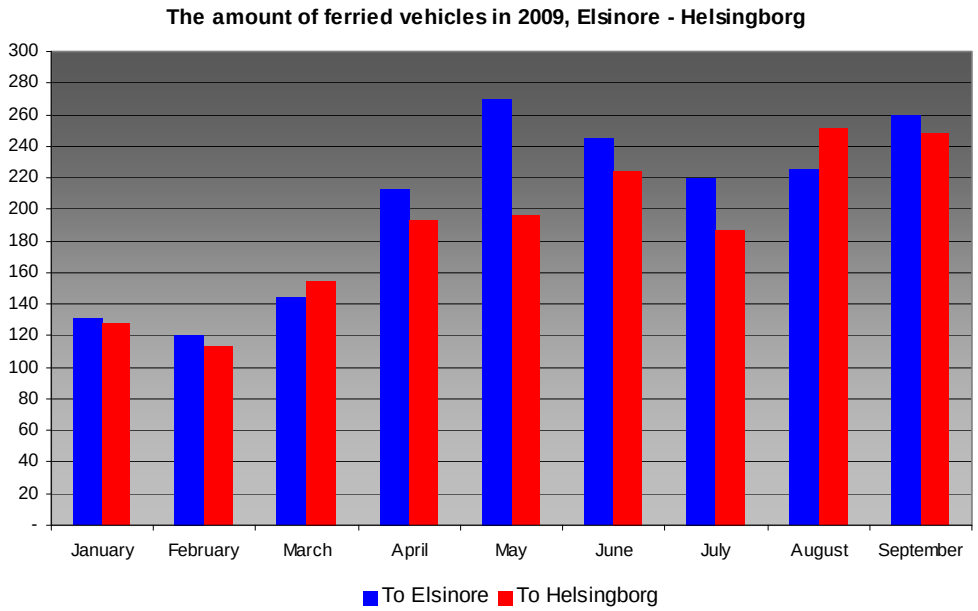


Figure 12 The amount of ferried EMS vehicles between Elsinore and Helsingborg

From Figure 13 the amount of ferried EMS vehicles between Gothenburg and Frederikshavn appears. For the entire period AADT can be calculated to 4.

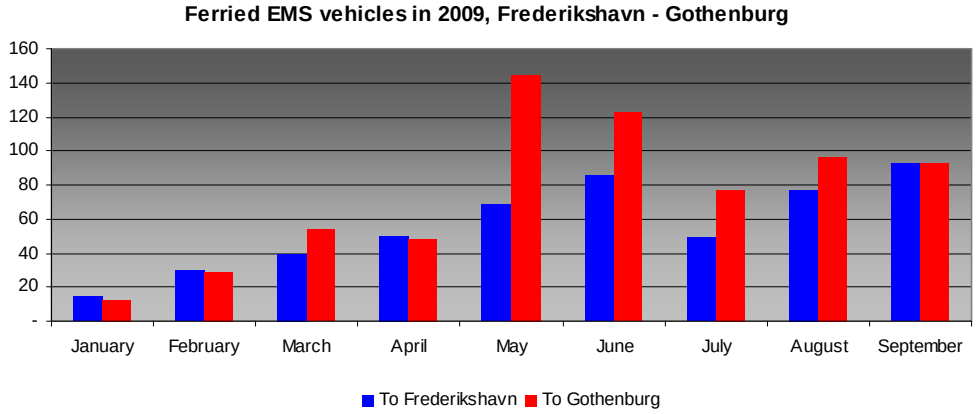


Figure 13 The amount of ferried EMS vehicles between Frederikshavn and Gothenburg

Only very few EMS apply Grenaa-Varberg

From Figure 14 the amount of ferried EMS vehicles between Grenaa and Varberg appears. A little more EMS vehicles are ferried to Varberg than to Grenaa. For the entire period the AADT can be calculated to < 1.

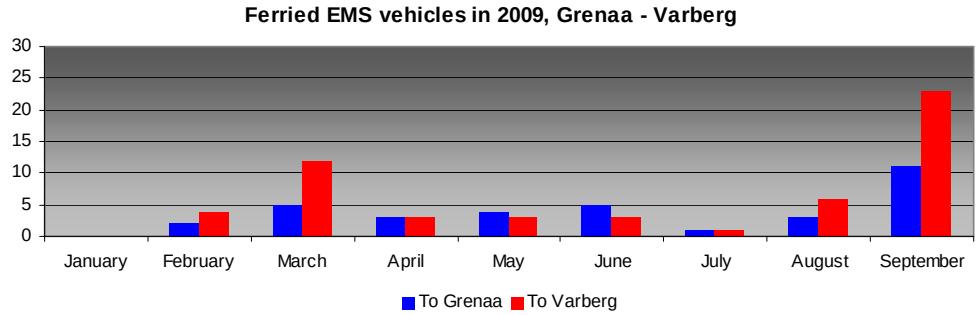


Figure 14 Amount of EMS vehicles ferried by the ferry line between Grenaa and Varberg

At Aarhus-Kalundborg more EMS are ferried towards Aarhus than towards Kalundborg

On the national lines the ferry line between Kalundborg and Aarhus is the only one ferrying EMS vehicles. This ferry line ferries EMS vehicles both with and without tractor [13]. The ferried amount of EMS vehicles have increased from 96 per month in January 2009 to 232 per month at the end of September 2009, which can be enumerated to an AADT of 5 for the entire period. Generally more EMS vehicles are ferried to Aarhus than to Kalundborg, cf. also Figure 15.

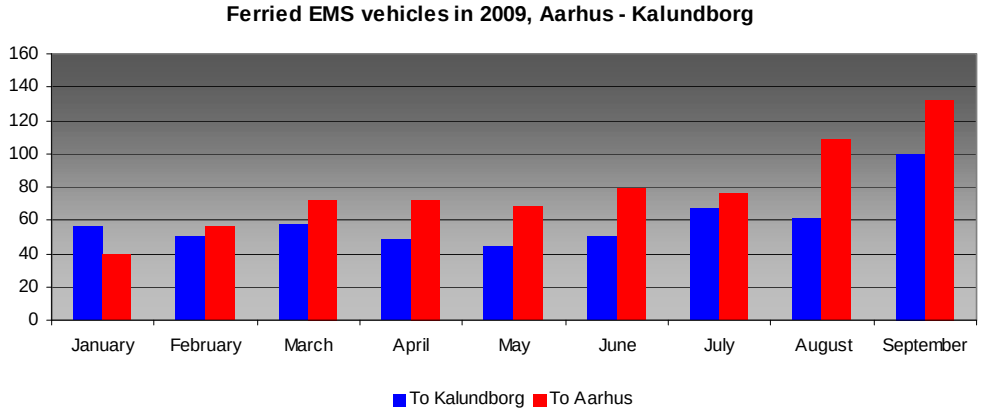


Figure 15 Amount of ferried EMS vehicles between Aarhus and Kalundborg

[13] The following does not distinguish between whether the EMS vehicles are ferried with or without tractor. The detailed figures for the ferrying with and without tractor respectively appear from table 4 in Appendix 1 A, of which appears that there is a rather large variance in the flow determined ferrying of EMS vehicles with and without tractor, respectively.

4.7 Transport patters of EMS vehicles

Figure 16 Transport patterns of EMS vehicles: "Accumulation" of EMS vehicles from January to September 2009

It appears from Figure 16 that more EMS vehicles are transported from Jutland to Sweden and from Kalundborg to Aarhus than the opposite way.

During 2009 considerably more EMS drove to Sealand than away from Sealand!

From Figure 16 it also appears that in the period January – September 2009 there has apparently been an "accumulation" of EMS vehicles on Sealand. Counts from ferry lines, the Great Belt Bridge and Oresund Bridge show that more EMS vehicles are driving to Sealand than from Sealand. Thus in this period 2,160 more EMS vehicles drove to than from Sealand [14]. The flow distribution and the total amount of EMS vehicle passages of Oresund appear from Figure 17, while the flow distribution and the total amount of EMS vehicles of the Great Belt appear from Figure 18.

[14] Taking into account that totally a little more than 300 EMS units are registered in Denmark, this corresponds to the fact that in the first 9 months of 2009, 6 times the amount on Sealand has been accumulated. In return it can be stated that this accumulation of EMS vehicles only corresponds to approx. 5 % of the total amount of EMS vehicles passing and/or being ferried on the Great Belt and Oresund.

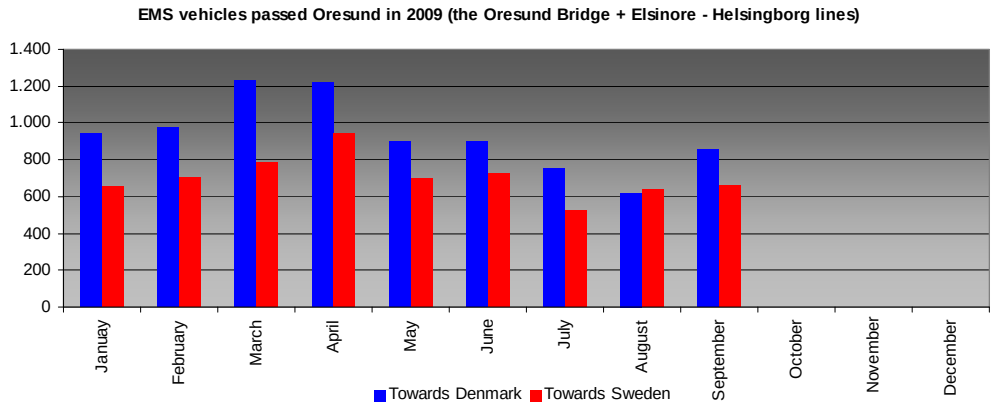


Figure 17 The development in the total amount of EMS vehicles having passed Oresund (Oresund Bridge + Elsinore-Helsingborg)

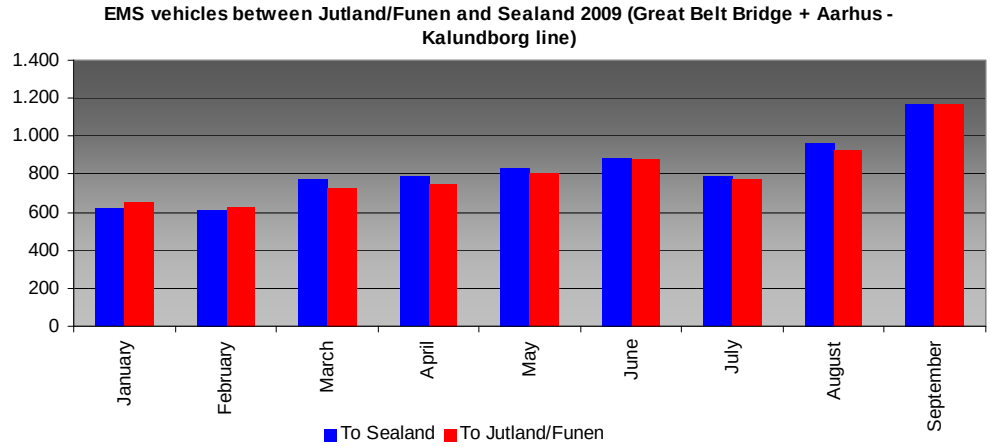


Figure 18 Development in the total amount of EMS vehicles having passed the Great Belt (The Great Belt Bridge + Aarhus-Kalundborg)

There are no immediate explanation to the accumulation of EMS vehicles on Sealand, but it can be assumed that EMS vehicles driving to Sealand are interchanged into smaller units to a larger extent e.g. in connection with further distribution before they return to their starting point[15].

EMSs and trucks under 9 m drive towards Denmark, while other trucks drive towards Sweden

For the Oresund traffic the flow determined distribution of the other freight traffic has been studied for the first 3 quarters of 2009. This shows that in the period in question a total of 1,967 more trucks were headed towards Sweden than towards Denmark.

[15] It can be mentioned that the phenomenon of accumulation of EMS vehicles on Sealand has been presented and discussed at a stakeholder meeting as well as at a panel meeting during the spring of 2010. In this connection a number of various explanations of the phenomenon has been given but any unique explanations have not been given. In the further evaluation work these possible explanations will be studied further.

The 1,967 trucks distributed with 5,605 truck over 9 meters (except EMS vehicles) and 257 trucks over 20 meters (apparently exceptional transports). To this came the 1,930 additional EMS vehicles mentioned in Figure 16 headed towards Denmark, and finally 1,965 more trucks under 9 meters, also headed towards Denmark. In other words it is a question about that EMS vehicles and trucks under 9 meters are headed towards Denmark while road trains not configured as EMS vehicles are headed towards Sweden. The transport pattern for trucks on the Oresund Bridge is illustrated in Figure 19.

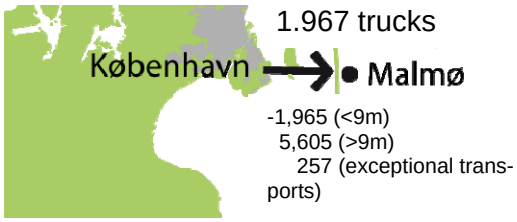


Figure 19 Transports with trucks on the Oresund Bridge the first 3 quarters of 2009

Looking at Elsinore - Helsingborg in the same period that is the 3 first quarters of 2009, then a total of 1,954 more trucks were ferried towards Denmark than towards Sweden – that is close to the 1,967 trucks passing over the Oresund Bridge but in the opposite direction towards Sweden.

Moreover, for the Elsinore – Helsingborg line it turns out that it is a question about EMS vehicles (100), solo trucks (267) and semitrailers (1,994) headed towards Denmark while 407 trucks with trailer are headed towards Sweden. The transport pattern for trucks on the Elsinore – Helsingborg line appears from Figure 20.

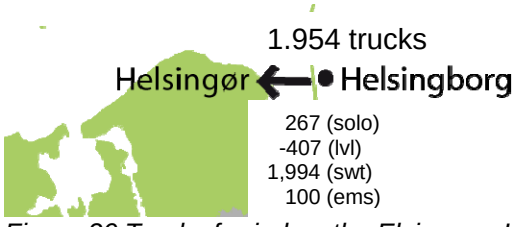


Figure 20 Trucks ferried on the Elsinore – Helsingborg line the first 3 quarters of 2009

All in all no clear picture begins to emerge for the Oresund traffic, as semitrailers on the Elsinore – Helsingborg line have a flow imbalance bound towards Denmark (with 1,994 trucks over 9 meters), while on the Oresund Bridge there is a flow imbalance bound towards Sweden for trucks over 9 meters (with 5,605 trucks over 9 months, except EMS vehicles).

4.8 Speed

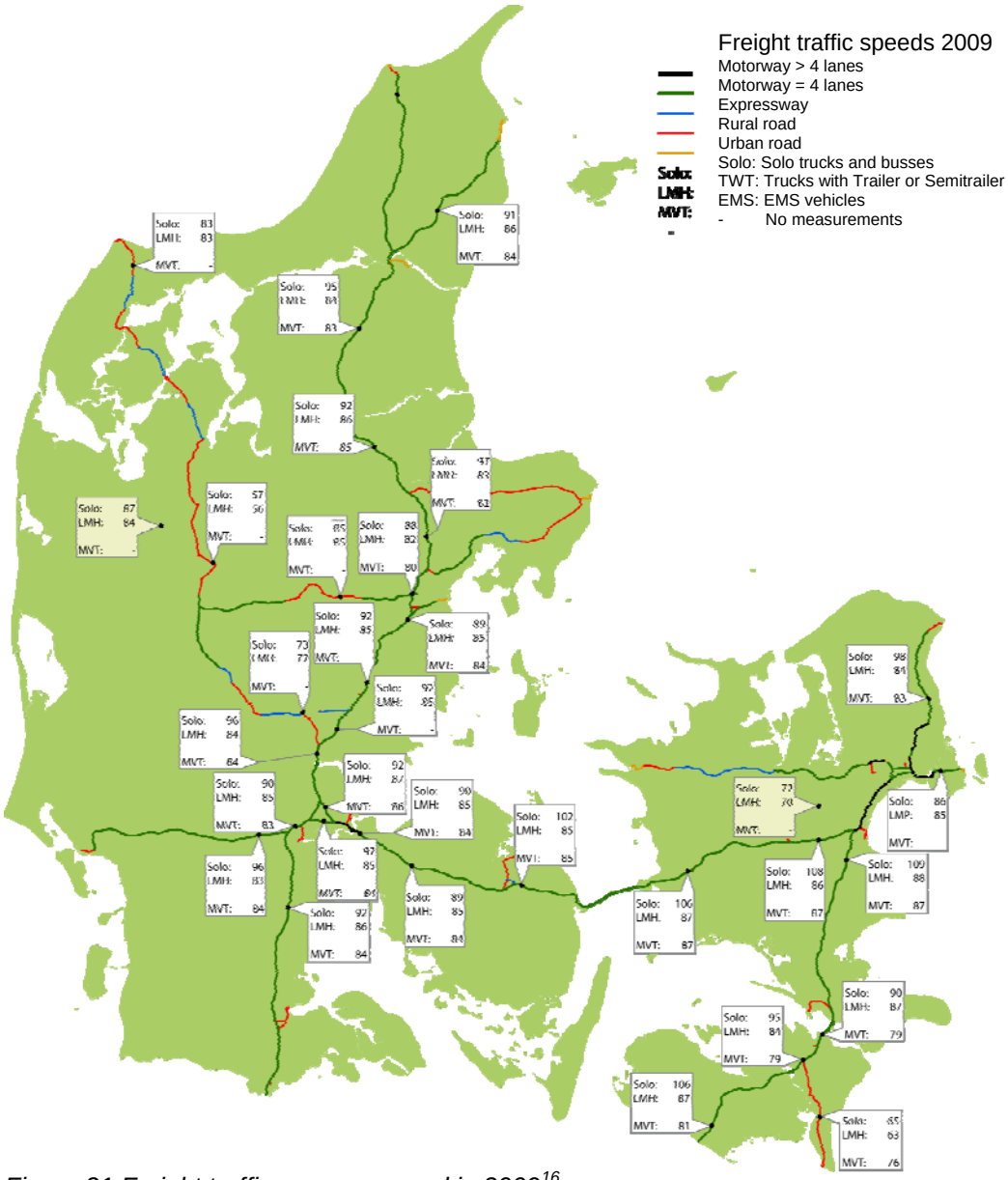


Figure 21 Freight traffic average speed in 2009[16]

The freight traffic speed has been measured on the average speed and grouped into the same categories as the WIM counts (Solo, TWT, and EMS vehicles).

[16] The speed measurements north of Herning can indicate that the measurement is made in a 50/60 km/h speed zone. The permitted speed limit does not appear from the individual speed measurements in Matra.

The freight traffic speed is the same on average before and after the introduction of EMS

In relation to the measured average speeds in connection with the pre-test situation in 2008, the solo trucks are fluctuating around the same speeds as in 2009. On some of the sections the average speed has increased 1 km/h while on other sections the speed has decreased with 1 km/h[17].

Generally trucks with trailers are lying on the same speeds like in the pre-test situation in 2008 with a few small fluctuations on a few sections.

The speed limiter is set to 85 km/h

More haulage contractors have indicated that their EMS vehicles are limited to drive maximum 85 km/h. Speed measurements from 2009 could apply to most EMS vehicles. So there is only one section in Jutland where the average speed has edged up to 86 km/h. Moreover on the motorway between Korsør and Køge and a little south of Køge the average speed for EMS vehicles is up at 87 km/t.

4.9 Total weights and axle loads

Due to uncertainties in conc. with weight data, this is not updated in the report

Some uncertainty about the weight data given by the WIM devices of the Danish Road Directorate has turned up. This uncertainty has apparently existed for some time and apparently also at the time of the pre-test situation report. Whether the uncertainty also applies to the registration of weight data on EMS vehicles is not clear. In order to be certain about the weight data that may be passed on in the report, a further investigation of the validity of the data will be necessary. This verification is at the moment ongoing in a dialogue with the Danish Road Directorate. The work is not expected to be finished before after publication of the midway report, which is why the present report is not expected to include further material within this area.

4.10 Degree of occupancy on service and rest areas

At the moment 17 service areas are part of the EMS vehicle test, and it should be noted that typically 2 rest areas are located opposite of each other. The service areas being part of the EMS vehicle test appear from the map in Figure 22.

[17] It may wonder, why solo trucks are driving at a speed above 100 km/h on a number of partial sections. The measurements in these cases have been checked an extra time and it seems like there are no errors in the data transfer.

Figure 22 Service areas where EMS vehicles can park

At all service and rest areas in the country WIM devices are typically installed in the form of semi-permanent stations. It is, however, pure quantity counts, which do not classify on vehicle type. Consequently the application of this data is limited for the present evaluation.

The degree of occupancy on service areas is being registered

In recent years the focus has been on the degree of occupancy of the service areas in the country, which is why the Danish Road Directorate has started to register manually the amount of vehicles applying the service areas for overnight accommodation. The counts to be applied for the midway report have been made mid March, end of July and end of October 2009. The counts have been made at night where the degree of occupancy for trucks is expected to be largest. In connection with the counting the trucks were differentiated according to the following categorisation; Solo trucks, trucks with trailer, semitrailer and EMS vehicles.

The average degree of occupancy on service areas decreased in 2009

With regard to the 19 service and rest areas being part of the EMS vehicle test the result of the investigation appears from Figure 23. For each rest area the figure shows amount of parking spaces for trucks (designated as the nominal truck capacity) and the average occupancy percentage for the 3 counts. The outer right column shows the average occupancy percentage for all service areas. 100 percent occupancy is indicated with a bold line.

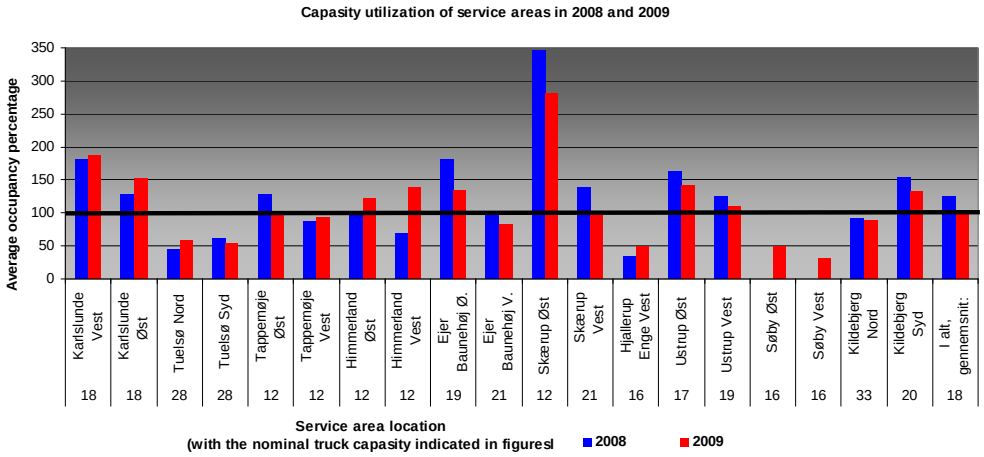


Figure 23 Capacity utilization of service and rest areas on the test road network

The degree of occupancy fluctuates between 30 % and 280 %

The capacity utilization varies somewhat from service and rest area to service and rest area in the night. In 2009 the highest utilization percentage was approx. 280% in average, which could be found in Skærup East, south of Vejle, while the lowest occupancy percentage was at Søby West, south of Herning where the occupancy percentage was around 30 % in average.

From Figure 23 appears likewise that the average load on the service areas was higher in 2008 than in 2009. This corresponds with a general decrease in traffic over the recent quarters.

Figure 24 shows the distribution of registered trucks on the service areas in 2009, and it appears that the amount of EMS vehicles is very limited, while the majority is semitrailer road trains. Solo trucks and trucks with trailer form a minor part.

It is still the semitrailers which are primarily using the service areas

The explanation of this difference should apparently be found in the condition that semitrailer road trains are by far the most widespread road train combination (not least in international traffic) driving long distance over several days with a need for overnight accommodation out. Generally the stricter handling and consequently observance of driving time and rest period regulations seem to have increased the quantity of night staying, also with regard to national transports. These will apparently often take place on carrier centrals etc. after unloading of the vehicle.

In connection with EMS vehicle transports night stayings happens on the trips between Eastern and Western Denmark[18], but this mostly happens in the logistics centrals which the vehicles are passing; that is not during the trip but at the end destination. Transport with EMS vehicles through Denmark can thus typically be performed without longer stays on service areas.

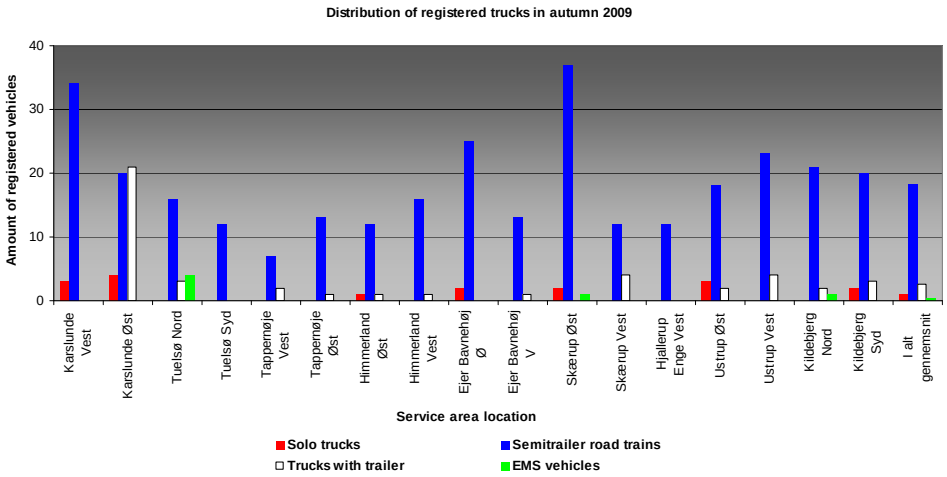


Figure 24 Distribution of registered trucks on service areas

It is expected that the Danish Road Directorate will continue to perform this type of manual data collections throughout the remaining period of the EMS vehicle test.

[18] This picture has been characteristic for several of the EMS vehicles being part of the first interview and other survey.

5 FREIGHT TRAFFIC

If nothing else is mentioned, data in this section has been derived from Statistics Denmark either from Statistiske Efterretninger [*Statistic Information*] or StatBank Denmark. A number of figures will contain data from the first 3 quarters of 2009, which is the material published to date (March 2010). In some cases data from the first 3 quarters of 2009 has been recalculated giving an estimate for all of 2009. This makes the figures comparable with the figures from 2007. In other cases the figures have been made comparable by including the figures for all of 2007, followed by the 3 first quarters in 2007, and finally the 3 first quarters of 2009. In a number of cases the designations ”N.A.” or ”–” will be applied which means that data is not available – e.g. because there were no EMS vehicles in 2007 or because data is still not available. Finally a ”0” will indicate that data is available and that the quantity has been calculated to zero units.

With regard to preparation of the reporting for the final report, space has been reserved in a number of cases in various figures for handling of the development of EMS vehicles. This has been done in spite of the fact that at the present time (March 2010) only a relatively small amount of data is available on transport with EMS vehicles alone.

Special run of the driver’s log has been performed by Statistics Denmark

In connection with the evaluation of the EMS vehicle test a special run of the driver’s log has been performed solely focusing on the application and spread of EMS vehicles. In order to ensure total anonymity for the respondents, Statistics Denmark has been responsible for the distribution of questionnaires and collection of data. The preparation of the questionnaires has been made in close collaboration between Statistics Denmark and the evaluation team with consultation of the haulage trade. The treatment of data has been made by the evaluation team.

The results of the special run of the driver’s log have been gathered in Appendix 2 B. Here a copy of the questionnaires can be found as well. The results of the investigation will be included currently where it can enrich and vary the other and typically more general analyses of the freight situation.

5.1 Freight traffic divided nationally and internationally

Approx 2.5bn vehicle-km are driven on the road network in Denmark

The freight traffic on the Danish road network is combined by national and international traffic[19]. It is estimated that in 2007 a total of 2.7bn km was driven with truck on the Danish road network while in 2008 this had fallen to approx. 2.6bn km. These kilometres were distributed with 1.7bn km on the national road network and 0.9bn km on the municipal road network. Furthermore it is assessed that in 2008 2bn km of the driven 2.6bn km were performed by the national traffic, while the remaining approx. 0.6bn km were performed as a part of the international traffic. From 2007 to 2008 the amount of driven vehicle-kilometres has fallen with estimated 3.7 %.

[19] In addition to national and international traffic there is transit traffic. As the transit traffic is normally not treated separately by Statistics Denmark, this will as an exception be treated explicit further on.

With a certain caution a preliminary estimate is that the national traffic in 2009 was approx. 19 % below the level in 2007. The international traffic with Danish vehicles was approx. 10 % below the level in 2007, also compared to Figure 25.

All figures in million km	Danish vehicles		Foreign vehicles		Total traffic work	
	200	2009	2007	2009	2007	2009
National traffic	2.1	1,740	43.2	-	2,205.	-
International traf.	199	179	275.1	-	474.1	-
Transit haulage	3.1	-	48.3	-	51.4	-
Total	**2.3**	**-**	**366.6**	**-**	**2,730.**	

Figure 25 Traffic work in 2007 and 2009 distributed on Danish and foreign vehicles

The national goods transport has decreased with approx. 28 % from 2008 to 2009

The national goods transport in 2nd quarter of 2008 amounted to 46.6 million tonnes, which in 2nd quarter of 2009 had fallen to 34.6 million tonnes corresponding to a fall of approx. 28 %. The transport work has fallen during the same period from 2.8bn tonne-kilometres to 2.4bn tonne-kilometres, corresponding to a fall of approx. 15 %.

5.2 Freight traffic internationally

ITD's counts of freight traffic at the border to Germany, the Oresund Bridge and at the Elsinore – Helsingborg line, show a fall in the amount of vehicles between 2nd quarter of 2008 and 2nd quarter of 2009 of approx. 15 %, see Appendix 1 as well. It should be noticed that the traffic in 2nd quarter of 2008 was the highest registered traffic in the period during which ITD has performed the counts. According to the driver's log statistic the international goods quantity on Danish vehicles fell from 2nd quarter 2008 to 2nd quarter of 2009 with approx. 28 %, while the transport work (tonne-km) fell with more than 30 %. Traffic work fell with approx. 20 %.

When comparing the driver's log and the figures of ITD, please recall that the driver's log solely contains figures for Danish trucks while the counts of ITD comprise all trucks both Danish and foreign. In return the ITD counts do not comprise information about goods quantity and trip distance.

The above figures about the development in the international freight traffic indicate that the largest fall can be found in the transported quantity which has fallen with 28 %, and in the transport work which has fallen with more than 30 %. Apparently this means that a smaller goods quantity is transported over somewhat shorter distances than earlier. As the fall in traffic work is at the same time somewhat smaller than the fall in goods quantity and transport quantity, this should be expected to give a lower capacity utilization. A closer analysis of these conditions requires a somewhat more homogeneous data basis, which is why it cannot be carried out before at a later time, when data for the entire 2009 is present for the various types of freight traffic.

The traffic work is estimated to have fallen with 10 % in 2009 in relation to 2007

In connection with the pre-test situation it has been assessed that in 2007 450 million km were driven in Denmark as part of the international transport. A figure which in 2008, as mentioned above, is estimated to have increased to 500 million km. For 2009 it is still too early to say anything certain about the size of the figure but for the Danish trucks alone there are indications of a fall of 10 % compared to the figures from 2007.

Vehicle type	Traffic work performed in Denmark as part of international transport (million km)	
	2007	3 first quarters of 2009 [20]
Danish trucks (Except EMS)	200	135
Danish EMS	N.A.	-
Foreign trucks (Except EMS)	250	169
Foreign EMS	N.A.	-
Total, Of these EMSs	**450 N.A.**	**-**

Figure 26 Traffic work performed in Denmark as part of international transport distributed acc. to nationality type

Based on data from the first three quarters of 2009, the international transport performed with Danish vehicles can for all of 2009 be estimated to approx. 11 million tonnes. Based on data from ITD and own estimates the international traffic performed with foreign vehicles can – with some uncertainty – be estimated to 15 million tonnes. The estimated figures for all 2009 are based on actual figures for the first 3 quarters of the year.

Nationality type	Goods quantities in international transport (million tonnes)		
	2007	3 first quarters of 2007	3 first quarters of 2009
Transport performed by Danish trucks (except EMS)	13.0	9.6	8.1
Transport performed by Danish EMS	N.A.	N.A.	-
Transport performed by trucks registered abroad (Except EMS)[21]	18.0	13.5	11.4
Transport performed by EMSs registered abroad	N.A.	N.A.	-
Total - of these EMSs	**31.0 N.A.**	**23.1 N.A.**	**19.3 -**

Figure 27 Goods quantities transported in Denmark as part of international transport distributed acc. to nationality type

[20] The source of this data is ITD and own estimates. The figures for the total amount of trucks in 2009, Danish as well as foreign comprise EMS vehicles so far.
[21] For transport performed by trucks registered abroad the figures for the 3 first quarters of 2007 are estimated on the basis of all-year data. For 2009 the figure is estimated on the basis of the 2007 share.

The goods on the international transports are to a large extent exported/performed by means of semi-trailer, and to some extent by means of trailer road trains.

Vehicle type	Share of transported goods in international transports	
	2007	2009 [22]
Transport carried out by solo trucks	1.5 %	-
Transport carried out by trailer road trains	15.0 %	-
Transport carried out by semitrailer	83.0 %	-
Transport carried out by EMSs	N.A.	-
Total	**99.5 %**	**-**

Figure 28 Share of international transport distributed per truck type

The quantity of goods has fallen but first commodity group is still general goods

Based on enumerated data for 3 quarters of 2009, the international goods quantity on Danish vehicles can be estimated to approx. 11 million tonnes. The by far largest commodity group comprises general goods.

Commodity groups [23]	Transport quantities (million tonnes)		
	2007	3 first quarters of 2007	3 first quarters of 2009
Construction material (gravel, soil, stones, bricks, etc.)	1.0	0.8	1.1
Food stuffs	2.1	1.6	1.3
General cargo	7.5	5.6	4.7
Agricultural products	1.4	0.9	0.6
Coal, coke and chemical products	0.8	0.6	0.5
Total	**12.8**	**9.5**	**8.2**

Figure 29 Quantities transported goods in international transports distributed in commodity groups.

Generally the capacity utilization has grown smaller

Based on data for the 3 first quarters in 2009, the capacity utilization for all of 2009 can cautiously be estimated to be some percentages below the corresponding figures in 2007. However it should be noticed that in 2009 the capacity utilization figures have been rather fluctuating.

[22] the figures for 2009 will not be available before a total statement for the year has been made.
[23] It should be noticed that the method for the calculation of commodity groups has been changed by Statistics Denmark between 2007 and 2009. In the figures concerning commodity groups the new nomenclature has been applied. This means that the figures for 2007 cannot be compared with the pre-test report and the midway report.

Truck type	Capacity utilization for all trips % of tonnes (corrected for volume goods)		Capacity utilization for trips with load % of tonnes (corrected for volume goods)	
	2007 [24]	3 first quarters in 2009	2007	3 first quarters in 2009
Transport performed by solo trucks	28.8 % (37.2 %)	-	33.1 % (42.7 %)	-
Transport performed by trailer road train	34.5 % (42.9 %)	-	44.7 % (55.5 %)	-
Transport performed by semitrailer	41.6 % (46 %)	-	55.4 % (61.3 %)	-
Transport performed by EMS vehicles	N.A.	-	N.A.	-
Average	**40.5 % (45.5 %)**	**34.4 % (39.5 %)**	**53.7 % (60.3 %)**	**45.6 % (52.5 %)**

Figure 30 Capacity utilization in international transports distributed on truck type

As it appears from Figure 30, the capacity utilization has fallen in the period [25].

5.3 The national freight traffic

5.3.1 Type of transport including capacity utilization

In the following type of transport is understood as transport with various types of trucks including e.g. whether it is haulage contractor or company transport.

In 2007 the national transport work amounted to a total of 11.73 billion tonne-km. For all of 2009 this is estimated to be 10 billion tonne-km.

	Transport work (billion tonne-km)		
	2007	3 first quarters in 2007	3 first quarters in 2009
Transport performed by solo trucks	2.33	-	-
Transport performed by trailer road train	3.00	-	-
Transport performed by semi-trailer	6.40	-	-
Transport performed by EMS	N.A.	N.A.	-
Total	**11.73**	**8.8**	**7.4**

Figure 31 Transport work in 2007 and in the first 3 quarters of 2009 distributed on truck type

The total amount of trips for 2009 is estimated to be 17 million, and the expectation is that the capacity utilization will be approx. 70 % for trips with load.

[24] The capacity utilization for 2007 for the various truck types has not been calculated for quarters. This is due to the fact that the total average figures for all truck vehicle types are practically identical for the 3 first quarters of 2007 and for the entire year. This is why Figure 30 did not distinguish between the 3 first quarters of 2007 and the entire year.

[25] This impression is also confirmed by the haulage trade being of the opinion that the individual order has become smaller but the quantity of orders and thus the amount of trips has not changed.

	Amount of trips (million)			Share of trips with load		
	2007	**3 first quarters in 2007**	**3 first quarters in 2009**	**2007**	**3 first quarters in 2007**	**3 first quarters in 2009**
Amount of trips with solo trucks	10.0	-	-	75 %	-	-
Amount of trips with trailer road trains	4.1	-	-	70 %	-	-
Amount of trips with semitrailer	7.2	-	-	75 %	-	-
Amount of trips with EMS vehicles	N.A.	-	-	N.A.	N.A.	-
Total	**21.3**	**16.2**	**12.1**	**74 %**	**72 %**	**69 %**

Figure 32 Amount of truck trips and share of trips with load in selected years distributed on truck type

The total goods quantity transported in national transport and performed by Danish trucks amounted to 183,6 million tonnes for all of 2007. For 2009 the corresponding total figure is estimated to 135 million tonnes.

	Transported goods quantities (million tonnes)		
	2007	**3 first quarters in 2007**	**3 first quarters in 2009**
Transport performed by haulage contractors	149.4	114.4	79.9
Transport performed by company vehicles	34.2	23.6	21.4
Total	**183.6**	**138.0**	**101.3**

Figure 33 The amount of transported goods in 2007 and in the first 3 quarters of 2009 distributed on haulage contract and company transport

As it appears from Figure 33, the company vehicles seem to be relatively better at handling the competition compared to the haulage contractor vehicles. This can possibly be referred to the fact that companies with own vehicles in a crisis situation choose to increase the use of those at the expense of the external vehicles.

The goods are transported on various truck combinations but with a clear majority of road trains.

	Goods quantities transported (million tonnes)		
	2007	**3 first quarters in 2007** [26]	**3 first quarters in 2009**
Transport performed by solo trucks	50.3	37.8	-
Transport performed by trailer road trains	48.6	36.5	-
Transport performed by semitrailers	84.7	63.5	-
Transport performed by EMS vehicles	N.A.	N.A.	-
Total	**183.6**	**138**	**101.3**

Figure 34 The transported goods quantity in 2007 and in the 3 first quarters of 2009 distributed on truck types

Based on information from the three first quarters of 2009, a minor fall in the capacity utilization can be seen compared to 2007, cf. also Figure 35.

Vehicle type	**Capacity utilization for trips with load % of tonnes (% corrected for volume goods)**	
	2007 [27]	**3 first quarters in 2009**
Transport performed by solo trucks	58.1 % (60.3 %)	-
Transport performed by trailer road trains	56.4 % (57.4 %)	-
Transport performed by semi-trailers	70.4 % (71.6 %)	-
Transport performed by EMS	N.A.	-
Average for trips with load	62.6 % (64.2 %)	59.3 % (61 %)
Haulage contractor owned transports	64.4 % (65.7 %)	60.1 % (62 %)
Company vehicle transports	56.0 % (58.3 %)	56.6 % (57 %)

Figure 35 Capacity utilization of trucks in national transports distributed on truck type and ownership for selected years

5.3.2 Sort of goods

Sort of goods are to be understood as goods distribution in various commodity groups.

Of the total of 183 million tonnes transported goods construction material represented the largest goods type with a total of 80 million tonnes in 2007. In 2009 the commodity group is expected to be the largest as well, with a total volume of approx. 52 million tonnes, cf. also Figure 36.

[26] For 2007 the distribution in the 3 first quarters is based on all-year data.
[27] Since the capacity utilization for the 3 first quarters of 2007 is practically identical with all of 2007, both distributions have not been included in the figure.

Commodity groups	Transported goods quantities					
	2007 in million tonnes	2007 in %	2007, 3 first quar-ters in million tonnes	2007, 3 first quar-ters in %	2009, 3 first quar-ters in million tonnes	2009, 3 first quar-ters in %
Construction materials (gravel, earth, stones, bricks, etc.)	80.2	44 %	61.1	44 %	40.4	40 %
Food stuffs	32.0	17 %	23.8	17 %	15.7	15 %
General goods	35.5	19 %	26.6	19 %	23.9	24 %
Agricultural products	27.4	15 %	20.5	15 %	13.8	14 %
Coal, coke, oil and chemical products	8.4	5 %	6.1	5 %	7.5	7 %
Total	**183.5**	**100 %**	**138.1**		**101.4**	**100 %**

Figure 36 Transported goods on truck distributed on commodity groups in selected years[28]

Food stuffs and general goods are transported with EMS

On the basis of the special run of the driver's log mentioned earlier Figure 37 has been created showing the distribution on commodity groups among the EMS vehicles included in the special run.

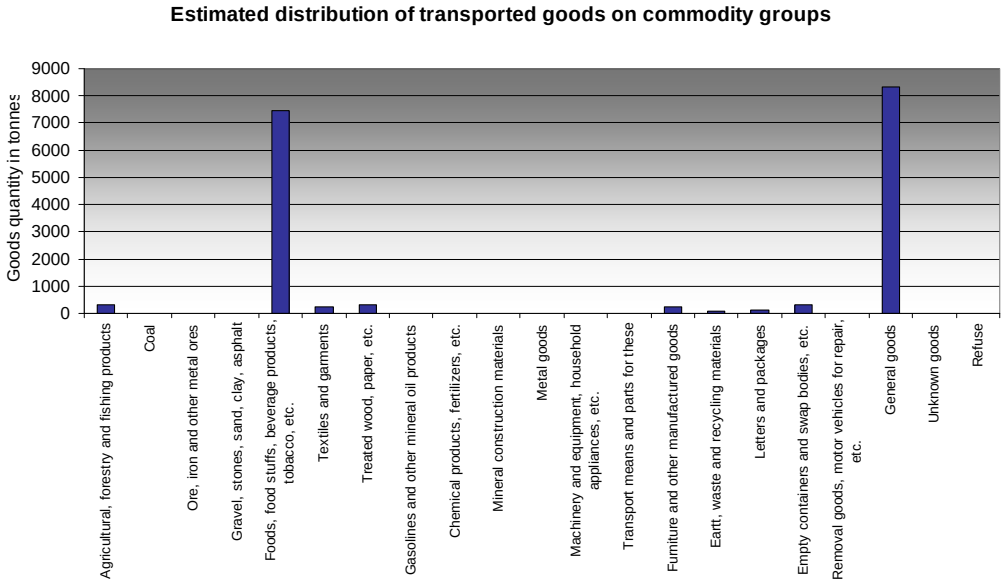


Figure 37 Distribution in % on commodity groups transported with EMS vehicles

[28] Changes in commodity group distribution cause the figures not to be directly comparable between 2007 and 2009.

Looking at the similar distribution for trucks with a total weight of more than 6 tonnes and the transport in national traffic in 2008, it appears from Figure 38 that the largest commodity groups are gravel, stones, clay, etc. foods and food stuffs, agricultural and fishery products, earth and waste, and construction material [29].

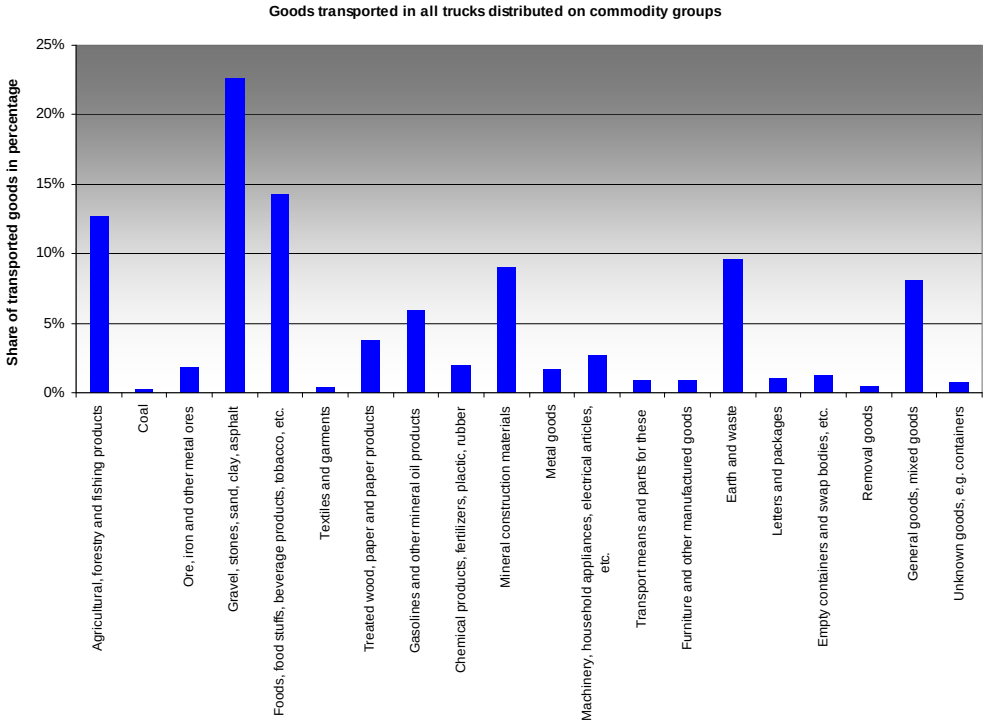


Figure 38 Distribution in % on commodity groups transported with all trucks

Only two commodity groups; ”foods, food stuffs, beverages, etc” and ”general goods” appear in both truck groups in Figure 37 as well as Figure 38 with a relatively large share. This stresses the fact that so far EMS vehicles are primarily applied for transport of a minor amount of commodity groups where the strength with regard to volume of the EMS vehicles is apparently best exploited for transport of foods and general cargo.

5.3.3 Applied routes

EMS trips mainly between Eastern and Western Denmark

Figure 39 illustrates that among the questioned companies in the special run, the majority of trips is between Eastern and Western Denmark and trips between Northern and Southern Jutland supplemented with trips to accessible destinations in the rest of Scandinavia.

The picture is to a large extent similar to the pattern known from semitrailer transports as solo truck transports are typically applied over shorter distances.

[29] It has been decided to apply figures for commodity group from 2008, as the special run has been prepared with use of the new commodity group codes which cannot be referred to commodity group figures for 2007.

Figure 39 Map with postal code relations with 10 or more trips made with EMS vehicles in the counting week

5.3.4 Destinations

Brøndby is the most applied destination

Data forming the basis of Figure 39 illustrates that the questioned companies in the special run has 57 locations from where they drive with EMS vehicles, of these 16 are foreign, while 53 destinations are end destinations of which 17 are foreign [30].

[30] Pursuant to "The executive order for transport with EMS vehicles" (December 2009) there are 69 locations, from where EMS vehicles can drive from/to, including 19 service areas. If we look at Danish start locations alone, transport is done from 41 locations and if the 19 service areas are excluded, 9 locations in the special run in the counting week are not applied by EMS vehicles within this particular week.

Most often applied end destinations (out of a total of 282 trips)		
	Quantity	**Percentage**
Brøndby	34	12 %
Tåstrup	25	9 %
Padborg	21	7 %
Vejle	19	7 %
Glostrup	16	6 %
Køge	17	6 %
Kolding	13	5 %
Odense SØ	12	4 %
Herning	10	4 %
Fredericia	10	4 %
Aalborg	10	4 %
Total	**187**	**66 %**

Figure 40 End destinations with a frequency of 10 or more for EMS vehicles[31]

Figure 40 shows the end destinations for EMS vehicles from the questioned companies with a frequency of 10 and more. All destinations are cities of a certain size and they all have either a transport terminal, a port, large companies or a combination of these. Taking the 11 most frequent destinations gives a picture of 66 % of the end destinations. Among foreign end destinations Oslo is the most important one with 7 trips ending here. Further down the table some Swedish cities with 3 and 2 trips ending there are listed.

5.3.5 Trips distances

A comparison between trip distance and capacity utilization in the pre-test situation showed that the best capacity utilization could mainly be found on the long distance trips and for transport with haulage contractor vehicles. However, it has not been possible to update the corresponding figures for trip length and capacity utilization for 2009, which is why it is still not possible to conclude on, whether this pattern has changed.

Good capacity utilization but still potential for optimization

In the same way it was illustrated for the pre-test situation what the capacity utilization was for haulage contractor vehicles and company vehicles for various section lengths respectively. It has, however, turned out that this type of statement can still not be updated for 2009. With regard to the pre-test situation in 2007, reasonable capacity utilization was revealed, but theoretically there is a certain unused potential especially on shorter trips and especially with regard to company vehicles.

[31] It should be noticed that postal codes for end destinations were asked for, which is why postal codes can cover more locations. E.g. ”Brøndby” can cover 3 different interchange locations.

On the basis of the performed special run of the driver's log, Figure 41 has been created. The figure illustrates that there is no direct connection between goods weight and trip distance. On the contrary the figure illustrates that there is a tendency that EMS vehicles of type 3 (the link-trailer) is applied on shorter distances; while the modular combination type 1 (dolly) is applied on longer distances.

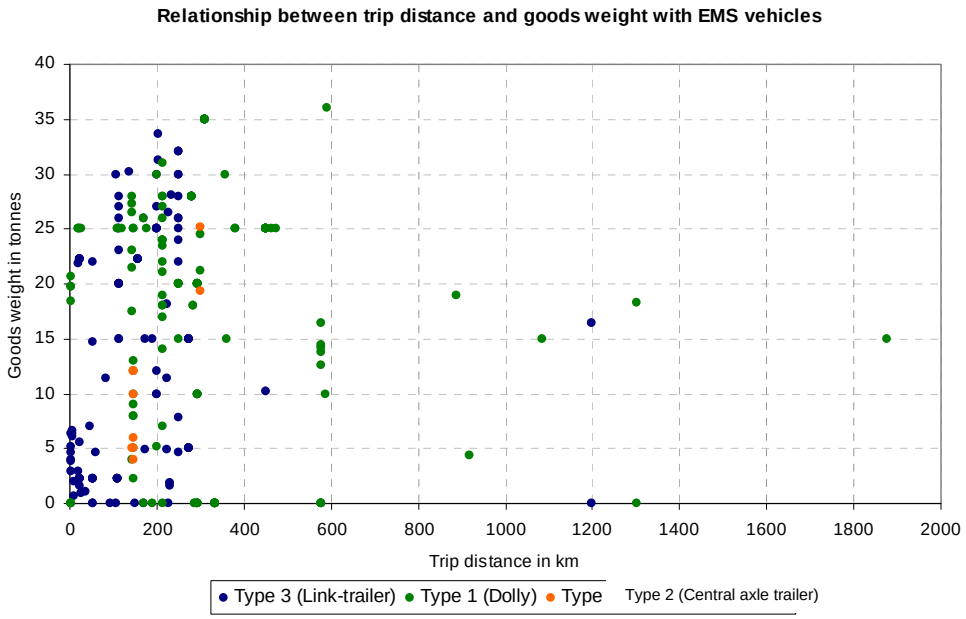


Figure 41 Relation between trip distance and goods weight for EMS vehicles in the special run[32]

Especially type 1 (dolly) is applied for long distance trips

A possible explanation can be that type 1 is primarily applied for terminal transport, while type 3 is to a large extent applied when all goods are for one customer. At the same time it should be notices that relatively many long trips with low goods weight may be an expression for volume goods where the road train with regard to volume has been well-exploited without this having an effect on the weight. However, the opposite possibility is also present, as the special combination of EMS vehicle units could mean that a haulage contractor sometimes chooses to drive with e.g. an empty link-trailer in order to have this returned even if there is not goods onboard, but simply because it is going to be used for a modular combination e.g. the day after. This must e.g. be assumed to be the case on the long distance trips where the goods weight is 0.

However, comparing Figure 41 and Figure 42, the same pattern is seen as there is a concentration of trips between 100 and 500 km, where especially type 1 (dollies) travels the longest distances [33]

Share of trips

[32] It should be mentioned that a "dot" in the figure can contain more trips.
[33] In principle type 2 (central axle trailer) travels rather long distances as well. But as there are relatively few of these, it is not that significant.

Type 3 (Link-trailer)
Type 1
Type 2 (Central axle trailer)
All units

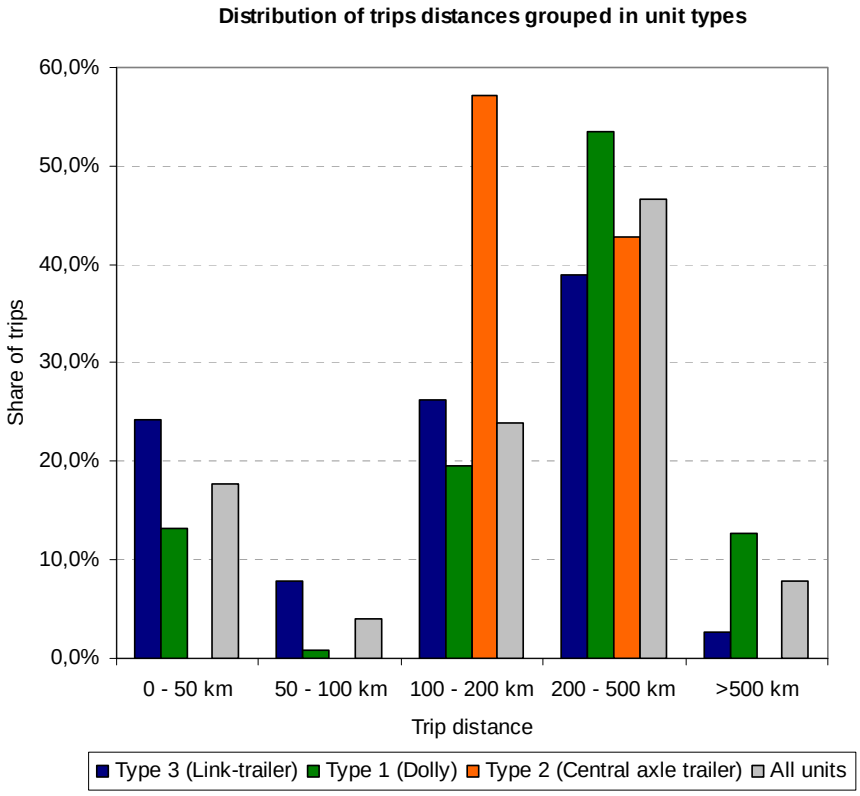


Figure 42 Trip distances for various types of EMS vehicle units

In addition to the above should be added that as a main rule existing transports with traditional road trains are replaced by EMS vehicles, which is why there are no immediate changes in the travelling patterns, distances, etc. and therefore no fundamental changes in the transport and traffic picture. Basically it should, however, still be assumed that especially longer trips are performed by EMS vehicles even if this pattern should change concurrently with the extension of the accessible road network and the fact that the road trains can to a larger extent travel from a to b without interchanges.

5.3.6 Interchange patterns

Interchanging of EMS vehicles for transport as separated units ins done partly according to the same system as is known from transport with traditional road trains in the haulier system and partly as transport with full loads [34].

The interchange pattern resembles the interchange pattern from other truck transports

In the first-mentioned case it is a question about the EMS vehicle travelling between e.g. two goods terminals and are then interchanged in the terminal. On unit (often a traditional solo truck) continues the transport as a distribution vehicle and delivers/collects cargo from a number of customers but (typically) the semitrailer remains at the terminal where it is unloaded and then loaded again with cargo from the terminal. In other words it is a question about a system which only marginally differs from a traditional combination performed with (the same) solo truck and a traditional trailer.

[34] In Appendix 3 C, which refers to a number of interviews with hauling companies and drivers of EMS vehicles, a number of illustrative examples of interchange patterns can be found.

In the other case the entire EMS vehicle must arrive at a customer but limitations on the road network makes this impossible. In such situations link-trailer based solutions are often applied, where the long road train can be interchanged and travel separately to the customer with the same tractor. This type of transport can be reduced if the road network for EMS vehicles was extended and included more company solutions.

Interchange is done on many locations, however mostly at transport centres

Figure 43 lists the locations where companies, which took part in the special run, perform their EMS vehicles interchange. The figures show that interchange is performed at a variety of locations, where the transport centres account for the largest part with 40 %, while private terminals, ports and service and rest areas play a minor but not unimportant role with 20 %, 17 % and 13 %, respectively.

Locations	Amount of companies	
Ports	13	17 %
Service and rest areas	10	13 %
Transport centres	30	40 %
Private terminals	15	20%
Toll stations	2	3 %
Industry areas	1	1 %
Did not make interchanges	4	5 %
Total	**75**	**100 %**

Figure 43 Interchange locations for EMS vehicle)

5.3.7 Effect evaluation of changed capacity utilization and replacement of goods transport

EMSs results in transfer of goods from other truck types

An important issue in relation to the use of EMS vehicles is the assessment of whether they replace existing road trains and the transport performed by these or whether they generate new cargo transport on the roads. Based on the conducted interviews, own observations on the transport centres, service and rest areas and road network of vehicle types, ownership, etc. the indications are clear that it is a question about a transfer of cargo from existing road trains.

Good examples of this are the transports performed by e.g. Danske Fragtmænd, Transportgruppen, Frode Laursen and Alex Andersen Ølund. Here the EMS vehicles are involved totally on par with other road trains for e.g. transport between Eastern and Western Denmark. However except for transport of very heavy products (such as paint), in which cases the EMS vehicles volume capacity cannot be exploited. The transport tasks are often solved by implementing e.g. one or two EMS vehicles ”supplemented” by a number of traditional road trains.

Often the EMS vehicle drives first, which may be due to the fact that it is filled up first or it takes longer time to unload this vehicle as a consequence of the subsequent interchange at the end destination. In such cases a 100 % capacity utilization of the EMS vehicles is often worked with, which means that it can reduce the capacity utilization on the traditional road trains supplementing the transport.

The above evaluations have been confirmed by the conducted interviews with haulage companies and drivers (see also Appendix 3 C), as well as they appear from the data collected from the special run (see Appendix 2 B).

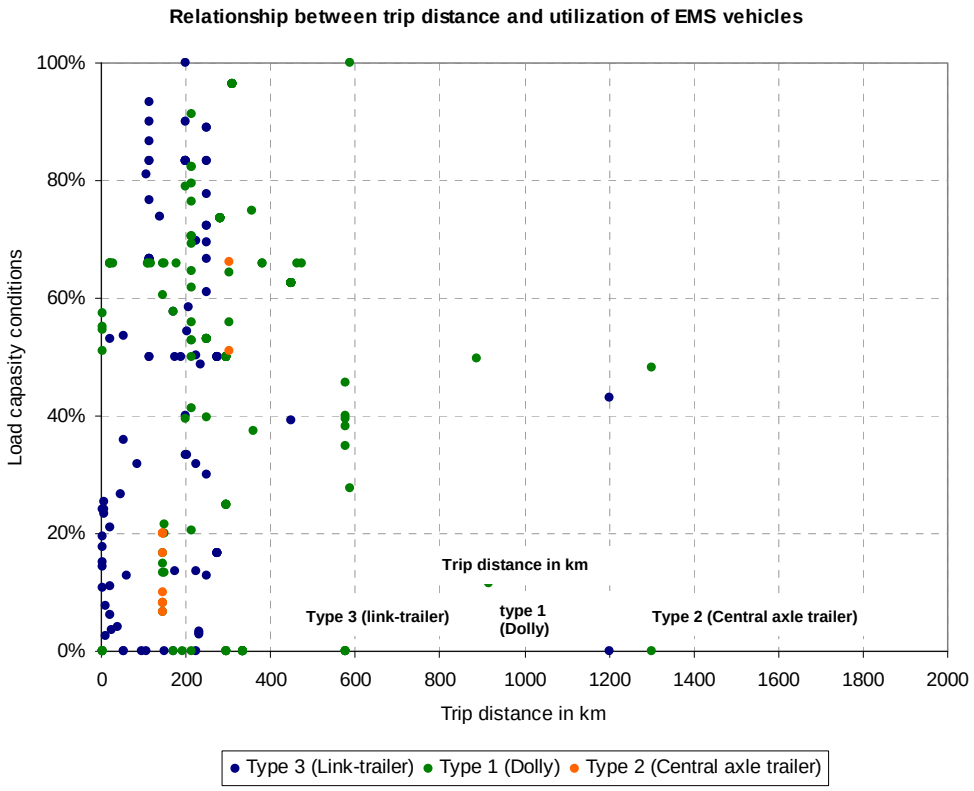


Figure 44 The relation between trip distance and loading for EMS vehicles

On the basis of the results from the special run of the driver's log, referred in Appendix 2 B, Figure 44 has been created. The figure illustrates the relation between the loading degree, measured in potential tonnes that can be loaded and the actual capacity utilization[35]. The figure illustrates that there are no direct relation between loading degree and trip distance. However the figures reveal that the dolly combinations are applied on the longest trips. In that case further investigations must be conducted in order to uncover whether this can be referred to the individual vehicle types' flexibility and other conditions.

Figure 45 shows the distribution of capacity utilization on EMS vehicles stated on the basis of data of the special run (see Appendix 2 B). The statement covers all trips.

Average capacity utilization	Percentage
EMS type 1(dolly)	47 %
EMS type 2 (centre axle trailer)	28 %
EMS type 3 (link-trailer)	42 %

Figure 45 Average capacity utilization on EMS vehicles

[35] The unloading frequency measured in potential tonnes has been made on the basis of a cargo carrying capacity of 39 tonnes. The 39 tonnes has been found as an average on the basis of the actual savings given by the respondents in the special run of the driver's log.

EMS are to a large extent applied for volume goods transports

It should be mentioned that in the above Figure 45 no corrections have been made for volume goods. In return the following Figure 46 elaborates on the issue in relation to the capacity utilization of EMS vehicles. As appears from the figure, a rather considerable part of the transported goods are volume goods, as 44 % has been stated as tonne-km. For a number of commodity groups it is a question about that even up to 100 % is volume goods. The rather high volume goods share in combination with the corresponding low share of heavy cargo within e.g. the commodity group ”earth, waste and recycling materials” gives a clear indication of the fact that the real capacity utilization for EMS vehicles is higher than stated in Figure 45. When the total annual figures for 2009 from Statistics Denmark are ready, it will be possible to carry out a comparing analysis of the ”volume goods corrected” capacity utilization on traditional road trains and EMS vehicles.

Commodity group	Goods type	Transport work in EMS total (1000 tonne-km)	As volume goods in tonnes	Share in %
1	Agricultural, forestry and fishery products	22	0	0 %
5	Foods, food stuffs, beverage, etc.	213	0	0 %
6	Textiles and textile products, etc.	1	0	0 %
7	Worked wood, paper, etc.	4	4	100 %
12	Machines and equipment, white goods, etc.	4	0	0 %
14	Furniture and other finished products	18	18	100 %
15	Earth, waste and recycling materials	10	0	0 %
16	Letters and packages	42	42	100 %
17	Empty containers and swap body, etc.	8	6	74 %
19	General cargo	948	487	51 %
Total		1,270	556	44 %

Figure 46 Share of volume goods for the various goods types [36]

The capacity utilization in EMS is somewhat lower than in trucks in general when calculated in weight and not volume

In spite of the fact that the expectation was that EMS vehicles would generally have a higher capacity utilization than other truck combinations, a comparison between Figure 35 showing the capacity utilization of trucks in national transports and Figure 45, reveals that the capacity utilization based on data in the special run seems to be lower for EMS vehicles than for trucks in general.

[36] It should be noticed that the figure only includes trips where the commodity groups are indicated.

The lower capacity utilization may be due to the fact that the capacity calculation for EMS vehicles has solely been prepared on the basis of weight indications. As EMS vehicles often transport volume goods, cf. above Figure 37, this may mean that the capacity utilization is larger than the figures in Figure 45 indicate. An explanation of a somewhat lower capacity utilization for EMS vehicles than for trucks could also be the flow imbalance between Eastern and Western Denmark, where EMS vehicles often travel empty in the western bound flows. As we are talking about relatively expensive units, such as link-trailers, it will apparently often be attractive to have these returned even when travelling empty.

The above considerations on capacity utilization of EMS vehicles will be studied closer in the further evaluation process.

Finally two conditions about the effect evaluation of the introduction of EMS vehicles should be mentioned:

In 2009 EMS transported an estimated amount of 0.8 % of the national goods

- On the basis of Appendix 2 B referring to the special run of the driver's log, the respondents have answered that in the counting week they transported 17,400 tonnes goods on EMS vehicles. This is assumed to have been performed by 269 EMS vehicle units. Provided that the counting week is regarded as a normal week and the 269 EMS vehicle units amount to 85 % of the total amount of registered units of 316, this will correspond to a transport estimate of 1,060,800 tonnes cargo on EMS vehicles on an annual basis [37]. Based on a total quantity of estimated transported cargo on trucks in 2009 amounting to 135 million tonnes, this corresponds to EMS vehicles transporting 0.8 % of the total quantity of national cargo in 2009.

In 2009 EMS performed an estimated amount of traffic work of 0.9 %

- On the basis of enclosure 2 B it also appears that in the counting week the 52 reported EMS vehicle units travelled approx. 82,000 km. Based on the fact that at the end of 2009 there were 316 registered EMS vehicle units in the Central Register for Motor Vehicles and that 85 % of these can be expected to have been travelling as EMS vehicles, an estimate would be that EMS vehicles potentially travel 22,000,000 km annually. All in all it is expected that in 2009 2.4 billion km will be travelled with trucks in national traffic and of these it can be estimated that EMS vehicles will account for 0.9 % of the traffic work performed in Denmark.

[37] In the calculation example it is presumed that all 316 registered EMS vehicle units are driving as EMS vehicles. This is hardly realistic, but in the great picture this is not that important.

6 TRAFFIC SAFETY

6.1 Accidents

In Appendix 4 and 5 a number of master files are shown. The master files in Appendix 4 deals with the individual partial sections into which the road network for EMS vehicles is divided. Each master file shows annual average daily traffic as well as accident figures for the partial section in question.

Master files in Appendix 5 are grouped according to the locations which have been reconstructed in connection with the introduction of EMS vehicles. In each master file the performed reconstruction(s) is illustrated and after this follows a survey of accident figures for the location in question.

On the basis of master files in enclosure 5 the amount of accidents with personal injuries and material damage are calculated for 2 five-year periods. The result appears from Figure 47.

Phase	Amount of locations	Accidents with personal injuries		Accidents with material damage	
		2003 - 2007	2005 – 2009	2003 - 2007	2005 – 2009
Phase 1	62	39	26	98	92
Phase 2	88	70	53	241	192
Total	150	109	79	339	284

Figure 47 Amount of accidents on reconstructed locations in two different periods

The amount of both types of accident has decreased over the years. Whether this is an expression of a general tendency or local conditions on the given locations have not been studied further. When analysing the picture of accidents for the reconstructed locations this is due to the fact that the traffic safety conditions in general in connection with e.g. reconstruction of a roundabout have been changed in order to facilitate the passage with EMS vehicles. But at the same time the passage has also become easier and in principle made a higher speed possible for other vehicle types.

Even if the total amount of accidents has fallen a closer study of the material in Appendix 5 reveals that this fall covers over a bred variety in the development. Actually the amount of accidents during 2009 has increased at a number of the reconstructed locations which has especially involved passenger cars. Since it is a question about very small variations and since it is only a question about one single year's fluctuation, it is too early to speak about a pattern or a trend. In the introduction to Appendix 5 these locations have been sketched.

No accidents registered with EMS

It should be mentioned that since the start of the EMS vehicle test, no accidents involving EMS vehicles have been registered.

6.2 Risk analysis

100 persons from DCF have received a questionnaire about EMSs

At the national congress of the Danish Cyclist Federation (DCF) in October 2009 a questionnaire was distributed to all approx. 100 delegates in agreement with DCF's Secretariat.

The introduction of the questionnaire comprised a brief description of EMS vehicles including the EMS vehicle test. The entire questionnaire in its original form is shown at the end of Appendix 3 A.

73 persons have replied to the questionnaire and the major part (62 %) comes from Region Hovedstaden (Capital region) and Region Sjælland (Region Sealand).

Only few cyclists have registered a EMS in the traffic

However only very few have seen an EMS vehicle in the traffic which is why we have chosen to postpone focus group interviews.

For further details on the replies to the questionnaire for the DCF delegates, please refer to Appendix 3 A.

Furthermore contact has been established with FDM (Federation of Danish Car-owners) with the same purpose – to have a survey of the possible dangerous situations between motorists and EMS vehicles. Here the conclusion is also that there is not enough experience at the moment which is why a focus interview will be conducted later this year, when more experience has been gained by the motorists.

A final issue which will be studied closer in the further evaluation is whether it is possible to estimate the expected amount of accidents per driven tonne-km, in order to make a subsequent comparison as to how this estimate will "normally" develop and how it actually did develop during the test period.

7 ENVIRONMENTAL CONDITIONS

Environmental conditions from the pre-test report cannot just be compared with the situation of today

On the basis of the traffic figures for the individual road sections in the EMS vehicle road network, as these are displayed in principle in enclosure 4, it is possible to calculate the emission of various air contaminating substances from the freight traffic, as well as the noise effect can be calculated. However, there is a number of WIM devices being part of Appendix 4 where EMS vehicles are not registered. In order to be able to compare the figures between the pre-test situation and the midway situation, only traffic values from the WIM devices where the results from 2008 and 2009 can be compared have been included. This means that environmental conditions in the midway report are assessed on the basis of much fewer WIM devices than in the pre-test report. Therefore the total evaluation of the environmental conditions of the two reports cannot be compared.

7.1 Air pollution and climate impacts

With regard to air pollution a calculation of the emission of a number of air polluting substances has been performed. Apart from these substances a calculation of the CO_2 emission has been calculated, which has an impact on the climate. The individual substances and their negative environmental impacts are described in detail in Appendix 6.

For each of the air polluting substances a calculation of the emission of these has been made for relevant road sections. These calculations are taking the following 5 parameters into account:

- Estimated emission factors for year 2006-2008 for each vehicle type
- WIM counts from 2008 and 2009 respectivly in the form of figures for the annual average daily traffic
- The various vehicle types forming part of the figures for the annual average daily traffic
- Road sections
- Speeds

On the basis of the setup emission factors, sections and traffic figures a theoretical calculation of the emissions for the individual sections and the total for all sections has been made. The results of the calculation appear on Figure 48.

Substance	2008 tonnes	2009 tonnes
NO_X	8179	7555
CO	1110	1025
HC	462	426
PA	122	112
SO_2	31	28
CO_2	1,062,000	981,000

Figure 48 Calculated emissions for individual sections and as a total

The freight traffic fell from 2008 to 2009 so did the emissions

From Figure 48 appears that from 2008 to 2009 there has been a fall in the emissions of approx. 8 %.

Considering the emission of CO_2 the annual emission is approx. 1 million tonnes. Every Dane emits approx. 10 tonnes CO_2 per year. The emission for the calculated traffic volume thus corresponds to approx. 100,000 persons' annual emissions. The difference between 2008 and 2009 corresponds to approx. 8000 persons' emissions.

It should be notices that the above calculations have been performed on the basis of the methodical considerations which have been accounted for in detail in Appendix 6. Whether these calculations are 100 % correct is not important as mainly it is a question about conditions to be compared between the pre-test situation and data from later periods in the evaluation.

In connection with the calculations performed for the pre-test situation based on traffic values for 2008, the total CO_2 emission was calculated to 870,000 tonnes CO_2. Due to the fact that the calculations in the pre-test report are based on traffic values for some other road sections than for the midway report, these figures for emissions cannot be compared directly[38].

On the basis of various interviews with companies and drivers using EMS vehicles, it has been possible to qualify the above more theoretic going through of the released emissions. Therefore it is possible to come with some more realistic and preliminary assessments of the effect of the air pollution as a consequence of EMS vehicles.

More conditions are of importance for the extent of the truck air pollution

A direct comparison of air pollution between traditional road trains and EMS vehicles is however made difficult by two conditions:

- There is a tendency that haulage companies in a number of cases have purchased tractors with more motor power than normal, that is with 500/540 hp against normally 440/460 hp. In addition to this the newly purchased units comply with the requirements to Euro standards 4 or 5, while the earlier units only complied with the requirements of Euronorm 3. [39]
- In addition to this the tendency is, apparently as an expression of giving a certain signal value, that in general the EMS vehicle travelling speed is slightly slower because the speed limiters of these vehicles have been set to 85 km/h against normally 92 km/h.

The above conditions are of importance for the evaluation of environmental impacts and pulls up and down with regard to energy consumption and emissions. The following example must of course be subject to some reservation and is as such just intended as an example. Based on the information from a haulage company experienced in driving with various vehicle combinations, the following consumption figures can be calculated under the precondition of equal conditions with regard to speed (set to 85 km/h):

[38] As mentioned elsewhere in the report, it has not been possible to register the EMS vehicles on the originally planned sections which were included in the pre-test report.
[39] Among trade people there is a discussion about whether an Euronorm 5 truck is more economic with regard to fuel that an Euronorm 3 truck. In principle this should be the case. However there are so many conditions influencing the total fuel economy that it is not necessarily a question about an unambiguous situation.

- Traditional road trains with a tractor combination with a total weight of 48 tonnes and with a 440 hp motor, the motor is assessed to drive 2.8 km/l.
- EMS vehicles with a total weight of 60 tonnes and 500 hp in motor power are assessed to drive 2.5 – 2.6 km/l.

The additional consumption for the EMS vehicle is approx. 10 % per driven kilometres. If this is compared with the increased total weight inclusive of an increased carrying capacity calculated in tonnes of approx. 7 tonnes (from 32 tonnes to 39 tonnes corresponding to approx. %) and a volume capacity increase of approx. 40 % (from typically 32/36 pallet spaces in a road train structured with single stack), the example reveals that it is a question about rather considerable energy and environmental gains, as the additional consumption for a EMS vehicle is approx. 10 % per travelled kilometre, while with regard to load it can load approx. 22 % more than an ordinary road train and has a volume capacity of up to 40 % more than an ordinary road train.

7.2 Noise effect

In continuation of the pre-test report, where the noise effect on a number of selected sections was investigated prior to the start of the test period, the noise conditions have been investigated again in the present report. The consequences with regard to noise are elucidated through calculation of the noise effect from the heavy traffic on selected sections.

The noise calculations are made primarily for motorway sections all over the country and the results for the individual partial sections are compared with the results from the pre-test report.

In order to compare the noise distribution under conditions with conventional trucks (2008) and conditions with conventional road trains and EMS vehicles (2009), the 58 dB lines for both 2008 and 2009 are examined. In Appendix 7 about noise load a closer review of the technical precondition of the calculations of the noise conditions can be found.

The calculation results specifying the 58 dB line with the WIM counts for both 2008 and 2009 can be seen in detail at the end of Appendix 7.

The calculation results indicate very modest changes in the noise load of up to approx. -1 dB, however with the exception of a few sections. The few major deviations are provided by considerable changes in the traffic values for the road sections. Generally the noise effect decreases slightly on the majority of the sections. This may have a connection with a general reduction in the amount of vehicles on the Danish roads due to a broad financial recession which must be expected to affect the goods transport with trucks.

8 FINANCIAL CONDITIONS

In connection with the midway reporting primarily data on construction costs in continuation of various reconstructions on the road network has been collected. In a few cases it has been decided whether performed reconstructions result in changed operation costs for maintenance and in that case how large these will be. At the present time data has not been collected systematically and it is therefore too early to report on these conditions.

During the evaluation and with a view to being able to assess a number of financial conditions on goods economy and the national economy in the final report, the collection of data within the following areas is currently in focus:

- Operation costs in connection with driving with EMS vehicles
- Operation costs of reconstructions on the road network
- Operation costs in connection with road wear changes as a consequence of changed total weights for the vehicles
- Accident costs which must be evaluated on the basis of the accident statistics.

As mentioned above, data has not yet been collected systematically within these areas, and therefore nothing specific can be said about the development within these areas in the midway report.

Appendix 1: Traffic statistics

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Midway Report
Appendix 1: Ferry-, Bridge- and Service area statistics

1. A Ferry statistic

Table 1: Ferried trucks on lines between Elsinore and Helsingborg

		Truck no/trailer	Trucks w/trailer	Semitrailer w/tractor	Semitrailer no/tractor	EMS vehicle w/tractor	EMS vehicle no/tractor
Jan	To Elsinore	1,275	1,032	11,398	-	131	-
	To Helsingborg	1,305	1,325	11,444	-	128	-
Feb	To Elsinore	1,267	1,046	10,505	-	120	-
	To Helsingborg	1,369	1,291	10,944	-	117	-
Mar	To Elsinore	1,543	1,240	11,823	-	144	-
	To Helsingborg	1,499	1,590	12,176	-	155	-
Apr	To Elsinore	1,518	1,089	11,328	-	213	-
	To Helsingborg	1,543	1,398	11,134	-	193	-
May	To Elsinore	1,850	1,176	11,072	-	270	-
	To Helsingborg	1,968	1,523	11,705	-	196	-
Jun	To Elsinore	1,960	1,245	11,380	-	245	-
	To Helsingborg	1,923	1,550	11,740	-	224	-
Jul	To Elsinore	1,652	1,014	10,281	-	220	-
	To Helsingborg	1,624	1,376	10,572	-	187	-
Aug	To Elsinore	1,698	1,062	10,993	-	225	-
	To Helsingborg	1,779	1,459	10,965	-	251	-
Sep	To Elsinore	2,591	1,382	11,276	-	259	-
	To Helsingborg	2,599	1,712	11,302	-	248	-

Table 2: Ferried trucks on the line between Frederikshavn and Gothenburg

		Truck no/trailer	Trucks w/trailer	Semitrailer w/tractor	Semitrailer no/tractor	EMS vehicle w/tractor	EMS vehicle no/tractor
Jan	To Frederikshavn	248	5,056	411	546	14	-
	To Gothenburg	626	4,525	407	574	13	-
Feb	To Frederikshavn	226	4,727	415	463	30	-
	To Gothenburg	210	4,333	374	470	29	-
Mar	To Frederikshavn	251	5,067	433	437	40	-
	To Gothenburg	255	4,699	454	405	54	-
Apr	To Frederikshavn	234	4,804	408	438	50	-
	To Gothenburg	267	4,426	433	438	48	-
May	To Frederikshavn	242	5,103	434	515	68	-
	To Gothenburg	248	4,612	410	510	145	-
Jun	To Frederikshavn	289	5,189	541	479	86	-
	To Gothenburg	284	4,713	566	439	122	-
Jul	To Frederikshavn	329	4,562	444	323	49	-
	To Gothenburg	262	4,045	416	315	77	-
Aug	To Frederikshavn	301	4,959	507	412	77	-
	To Gothenburg	247	4,845	461	405	96	-
Sep	To Frederikshavn	328	5,521	590	435	93	-
	To Gothenburg	291	5,180	518	450	93	-

Table 3: Ferried trucks on the line between Grenaa and Varberg

		Truck no/trailer	Trucks w/trailer	Semitrailer w/tractor	Semitrailer no/tractor	EMS vehicle w/tractor	EMS vehicle no/tractor
Jan	To Grenaa	9	749	33	204	-	-
	To Varberg	8	962	38	169	-	-
Feb	To Grenaa	24	1,086	35	293	2	-
	To Varberg	12	1,280	39	261	4	-
Mar	To Grenaa	40	1,467	61	230	5	-
	To Varberg	30	1,707	32	200	12	-
Apr	To Grenaa	24	1,275	37	220	3	-
	To Varberg	26	1,427	34	188	3	-
May	To Grenaa	17	1,194	37	244	4	-
	To Varberg	27	1,437	47	239	3	-
Jun	To Grenaa	37	1,279	48	315	5	-
	To Varberg	36	1,517	47	304	3	-
Jul	To Grenaa	29	967	24	229	1	-
	To Varberg	31	942	29	196	1	-
Aug	To Grenaa	26	1,154	31	223	3	-
	To Varberg	21	1,323	33	207	6	-
Sep	To Grenaa	34	1,343	43	287	11	-
	To Varberg	36	1,619	32	259	23	-

Table 4: Ferried trucks on the line between Kalundborg and Århus

		Truck no/trailer	Trucks w/trailer	Semitrailer w/tractor	Semitrailer no/tractor	EMS vehicle w/tractor	EMS vehicle no/tractor
Jan	To Kalundborg	135	152	1,490	3,669	47	9
	To Århus	128	221	1,399	3,527	36	4
Feb	To Kalundborg	140	175	1,471	3,250	32	18
	To Århus	133	197	1,273	3,095	23	33
Mar	To Kalundborg	157	212	1,709	3,765	33	24
	To Århus	151	215	1,521	3,550	33	39
Apr	To Kalundborg	130	141	1,298	3,761	35	13
	To Århus	118	177	1,187	3,560	37	35
May	To Kalundborg	153	159	1,442	3,356	31	13
	To Århus	159	133	1,278	3,170	46	22
Jun	To Kalundborg	204	198	1,612	3,471	39	11
	To Århus	192	171	1,458	3,226	55	24
Jul	To Kalundborg	154	116	1,336	3,077	42	25
	To Århus	151	132	1,339	3,166	41	35
Aug	To Kalundborg	172	177	1,615	3,332	35	26
	To Århus	145	179	1,563	3,055	51	58
Sep	To Kalundborg	148	191	1,800	3,427	48	52
	To Århus	161	180	1,902	3,211	56	76

1. B Bridge statistic

Table 5: Trucks on the Oresund Bridge

		2008		2009		
		Trucks	EMS vehicles	Trucks	EMS vehicles	Total
Jan	To Denmark	13,917	-	12,156	807	12,863
	To Sweden	14,052	-	12,533	526	13,059
Feb	To Denmark	14,230	-	12,050	856	12,906
	To Sweden	14,159	-	12,384	589	12,973
Mar	To Denmark	13,737	-	13,715	1.089	14,804
	To Sweden	13,933	-	13,850	634	14,484
Apr	To Denmark	15,582	-	12,741	1.006	13,747
	To Sweden	15,643	-	12,913	745	13,658
May	To Denmark	15,224	-	12,141	629	12,770
	To Sweden	15,281	-	12,248	503	12,751
Jun	To Denmark	14,298	-	12,833	654	13,487
	To Sweden	14,612	-	12,870	497	13,367
Jul	To Denmark	14,311	-	11,490	531	12,021
	To Sweden	14,445	-	11,938	337	12.275
Aug	To Denmark	13,804	-	11,409	397	11,806
	To Sweden	13,768	-	11,799	389	12,188
Sep	To Denmark	14,658	-	12,888	595	13,583
	To Sweden	15,161	-	12,978	413	13,391
Oct	To Denmark	15,081	-	12,575	665	13,240
	To Sweden	15,031	-	12,624	402	13,026
Nov	To Denmark	13,252	-	12,209	708	12,917
	To Sweden	13,090	-	12,643	511	13,154
Dec	To Denmark	11,930	-	11,576	646	12,222
	To Sweden	11,900	-	11,262	435	11,697

Table 6: Trucks on the Great Belt Bridge

		2008 Trucks Total	2009 Trucks	Ems Vehicles	
Jan	To Korsør	104,080	90,779	566	91,952
	To Nyborg			607	
Feb	To Korsør	102,910	86,657	561	87,787
	To Nyborg			569	
Mar	To Korsør	100,877	99,191	713	100,559
	To Nyborg			655	
Apr	To Korsør	113,106	94,914	740	96,334
	To Nyborg			680	
May	To Korsør	109,654	91,331	787	92,852
	To Nyborg			734	
Jun	To Korsør	108,705	99,463	836	101,102
	To Nyborg			803	
Jul	To Korsør	100,927	90,229	721	91,646
	To Nyborg			696	
Aug	To Korsør	104,270	95,642	902	97,359
	To Nyborg			815	
Sep	To Korsør	109,917	98,661	1072	100,771
	To Nyborg			1038	
Oct	To Korsør	111,373	96,868	1184	99,152
	To Nyborg			1100	
Nov	To Korsør	100,698	92,730	1288	95,197
	To Nyborg			1179	
Dec	To Korsør	89,384	83,448	1044	85,466
	To Nyborg			974	

1. C Service area statistic

Service area	Capacity for trucks	Percentage capacity utilization for trucks, counted at night		
		Spring 2009	Summer 2009	Autumn 2009
Karlslunde Vest	18	206	150	206
Karlslunde Øst	18	139	67	250
Tuelsø Nord	28	54	39	82
Tuelsø Syd	28	57	61	43
Tappernøje Øst	12	83	100	117
Tappernøje Vest	12	58	150	75
Himmerland Øst	12	183	67	117
Himmerland Vest	12	192	83	142
Ejer Baunehøj Øst	19	142	116	142
Ejer Baunehøj Vest	21	91	91	67
Skærup Øst	12	325	183	333
Skærup Vest	21	143	71	76
Hjallerup Enge Vest	16	31	38	75
Ustrup Øst	17	153	141	135
Ustrup Vest	19	121	68	142
Kildebjerg Nord	33	188	6	73
Kildebjerg Syd	20	130	140	125

Appendix 2: Cargo traffic

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Midway Report
Appendix 2 A: EMS vehicle units in the Danish Central Register for Motor Vehicles

Since August 2008 Statistics Demark has registered the number of EMS vehicle with Danish licence numbers. The information has been collected via the Danish Central Register for Motor Vehicles (CMR).

The extracts from CMR clearly show a current increase in the amount of vehicles which can form part of an EMS vehicle combination.

	Aug. 2008	Dec. 2008	Jan. 2009	Mar. 2009	Feb. 2010
EMS vehicle, type 1: Dollies	1	35	43	59	105
EMS vehicle, type 2: Semitrailers	0	3	3	3	4
EMS vehicle, type 3: Link-trailers	0	40	88	143	207
EMS vehicle, type 1 og 4: Trucks	491	2.186	2.664	3.298	4.054
EMS vehicle, type 2 og 3: Tractors	613	3.418	3.633	4.637	5.315

Totally the statement reveals that EMS vehicles are combined units with link-trailers and dolly combinations, which means a major part of combinations with semitrailers.

Statistics Denmark's analysis method

Statistics Demark has on the basis of Road Safety and Transport Agency's guide extracted EMS vehicles relevant data from the vehicle register (*Road Safety and Transport Agency; Communication no. 1916 about vehicles' arrangement and equipment, etc., 22. May 2008).*

All units in EMS vehicles, except the rear ones, are registered with special data, which in most cases can be found in the CRM register.

The units can be attached to user as well as owner.

Foreign vehicles cannot be identified.

The guide directs that special variable values and variable constellations are registered for:

- EMS vehicle, type 1: trucks and dollies
- EMS vehicle, type 2: tractors and semitrailers
- EMS vehicle, type 3: tractors and link-trailers
- EMS vehicle type 4: Trucks

The rear units for the individual EMS vehicle types, such as semitrailers, central axle trailer, semitrailers and trailers are registered in a special way and therefore they cannot be attached to an EMS vehicle type based on the register.

In a gross data set created on the basis of the vehicle type and application for:

- Common trucks/tractors
- Semitrailer tractors
- Semitrailers and any link-trailers
- Trailers and any dollies

the relevant EMS vehicle units can be found by analysing the below variables in the vehicle register (the most interesting ones stated in bold *italic*):

- Ident, [unique key for identification of the vehicles in CRM]
- Type approval number
- Type no., [4: Trucks and tractors, 5: Trailers, 6: Semitrailers]
- Application number,
- Registration date
- Amendment date
- Inspection approval date
- ***Coupling no.***, [1: Coupling to trailers, 2: Coupling to semitrailers]
- Tare weight
- ***Total weight***
- Transport weight
- Technical total weight
- ***Coupling weight 1***, [Content determined by EMS vehicle type]
- ***Coupling weight 2***, [Content determined by EMS vehicle type]
- ***Road train weight for trucks and tractors****,* [Total weight + coupling weight 1, Total weight + coupling weight 2, res.]
- Axle load
- Number of axles
- Tax axle number
- Tax axle load
- *Supplementary data*

EMS vehicle units can be extracted from the gross data set in the following way:

EMS vehicle type 1 and 4: Trucks
Trucks to have coupled a dolly+semitrailer (EMS vehicle type 1) or a trailer > 18,75 metres (EMS vehicle type 4 have largest total weight in *Coupling weight 1* and W-value (maximum pulling power in kN) in *Coupling weight 2.* If the W value is 0, the truck can only be coupled to a long trailer (EMS vehicle type 4). (Sec. 1.2 in guide).

Dollies
Dollies to be coupled to a semitrailer, must have their wheel load approved in *Coupling weight 1* and the largest total axle load of the semitrailer in *Coupling weight 2* and have code 82 in *Supplementary data* (Sec. 3.2 and 6.1 in guide).

EMS vehicle type 2 og 3: Tractors
The tractors to be coupled with a semitrailer and central axle trailer (EMS trailer type 2) or link-trailer and semitrailer (EMS vehicle type 3) have the permitted wheel load in *Coupling weight 1* and the maximum axle load for semitrailer/link-trailer in *Coupling weight 2.*

EMS vehicle type 2: Semitrailers
Semitrailers to be coupled with a central axle trailer must have the largest total weight of this trailer in *Coupling weight 1* and the so-called W-value in *Coupling weight 2* and have code 83 in *Supplementary data* (sec. 4.2 in guide).

EMS vehicle type 3: Link-trailers (semitrailers)
Link-trailers to be coupled with a semitrailer must have their permitted skammelbelastning in *Coupling weight 1* and largest total axle load of the semitrailer in *Coupling weight 2* and have code 82 in *Supplementary data* (sec. 5.2 in guide).

Midway Report
Appendix 2 B: Special run of Driver's log

Appendix 2 B is divided into the following main headings:

1. An introduction with a brief of the background for the investigation.
2. Response to Form 1
3. Response to Form 2
4. Copy of the distributed Form 1
5. Copy of the distributed Form 2

1 INTRODUCTION

In collaboration with Statistics Denmark a survey divided into 2 Forms has been prepared:

- Form 1: Generally about the application of EMS vehicles in the selected company, this is divided into two parts: Part 1 deals with the company's application of EMS vehicles, if any, in a given week, and part 2 deals with the company's application of EMS vehicles in general.
- Form 2: Driver's log for selected EMS vehicle units for the individual trips in a given week.

The two forms are reproduced in full at the end of the appendix.

These questionnaires have been sent out in a special run by Statistics Denmark asking the companies to report on the trips they had made with the specific EMS vehicle unit in calendar week 2, 2010 also referred to as the counting week.

Statistics Denmark sent out questionnaires to all 61 companies registered with EMS vehicle units. These companies had 99 dollies, 205 link-trailers and 4 central axle trailers[1].

Maximum 2 units have been selected per company for reporting of driver's log, a total of 99 units distributed on 51 dollies, 45 link-trailers and 3 central axle trailers. The selection on units was made to ensure an as wide as possible representativity per company.

Calls have been made to the companies up to the counting week in order to ensure that they were aware of the investigation. Moreover reminders for lacking responses have been sent out immediately after the expiry of the reply deadline.

Statistics Denmark has received replies from 47 companies corresponding to 77 % of the questioned companies.

[1] As the EMS vehicle type 4, called "Long trailer", is not represented explicitly in the CMR register, these units are not part of the special run of the driver's log. This type may be included in any subsequent investigation.

Reports for 75 EMS vehicle units have been sent in, corresponding to 76 % of the selected units, of which trip details have been reported for 52 units, as 23 units have not been applied as an EMS vehicle in the counting week by the questioned company.

Therefore the result of this special run can be regarded as extremely satisfactory as the response percentage is very high compared to the response on the ordinary driver's logs.

Reply to Form 1

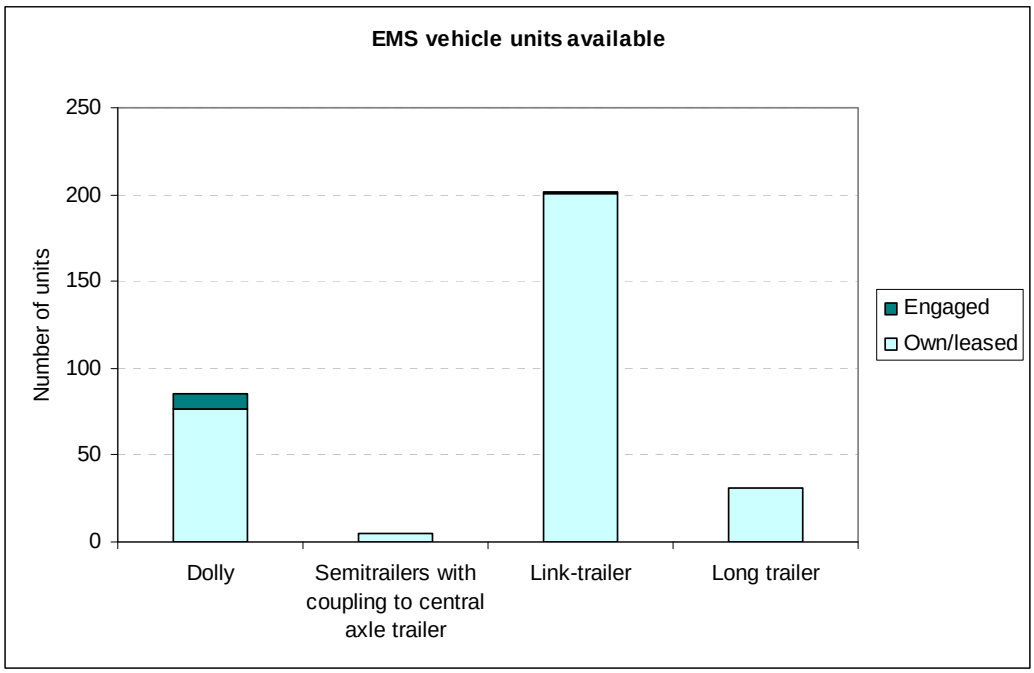

Figure 1 Distribution of units among questioned companies

Question 1: Number of units available in the counting week

Reply to question 1:
Figure 1 reveals that the most applied unit of the EMS vehicles is the link-trailer with 202 units. The dolly came in second with 85 units. It should be mentioned that the indicated amount does not take the Swedish registered units into account, which are apparently travelling on the Danish road quite often [2]. The dolly-combination is the most dominant for ordinary transport of general goods as it is known from e.g. the carrier system. This is characterised by the fact that it is possible to use EMS vehicles between the terminals and then distribute to the customers by means of a tractor / solo truck.

The last two types of EMS vehicles are applied to a very limited degree, since only 5 units of type 2 "semitrailer with central axle trailer" and 31 units of type 4 "long trailer" are applied.

Among the 202 link-trailers having been at disposal, only one unit has been engaged, while 8 were engaged as for the 85 dollies.

2 The application of Swedish registered dollies is especially due to the fact that it is most often this unit, which is applied in the Swedish market and therefore can be applied relatively easily in the Danish test.

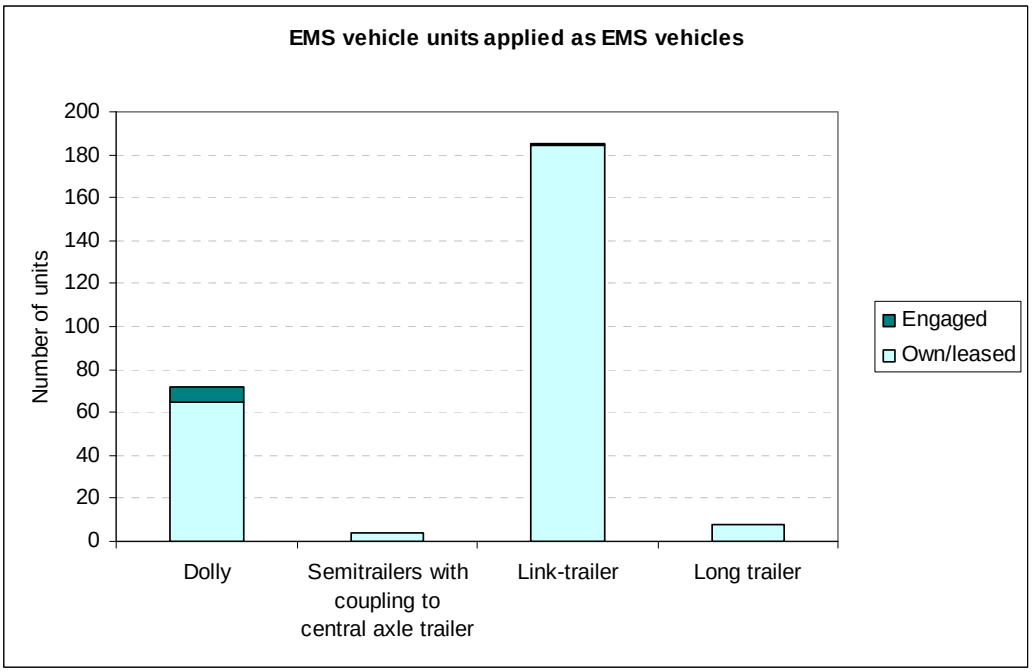

Figure 2 Distribution of units applied for transport with EMS vehicles

Question 2: Number of units applied for transport in the counting week

Reply to question 2:
The actually applied units in Figure 2 confirm the picture that link-trailers and dollies are dominating in connection with the application of EMS vehicles including the fact that the long trailers only represent a small part of the market. There are thus 72 dollies and 185 link-trailers and 4 semitrailers with coupling to central axle trailer and 8 long trailers which have been applied for transport with EMS vehicles. The assessment is that the long trailers are primarily applied in connection with transport of bulk cargo such as scrap. Transport of timber on long road trains, as it is known in e.g. Sweden, will hardly be applied in Denmark.

Of the units applied for transport with EMS vehicles, a link-trailer and 7 dollies have been engaged.

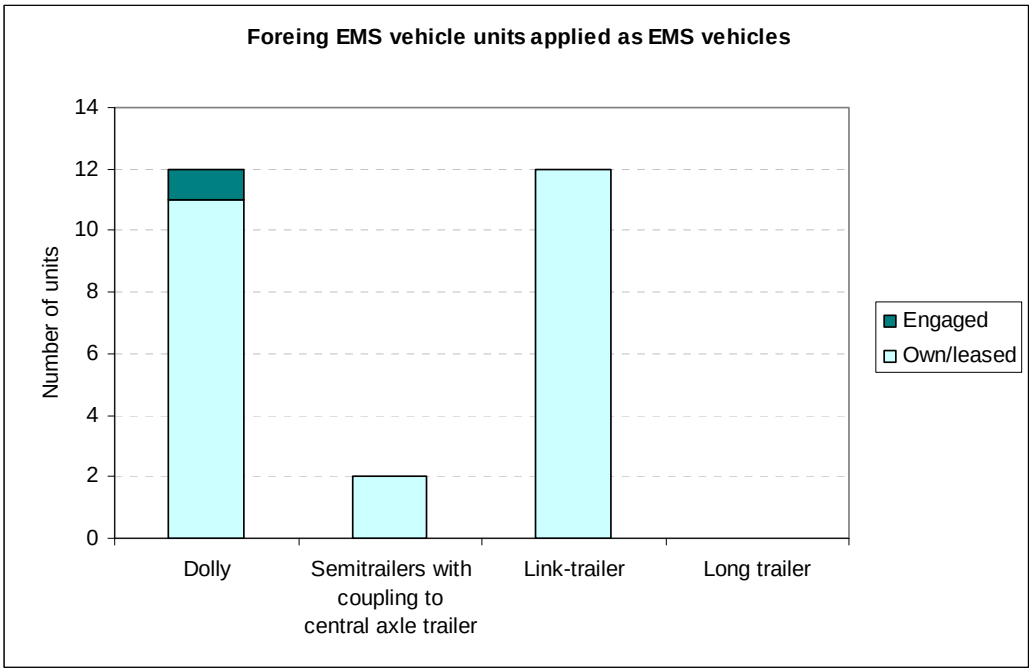

Figure 3 Distribution of applied units registered abroad

Question 3: Number of units registered abroad in the counting week

Reply to question 3:
The replies to question 3 appear from Figure 3**,** which shows that 12 of the applied units of dollies as well as link-trailers were registered abroad and of these 1 dolly had been engaged. From this point of view two semitrailers with coupling to central axle trailers were registered abroad, whereas no long trailers fell under that category.

Comparing the results from with the results from Figure 2 reveals that 16 % of the applied dollies are registered abroad, while the corresponding number for the link-trailers is 6 %. This shows that the dolly units are registered abroad to a larger extent, proportionally, than the link-trailers. This confirms the expectation that several dolly units may origin from Sweden where they are both applied and registered.

Question 4: Number of units in international traffic

Reply to question 4:
Of the EMS vehicles applied in the counting week, a total of 163 have been applied in international traffic. When considering that almost 300 EMS vehicle units have been applied during the counting week, a relatively high amount, a little more than half of the units, is applied in international traffic. This figure does not say anything about how many times the unit in question was abroad or how many times the unit in question was applied in the counting week.

Question 5: Units registered abroad in the counting week

Reply to question 5:
During the counting week the respondents indicate that 3 have applied tractors registered abroad, while 35 indicates that they have not applied foreign tractors. Among those having applied foreign tractors, it is indicated that a total of 94 tractors have been applied and are distributed with 5 to 84 per company. This means that especially one company, even a relative large one, applied foreign tractors.

Reply to question 6:

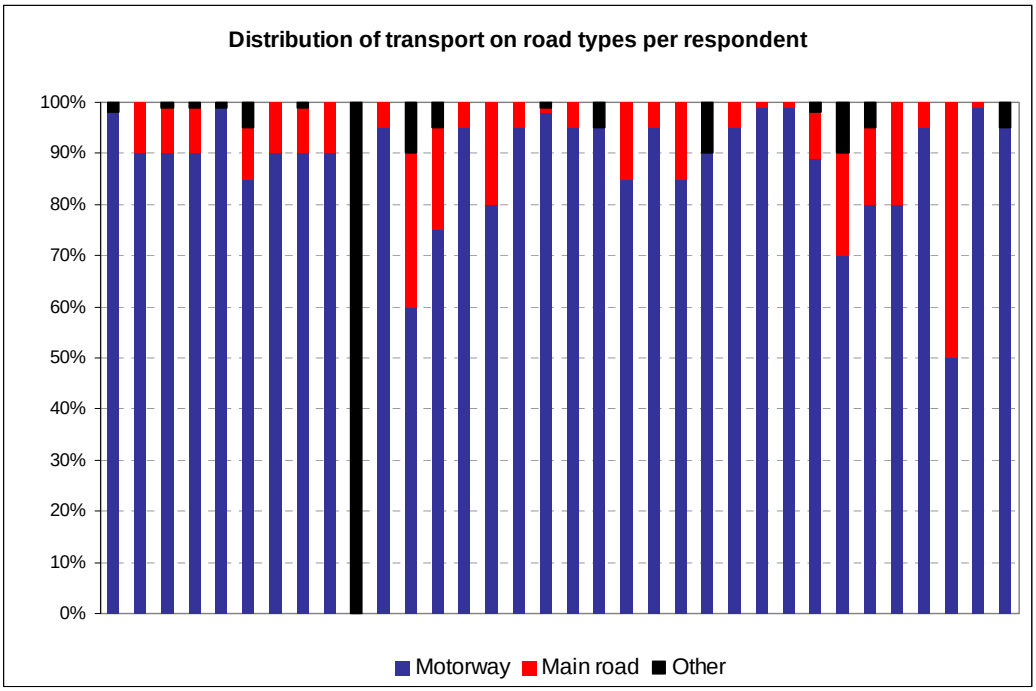

Figure 4 Distribution of traffic work on road types for each company [3]

Question 6: Danish road sections where EMS vehicles travelled in the counting week

Figure 4 reveals very clearly that by far the largest part of the traffic work is carried out on motorways. This seems natural, as the road network in the first part of the test with EMS vehicles primarily related to motorways. It should be noticed that only 33 of the participating companies wanted to reply to question 6.

Reply to question 7:

Question 7: Trips (postal codes) where EMS vehicles were applied in the counting week

Among the trip relations which the companies have indicated as the most frequently used, the following trips are in top 10, cf. Figure 5:

Trips between destinations		Number of companies
4600 - Køge	7100 – Vejle	5
2630 - Tåstrup	7100 – Vejle	4
2630 - Tåstrup	9220 – Aalborg East	3
6330 – Padborg	8000 – Århus C	2
8000 – Århus C	9000 – Aalborg	2
6330 - Padborg	7100 – Vejle	2
4600 - Køge	6330 – Padborg	2
4200 - Slagelse	7100 - Vejle	2
2630 - Tåstrup	5220 – Odens SE	2
5220 – Odense SE	9220 – Aalborg East	2

Figure 5 Trips between destinations with EMS vehicles

In addition to this, 8 respondents have indicated that foreign postal codes were included in trips which were among the most frequent ones.

Reply to question 8:

[3] It should be mentioned that the company, which solely applies "Other" as road type, has made a note that this is a driving area which has one EMS vehicle only applied in this private area.

Question 8: Transported tonnes with EMS vehicles in the counting week

Totally the respondents have replied that in the counting week, they transported 17,400 tonnes of goods on EMS vehicles. This must be expected to have been performed by 269 EMS vehicle units, cf. Figure 2. If the counting week is regarded as a normal week and the 269 EMS vehicle units amount to 85 % of the total number of registered units being 316, this will correspond to an estimated transport of 1,060,800 tonnes of goods on EMS vehicles on an annual basis. Out of a total amount of estimated transported goods of 135 million tonnes on trucks in 2009, this corresponds to EMS vehicles having transported 0.8 % of the total amount of national goods in 2009.

Question 9: Commodity groups transported with EMS vehicles in the counting week

Reply to question 9:
The statements of commodity group distribution on EMS vehicles show that two commodity groups are dominating. These are the commodity group food, beverage and food stuffs and the commodity group general goods. A number of other commodity groups are also represented which appears from Figure 6 and Figure 7. It should be stressed that this commodity group distribution is based on the company's own experience and assessment of the distribution of commodity groups and that in practice in connection with the statement of trip-based distributions, the picture is difference, which will be illustrated later in Figure 23[4].

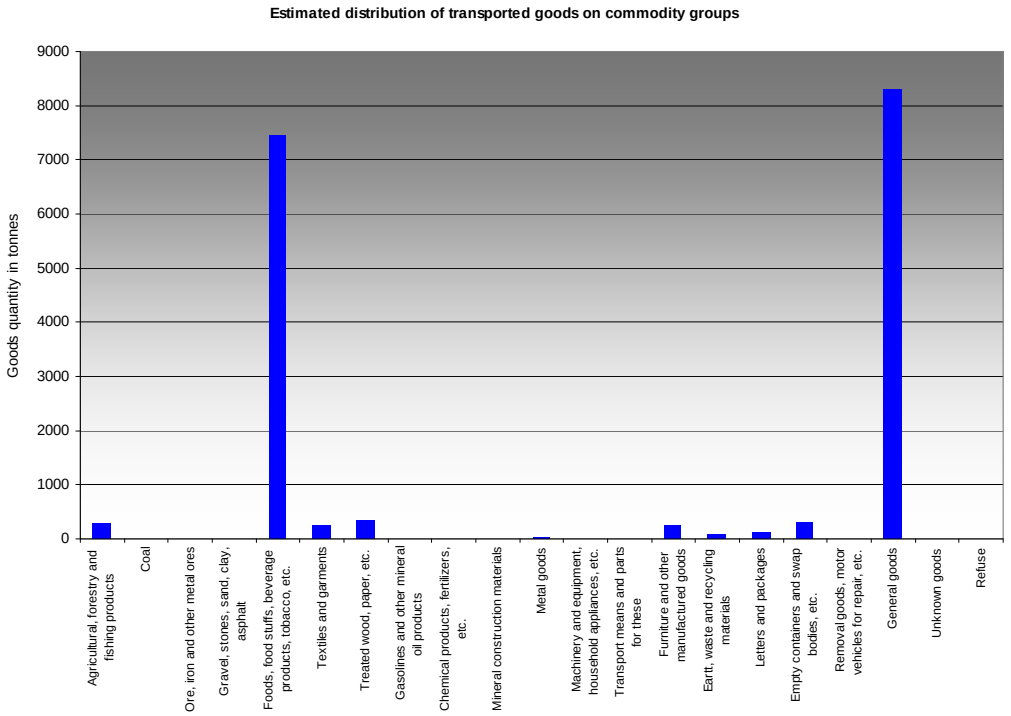

Figure 6 Distribution on commodity groups of goods transported on EMS vehicles in tonnes

[4] It should be mentioned that the companies have only replied to the quantity of goods transported totally in the counting week, and how this is distributed in commodity groups as per percentage. The distribution on commodity groups and the subsequent summary has hereinafter been made by the evaluation team.

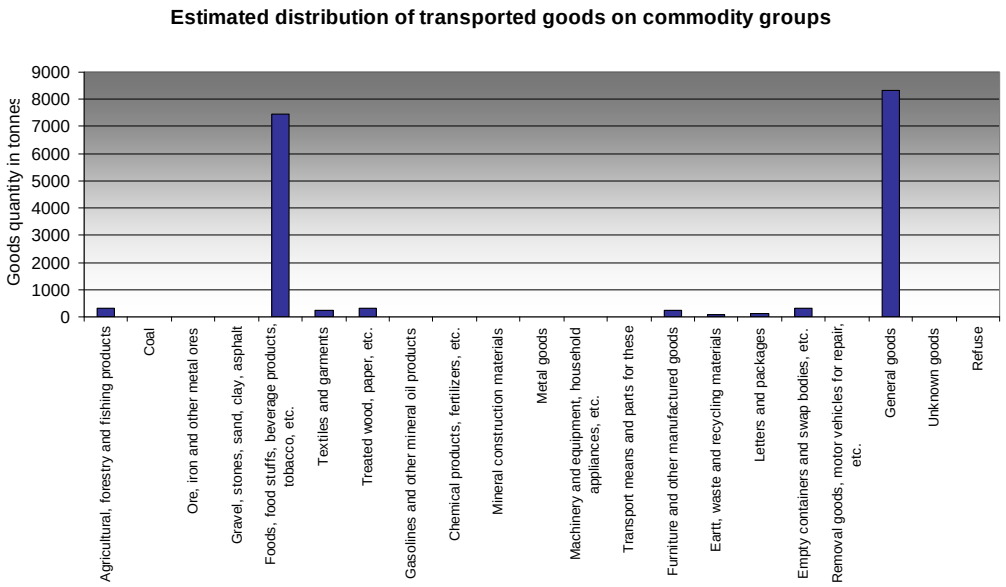

Figure 7 Distribution according to percentage of commodity groups with goods transported on EMS vehicles

Figure 8 illustrates the total goods quantity distributed as per percentage on commodity groups, transported on all trucks in Denmark in 2008.

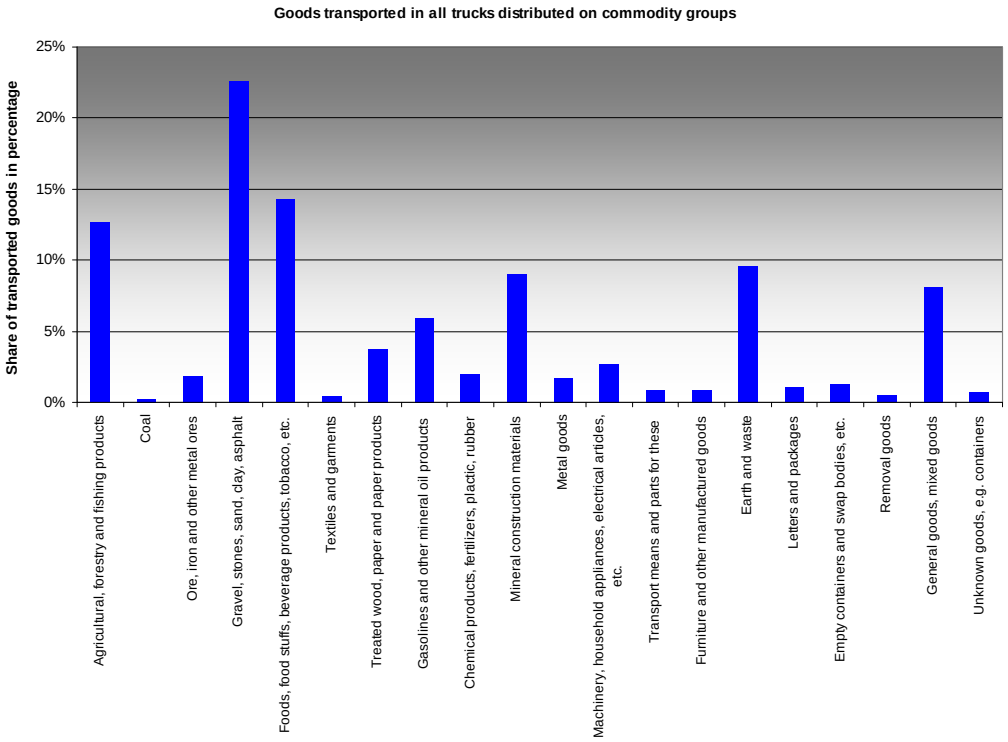

Figure 8 Distribution on commodity group in percentage of goods transported on all trucks in 2008

Only the two commodity groups foods, food stuffs, beverage and general goods, are represented in both transport groups with a relatively large share. This stresses the fact that so far EMS vehicles are applied primarily for transport of a minor quantity of commodity groups, where the volume strength of the EMS vehicles is expressed.

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Question 10: Goods on EMS trains and common road trains in the counting week

Reply to question 10:
Among the respondents, 32 reply that there is no difference between the article numbers they transport with EMS vehicles and with ordinary road trains in the counting week. A respondent replies that the article numbers they transport on EMS vehicles are different compared to ordinary road trains, as on EMS vehicles, the company primarily transports article number 19 corresponding to general goods.

Reply to question 11:

	Trailer type			
	Dolly	**Semitrailer with coupling to central axle trailer**	**Link-trailer**	**Long trailer**
Advantages:				
High flexibility	11	3	14	4
Larger volume	19	4	18	5
Between terminals	19	6	15	6
Low purchase cost	10	1	1	0
Lower opr. costs	17	1	10	2
Well-suited for except. goods	4	0	0	1
More env. friendly	15	4	12	4
Larger road safety	12	2	6	2
Other	4	1	0	0
Disadvantages:				
Less flexibility	7	2	6	2
High purchase price	3	1	11	3
Difficult interchanges	9	2	16	1
Spread of road network	19	7	17	5
Poorer traffic safety	0	1	2	0
Larger environmental effect	0	0	0	0
Other	5	0	1	1

Figure 9 Advantages and disadvantages of the various types of EMS vehicles[5]

Question 11: Advantages and disadvantages of various types of EMS vehicles

Figure 9 shows that advantages and disadvantages of EMS vehicle units are attached to the ability to transport more goods in combination with flexibility and the level of purchase cost. Without over-interpreting the figures, it appears that especially the flexibility is popular among the users of link-trailers, while the low purchase cost dominates the users of dollies.

[5] The individual respondents could reply with more than one mark next to each type of EMS vehicle

Further replies to question 11:

Trailer type	Advantages	Disadvantages
Dolly	- Less diesel consumption (less units), less pollution - Flexibility in con. with parallel use of the two combinations - Fits with our need for having a tractor for transports in the CHP area	- No interchange places in Randers More expensive bridge duty - Many limitations as to where the vehicles are allowed - Lack of sections e.g. near Gardermoen (4 km) - Difficult due to the range of road network
Semitrailer with coupling to central axle trailer	Flexibility in connection with parallel travelling with the two combinations	
Link-trailer		At the moment the link-trailer cannot transport dangerous goods.
Long trailer		Lack of sections e.g. near Gardermoen (4 km)

Figure 10 Other advantages and disadvantages of EMS vehicle types

As part of the reply to question 11, the respondents could tick off in the field "Other", after which they could ad other advantages and disadvantages when travelling with the various types of EMS vehicles. The result of this part of the questionnaire appears from Figure 10, showing that generally there is a request for extension of the EMS vehicle road network.

Question 12: Interchange of EMS vehicles

Reply to question 12:
From the replies to question 12 it appears that 4 do not interchange their EMS vehicles in order to continue outside the EMS vehicle road network. Among the replies 71 replied to where they interchange as the respondents could tick off more than once. The distribution of the replies appears from Figure 11.

Locations	Number of companies
Ports	13
Service areas	10
Transport centre	30
Private terminals	15
Custom locations	2
Industrial areas	1

Figure 11 Locations for interchange of EMS vehicles

Figure 11 supports the earlier assessments of the fact that interchange takes place on a broad variety of destinations and that service and rest areas as well as private terminals are rather important in this regard.

Reply to question 13:

Change in cost	Number of companies
Higher	0
Unchanged	3
Lower, below 10 pct.	7
Lower, 10-20 pct.	18
Lower, above 20 pct.	7

Figure 12 Change in cost per transported tonne compared to traditional road trains

Question 13: Costs per tonne compared to traditional road trains

The costs for goods transport carried out with EMS vehicles are assessed by the major part of the respondents to be below the other road trains. From Figure 12 it appears that the major part of the companies assess that the cost per transported tonnes lies at minimum 10 % below the price for a normal transport. This can be referred to the fact that the higher capital and operation costs connected to the individual EMS vehicle should be compared to the larger goods volume that these vehicles can transport[6].

Reply to question 14:

Question 14: The financial recession's influence on the application of EMS vehicles

Among the respondents 17 indicated that the financial recession has had a positive influence on the application of EMS vehicles, while 24 have replied that the economic recession has had a negative influence. The respondents were asked to give reasons for their check offs. The reasons are reproduced in Figure 13.

[6] The savings of 10 – 15 % from driving with EMS vehicles cannot be a surprise, since this is the common expectation to driving with EMS vehicles in the trade. Thus the replies can be interpreted as either a real evaluation of the conditions or a confirmation of the expected effect from driving EMS vehicles.

Positive influences	Negative influences
• Better exploitation of equipment • Better exploitation of equipment • More goods between terminals with less vehicles • Creative thinking more than ever to obtain lower cost. • We save some extra trips between terminals • No influence • Move more goods with less vehicles • Rearrangement of transport (saved a night vehicle) • Better profitability (savings) • No importance, as we have applied EMS vehicles for 10 years.	• Lower goods quantity • We have less to do = too much equipment • Less to transport = too much equipment • No goods • No influence • Less activity • Lower goods quantity • More difficult to fill up the road train with goods • Less combination options • Drivers have more waiting time due to driving time and rest period regulations • Fall in goods quantity • In periods they could not be exploited optimally • Less goods • Generally lower demand • Much lower goods quantity • Lower goods load • Not so much cargo to transport • Lack of goods and lower prices • Price for transport can no longer cover cost

Figure 13 The companies' evaluation of the financial recession's influence on the application of EMS vehicles

As it appears from the replies to question 14, the financial recession has been applied differently by the various companies seen in relation to EMS vehicles: For some companies the recession has been a motive to apply EMS vehicles because it has made the transport more efficient. For some companies the recession has meant that there are fewer goods and therefore they have not been motivated for shifting to equipment with potentially larger capacity utilization.

Question 15: Barriers for transport with EMS vehicles

Reply to Question 15:
The replies to question 15 appear from Figure 14. After the figure the verbal comments given by the respondents follow.

Barriers		Number of companies
No barrier		2
Minor extent		4
Larger extent	Road network which can be applied	31
	Access conditions	5
	Poor capacity utilization	2
	Economy, purchase	1
	Economy, operation costs	0
	Other	7

Figure 14 Experience barriers in relation to increasing the transport with EMS vehicles

Specific comments from haulage contractors and logistics companies about the barriers for increasing transport with EMS vehicles:

- Copenhagen Municipality's lack of understanding and participation.
- It is our opinion that there are many locations where you are not allowed to drive, even if this, according to our knowledge, is possible without changing the roads.
- Link-trailers cannot transport dangerous goods. Very problematic within the range of general goods.
- Let the modular vehicles drive on the entire road network – it will increase flexibility and unnecessary km to interchange locations can be avoided.
- Use too much time on travelling between interchange locations.
- Lack of interchange locations in Denmark especially in Randers.
- Lack of harmonisation with neighbour countries.
- Cannot transport ADR (dangerous goods) on the link combination.

All in all it appears from Figure 14, that it is the extension of the EMS vehicle road network which is the largest barrier.

Reply to "other comments":
As the last part of Form 1 in the questionnaire, the respondents had the option of adding further comments to the use of EMS vehicles. These comments are listed below:

- Dolly can carry dangerous goods – link-trailer cannot.
- Many dollies drive in Sweden with Danish registered vehicles. Need more sections where it is allowed in Denmark. For example from our own terminals.
- We are very pleased that the test is ongoing and all measures increasing flexibility is a plus for the trade and the transport purchasers.
- The attached vehicles are solely applied for training driving in connection with driver education and obtaining driver's licence
- We live in an industrial area near the motorway outlet 42 in Randers. You cannot drive from Grenå via the rural road and then apply the motorway outlet 42 in Randers. Our nearest interchange location is Aarhus. It is very uneconomic and environmentally polluting that there is no interchange location in Randers.
- We apply these only between the freight central in Esbjerg-Tåstrup – therefore no barriers for driving.
- The transport becomes more economic for the company through a better and more rational terminal set up. Increased combination options between the terminals.

Reply to Form 2

In Form 2 the companies have had the option of registration of a driver's log for one or two selected EMS vehicle units depending on what they were asked for. The replies to Form 2 can, as a consequence of the relatively large data quantity, not be treated in the same way as in the case of Form 1. Instead a number of figures have been created which gathers and illustrates the results across the received replies.

Generally for Form 2, it can be said that a total of 314 trips were made in the counting week, where the EMS vehicle units have been travelling as a part of an EMS vehicle. To this can be added 24 trips, where the unit in question did not travel as a part of an EMS vehicle and finally 72 trips were made where it has not been informed, whether the unit travelled as an EMS vehicle or not. Totally there is data on 410 trips.

Among the 314 trips where the unit has travelled as part of an EMS vehicle, the 267 trips were solely travelled in Denmark and the 13 trips between Denmark and abroad, while the remaining 34 trips were solely travelled abroad that is between various destinations abroad.

As mentioned earlier, 99 EMS vehicle units have been identified, for which the companies have been asked to prepare driver's logs in the counting week. The 99 units are distributed on 51 dollies, 45 link-trailers and 3 central axle trailers. Reports were received for a total of 75 EMS vehicle units, corresponding to a reply percentage of 76 %. The replies are distributed on 41 dollies, 31 link-trailers and 3 central axle trailers. Among the units for which trips have been reported, there were 52 replies distributed as follows: 33 dollies, 17 link-trailers and 2 central axle trailers, which means that 23 units distributed on 8 dollies, 14 link-trailers and one central axle trailer which were not applied by the reporting companies for transport with EMS vehicles in the counting week. Of the replies it appears that 3 of the 23 have replied that the unit has not been applied because of overcapacity within the area, 4 units have not been applied because the demand for transport was not within the EMS vehicle road network, while 16 have indicated "Other". Among these 16 replies, approximately half of these gave the reason for not having filled in the driver's log that the unit had been hired out to other haulage contractors or third parties which is typical for the link-trailers. It must be assumed that the hired / lent out units have been applied for transport as EMS vehicles, since it would not have been rented if it was not to be used for this purpose.

Figure 15 shows that there is no direct relation between goods weight and trip distance. On the contrary the figure shows that there is a tendency to apply the link-combination over shorter distances while the dolly-combination is primarily applied over longer distances. A possible explanation to this may be the fact that the dolly-combination is primarily applied for terminal transport while the link-combination is to a large extent applied when all goods are to be delivered to one customer. At the same time it should be noticed that several relatively long trips with low goods weight can be an indication of volume goods, where the road train is well-exploited with regard to volume goods but this will not affect the weight. The opposite possibility is also present, as the special combination of EMS vehicle units could indicate that a haulage contractor chooses to drive with an empty link-trailer in order to have this returned, even with no goods in it, but simply because it is to be applied for an EMS vehicle combination e.g. the day after.

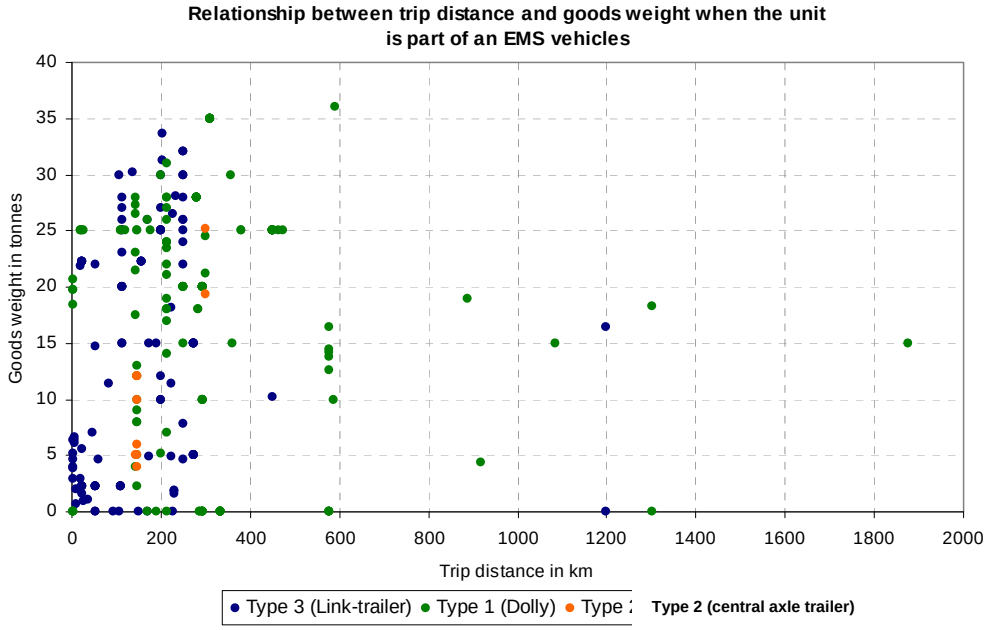


Figure 15 Relation between trip distance and goods weight when travelling with EMS vehicles [7]

To the above should be added that mainly it is a question about replacing existing transports with traditional road trains with EMS vehicles and therefore there are not any immediate changes in the transport patterns, distances, etc. and therefore no basic changes in the transport and traffic picture. Basically it should, however, still be assumed that EMS vehicles will be applied particularly over longer distances.

[7] It should be mentioned that a "dot" can contain more trips, and the dots may cover each other. The distribution of dots cannot be taken as a unique expression of the frequency of the trips.

As it appears from the attached questionnaire, part 2, one of the questions is, whether the EMS vehicle unit in question on a given trip was part of an EMS vehicle or not. As mentioned earlier, the units in question were not part of an EMS vehicle on 24 trips of the 410 trips. Among the 410 trips the unit was part of an EMS vehicle on 314 trips. For 72 trips the respondents did not inform whether the EMS vehicle unit was part of an EMS vehicle or not. The background for the relatively large share of uninformative replies is not clear; the cause may be that in some cases the question does not make sense. For example; typically a dolly unit only forms part of an EMS vehicle, why it may have been found irrelevant to reply to the question about whether this unit has travelled as part of an EMS vehicle or not.

Among the 24 units, which did not form part of an EMS vehicle on a trip, their trip distances combined with the goods' weight appear from Figure 16 with regard to link-trailers. This statement only includes link-trailers, as this is the only type of EMS vehicle where it is relevant to talk about that a unit did not form part of an EMS vehicle.

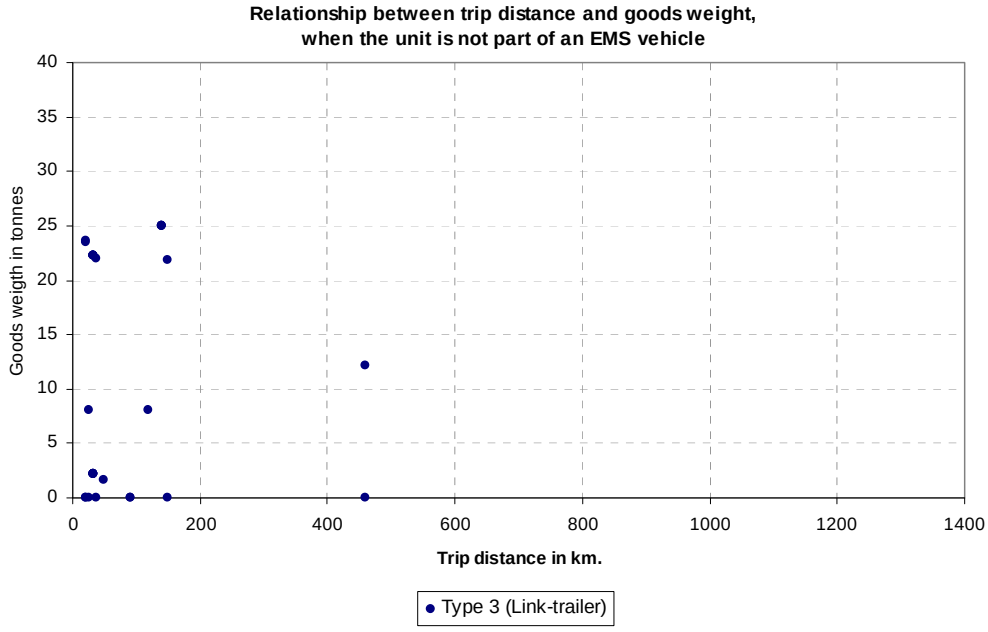


Figure 16: Transport with link-trailers not being part of an EMS vehicle

The distribution of transport with link-trailers not being part of an EMS vehicle does not show any unique results, cf. Figure *16*. A comparison between Figure 15 and Figure 16 does not show a distinct difference in trip distance and goods weight between the link-trailers travelling alone or as a part of an EMS vehicle.

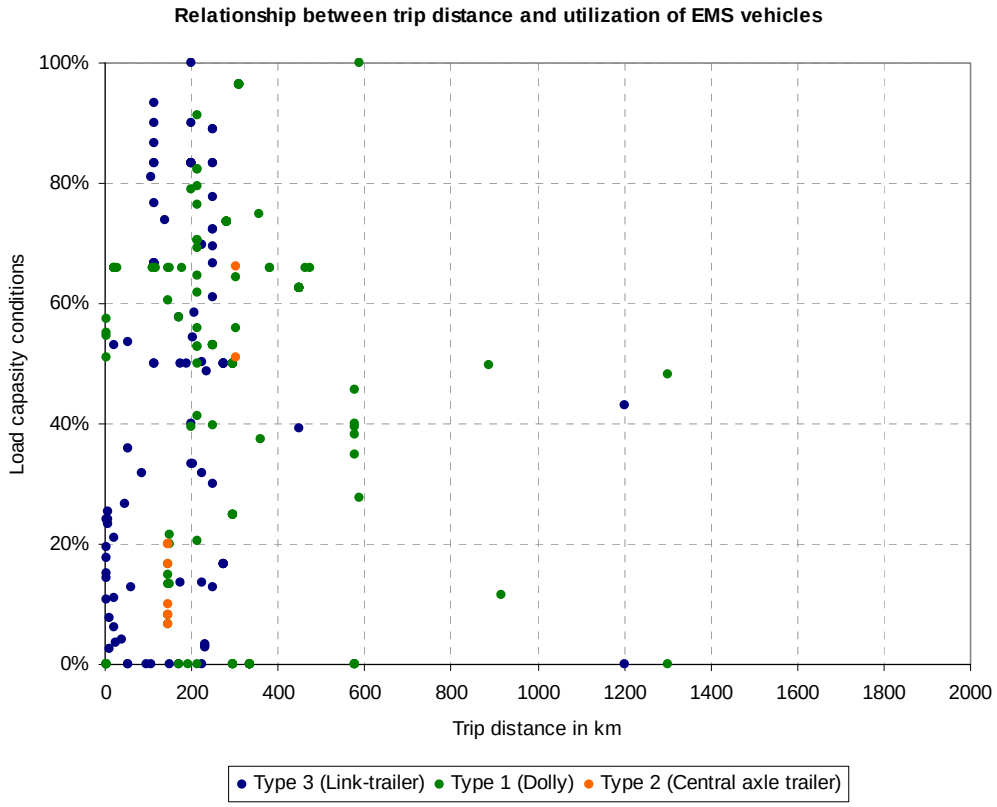


Figure 17 Relation between trip distance and load capacity for an EMS vehicle [7]

Figure 17 illustrates the relation between load capacity degree, measured in indicated potential tonnes that can be loaded and the real capacity utilization [8]. The picture is again that there is no direct relation between load capacity degree and trip distance. However the figure shows that the dolly-combinations are applied on the longest trips. Further investigations will be required in order to uncover, whether this can be related to the flexibility of the individual vehicle types or to other conditions.

[8] Based on the respondents' replies to the question about "The road train's total load capacity", this has been set to 39 tonnes on average. On this basis it has been possible to calculate the load capacity percentage as appears from Figure 17.

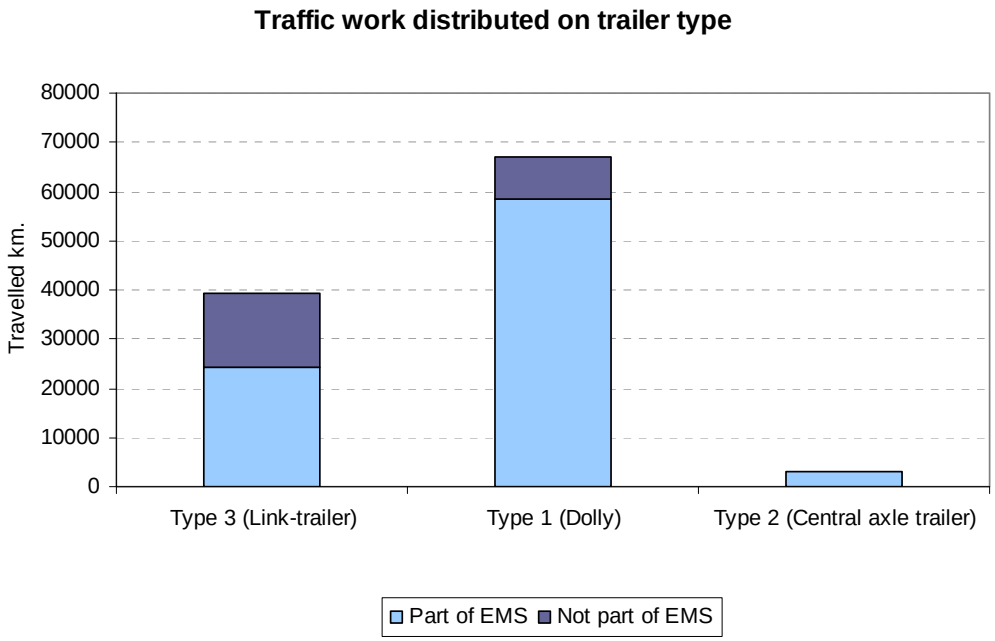


Figure 18 Traffic work for various trailer types

Figure 18 reveals two quite striking phenomenon: First the total traffic work carried out by dolly-combinations does to a large extent exceed the corresponding for link-trailer-combinations. Second the link-trailers are often part of the trip as other than an EMS vehicle. The last-mentioned can be referred to the fact that link-trailers are more often applied for trips between destinations, where it is not possible to apply EMS vehicles on the entire trip. The link-trailer-combination must therefore be split up on parts of the trip. In this connection the link-trailer is far more flexible than the dolly-combination and is therefore chosen more often for such transport tasks.

Totally the number of trips for the individual types has also differed, as there are 129 trips with link-trailers, 171 with the dolly-combination and 14 with central axle trailer. However, the significant difference in number of travelled kilometres with link-trailer and dolly-combination, respectively, cannot be referred to these differences but also covers over differences in trip distances for the individual types, which is accounted for in connection with figure 10.

On the basis of Figure 18 it can be calculated, that the 52 reported EMS vehicle units in the counting week, on estimate, have travelled 82,000 km as EMS vehicles. Based on the fact that at the end of 2009 316 EMS vehicle units were registered in CMR and as it can be expected that 85 % of these have travelled as EMS vehicles, an estimate would be that EMS vehicles are potentially travelling 22,000,000 km annually[9].

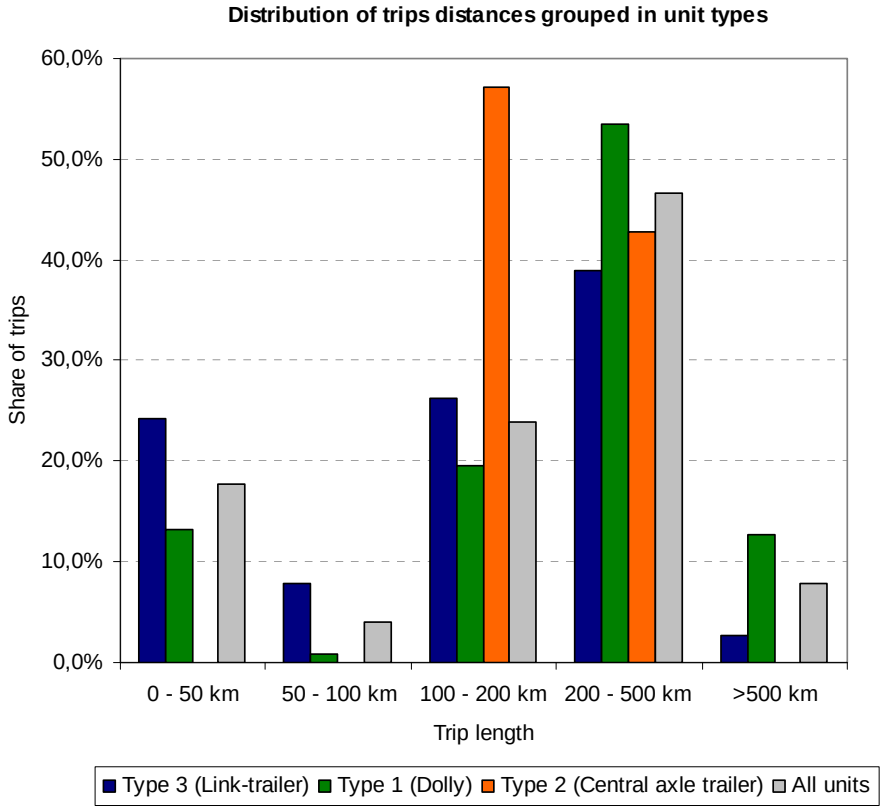


Figure 19 Trip lengths for various types of EMS vehicle units (not necessarily as part of an EMS vehicle).

Figure 19 reveals at least two interesting issues: First; EMS vehicles are often applied on trips between 200 and 500 km and that these trips are between Eastern and Western Denmark. Totally this interval counts for almost 45 % of the trips, while the second place is occupied by the interval between 100 and 200 km with almost 25 % of the trips. Second; there is no significant difference as to what type of EMS vehicle combination is applied on the various trip distances. Central axle trailers are only part of two distance intervals due to the limited number being part of the EMS vehicle concept. With regard to link-trailers and dollies there seems to be a little tendency that link-trailers have a certain dominance on the shorter distances, while the dollies take over on the long distances. This picture fits quite well into the earlier assessments of which distances and for which transport tasks the two types have their strengths.

[9] The 82,000 km distributed on 52 units means that a unit travels 1,577 km on average per week. As it has at the same time been reported that approximately half of the EMS vehicle units being part of the special run are hired out and these must be expected to be applied for EMS vehicle transports, this means 52 + (23/2) = 64 units out of 75 replies. 64 of 75 units, corresponding to 85 % of the total EMS vehicle population, can be expected to travel as EMS vehicles.

As it appears from Figure 19, the total transport is dealt with, which the EMS vehicle units have travelled. By way of comparison Figure 20 shows the number of trips where the EMS vehicle units have actually been part of an EMS vehicle. There is hardly any difference between the distributions in the two figures except for the fact that the link-trailers' share of trips demonstrates a larger fall in the group 200 – 500 km, than for the other trips with link-trailer and other trips in general.

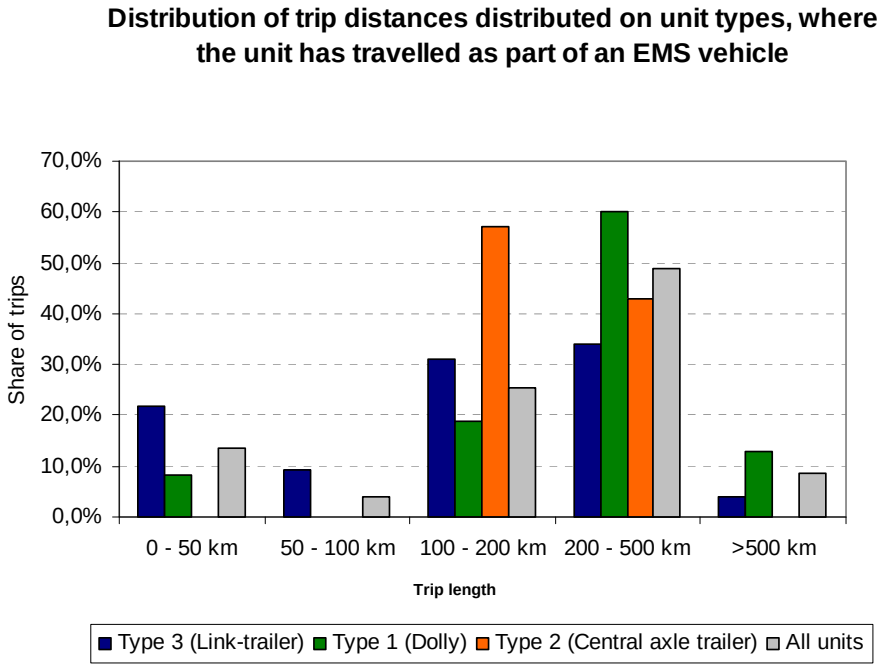


Figure 20 Trip distances for various types of EMS vehicle units being part of an EMS vehicle

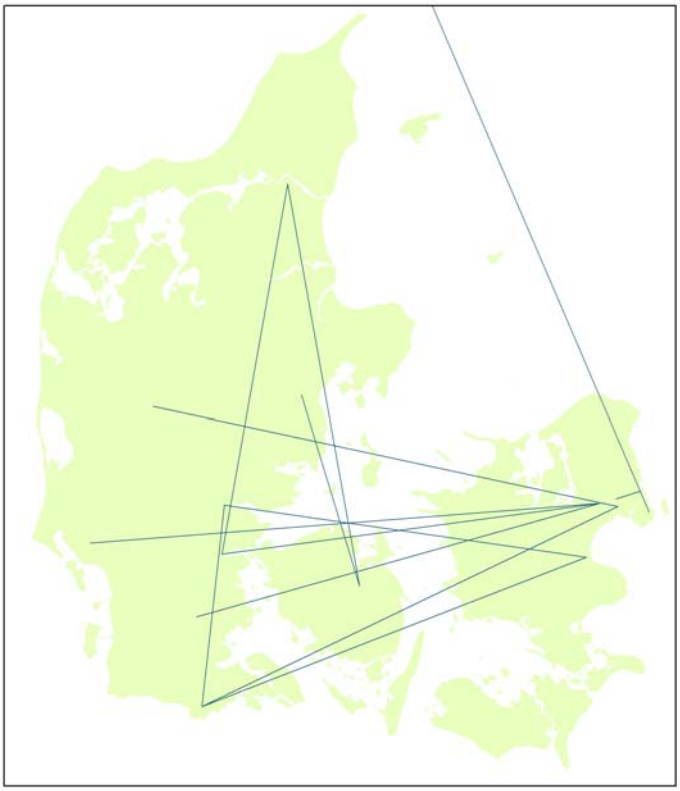


Figure 21 Map with postal code relations with 10 or more trips with EMS vehicles in the counting week

Figure 21 shows for 5 return trips or 10 single trips or more that these are to a large extent trips between Eastern and Western Denmark, and trips between Northern and Southern Jutland supplemented by trips to accessible destinations in the rest of Scandinavia.

Based on the nationality of the tractor per trip, it has been calculated how many kilometres the various nationalities' tractors are travelling. This appears from Figure 22.

Nationality	Traffic work (1000 km)
DK	72.2
D	4.2
PL	2.5

Figure 22 Traffic work with EMS vehicles distributed on nationality of tractor

Figure 22 gives a clear indication of the fact that the transport is mainly performed by Danish trucks/tractors. It should, however, be recalled that the companies, irrespective of size, has participated with maximum two EMS vehicles in the investigation. A number of the large users of EMS vehicles using both Danish and foreign tractors, does not have this condition expressed precisely in the investigation. Therefore the actual picture comprising all the companies' EMS vehicles should be assumed to contain a significant part of tractors on foreign licence plates [10].

[10] Looking at the replies to the earlier question 5 in Form 1, whether tractors registered abroad were used, it was revealed that relatively few companies are applying tractors registered abroad. While those, who do, or part of those, do it to a large extent.

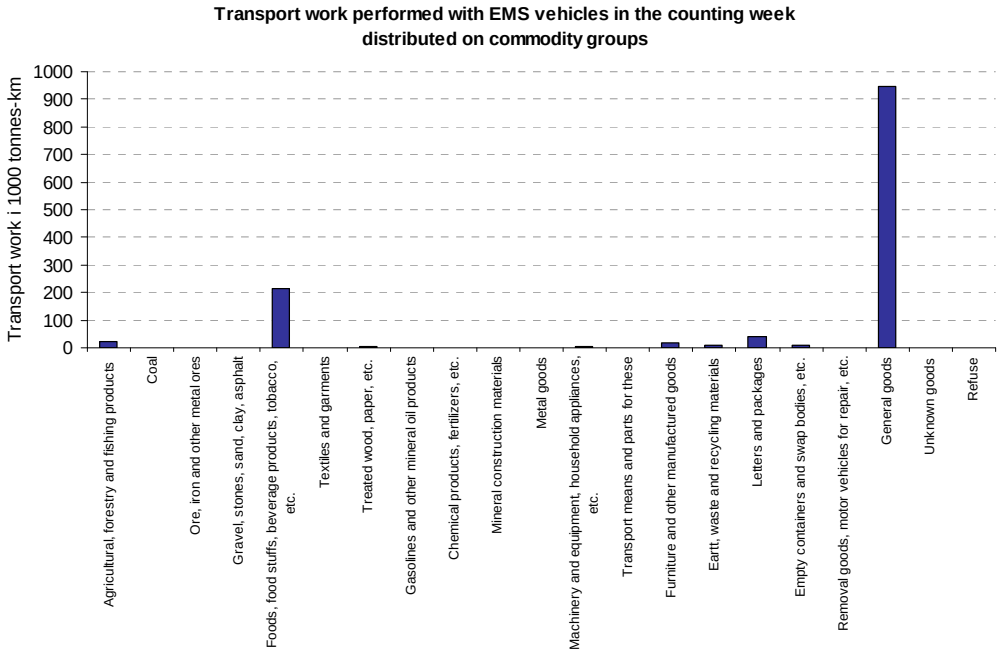


Figure 23 Transport work with EMS vehicles distributed on commodity groups

Figure 23 shows that the transport work carried out with the selected EMS vehicles in the counting week distributed on commodity groups is to some extent in accordance with the corresponding investigation of goods quantities on commodity groups, which was created on the basis of question no. 9 in Form 1, there are, however, rather significant differences as well. It gives, however, food for thought that the commodity groups, food, food stuffs, etc. in the statement of the transported goods quantity in Figure 6 is on level with the group general goods, while in the statement in Figure 23 this only corresponds to a little more than 20 % of this.

The explanation may be referred to significant differences in trip distances for the individual commodity groups, but the difference is striking. A similar picture can be seen for a number of the other goods types where significant differences also seem to be the case when comparing these two statements.

A more real explanation is probably that while Figure 6 expresses an estimated distribution (calculated from the questioned companies) of goods quantities on all EMS vehicle units at the companies, Figure 23 expresses a more systematic way of calculating the distribution, why there is more reason to credit the last-mentioned statement.

Looking at the corresponding distribution for the amount of ordinary trucks with a total weight of above 6 tonnes and transport in national traffic, it appears from Figure 8, that the largest commodity groups here are gravel, stones, clay, etc., foods, food stuffs, agricultural and fishery products, earth, waste and construction materials.

DANMARKS STATISTIK

Scheme 1: General questions on transport with all of the companies EMS vehicle units

Part 1: Concern the companies use in general of EMS vehicle units in the counting week, the second week of 2010

1. How many EMS vehicle units was available in the counting week for the company?

	Dolly	Semitrailers with coupling to central axle trailer	Link-trailer	Long trailer (24 meters trailer train)
Engaged				
Own/leased				

2. How many of the above mentioned units have applied for transport at EMS vehicles in the counting week?

	Dolly	Semitrailers with coupling to central axle trailer	Link-trailer	Long trailer (24 meters trailer train)
Engaged				
Own/leased				

3. How many of the EMS vehicle units that you used in the counting week, was registered abroad?

	Dolly	Semitrailers with coupling to central axle trailer	Link-trailer	Long trailer (24 meters trailer train)
Engaged				
Own/leased				

4. How many of the used EMS vehicle units was driving in international traffic in the counting week?

EMS vehicle units in international traffic in the counting week, in total: ☐

5. Have the company used abroad registered driving units in EMS vehicle units in the counting week?

☐ Yes → Designate number of abroad driving units: ☐

☐ No

6. On which danish road types did the companies EMS vehicles drove in the counting week?

	Motorvej	Mainroad	Other
Estimated distribution on road types:	%	%	%

Sejrøgade 11
2100 København Ø

Direkte tlf. 39 17 39 30
e-post transport@dst.dk

Fax 39 17 30 37

7. On which trips (indicate postal code) was EMS vehicles used in the counting week

indicate the most frequent trips (to/from)

Trips - with postal code, from:	Trips - with postalcode, to:	Trips - with postal code, from:	Trips - with postalcode, to:

8. How many tons did the company transport with EMS vehicles in the counting week?

Estimated ☐ Tons

9. Which commodity grops was transported with EMS vehicles in the counting week

Indicate an estimated distribution of the transported freightload

Good No.	Description	share of total transport in %
01	Agricultural-, forestry- og fishing products	
02	Coal	
03	Ore, iron and other metal ore	
04	Gravel, stone, sand, clay, asphalt	
05	Foods, food stuff, beverage and tobacco	
06	Textile and garments	
07	Treated wood, paper and paper products	
08	Gasoline and other mineral oil products	
09	Chemical products, fertilizer, plastic, rubber	
10	Mineral construction materials	
11	Metal goods	
12	Machinery, household appliances, electical articles, etc.	
13	Transportmeans and parts for these	
14	Furniture and other manufactured goods	
15	Earth and waste	
16	Letters and packages	
17	Empty containers and swap bodies, etc.	
18	Removal goods	
19	General goods, mixed goods	
20	Unknown goods (non identifiable goods)	
21	Refuse	

10. Are there difference in which goods numbers the company transported in the EMS trains and on common road trains in the counting week?

☐ No

☐ Yes → Which goods numbers where primarily transported in EMS trains compared to common trains

Good No.

Part 2: Concerns your companys use of EMS trains at all

11. Which advantages and disadvantegas are related to the various types of EMS vehicles for your company?
Mark one og more boxes under every EMS type.

Advantages:	Dolly	Semitrailer with coupling to central axle trailer	Linktrailer	Long trailer (24 m trailer train)
High flexibility	☐	☐	☐	☐
Larger volume	☐	☐	☐	☐
Solution of transport demand between terminals	☐	☐	☐	☐
Low purchase price	☐	☐	☐	☐
Lower operation costs	☐	☐	☐	☐
Well suited for special goods, in which case what special goods: _____	☐	☐	☐	☐
More environmentally friendly	☐	☐	☐	☐
Larger traficsafety	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐
_____				
_____				
Disadvantages:				
Less Flexibility	☐	☐	☐	☐
High purchase price	☐	☐	☐	☐
Difficult interchanges	☐	☐	☐	☐
Spread of the road network	☐	☐	☐	☐
Poor trafficsafety	☐	☐	☐	☐
Larger environmental effect	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐
_____				
_____				

12. Do your company interchange the EMS vehicles to transport goods further outside the EMS road network?

☐ No

☐ Yes → Where were the interchanges carried out?
Mark one or more boxes

- ☐ Habour
- ☐ Rest area
- ☐ Transportcentre
- ☐ Private terminals
- ☐ Other pleces, indicate where: _____

13. How are the costs per transported tonne by EMS trains compared to traditional trains?

- ☐ Higher
- ☐ Undisturbed
- ☐ Lower → How much lower are the cost evaluated to be?
  - ☐ under 10%
  - ☐ 10 - 20%
  - ☐ above 20%

14. Which influence have the financial recession had on your companys application of EMS vehicles?

- ☐ Positive, justify: _____
- ☐ Negative, justify: _____

15. To which extend do your company experince barriers to expand transport with EMS vehicles

- ☐ No barriers
- ☐ Smalle amount
- ☐ Larger amount → Indicate the barrier(s) that seems the greatest

  Mark one og ore boxes.
  - ☐ The road network, used in EMS vehicle transport
  - ☐ Access condition when collection/unloading goods
  - ☐ Poor capacity utilization, resulting in lack of demand
  - ☐ Economy, purchase
  - ☐ Economy, operation costs
  - ☐ Other, which: _____

Comments

Contact person

Name

Telefone No. E-mail

DANMARKS STATISTIK

In the following section you are asked to give information about the use in of the above mentioned registration number and only this unit and the EMS vehicle combinations, which the unit have been a part of, during the sencond week of 2010.

The objective with this survey is to clarify, how the selected unit is used and used in different combinations of EMS trains.

Have the above mentioned registration number been used in the counting week?

☐ Yes → Inform about the trips in the counting week on the next pages.

☐ No → Indicate the reason why the unit haven't been used and return the scheme to Danmarks Statistik:

- ☐ The vehicle is sold/signed off
- ☐ Techinal problems
- ☐ Shortage of drivers, e.g. vacation, illness, courses
- ☐ Over capacity in the area
- ☐ Transport demand outside the EMS train road network.
- ☐ Other economical contemplations
- ☐ Other, indicate: _____

Sejrøgade 11
2100 København Ø

Direkte tlf. 39 17 39 30
e-post transport@dst.dk

Fax 39 17 30 37

Trips in the counting week

Notice:

That a trip with goods starts by loading the selected EMS vehicle train and ends with unloading it.
A new trip starts at every interchange of the selected EMS vehicle unit.
It is not perceived as a new trip if the driving unit are replaced on a trip.
It is perceived as an "empty trip" to drive with an unloaded EMS vehicle train.
Definitions, Goods numbers and Country code can be found on 4.

Infomation on the selected EMS vehicle unit								Infomation on the whole EMS vehicle train						
Trips driven from/to				Trip infomation				The vehicle			Infomation on goods			
Date dd.mm	From/ to	Postal no.	City	Empty trip Mark X	Similar trips Amo-unt	Trip length Km	A part of a EMS Mark X	Total load capacity of the EMS Kilo	Same driving unit on the trip Mark X	Driving units nationality at tripstart Contry code	Goods weight kg	Goods no.	Hazard-ous goods Mark X	Goods volume Mark X
	From						Yes		Yes					
	To						No		No					

Definitions

Empty trip:
Transport without cargo with a EMS vehicle. Notice that transport with an empty container is cosidered transport with load.

Similar trips:
If a certain trip was drived more times within the periode, only describe the first trip and note the amount of trips similar under "Similar trips".

Volume goods
Goods with large dimensions compared to its weight (e.g. glass wool) or of a certail caracter,
that the vehicle units load capacity are not fully used (e.g. furniture).

Weight of the goods
The weight of the goods total quantity incl. wrapping and the weight of containers and swap bodies.

Goods numbers

Goods no.	Description
01	Agricultural-, forestry- og fishing products
02	Coal
03	Ore, iron and other metal ore
04	Gravel, stone, sand, clay, asphalt
05	Foods, food stuff, beverage and tobacco
06	Textile and garments
07	Treated wood, paper and paper products
08	Gasoline and other mineral oil products
09	Chemical products, fertilizer, plastic, rubber
10	Mineral construction materials
11	Metal goods
12	Machinery, household appliances, electical articles, etc.
13	Transportmeans and parts for these
14	Furniture and other manufactured goods
15	Earth and waste
16	Letters and packages
17	Empty containers and swap bodies, etc.
18	Removal goods
19	General goods, mixed goods
20	Unknown goods (non identifiable goods)
21	Refuse

Crountry codes

CZ	Czech Reublic
D	Germany
DK	Denmark
N	Norway
PL	Poland
S	Sweden
ZZ	Others

Appendix 3: Interview and surveys

Grontmij | Carl Bro

planning connecting
respecting
the future

Midway Report
Appendix 3 A: Survey from Danish Cyclist Federation Annual Meeting 2009

At the annual meeting of Danish Cyclist Federation (DCF) in October 2009 a questionnaire was distributed among all delegates, approx. 100 persons, in agreement with DCF.

In the introduction to the questionnaire comprised a brief description of EMS vehicles, including the test with EMS vehicles. The entire questionnaire in its original form can be found at the end of the present appendix.

Response
73 persons responded to the questionnaire and the superior part (62 %) comes from Region Hovedstaden (the Capital Region) and Region Sjælland (Region Sealand).

With regard to the responses there are problems with questions 2, 4 and 5. To question 2 six respondents replied that they had met an EMS vehicle in the traffic as a cyclist, while to question 4 fifteen respondents expresses themselves about how the meeting was compared to meeting an ordinary road train. This means that nine respondents, who at first indicated that they had not met an EMS vehicle in the traffic as cyclists express their opinions about whether this meeting was difference from meting an ordinary road train. In the same way, to question 5, nine respondents have expressed how they experienced the meeting was different from meeting ordinary road trains.

Summary of replies
1) Apart from the above, what do you know about EMS vehicles?
57 % of the respondents have no or very little knowledge about EMS vehicles apart from what is standing in the introduction to the questionnaire, other 5% have seen or read about the vehicles in the media. Approx. 10 % find that EMS vehicles require changes of parts of the road network, such as roundabouts, which may result in a reduction of the traffic safety for cyclists.

2) Have you met EMS vehicles in the traffic as a cyclist? If yes, on what road section was that?
Only 8 % of the respondents have met an EMS vehicle as a cyclist in the traffic, while 89 % respond now to this.

3) Do you generally feel insecure when meeting a road train (yes/no)?
60 % of the respondents feel insecure when meeting road trains, while 19 % do not have this experience. In this connection several respondents express that it depends on where they meet road trains. For example whether there is a cycle track.

4) If you meet an EMS vehicle: Is this experience different from meeting ordinary road trains (yes / no)?

* Out of the 15 respondents having replied to, whether meeting with the EMS vehicle was different from meeting ordinary road trains, 7 finds (approx. 47 %) that the meeting was different, while 8 (approx. 53%) find that there is no difference

5) If yes, how did you find the meeting was different?
* 9 respondents responded to how the meeting with the EMS vehicle was different and their replies are within the areas surprising, larger air pressure and the considerable size of the EMS vehicles.

6) Do you find that EMS vehicles are more dangerous for cyclists than other road trains (yes/no)?
78 % of the respondents find that EMS vehicles are more dangerous for cyclists than other road trains, while 11 % find that they are not more dangerous than other road trains.

7) If yes, what do you base this statement on?
36 % of the respondents find that it is the size (length and width) of the vehicles that makes them more dangerous, while 16 % find that they are more dangerous because the driver's possibilities of orienting himself is poorer and 14 % find that EMS vehicles are more dangerous because they give more turbulence when passing.

9) Which measures in relation to road trains would increase your feeling of safety?
There are more suggestions as to how the feeling of safety can be increased for the cyclists, e.g. 25 % find that separate cycle tracks could help and 16 % find that it is important to ensure that EMS vehicles are only driving on certain roads (primarily the motorway network).

10) Do you think that EMS vehicles can be an environmental gain due to their ability to handle larger quantities of goods (yes / no)?
49 % of the respondents find that there is no environmental gain from EMS vehicles, while 29 % find that there may be an environmental gain.

11) Do you think that there is a need for more information to cyclists about EMS vehicles and their spread in order to ensure a safety level for soft road-users (Yes/ no)?
67 % find that there is a larger need for information to cyclists about EMS vehicles, while 21 % do not agree to this

Selected quotes

- "that public funds have been applied for changing road crossings and roundabouts in consideration for EMS vehicles"
- "very little, but they are large and more dangerous"
- "Many national politicians are interested in introducing EMS vehicles"
- "that Falster will be influenced by this. Large changes (costs) crossings and roundabouts so that other motorists can drive too fast in city centres to reach Gedser. (In Germany EMS vehicles are not allowed)"
- "that the risk of getting sucked under a train/vehicle is higher"
- "They require road extensions in crossings and thus higher speed"

- ”in case of side wind the effect on the cycle track becomes larger as it takes longer before the road train has passed.”
- ”When passing by, a longer road train generates a higher risk of swaying and fall for the cyclist”
- ”Yes, longer, larger and more obstructed view for the driver”
- ”longer brake length, obstructed view”
- ”length, volume (air pressure), survey for driver, rear wheel cuts corner, turning time”
- ”The EMS vehicle itself is not dangerous, but cut backs in speed damping measures are dangerous”
- ”that they are forbidden totally together with soft road-users”
- ”That they only drive on motorways + express roads or other roads without cycle tracks”
- ”Lower actual speed, more focus on driver behaviour”
- ”forbid them”
- ”Marking of the roads, where they are allowed to drive through signs”

Focus group interview
14 of the respondents have indicated that they would like to take part in a focus group interview at a later time

Where did the cyclists meet EMS vehicles?

- Horsensvej in Vejle (once)
- Marselis Boulevard
- In city traffic in Aarhus
- Thomas B. Thrige, Svendborgvej 83, Odense
- Ferry berth in Kalundborg
- On main road (respondent lives in CBH NV)

Distribution of replies to the individual questions (see questions below in the appendix):

1) What do you know apart from the above-mentioned about EMS vehicles?

No reply	13	18 %
Nothing	33	45 %
Very little	9	12 %
Have read and heard about it in the media	4	5 %
Other	14	19 %
	73	100 %

2) Have you met EMS vehicles in the traffic as a cyclist? If yes, on which road section?

No reply	2	3 %
Yes	6	8 %
No	65	89 %
	73	100 %

3) Do you feel generally insecure when meeting road trains (yes / no)?

No reply	8	11 %
Yes	44	60 %
No	14	19 %

Other	7	10 %
	73	100 %

4) If you have met an EMS vehicle: Is this experience different from meeting ordinary road trains (yes / no)?

No reply	56	77 %
Yes	7	10 %
No	8	11 %
Other	2	3 %
	73	100 %

5) If yes, how did you experience that this meeting was different?

No reply	63	86 %
Wind pressure	2	3 %
Surprise	2	3 %
Other	6	8 %
	73	100 %

6) Do you find that EMS vehicles are more dangerous for cyclist than other road trains (yes / no)?

No reply	3	4 %
Yes	57	78 %
No	8	11 %
Do not know	3	4 %
Other	2	3 %
	73	100 %

7) If yes, on what do you base this statement?

No reply	17	23 %
Length	16	22 %
Weight	2	3 %
Size in general	8	11 %
Driver’s possibility to orientate himself	12	16 %
Air pressure	10	14 %
Other	8	11 %
	73	100 %

8) If no, why not?

No reply	65	89 %
Not different from other trucks	6	8 %
Other	2	3 %
	73	100 %

9) Which other measures in relation to road trains would increase your feeling of safety?

No reply	22	30 %
Separation/cycle track	18	25 %
Forbid them	4	5 %
Only on motorway/certain roads	12	16 %
Do not know	2	3 %

Other	15	21 %
	73	100 %

10) Do you think that EMS vehicles can be an environmental gain due to their ability to handle larger quantities of goods (yes / no)?

No reply	8	11 %
Yes	21	29 %
No	36	49 %
Do not know	3	4 %
Other	5	7 %
	73	100 %

11) Do you think that there is a need for more information to cyclists about EMS vehicles and their spread in order to ensure that safety level for soft road-users (yes/ no)?

No reply	6	8 %
Yes	49	67 %
No	15	21 %
Other	3	4 %
	73	100 %

12) Which town and postal code do you live in?

No reply	3	4 %
0-0999		0 %
1-1999		0 %
2-2999	34	47 %
3-3999	3	4 %
4-4999	8	11 %
5-5999	1	1 %
6-6999	2	3 %
7-7999	11	15 %
8-8999	10	14 %
9-	1	1 %
	73	100 %

QUESTIONNAIRE DISTRIBUTED AT DANISH CYCLIST FEDERATION'S NATIONAL CONGRESS 2009

Questions about the use and spreading of EMS vehicles

Introduction
EMS vehicles are trucks with a length of up to 25.25 meters and a total weight of up to 60 tonnes. By way of comparison a normal road train has a length of 18.75 m and a total weight of 48 tonnes. The new EMS vehicles are built up by known elements from existing road trains and will therefore not be broader or higher than existing road trains, but longer and apparently also heavier. The EMS vehicles will at the rear end have the sign "25 metres". On the back of this paper sketches of the EMS vehicles types driving in Denmark today are shown.

Since November 2008 it has, as part of a three-year test arrangement, been allowed to drive with EMS vehicles on parts of the Danish road network, primarily the motorways. The road network, which can be applied for driving with these vehicles, is currently being extended. Mainly the extensions comprise road sections having connection to companies and transport centres with a large need for transport, where the use of EMS vehicles can reduce the total number of road trains driving to and from these companies. The main rule will be that EMS vehicles apply the road network outside of city areas and basically connect transport intersections. EMS vehicles will therefore typically drive on sections where there are no access for soft road-users. However, in connection with e.g. servicing of a number of ports, the EMS vehicles will have to drive through city areas with soft road-users. This applies to e.g. Elsinore, Kalundborg and Aarhus.

As part of the three-year test arrangement, the Road Directorate conducts an evaluation of the aspects with regard to traffic, transport and safety which are connected to the application of EMS vehicles. The evaluation is conducted by a consultant team consisting of consultants from Grontmij | Carl Bro and Tetraplan. As part of this investigation, it will be of great value to us, if you would help us by replying to below questions.

Questions

1) What do you know apart from the above-mentioned about EMS vehicles?

_____

_____

2) Have you met EMS vehicles in the traffic as a cyclist? If yes, on which road section?

_____

3) Do you feel generally insecure when meeting road trains (yes / no)?_____

4) If you have met an EMS vehicle: Is this experience different from meeting ordinary road trains (yes / no)?: _____

5) Do you find that EMS vehicles are more dangerous for cyclist than other road trains (yes / no)?

6) If yes, on what do you base this statement?

7) If no, why not?

8) Which measures in relation to road trains would increase your feeling of safety??

9) Do you think that EMS vehicles can be an environmental gain due to their ability to handle larger quantities of goods (yes / no)?

10) Do you think that there is a need for more information to cyclists about EMS vehicles and their spread in order to ensure that safety level for soft road-users (yes/ no)?

11). Which postal code area do you live in? _____

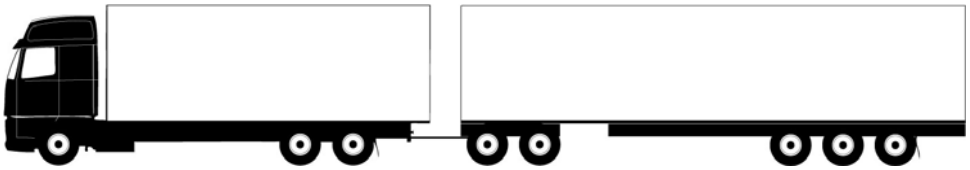
In connection with the on-going evaluation we would like to interview a number of cyclists more detailed about the meeting between soft road-users and EMS vehicles. If you would like to take part in such an interview of 2 times a couples of hours' duration, we kindly ask you to inform us of:
Name:
_____

Address (or just mail address): _____

Telephone: _____

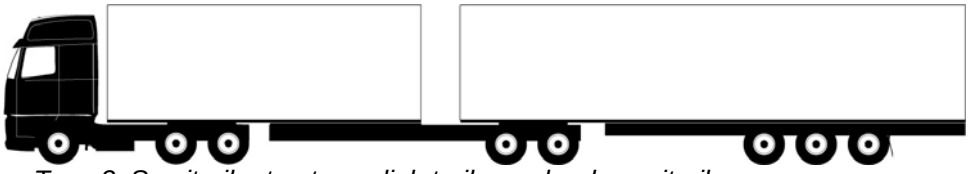
THANK YOU FOR YOUR ASSISTANCE!

Four types of EMS vehicles are applied:

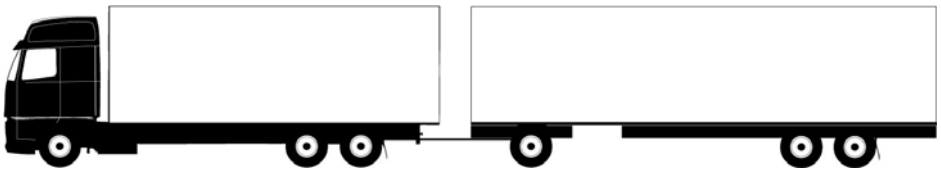


Type 1: Truck and semitrailer with dolly

Type 2: Semitrailer tractor w. ord. semitrailer and central axle trailer



Type 3: Semitrailer tractor w. link-trailer and ord. semitrailer



Type 4: Truck with long trailer

Midway Report
Appendix 3 B: Survey among ports and transport centres

On the basis of the revised Executive order for transport with EMS vehicles which came into force on 1 December 2009, all ports and transport centres are represented here and have nothing to do with the company arrangement were contacted in writing.

Mid December 2009 the contacted ports and transport centres received a questionnaire about the traffic with EMS vehicles on the location in question. The questionnaire is included at the end of this appendix. As part of the investigation the locations in question were asked, whether any reconstructions had been performed before the transport with EMS vehicles could be permitted and in that case who paid for these reconstructions.

A total of 39 questionnaires were sent out. In spite of several reminders, only 22 replies have been received so far, which means a response percentage of 56. It can, however, be stated that a number of the replies, which have not been returned, are in most cases from more peripheral locations where there have hardly been any reconstructions or where many EMS vehicles are not expected to come by.

The replies in the returned questionnaires are gathered in a survey where the question numbers refer to the following questionnaire. The survey follows on the next page.

The main conclusions which can be extracted from the questionnaire are:

- A total of 9 ports and transport centres have responded that they have been responsible for reconstructions on the locations in question. The reconstructions are described in brief in the questionnaire.
- During 2008 DKK 12.8m was spent on reconstructions of various locations in addition to the amount spent by the Road Directorate.
- For 2009 the corresponding figure is DKK 3.025m. After 2009 another DKK 500,000 are expected.
- Most respondents reply that the number of EMS vehicles daily frequenting the location almost corresponds to the expected. An estimate is that per day a little more than 150 EMS vehicles are frequenting the locations in question.
- 15 of the asked reply that the port / transport centre in question is applied as an interchange location, while 5 reply that the location is applied as interchange location for reloading between various transport forms.
- The respondents' comments etc. are presented in the questionnaire. There are no big surprises but several of the comments are rather informative about the attitude and the expectations to the test with EMS vehicle transport.

Response to questionnaire for ports and transport centres

Location / question	1	2	3	4		5	6	7	8		9		10			11	12	13
	Date for participa-tion in the test	**Rrecon-structions on own area?**	**Number of reconstruc-tions**	**Cost of reconstruction**		**Other expected reconstruc-tions**	**If yes, which**	**Paid for reconstructions**	**Number of actual EMS compared to expected number**		**No. of EMS per day on average**		**Use of transport centre**			**Advantages from use of EMS**	**Disadvan-tages from use of EMS**	**Other issues**
Location				**2008**	**2009**				**Less**	**More**		**Pointed out by editor**	**Trimodalt**	**Interchan ge loc.**	**Other**			
Aabenraa Port	01-09-2009	No				No			1		1	1		1				
Aalborg Port	Nov. 08	Yes	Arranged space for parking and decoupling of EMS	3.500.000		No		Port itself	As expected		7-10 no WIM)	8		1		No immediate advantages/disadvantages		
Brøndby Interchange location; Industrivej																		
Brøndby Interchange location; Park Allé																		
Brøndby Interchange location; Priorparken																		
Esbjerg Port	Nov. 08	Yes	Interchange loca	700.000		No		Port itself		1	5-6 pcs	6		1		Outside city, but still close to, direct to motorway.	No	No
Fredericia Port	Nov. 08	No				No			1		0-5 Large fluctuations	3	1					If opened for transport with EMS to Germany, then a competitor to the feeder traffic of containers should be expected, especially if the tonnage follows up to 60 tonnes
Frederikshavn Port	Nov. 08	No				No			As expected		10	10	No	Partly	Transit	No	No	
Gedser Port																		

Location / question	1	2	3	4		5	6	7	8		9		10			11	12	13
	Date for participa-tion in the test	**Rrecon-structions on own area?**	**Number of reconstruc-tions**	**Cost of reconstruction**		**Other expected reconstruc-tions**	**If yes, which**	**Paid for reconstructions**	**Number of actual EMS compared to expected number**		**No. of EMS per day on average**		**Use of transport centre**			**Advantages from use of EMS**	**Disadvan-tages from use of EMS**	**Other issues**
Location				**2008**	**2009**				**Less**	**More**		**Pointed out by editor**	**Trimodalt**	**Interchan ge loc.**	**Other**			
Grenaa Port	Sept. 09	No				No				1	10-15	12	Ferry to Sweden	Other goods		The impression is that it works really well and that the add. capacity available with EMS is totally exploited. EMS maneouvres around the port without problems.	We cannot see any disadvan-tages	
Haderslev Interchange location																		
Hanstholm Port	01-12-2009	No				No				On the basis of responses from haulage contractors a wide use of EMS can be expected - larger than expected!	So far no EMS in the Port. A bit hesitating attitude. Will they be allowed in Northern Germany?			1	Distribution centre for fresh food	Higher transport capacity for the European market for goods landed in Hanstholm.	No	No
Helsingør Port	01-07-2008	Yes	Access to and from ferry deployment area and upgrading of light signal.	2.500.000	-	No		The port	As expected		4-5	5			For ferry traffic	Very few advantages but a necesssity to maintain the competition with the Oresund Bridge.	None found.	No
Herning-Ikast Transport centre	01-12-2009	Yes	1 new road and 3 roundabouts taken care of by the Road Directorate.	1.800.000		Yes	1 Recon-struction of round-about, cost approx. DKK 350,000	100 % municipality!	No experiences		No experiences			1	Logistics centre for more production companies	Improved capacity utilization, less traffic and pollution.	No experience	

Location / question	1	2	3	4		5	6	7	8		9		10			11	12	13
	Date for participa-tion in the test	**Rrecon-structions on own area?**	**Number of reconstruc-tions**	**Cost of reconstruction**		**Other expected reconstruc-tions**	**If yes, which**	**Paid for reconstructions**	**Number of actual EMS compared to expected number**		**No. of EMS per day on average**		**Use of transport centre**			**Advantages from use of EMS**	**Disadvan-tages from use of EMS**	**Other issues**
Location				**2008**	**2009**				**Less**	**More**		**Pointed out by editor**	**Trimodalt**	**Interchan ge loc.**	**Other**			
Hirtshals Port	24-11-2008	No				No			As expected		1-3	2			Delivery of goods to companies on the area of the port.	With reg. to transport with EMS on the port ara no special advantages have been identified. There seems to be advantages in relation to transport costs considering transport of goods to the port with EMS.	No disadvantage s from trafficing the port with EMS have been found considering that the vehicles are using the existing roads in the port without any inconv. for other road-users.	When the motorway between Larvik and Hirtshals has been finished a notiable increase in the number of EMS passing the port to Norway is expected. The reason is the obtained efficiency and the fact that the motorway is expected to be approved for transport with EMS.
Hirtshals Transport Centre	Nov. 08	Yes	2 roundabouts	-	-	No		Road Directorate	As expected		5	5	Ferry/vehic	1		More space	No	A new motorway extension in the spring
Horsens Transportcentre																		
Høje-Taastrup Transport centre	Nov. 08	Yes	1 vejsving og sn	150.000		No		Transport centre and municipality		1	29-30	30	Yes	Especially	Recommenda	Many	Nothing	EMS should not be using roads with cycle tracks.
Jyderup Interchange location	24-11-2008	No	None			No				1	30-40		1	1		Allows delivery of goods with EMS to customer on Wester Sealand without large extra costs, we drive with less vehicles for our traffic to Sweden. Totay all transport to and from Sweden is with EMS.	None	Extra costs are connected to transports with EMS as long as we cannot delivery directly to the customers.
Kalundborg Port	Nov. 08	No				No			1		10-15	12	1	1	Transfer of EMS on the freight line Kalundborg - Aarhus.	-	-	-
Kastrup Goods registration centre																		

Location / question	1	2	3	4		5	6	7	8		9		10			11	12	13
	Date for participa-tion in the test	**Rrecon-structions on own area?**	**Number of reconstruc-tions**	**Cost of reconstruction**		**Other expected reconstruc-tions**	**If yes, which**	**Paid for reconstructions**	**Number of actual EMS compared to expected number**		**No. of EMS per day on average**		**Use of transport centre**			**Advantages from use of EMS**	**Disadvan-tages from use of EMS**	**Other issues**
Location				**2008**	**2009**				**Less**	**More**		**Pointed out by editor**	**Trimodalt**	**Interchan ge loc.**	**Other**			
	01-09-2009	No				No			1		1-5. Not known as there are no duty to report.	2	1	1		This is too early to say. However it will be of importance for the marketing of the port.	This is too early to say.	-
Kolding Port																		
Køge Port+A21																		
Køge Transport Centre (Scandinavian Transport Centre)	Nov. 08	No, transport centre was prepared.				No			As expected		25	25		1				Look forward to Køge Port being connected.
Nørre Alslev Goods registration centre																		
Odense Erhvervshavn																		
Odense Port terminal / Lindøterminal																		
Odense Interchange location	Nov. 08	No, only what was carriied out by the Road Directo-rate!				No			As expected		1-2	2		1				The interchange location is not used very much, as it is said to be too expensive to use it and they prefer to drive directly from company to company.
Padborg Transport centre	Nov. 08	Yes, see Aabenraa Municipality's reply (which we cannot find!?)				Yes	See reply from Aabenraa Municipalit y (!?!?)		Unknown		Unknown		1	1			No inconveniences!	
Ringsted Interchange location	Not started	No				No			-	-				1				No.
Rødbyhavn Trafikhavn																		
Slagelse Transport centre	Nov. 08	No				No			1		1-3	2		1				
Taulov Transport centre																		
Uldum Interchange location	Sept. 09	No, new construc-tions planned for the purpose.				No			As expected		5 and increasing	5			Primarily for Jysk's own need.	Economy in the transport and then less trucks on the cadaster.	Lack of space in the area and thus "dangerous" or blocked parkings.	Transports to all of Scandinavia would be appropriate!

Location / question	1	2	3	4		5	6	7	8		9		10			11	12	13
	Date for participa-tion in the test	**Rrecon-structions on own area?**	**Number of reconstruc-tions**	**Cost of reconstruction**		**Other expected reconstruc-tions**	**If yes, which**	**Paid for reconstructions**	**Number of actual EMS compared to expected number**		**No. of EMS per day on average**		**Use of transport centre**			**Advantages from use of EMS**	**Disadvan-tages from use of EMS**	**Other issues**
Location				**2008**	**2009**				**Less**	**More**		**Pointed out by editor**	**Trimodalt**	**Interchan ge loc.**	**Other**			
Vejle Transport centre	Nov. 08	Yes	Extension of roundabout and construction of new roundabout, change of road width and swep paths	1.500.000	1.500.000	No		Transport centre		Considera bly larger	20-25 in January 2010 they will have a WIM capable of counting precisely	22		1	Distribution centre/truck traffic	No special advantages	No found disadvantage s	No, should bave been introduces much earlier.
Vordingborg Port																		
Aarhus North Port																		
Aarhus South Port																		
Årslev Industrial area	Sep. 09	Roads in Aarslev Industrial Area have been adapted as a consequence of the EMS test. This has been done in connec-tion with construc-tion of roads in the area.	Project adjustments out of conside-ration for EMS cannot be extracted from the projects.	Consequenti al cost for the EMS adjustments cannot be extracted.		Not for Aarslev Industrial area. A local extention of the test in Aarslev Municipality is being considered. A number of applications have been sent in and a dialogue about the determination of a road network to be investigated as well as finansing of the investigation as well as reconstructions.		Construction costs for Aarslev Industrial area have been covered as part of the site development which is performed for the account of the municipality but as a principle forms part of the sales price for the areas.	There were no expectations from Aarhus Municipality about the number of frequenting EMS, as well as the municipality have not made any registrations about the number of EMS.			-	Aahus Municipality does not have any particular knowlege about how EMS is actually applied, but the impression is that it is a question about both companies situated in Aarhus Port and in Aarslev Industrial Area appling EMS and that other companies apply Aarhus Port and Aarslev Industrial area for interchange. More precise details should be collected from the individual companies in Aarslev Industrial area. A possible contact to these could be Preben Juste from Aarhus Transport Group, dalogma@mail.tele.dk			Aarhus Municipality has no exact knowledge about this.	Aarhus Municipality has no exact knowledge about this.	As a part of the test, more interchange possibilities should have been established with direct connection to the motorway network. It should have been made more clear how the Road Directorate interprets the obligation to ensure free and direct access to the areas connected to the EMS road network, and the purely practical conditions /obligations should have been cleared prior to the test.
Total:				10.150.000	1.500.000				5,00	4,00	41,00	152,00	5,00	15,00				

Tetraplan

Grontmij | Carl Bro

Evaluation of test with transport with EMS vehicles
- questionnaire for transport centres and ports

11 December 2009

Dear receiver of this letter

Since November 2008 it has, as you may know, been allowed to apply EMS vehicles on selected parts of the road network and on a number of transport centres and ports.

We are writing to you, because you work at a transport centre or in a Port comprised by the test with EMS vehicles. The Road Directorate is responsible for this test and has asked Grontmij | Carl Bro in collaboration with Tetraplan to conduct an evaluation of the 3-year test.

As part of this evaluation we will ask you to answer a number of questions. If you have comments to the evaluation, you are most welcome to contact the signer.

You are kindly asked to return the questionnaire as soon as possible and on **17 December at the latest**.

Please note. Below on page 2 it is possible to add further comments / replies.

We thank you very much in advance for your assistance.

1. Since when have you been part of the test with EMS? Date: _____
2. Have any reconstruction at the transport centre's / Port's own area been performed in connection with the introduction of EMS vehicles in order to ensure access to the transport centre for the EMS vehicles (yes/no)? _____
3. In that case, how many reconstructions have been made? (indicate number and type: E.g. 1 roundabout, 2 left turns, etc.)
   _____
4. What was the cost of the mentioned reconstructions in DKK in 2008 _____ and in 2009_____?
5. Are performance of other reconstructions in relation to the test with EMS vehicles expected?
   No, no actual plans _____ Yes, ____
6. If Yes, which (write number and type: E.g. 2 right turns, etc.)? Kindly indicate the estimated amount set off for the reconstruction(s): _____ _____
7. Who did in that case pay for the performed reconstructions (Make more crosses and marked the distribution with percentage or size of amount):
   Transport centre / port: _____ Municipality: _____
   Private actors: _____ Other: _____
8. Consider whether the number of visiting EMS vehicles is higher or low than expected when the test was decided (in 2007): _____
9. How high an amount of EMS vehicles is estimated to apply the transport centre /port per day on average? Write number: _____

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10. Transport centres / ports are often regarded as goods intersections, where various transport forms meet. In the case of EMS vehicles it is, however, the perception that the transport centres /ports primarily are to function as interchange locations. For what is the present transporter /port primarily applied in connection with the test with EMS vehicles?

    - As goods intersection where various transport forms meet: _____
    - As interchange location: _____
    - Other – describe: _____

11. Are there special advantages connected with the use of /transport with EMS vehicles on the transport centre's / port's area (could it be an impression of an improved capacity utilization of road trains and therefore less traffic and crush, less pollution, etc)? Describe the advantages, preferably in priority listing the most important advantages first:
    _____
    _____

12. Are there special disadvantages with the use of / transport with EMS vehicles on the transport centre's / port's area (could be traffic safety conditions, manoeuvre skills, blocking of other road-users, critics from other road-users, increasing number of bumping into signs or other things?) Describe the disadvantages, preferably in priority listing the most serious disadvantages first:
    _____
    _____

13. Are there other conditions in connection with the test with EMS vehicles that you would like to comment on?

    _____

Questionnaire filled in: Date: _____ Location (centre / port): _____

Name: _____ Information on you (tel./mail): _____

Once again thank you for your assistance.

Best regards

Grontmij | Carl Bro A/S in collaboration with Tetraplan A/S
v/ Henrik Tornblad
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Any further comments to one or more questions:

Question no.	**Comment:**

Midway Report
Appendix 3 C: Interview with companies and drivers

In connection with the evaluation of the test with European Modular System a number of interviews are to be conducted with the actors being various companies and drivers daily applying EMS vehicles.

In order to identify some of the major actors, the transport trade's two main organisations in collaboration with Statistics Denmark have been asked to select a number of companies supposed to apply EMS vehicles in their daily transport work. On the basis of this selection the evaluation team has selected 10 companies assessed to have a geographical spread and a spread on various types of transport work, including transport of various commodity categories.

Among the 10 companies it is the intention to conduct 3 qualitative interviews in the autumn of 2009, 4 in the spring of 2010 and finally the last 3 in the autumn of 2010. To the extent possible the intension is to interview a manager, e.g. a transport manager or a department manger and 1 to 2 drivers from the same company.

A total of 20 qualitative driver interviews are to be conducted. These are divided into 6 in the autumn of 2009, 7 in the spring of 2010 and 6 in the autumn of 2010.

The survey below shows the 10 companies selected for the interviews including comments on their location and reason for selection.

Date	Company name	Localisation	Characteristics	Reason for selection
Autumn 2009:	Per Damgaard Transport	Padborg	Transports for Transportgruppen – especially national trips.	We get the southern part of Denmark covered and partly the transports further southwards.
Autumn 2009:	Alex Andersen Ølund	Odense	Transporting volume goods/grocery goods – often Sweden and Finland.	Actually outside the net – but apply EMS quite a lot.
Autumn 2009:	Frode Laursen	Hinnerup / Jyderup	Large haulage company – broad entry of new customers	Interview conducted in Jyderup, so we have the Kalundborg route covered.
Spring 2010:	Jørgen Jensen Distribution	Ikast	Member of Transportgruppen.	Location in Ikast – at the border of the net. Has purchased various equipment (dolly + central axle trailer) in order to comply with the demand).
Spring 2010:	Arla Distribution	Hobro	Grocery goods distribution.	Should be able to cover terminal/terminal and terminal/distribution

Date	Company name	Localisation	Characteristics	Reason for selection
Spring 2010:	C. Schmidt & Søn	Herning	Transports for Danske Fragtmænd. Was outside the net at the start of the test.	Actively promoting EMS, etc.
Spring 2010:	Anco Trans A/S	Århus / Ch.	Solely transporting containers – solely direct to customers	Location for interview should be Aarhus and/or e.g. Høje Tåstrup.
Autumn 2010:	DSV Road	Esbjerg / Brøndby	Large company – with much international and national transport!	Esbjerg should be location, as this is where the old Roland Munch haulage company is located.
Autumn 2010:	K. Hansen Transport	Vejen	Also a member of Transportgruppen.	Interesting location - outside the net.
Autumn 2010:	Ole Larsen Transport A/S	Brabrand	Rather big transport company. Grocery such as fruit and vegetables.	

In addition to the 10 companies 3 ”stand-in companies” have been selected, which could replace one of the above-mentioned. The 3 stand-in companies are:

- Esbjerg Godstransport
- Poul Schou
- Kim Johansen International

As mentioned above, the drivers to be interviewed, will typically come from the same companies. The 6 drivers interviewed in the autumn of 2009 come from the following companies:

- Alex Andersen Ølund
- Frode Laursen (with two drivers)
- Per Damgaard Transport
- C. Schmidt & Søn (also with two drivers).

For the company interviews as well as for the driver interviews the same interview guide was applied, however so that the drivers were questioned about a number of additional subjects with regard to the specific driving of and traffic with EMS vehicles. On the following pages the interview guide is rendered, which has formed the basis of the interview conducted during autumn 2009. As it appears, the driver interviews are longer, as they comprise up to and including question 50, while the company interviews only comprise up to and including question 28.

A study of the replies from the 3 company interviews and the 6 driver interviews in the autumn of 2009 reveals in summarised form the following tendencies:

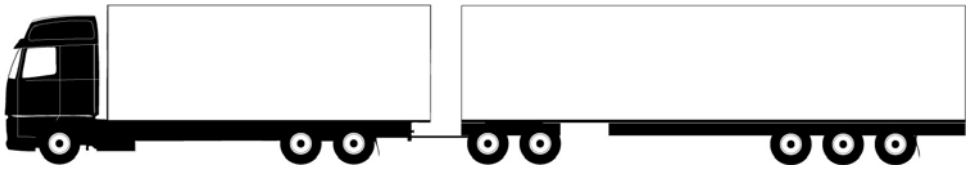
- EMS vehicles are applied very differently by the trade:

  - Some only apply the system for terminal driving
  - Other apply it almost only in connection with interchanges in spite of the fact that this is time consuming and consequently expensive.
- Various considerations lie behind this (thinking in grooves, needs, price and safety) provision of the various types of EMS vehicle units: The link-trailer is the most spread followed by the dolly.
- EMS vehicles are especially well-suited for volume goods (light food, flowers, general goods).
- The capacity of the EMS vehicles is exploited even as well and maybe even better than of common road trains. This may be due to the fact that EMS vehicles are not applied unless there is a capacity need for this.
- Estimated savings from driving with EMS vehicles are between 10 and 20 %. Depending on goods type, customer relation, etc. the savings are more or less shared with the customers.
- Even if a road train must be interchanged on an interchange location and it normally requires somewhat more planning/coordination of the transport, EMS vehicles are applied quite often for national transports.
- As expected, typically the older and more experienced drivers drive EMS vehicles. A Swedish driver found it interesting that earlier Danish drivers were reluctant just to sit behind the wheel in an EMS vehicle.
- Some drivers have gone through some sort of training. The main part of the drivers find, that training in driving with an EMS vehicle should be compulsory.
- Both Danish as well as foreign drivers are applied for the transport with EMS vehicles.

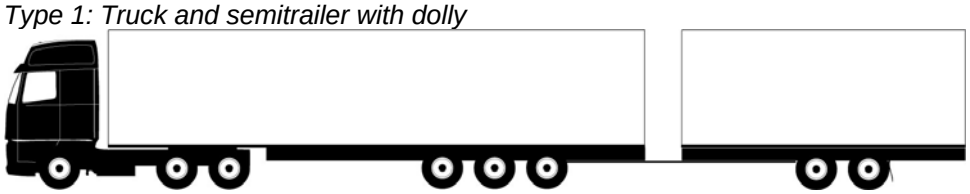
Evaluation of Test with European Modular System

INTERVIEW OF EMS VEHICLE DRIVERS – conducted onboard the vehicle[1]

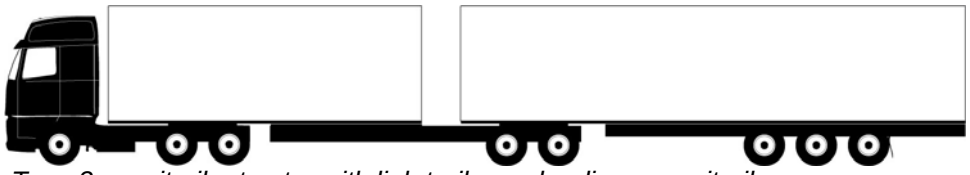
The four below types of EMS vehicles are applied:



Type 1: Truck and semitrailer with dolly



Type 2: Semitrailer tractor with ordinary semitrailer and central axle trailer



Type 3: semitrailer tractor with link-trailer and ordinary semitrailer

Type 4: Truck with long trailer

1. For each of the 4 types of EMS vehicles, kindly reply to the following questions:

	Type 1			
A. Do you use this type for national transport?				
B. Do you use this type for international transport?				
C. How many of this type do you have in your company?				

[1] Both companies and drivers will be asked to and including question 28, while all questions will be gone through with the drivers in on-board interviews, where the route is at the same time video-filmed (2 hours have been allotted per driver interview).

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Are there any special advantages /disadvantages about the individual types with regard to:				
D. Cost, with regard to investment:				
E. Costs per transported amount of goods (tonnes), operationally:				
F. Manoeuvre capability:				
G. Load capacity				
H. Other:				

2. Are other tractors applied than is the case with traditional road trains? (With regard to particularly number of horse powers / moment of rotation and any other construction of the tractor)

No	Yes	Difference:

3. On which sections are the EMS vehicles driving:

a. Motorway no.	b. Main road no.	c. Transport centre	d. Port	e. City area

4. At which times of the day and week are the EMS vehicles driving? Is there any specific explanation to this condition?

a. Day	b. Specific day	c. Night	d. Other

5. Are there differences in above-mentioned patterns (times of driving – days and week days) depending on traffic direction (north/south or east/west)?

Yes	No	Don't know

6. If yes, why is this

a. Goods quantities
b. Logistics patterns
c. Other

7. What are the typical distances when driving with EMS vehicles stated at trip level. (km-distance per trip)

0-50 km	50- 100 km	100- 200 km	200-300 km	more than 300 km

8. Are there differences between these trip distances and normal road train trip distances?

Yes	No	Don't know

9. If yes, can this then be explained by:

Which goods types the EMS vehicles transport?	
Which geographic relations they service?	

10. Which intersections (terminals, ports, transport centres, etc.) and service and rest areas are applied – and for what?

Intersection (name)	Parking	Interchange	Other

11. Are interchanges with EMS vehicles made per trip?

No	a.
Yes, often	b.
Yes, frequently	c.
Yes, but rarely	d.

12. Are interchanges with EMS vehicles made on special / selected trips?

Yes	No	Don't know

13. If yes, which trips (describe location and type of trip):

14. Has the application of EMS vehicles led to use of other routes than earlier?

Yes	No	Don't know

15. If yes, which advantages and disadvantages are attached to this?

Advantages	
Disadvantages	

16. Have there been any route shifts in connection with the extension of the road network in September 2009?

Yes	No	Don't know

17. If yes, which routes will be applied?

Indication of route:

18. Are any route shifts expected in connection with the expected extension of the road network in December 2009 (with Gedser, Hundested and Hanstholm, Herning, Ringsted)?

Yes	No	Don't know

19. If yes, which routes will be applid?

Indication of routes:

20. Are there specific requests for more EMS vehicle routes?

Yes	No	Don't know

21. If yes, which would this be?

Requested EMS vehicle route:

22. Which goods types are typically transported by EMS vehicles (more types can be ticked off)?

Gods No.	**Description (NST 2007)**	**Tick off if yes**
01	Agricultural -, hunting -, forestry – and fishery products	
02	Coal, crude oil and natural gas	
03	Ore and other mine - and gravel products	
04	Food and beverage, and tobacco	
05	Textiles and textile products, leather and leather products	
06	Wood and wood products, steel material, cellulose and paper products, printed matter and recorded media	
07	Coke and refined oil products	
08	Chemical products and synthetic fibres, rubber and plastic products, nuclear fuel	
09	Other non-metallic – mineral products	

Gods No.	Description (NST 2007)	Tick off if yes
10	Metals and manufactured metal products, except machinery and equipment	
11	Machinery and equipment, office equipment, computers, electric machines, radios, televisions, communication equipment, medical equipment, precision equipment and optical instruments, watches	
12	Transport equipment	
13	Furniture and other manufactured goods	
14	Recycling material, municipal waste and other sorts of waste	
15	Letters and packages	
16	Equipment and materials applied for transport of goods	
17	Furniture, baggage, motor vehicles for repair, etc.	
18	General goods (carrier goods)	
19	Non-identifiable goods	
20	Container	
21	Swap body	
22	Other goods	

23. Which similarities and differences are seen in relation to traditional road trains?

Similarities	Differences

24. Is the capacity utilization in EMS better or poorer than is the case with traditional road trains?, and evaluation of the capacity utilization (calculated in tonnes and volume – or another measure)

Better capacity utilization	Poorer capacity utilization
Comments	

25. Do the customers (end-users, it may be shippers or other logistics planners such as purchasers) understand how to exploit the possibilities of EMS vehicles, or is this entirely up to the haulage contractor or shipper to plan this?

Yes	No
Comments:	

26. How do you experience the driving with EMS vehicle compared to a traditional road train. Is it in practice more difficult to drive an EMS vehicle compared to other ordinary road trains?

Easier	More difficult
Comments:	

27. If yes, where do the problems occur (and are they attached to specific EMS vehicle combinations):
    - A. When passing crossings (clearing period)

Yes	No	don't know

- B. By turning manoeuvres

Yes	No	Don't know

- C. When driving in roundabouts

Yes	No	Don't know

- D. At entry/exit to motorways

Yes	No	Don't know

- E. In relation to other road-users (motorists, cyclists, pedestrians)

Yes	No	Don't know

- F. Rise on large bridges

Yes	No	Don't know

- G. Irregular driving, including queuing, catastrophe braking and distance to other vehicles

Yes	No	Don't know

- H. Passage/overtaking of slow driving vehicles

Yes	No	Don't know

- I. Sidewind sensitive (especially on open sections and larger bridges)

Yes	No	Don't know

28. How are the safety aspects experienced when driving with EMS vehicles:

A:

Better	Poorer	Don't know

- B. In relation to motorists

Better	Poorer	Don't know

- C. In relation to soft road-users/cyclists

Better	Poorer	Don't know

- D. Do EMS vehicles meet soft road-users at all?

Yes	No	Don't know

---

29. To what extent are you familiar with the approved EMS road network?

Familiar	Not familiar

30. To what extent are EMS vehicles applied outside the approved road network?

Applied	Not applied

31. How do you receive information about this network including information on updates (extensions/changes) of the network?

A. Haulage co.	B. 3F	C. Meetings	D. Journals	E. Internet

F. Other: Please indicate:	

32. Which qualifications are required for driving EMS vehicles?

Formally	Actually

33. Have you gone through any special training /education before drivng with EMS vehicle?

Applied	Not applied

34. If yes, which training / education

a. Where?	
b. For how long time?	
c. Which subjects?	

35. Should it be mandatory to receive training /education before being allowed to drive EMS vehicles?

Yes	No	Description (Subjects, etc.:

36. Which drivers drive EMS vehicles in practice?

Age	Experience	Education

37. Has EMS meant changed working houses for the drivers?

Yes	No	Description

38. If yes, what is the reason for these changes and how does it work/does it cause any problems?

Description

39. Do EMS in Denmark drive with foreign vehicles / drivers?

No	Yes	Don't know:

40. Yes, to which extent are foreign vehicles /drivers driving in DK with foreign vehicles/driver ,

More than 50 %:	Below 50 %:	Quantity:

41. How do you experience space and capacity conditions on the permitted service and rest areas?

A: Unchanged - good	B. Changed – good/better
C. Unchanged - bad	D: Changed – bad/worse

42. Which advantages do you experience when driving with EMS vehicles compared to e.g. trucks with trailer and semitrailers?

43. Which disadvantages do you experience when driving with EMS vehicles compared to e.g. trucks with trailer and semitrailers?

a. Truck / trailer
b. Semitrailer

44. Which types of EMS vehicles are you driving/have you been driving?

Type 1, Dolly	Type 2, central axle trailer	Type 3, Link	Type 4, Long trailer

45. Are the above advantages and disadvantages of EMS vehicles connected to the EMS vehicle type or are they of general character?

With the EMS vehicle type	
Of general character	

46. Do other truck drivers (not driving EMS vehicles) notice EMS vehicles?

Yes	No	Don't know

47. If yes, how is this experienced / which reactions are there primarily from these?

a. Positive	b. Negative	c. Indifferent	d. Other

48. Do other road-users (and truck drivers) notice the EMS vehicles?

Yes	No	Don't know

49. If yes, how is this experienced/Which reactions are the primary ones?

a. Positive	b. Negative	c. Indifferent	d. Other

50. How do the drivers assess the effects of extending the road network with regard to extent of transport/use of EMS vehicles and the various road trains' interplay with the other traffic (read especially: "soft road-users".

a. Positive	b. Negative	c. Indifferent	d. Other

Below map is from the Danish Road Directorate's executive order of September 2009.

Traffic areas for the test with EMS

Appendix 4: Master files for individual partial sections

Grontmij | Carl Bro

planning connecting
respecting
the future

Midway Report
Appendix 4: Master files for the individual partial sections

On the following pages follows master files for each of the 64 partial sections into which the EMS vehicle road network has been sectioned. The sectioning follows the identification numbers for each individual road section shown in below figure.

Each master file contains a survey map, where the section in question has been roughly marked. In addition to this traffic volumes for one or two MIW devices on the individual partial sections have been indicated.

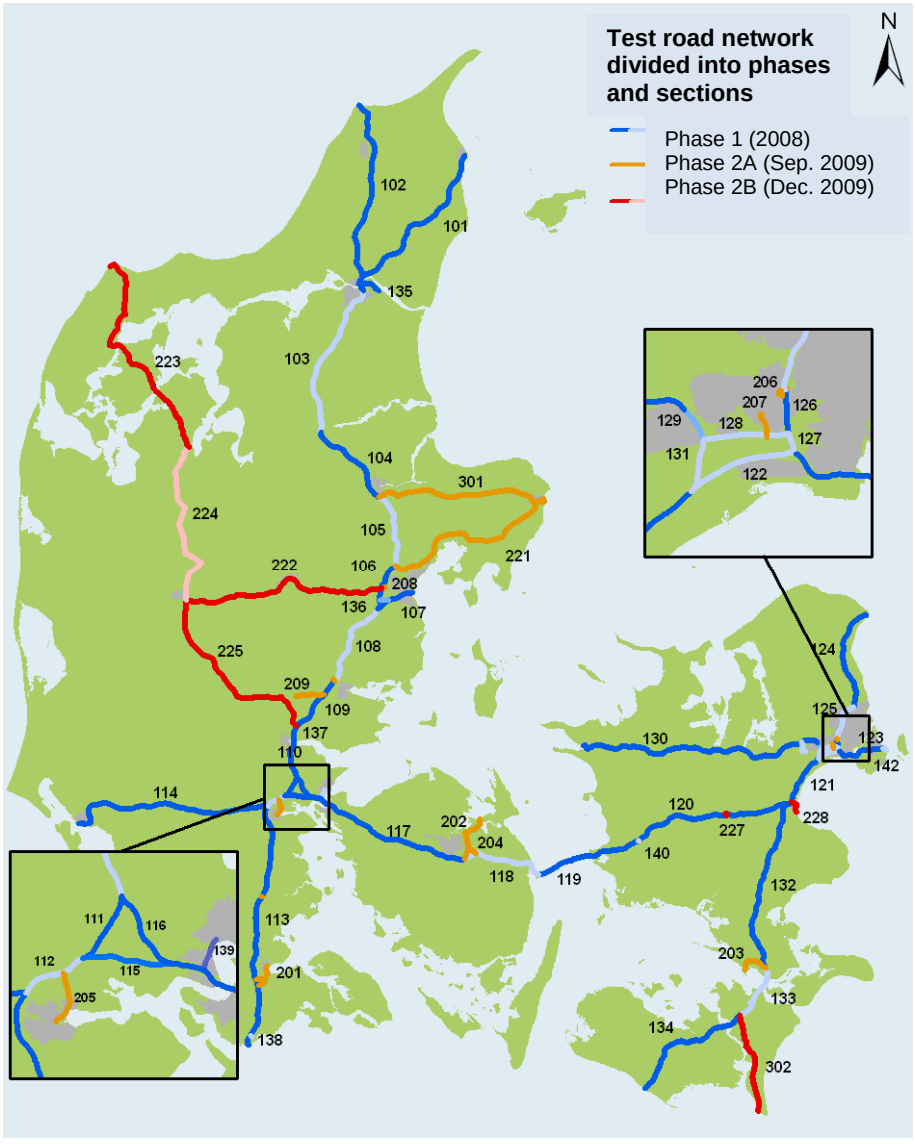


Figure 1 The phase divided road network sectioned into partial sections with ID no.

Finally each master file contains information on traffic accidents on the section in question. These are traffic accidents involving trucks. As it appears from the master file's accident part, there is a statement of the number of accidents on the section and a statement of the number of elements involved in the number of accidents in question. It should be noticed that more elements can involved in an accident, which is why the number of "Elements" can be higher than the number of "accidents".

As it appears from the master files, there is a number of sections for which no traffic volumes are indicated. This may either be the case for all the years or for some of the years. If data is missing for all the years, this is due to the fact that there are no permanent or semi-permanent WIM devices on the section in question which can count the EMS vehicles.

A semi-permanent WIM device is a counting station which only counts 5 weeks a year, typically before and after the summer. Since it is not of decisive importance for the present analysis that the traffic data are collected over 5 or 52 weeks over a year, it has not been stated in the following master files, which counts are permanent and which are semi-permanent.

In total there are 24 partial sections, that is master files, for which there are no traffic data available.

In addition to this 7 of the master files primarily covering the superior road network around the Capital city, only have traffic counts in TRIM. No data has been extracted for these sections.

The accident figures include extra accidents. An extra accident is an accident where the police has registered an accident but not prepared a report. It is a question about material accidents where the damage is normally of no importance.

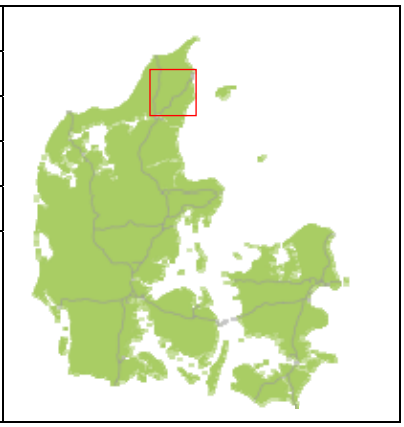
In relation to the pre-test report, which in principle covered to and including 2008 it has later turned out that for a large part of the WIM devices the case is that the figures were never updated. Therefore the informed traffic figures cannot in all cases be compared directly between the two reports. In the same way it can be pointed out that for certain sections in the midway report, AADT for transport with EMS vehicles in 2008 is included, which was not included in the pre-test report.

Furthermore it has turned out that a number of WIM devices applied for the reporting in the pre-test report cannot count EMS vehicles. Therefore it has been chosen to apply data from WIM devices on the particular section capable of counting EMS vehicles. In such cases a note is inserted in the master file in the field "Remark". Furthermore, the traffic figures for all the years have been changed in the midway report's master files so that these reflect traffic volumes for the WIM devices in question. This means that the traffic figures in such cases cannot just be compared between the pre-test report and the midway report. In return the traffic figures in the midway report can be mutually compared between the individual years.

In the master files the following definitions are applied:

AADT:	AnnualAverageDailyTraffic – corresponding to the average daily traffic on a given section with a given vehicle type.
Solo	Solo trucks and busses
TWT	Truck with trailer
ST	Semitrailer
TTS	Truck with trailer or semitrailer
EMS	European Modular System vehicle
TR	Truck – designation for all truck types except Semitrailer and EMS vehicles.
E10SS	E10 (ESAL10) is defined as the number of 10 tonnes axles giving the same impact on a road pavement, as all the actual axle loads in a given period. E10SS means that the E10 calculations are done in relation to a ”Super Single”, which means that each axle only has one wheel.
A ”0”:	Indicates that no accidents have been found in the location of the category in question for the year in question.
”NA”	This is an abbreviation for ”non-applicable, indicates that either there is no detailed accident data for the section in question in the year in question or traffic data is lacking for the section in question in that particular year. If NA is stated for a given year outside the row with AADT, this means that there are no data for the year in question and that data cannot be found for the year in question for the various trucks.

Master file no.	101
Main section	Frederikshavn – Aalborg
Phase / road type	1 (2008) – Motorway (main part) + Urban road
Version	3
Date	13-04-2010
Remark	



MIW ID	**Location**							
80080316	Near Thorup							
Traffic volume	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
AADT	9.900	9.977	10.166	11.487	10.576	10.523		
Solo	569	562	568	588	568	518		
TWT	869	860	871	966	926	772		
EMS						6		
E 10SS	2.058	2.037	2.061	2.265	2.173	1.848		

	Accidents	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Number of accidents	Total	7	13	8	12	16	9	3		
	Personal injury	1	2		1	1	2	1		
	Material damage	6	11	8	11	15	7	2		
Number of elements	TV	5	8	4	4	7	8	2		
	ST	3	6	4	8	10	2	1		
	EMS									

Please be advised that on the following pages the Danish version of the midway report contains 64 master files with data on traffic volume and accidents. Each master file is similar to the table on the current page, except for the fact that it covers another road section. The additional 63 master files could be made available upon request, but only in Danish.

Appendix 5: Master files for individual locations

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Appendix 5: Master files for the individual locations

The following pages are master files for each of the areas having been reconstructed in connection with the introduction of EMS vehicles. In total there are 58 master files each covering an area.

Each area contains at least one location which has been reconstructed with a view to ensuring manoeuvrability for an EMS vehicle. If more turning manoeuvres should be taken into account, a location can have more reconstructions. Totally the amount of locations is 150.

In spite of the fact that more locations have been reconstructed with the purpose of being capable of handling EMS vehicles, the reconstruction may have an effect on the total traffic situation, also for the other road-users. As a consequence of this, accident data has been collected for the locations in question on all types of vehicles including cycles and mopeds.

Figure 1 below indicates the amount of personal injury and material damage accidents, respectively, stated for the locations in phase 1 as well as phase 2. The accidents have been stated for two periods each covering a 5-year period [1].

Phase	No. of locations	Personal injury accidents		Material damage accidents	
		2003 - 2007	2005 – 2009	2003 - 2007	2005 – 2009
Phase 1	62	39	26	98	92
Phase 2	88	70	53	241	192
Total	150	109	79	339	284

Figure 1: Number of accidents at reconstructed locations in two different periods

As it appears from the figure above, the amount of both types of accidents has decreased over time: The amount of personal injury accidents has decreased by 28 %, while the amount of material damage accidents has decreased by 16 %. Whether this is an expression of a general reduction in traffic in the period in question will not be discussed further here.

The accident figures in the above Figure 1 covers a wide range of variations in the development of the amount of accidents. In the figure below the locations with the largest change in the amount of accidents have been included[2].

[1] As a rule of thumb accident statistics are calculated for a period of five years, in order to minimise the importance of fluctuations from year to year.
[2] Contrary to the normal way in which accident statistics are calculated, over a 5-year period, 2009 has in this case only been compared to the earlier years in order to assess, whether there are any special fluctuations in 2009 compared to earlier years.

Master file	Location	Comments
102	Hirtshals: 448.03	In 2009 there was a minor increase in the amount of accidents in the crossings in question compared to earlier years. A rise is especially seen where the amount of elements rise.
132	Tappernøje service area: 30.03 East	Up to and including 2008 no accidents were registered for this service area. In 2009 3 accidents are registered involving 2 passenger cars and 2 trucks.
142	Kastrup Customs: TSA 16 South	Since 2006 there have not been accidents in the roundabout in question. In 2009 there were two accidents involving 5 passenger cars in total.
207	Brøndby: 11.02 North exit	At this exit point there is generally a relatively high number of accidents with passenger cars. This figure has increased in 2009 compared to the previous years, especially with regard to the amount of passenger cars involved.
207	Brøndby: 511.01	At this crossings there have not been any accidents in 2007 and 2008. In 2009 there have been 4 accidents involving 4 passenger cars, 2 trucks and one cycle.
211	Hammelev: 50.04	This is a roundabout at an exit where there has been a small rise in the amount of accidents with a somewhat more significant rise in the amunt of involved passenger cars.
224.01	Hanstholm – Vejle: 430-02	Since 2005 there have been no accidents in this crossings, but in 2009 there have been 2 accidents.
225	Hanstholm – Vejle: 348.01	Compared to the previous years, 2009 shows a minor rise in the amount of accidents and especially in the amunt of elements comprising both passenger cars, trucks and semitrailers.
227	Ringsted: 102.01	An exit from E20, where a minor rise in the amount of accidents has been registered and especially the amount of involved elements such as passenger cars.
301	Roundabouts on Grenåvej: 415.01	Again a minor rise in the number of accidents, but a somewhat lager rise in the amount of involved elements in the form of passenger cars.
302	Nykøbing Falster: 501.04	In this crossings there are generally many accidents and have been through the entire period since 2003. Actually the number of accidents fell compared to the period from 2006 – 2008, however the amount is relatively high with 5 accidents involving a number of various elements such as cyclists, passenger cars and trucks.

Figure 2: Locations with the largest change in amount of accidents

As it appears from the above Figure 2, the locations with major changes in the amount of accidents are almost solely characterised by a rise in the amount of accidents. Even if the amount of accidents has generally fallen through the latest years, cf. Figure 1, this fall has happened on the locations in general.

For each location in a given area there is a table in the master files which calculates the amount of accidents and states the amount of elements involved in the amount of accidents in question. Since more elements can be involved in an accident, the amount of ”elements” can be higher than the amount of “accidents”

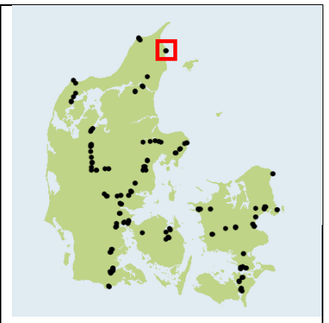
The accident figures comprise extra accidents. An extra accident is an accident where the police has registered the accident, but no reports were prepared. It is a question about material accidents where the damage is not serious.

In the following master files the following definitions are applied:

PC:	Passenger car also including vans
TR	Truck – a common designation for all truck types except for semitrailers and EMS vehicles.
ST	Semitrailer
EMS	EMS vehicles
A ”0”:	Indicates that no accidents have been found in the location of the category in question for the year in question. In the cases where no accidents have been registered for a number of years on a given location, this has been marked with the text ”No registered accidents”.

Please be advised that on the following pages the Danish version of the midway report contains 58 master files with details on the reconstructed locations and the related figures on accidents. Below you will find an example of these master files. The additional 57 master files could be made available upon request, but only in Danish.

Master file no.	101_01-03_Frederikshavn
Main section	Frederikshavn – Aalborg
Point location	Three crossings at the port in Frederikshavn
Phase / Rd. type	1 (2008) / Urban road
Version	3
Date	13-04-2010
Reconstruction	438.01: Extension of swept path 438.01: Extension of swept path 438.01: Extension of swept path



Year of constr.	**Construction estimate excl. VAT**	**Constr. price excl. VAT**
2008	-	Kr. 815.000

	438.01	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of accidents	Total	0	3	1	1	0	0	0		
	Personal injury		2							
	Material dam.		1	1	1					
Number of elements	PC		2	2						
	TR									
	ST									
	EMS									
	Cycle/moped		2	0	1					

	438.02	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of accidents	Total	1	1	1	1	2	1	0		
	Personal injury									
	Material dam.	1	1	1	1	2	1			
Number of elements	PC		2	1	1	1	2			
	TR									
	ST					2				
	EMS									
	Cycle/moped	1								

	438.03	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of accidents	Total	0	0	0	0	1	0	0		
	Personal injury									
	Material dam-					1				
Number of elements	PC					1				
	TR									
	ST									
	EMS									
	Cycel/moped									

Appendix 6: Air pollution and climate impacts

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Appendix 6: Air pollution and climate impacts

1. METHOD

A calculation has been performed of the total emissions of air polluting substances:

- NO_X (Nitrogen oxide)
- CO (Carbon monoxide)
- HC (Hydrocarbons)
- PA (Particles)
- SO_2 (Sulphur dioxide)

In addition to this a calculation has been made of the emission of CO_2 having an effect on the global heating. The primary negative environmental impacts of the emissions appear from figure 1.

Substance	**Acidification of water environment**	**Eutrophication (nitrogen effect on nature)**	**Photochemical air pollution Tropopheric ozone foresticide**	**Bronchial infections**	**Cancer**	**Green house effect**
NO_X	X	X	X	X		
CO			X			
HC			X		X	
PA			X		X	
SO_2	X			X		
CO_2						X

Figure 1: Environmental impacts of emissions from transport

The emissions are calculated for each of the informed sections to the extent that traffic data has been available. In addition to this a total calculation for all sections was made.

The calculations are based on:

- Estimated emission factors for years 2008-2009 for each vehicle type
- Traffic counts from 2008 and 2009 as annual average daily traffic figures
- Road sections

No information on specific emission factors for the individual vehicle types has been given for the calculation.

The estimation of the emission factors are based on Tema2000, which is a tool for calculation of the transport's energy consumption and emission in Denmark (Ministry of Transport 2000). The emission factors (g/km) have been estimated by Grontmij | Carl Bro A/S[1]. In addition to this corrections for speed for the various vehicle types have been made as follows:

- SOLO: Solo truck
- TWT: Truck with trailer (emission factors = SOLO + 10 %)
- EMS: EMS vehicle (emission factors = SOLO + 20 %)

Emission factors are subject to large uncertainty and the calculated emissions are therefore subject to very large uncertainty. Therefore the calculated values should primarily be applied for assessment of, whether there are differences between the elucidated situations.

The emission factors are also not corrected for road speed as there is no knowledge available about to what extent these speeds have influence on the actual emissions, and there is no details available about speed dependent emission factors for the various vehicle types.

The calculation of the emissions is performed by means of a spreadsheet where the factors can be adjusted centrally. New knowledge about emission factors for the individual vehicle types also as a function of the type of section can be changed afterwards and the consequences can be adjusted. Furthermore it will be possible to insert vehicle type(s) for EMS vehicles and attached emission factors.

In order to be able to make a real environmental assessment of the effect of the introduction of EMS vehicles, the spreadsheet can be supplemented with data for the size of the goods transport for a "before" and "after" situation.

The emission factors applied for the present calculation appear from Figure 2. The traffic values (annual average daily traffic) applied for the calculation appears from Figure 3.

		Substance	SOLO	TWT	EMS
Emission factors g/km Estimated 2008 data	All speeds	NO_X	4.80	5.28	5.76
		CO	0.65	0.72	0.78
		HC	0.27	0.30	0.32
		PA	0.072	0.079	0.086
		SO_2	0.018	0.020	0.022
		CO_2	626	687	751

Figure 2: Emission factors for vehicles

[1] Further background knowledge and data on emissions can be found in the publication "Denmark's National Inventory Report 2008, Emission Inventories 1990-2006, National Environmental Research Institute, 2008."

				Speed	2008 Vehicles / day		2009 Vehicles / day		
Master file no.	Text	Road cat.	Length km	km/h	Solo	TWT	Solo	TWT	EMS
101	Frederikshavnmotorvejen	Motorway	61.4	90	568	926	527	780	5
102	Hirtshalsmotorvejen	Motorway	61.9	90					
103	Nordjyske Motorvej	Motorway	54.6	90	1698	2873	1654	2501	28
104	Nordjyske Motorvej	Motorway	30.5	90	3554	3580	1467	2500	23
105	Nordjyske Motorvej	Motorway	25.3	90	1919	3474	1856	2895	27
106	Østjyske Motorvej	Motorway	16	90	1889	3331	1952	3499	18
108	Østjyske Motorvej	Motorway	15	90	1258	4818	996	4262	0
108	Østjyske Motorvej	Motorway	15	90	2569	4866	2327	4148	37
109	Østjyske Motorvej	Motorway	20.3	90	1445	5619	1077	4330	0
110	Østjyske Motorvej	Motorway	17.6		6530	7946	6156	6872	49
112	Sønderjyske Motorvej	Motorway	6.9	90	3203	6586	2831	5441	15
113	Sønderjyske Motorvej	Motorway	41.3	90	1629	4713	1573	4045	0
113	Sønderjyske Motorvej	Motorway	41.3	90	2277	5445	2118	4697	14
114	Esbjergmotorvejen	Motorway	69.8	90	1702	2139	1564	1778	12
115	Kolding-Fredericia	Motorway	9.2	90					
116	Østjyske Motorvej	Motorway	8.9	90	1442	2826	1412	2472	32
117	Fynske Motorvej	Motorway	56	90	2490	4922	2378	4302	47
118	Fynske Motorvej	Motorway	27.8	90	1546	3118	4167	3704	94
119	Storebæltsbroen	Motorway	19.1	90					
120	Vestmotorvejen	Motorway	35	90	4197	3181	4287	2915	45
120	Vestmotorvejen	Motorway	35	90	2948	3254	2713	2821	53
123	Øresundsmotorvejen	Motorway	16.1	90	1078	1059	2391	1276	0
124	Helsingørmotorvejen	Motorway	36.1		4576	1856	4239	1624	14
131	Sydmotorvejen	Motorway	57.9	90	5922	2482	3877	2257	11
132	Sydmotorvejen	Motorway	19.4	90	1577	1976	1409	1672	4
133	Sydmotorvejen	Motorway	22	90	1087	1394	997	1231	4
133	Sydmotorvejen	Motorway	22		508	1041	547	867	4
221	Århus - Grenaa	Motorway	34.6	75	853	676	892	630	0
222	Århus - Herning	Rural road	84.5	75					
223	Thisted - Hanstholm	Rural road	79.4	75	260	175	222	116	0
224	Hagebro - Skive	Rural road	54.9	75	338	198	318	264	0
225	Brande - Riis - Vejle	Rural road	65.6	75	18	15	809	1100	0
301	Randers - Grenaa	Rural road	59.1	75	267	188	316	179	2
302	Nykøbing F. - Gedser	Rural road	39.6						

Figure 3 Annual Average Daily Traffic (AADT) for sections

2. RESULTS AND EVALUATION

On the basis of the set up emission factors, sections and traffic values, a theoretic calculation of the emissions from the individual sections and one total for all sections have been made. The results of the calculations appear from figure 4.

Substance	**2008 tonnes**	**2009 tonnes**
NO_X	8179	7555
CO	1110	1025
HC	462	426
PA	122	112
SO_2	31	28
CO_2	1,062,000	981,000

Figure 4 Calculated emissions for individual sections and totally

From figure 4 appears that from 2008 to 2009 there is a fall in the emissions of approx. 8 %.

Looking at the emission of CO_2 , the annual emission is approx. 1 million tonnes. Every Dane emits approx. 10 tonnes CO_2 per year. The emission for the calculated traffic volume therefore corresponds to approx. 100,000 persons' annual emissions. The difference between 2008 and 2009 corresponds to approx. 8000 persons' emissions.

It should be noted that the above calculations have been performed on the basis of the methodical considerations accounted for earlier in the appendix. Whether these are 100 % correct is not that important as mainly it is a question about conditions which must be compared between the pre-test situation and data from later periods in the evaluation.

In connection with the calculations performed for the pre-test situation and which were based on traffic values for 2008, the total CO_2 emission was calculated to 870,000 tonnes CO_2. As the calculations in the pre-test report are based on traffic values for some other road sections than were applied for the midway report, these emission figures are, however, not directly comparable[2].

[2] As mentioned elsewhere in the midway report, it has not been possible to register EMS vehicles on the sections originally planned and included in the pre-test report.

Appendix 7: Noice effects

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Appendix 7: Noise effect

1 INTRODUCTION

Parallel with the ongoing test period of the Road Directorate about transport with EMS vehicles on parts of the Danish road network, the consequences with regard to noise are investigated.

This appendix has been prepared in direct continuation of the conditions previously described in the pre-test report, where the noise effect was investigated on a number of sections prior to the start of the test period.

The consequences with regard to noise are elucidated through calculation of the noise effect from the heavy traffic on selected sections. In the pre-test analysis the noise effect was calculated for the heavy traffic in 2008. The investigation forming the basis of this appendix treats WIM results for 2009 where EMS vehicles are driving on the selected sections.

The noise calculations are carried out primarily for motorway sections all over the country and the results for the individual partial sections are compared with the results from the previous investigation. The partial sections in question appear at the end of this appendix.

In order to compare the noise spread in connection with conventional trucks (2008) and EMS vehicles, respectively, the 58 dB line is elucidated for both 2008 and 2009. The 58 dB line has been selected as comparison parameter, as the 58 dB line represents the guiding limit value for noise on out-door common areas near houses.

2 PRECONDITIONS FOR CALCULATION

The noise effect from the heavy traffic has been calculated according to the calculation method Nord2000 and is performed in accordance with the Guide No. 4/2007 ”Støj fra veje” [Noise from roads] of the Danish Environmental Protection Agency. The calculations have been performed with 9 road classes.

The calculations performed with the calculation program ”SoundPLAN” version 6.5, update of 15.09.2009.

The comparison parameter, the 58 dB line, is calculated by means of the calculation module Grid Noise Map, where the result of the noise spread perpendicularly away from the road section is calculated.

WIM counts for this investigation are grouped into solo trucks, trucks with trailer and EMS vehicles. It has not been possible to provide noise data for EMS vehicles. Due to the lack of data a precondition is that the noise contribution from an EMS vehicle can be compared to the noise contribution from a truck with trailer. However this practice is not quite correct, as an extra contribution of some size should be expected from e.g. increased tire and road noise due to more axles on the EMS vehicles. This aspect should, however, be compared to an – after all – modest contribution of EMS vehicles compared to traditional trucks with trailers; up to approx. 2.5 %.

Assuming that the noise effect of EMS vehicles is 5 dB higher than of a truck with trailer, the total noise contribution for trucks with trailer and EMS vehicles will maximum be 0.2 dB higher than the present distributions.

Out of consideration for the Nord2000 calculation method, the vehicles are grouped with the following graduation:

- Category 2:
  - Solo trucks

- Category 3:
  - Trucks with trailer
  - EMS vehicles

Concerning the above groupings of vehicle categories it should be mentioned that at the same time the individual categories contain e.g. busses of various sizes and vans with trailers which cannot be expected to be replaced by EMS vehicles. The evaluation is, however, that the part and thus the effect of these deviating vehicles is small.

Nord2000 calculates the noise effect for day, evening and night periods, respectively, which requires a grouping of the traffic in the day periods. For this the guide lines in the Guide 4 / 2006, page 47 of the Danish Environmental Protection Agency is applied. Here estimated day groupings for six different road types are indicated. In this investigation the day grouping for motorway, 110 – 130 km/h and rural roads, 80 – 90 km/h, respectively.

The applied speeds have also been collected from the above guide. For rural roads the speed is 75 km/h all day and for motorways 90 km/h all day.

As it was done in the pre-test report, the individual road sections are “placed“ in a simplified test setup solely taking traffic load with vehicle category and day distribution, speed, lane width and centre strip width into account. The test setup consists of an absorbing flat terrain without shielding, where the road sections are placed individually with a distance of 2 km with north-south orientation. The road surface is presupposed to be reflecting. The calculation area has a width of 50 metres and is placed perpendicularly on the road section. In this way the distance from road centre to the 58 dB line can be measured.

3 RESULTS

The calculation results specifying the 58 dB line with the WIM counts for both 2008 and 2009 can be seen on the next page in the columns *58 dB line*. From the columns *Difference* the difference in metres from 2008 to 2009 appears. At the same time the difference to the noise level in the 58 line for 2008 is indicated as well.

The calculation results on the following page show very modest changes in the noise effect of up to approx. -1 dB. However with the exception of a few sections. The few larger deviations are conditioned by considerable changes in traffic values for the road sections. Knowledge about the basis of these changes in this investigation is not available. In general the noise effect falls slightly on the major part of the sections. This may be connected with a general fall in the number of vehicles on the Danish roads due to the financial recession which must be expected to have influence on the goods transport with trucks.

Data					2008				2009				Specifications			Results			
Master file no.	Text	Rd.Cat	Loc_id	MAIN SEC.	Solo	LWT	EMS	AADT	Solo	LWT	EMS	AADT	Speed	Road lane width	Centre strip	Distance to 58 dB line		Difference	
					Vehicles/day	Vehicles/day	Vehicles/day	Vehicles/day	Vehicles/day	Vehicles/day	Vehicles/day	Vehicles/day	km/h	Metres	Metres	2008 Metres	2009 Metres	Metres	dB
101	Frederikshavnmotorvejen	Motorway	80080316	Frederikshavn - Aalborg	568	926		1494	527	780	5	1312	90	7,2	3,5	105	90	-15	-0,7
102	Hirtshalsmotorvejen	Motorway	80090051	Hirtshals - Aalborg				0	152	429		581	90	7,2	3,5	0	44	44	---
103	Nordjyske Motorvej	Motorway	80070269	Aalborg - Hobro	1698	2873		4571	1654	2501	28	4183	90	7,2	11,4	297	272	-25	-0,4
104	Nordjyske Motorvej	Motorway	80070226	Hobro - Randers	3554	3580		7134	1467	2500	23	3990	90	7,5	3,2	292	271	-21	-0,3
105	Nordjyske Motorvej	Motorway	70070169	Randers - Århus	1919	3474		5393	1856	2895	27	4778	90	8	3	345	312	-33	-0,4
106	Østjyske Motorvej	Motorway	70060173	E45 - Århus N - Århus S	1889	3331		5220	1952	3499	18	5469	90	8,2	3	337	349	12	0,2
107	Århus Syd Motorvejen	Motorway		Århus S - Århus Havn				0	0	0	0	0	90					0	---
108	Østjyske Motorvej	Motorway	60060139	Århus S - Horsens N	1258	4818		6076	996	4262	0	5258	90	8,5	2,5	400	366	-34	-0,4
108	Østjyske Motorvej	Motorway	70060161	Århus S - Horsens N	2569	4866		7435	2327	4148	37	6512	90	8,2	11,5	428	391	-37	-0,4
109	Østjyske Motorvej	Motorway	60060122	Horsens N - Vejle N	1445	5619		7064	1077	4330		5407	90	7,5	3	431	366	-65	-0,7
110	Østjyske Motorvej	Motorway	60060110	Vejle N - Nordlig fletning	6530	7946		14476	6156	6872	49	13077	90	8	12,5	611	572	-39	-0,3
111		Motorway						0										0	---
112	Sønderjyske Motorvej	Motorway	60050085	Nord om Kolding	3203	6586		9789	2831	5441	15	8287	90	8,2	6	512	460	-52	-0,5
113	Sønderjyske Motorvej	Motorway	50050015	Kolding - Padborg	1629	4713		6342	1573	4045		5618	90	8,5	12	402	367	-35	-0,4
113	Sønderjyske Motorvej	Motorway	50050058	Kolding - Padborg	2277	5445		7722	2118	4697	14	6829	90	7,5	3,8	445	409	-36	-0,4
114	Esbjergmotorvejen	Motorway	60052235	Esbjerg - Kolding	1702	2139		3841	1564	1778	12	3354	90	8	3	255	225	-30	-0,5
115	Kolding-Fredericia	Motorway	60040214	Kolding-Fredericia				0	1403	2194	13	3610	90	8	3	0	250	250	---
116	Østjyske Motorvej	Motorway	60060095	Nordlig fletning E45/E20	1442	2826		4268	1412	2472	32	3916	90	8	3	293	271	-22	-0,3
117	Fynske Motorvej	Motorway	42040185	Fredericia - Odense	2490	4922		7412	2378	4302	47	6727	90	8	7	428	399	-29	-0,3
118	Fynske Motorvej	Motorway	42040162	Odense - Storebæltsbroen	1546	3118		4664	4167	3704	94	7965	90	8	3,5	314	414	100	1,2
119	Storebæltsbroen	Motorway		Storebæltsbroen				0	0	3068	56	3124	90	8	3,5	0	266	266	---
120	Vestmotorvejen	Motorway	25020049	Storebæltsbroen - Køge	4197	3181		7378	4287	2915	45	7247	90	8,2	11	386	377	-9	-0,1
120	Vestmotorvejen	Motorway	30020092	Storebæltsbroen - Køge	2948	3254		6202	2713	2821	53	5587	90	8	5	359	332	-27	-0,3
123	Øresundsmotorvejen	Motorway	15003061	Motorvej O3 - CPH	1078	1059		2137	2391	1276		3667	90	12	5	158	231	73	1,6
124	Helsingørmotorvejen	Motorway	15014026	Motorvej O3 - Helsingør	4576	1856		6432	4239	1624	14	5877	90	8,5	3,5	328	306	-22	-0,3
125-130								0										0	---
131	Sydmotorvejen	Motorway	25030048	Køge - Vordingborg	5922	2482		8404	3877	2257	11	6145	90	8	6,5	391	329	-62	-0,7
132	Sydmotorvejen	Motorway	35030106	Vordingborg - Nykøbing F	1577	1976		3553	1409	1672	4	3085	90	7	3,5	232	203	-29	-0,6
133	Sydmotorvejen	Motorway	35030132	Nykøbing F - rødby Havn	1087	1394		2481	997	1231	4	2232	90	7	3,5	167	150	-17	-0,5
133	Sydmotorvejen	Motorway	35030154	Nykøbing F - rødby Havn	508	1041		1549	547	867	4	1418	90	7	3,5	111	99	-12	-0,5
201-209								0										0	---
221	Århus - Grenaa	Motorway	70401019	Århus - Grenå	853	676		1529	892	630		1522	90	8	3	100	99	-1	0,0
222	Århus - Herning	Main road	70403034						810	686		1496	75	3,8	0	0	48	48	---
223	Thisted - Hanstholm	Main road	76480011	Hanstholm - Skive	260	175		435	222	116	0	338	75	3,8	0	19	17	-2	-0,5
224	Hagebro - Skive	Main road	650350	Skive - Herning	338	198		536	318	264		582	75	3,8	0	21	24	3	0,6
225	Brande - Riis - Vejle	Main road	60348017	Herning - Vejle	18	15		33	809	1100		1909	75	3,8	0	5	63	58	11,0
301	Randers - Grenaa	Main road	41504202	Randers - Grenå Havn	267	188		455	316	179	2	497	75	3,5	0	19	20	1	0,2
302	Nykøbing F. - Gedser	Main road	506050	Nykøbing F - Gedser Havn	299	0		299	1095	450	3	1548	75	4	0	13	45	32	5,4