European Environment Agency

Indicator Fact Sheet

TERM 2005 30 Load factors in freight transport

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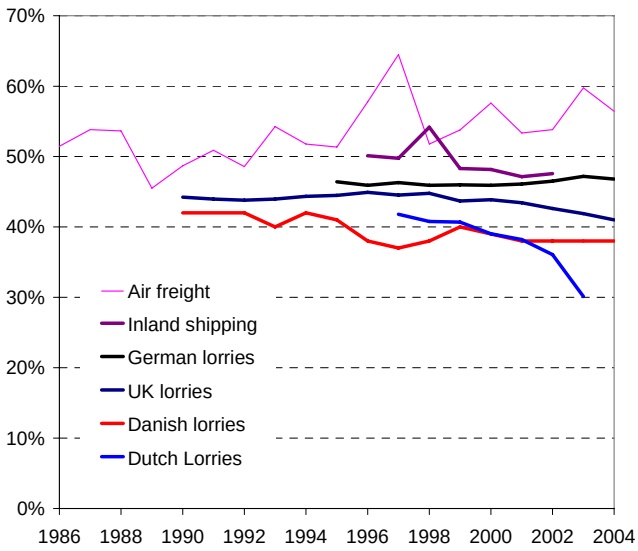
☹ **Load factors have generally declined for road freight transport in the countries where data is available and inland shipping, while it has increased for air freight transport. The fact that load factors are generally under 50 % (by weight), and that some freight transport companies achieve much higher load factors than others in the same sector suggests that load factors can be improved.**

Figure 1: Load factors in freight transport



Note: Air transport refers to principal European airline carriers. The load factor is the percentage utilization of the capacity (by weight). The figures would have been higher if empty running was excluded, as in some statistics. Inland shipping include all inland shipping that either loads or unloads in the Netherlands Data on lorry transport is for national transport only.

Source: DfT, 2005; DS, 2005; CBS, 2005; AEA, 2005 ; EEA, 2005

Results and assessment

Policy relevance:

Increasing vehicle load factors is a way to reduce the growth in freight transport vehicle kilometres. However, there are no EU-wide targets for load factors and overall freight transport efficiency, although individual countries may have.

Policy context:

Several Member States have taken initiatives to increase the efficiency of freight transport.

Germany: Logistics and fleet management systems are used to minimise empty journeys and generally increase the efficiency of freight transport. Information and communication technologies are used in combined transport chains to facilitate the interconnection of the modes and the tracking of consignments (German Federal Ministry of Environment and Nuclear Safety, 2000).

United Kingdom: The United Kingdom supports industry's efforts to identify opportunities for reducing empty and light running, through investment in new technology (such as double-deck trailers or IT tools which facilitate load sharing and better route planning) (DfT, 1998). Department for Transport furthermore backs the TransportEnergy Best Practice programme. This is a detailed benchmarking survey based on numerous operators and highlights how the best operators are able to achieve their higher efficiency (DfT, 2003).

Denmark: The Danish Government supports demonstration projects which aim to reduce the environmental impacts of transport. Emphasis is placed on initiatives which can improve exploitation of truck capacity for long and short trips (deliveries). For short delivery trips, there is a need to develop new concepts for improved city logistics through a coordinated effort by municipalities, the transport industry and the business community (Danish Ministry of Transport, 1996).

Finland: The *Environmental guidelines of the transport sector* set out actions for more efficient and freight transport with lower environmental impacts. Projects promoting logistical efficiency to reduce transport growth (including projects to increase truck load factors) are encouraged by the Ministry of Transport. The development of logistical systems using on-board computers and geographical information systems is encouraged (Finnish Ministry of Transport and Communications, 1999).

Environmental context:

Efficient loading of vehicles results in less vehicle-kilometres being needed to transport the same number of tonnes. Consequently, less environmental damage occurs for transporting the same tonnage.

Assessment:

Load factors are generally far below the theoretical maximum. While it is relatively easy to achieve full load on an outward trip, it is a complex puzzle to find return loads. Therefore, empty return trips are frequent. Transport of certain goods requires specialized vehicles that makes it impossible to find return loads – a gasoline tanker can neither bring milk nor pallets as a return load.

Load factors for road and inland freight transport have declined in most of the member states surveyed, indicating that vehicles are being less efficiently used. For road transport, the slow decline in load factors hides more marked developments in opposite directions: on the one hand a decline of empty haulage (see table 1) as result of better fleet management, and on the other hand a decline in load factors for laden trips. Companies are often more concerned with efficient time-management than efficient transport, resulting in an increasing number (more vehicle-kilometres) and a decreasing size of shipments (TNO, 1999), thereby contributing to lower efficiencies. 'Just-in-time' deliveries may stimulate this development. On the other hand,

increased use of IT has contributed to better fleet management and may have compensated. An alternative explanation for the decline in load factors could be that loads are being increasingly constrained by volume or deck space (see box 2), or a shift in the goods market away from bulk or bundled cargo and towards palleted goods (see box 3).

An easy answer cannot be given to the question of how much load factors can be improved. Large differences in load factors within market segments (figure 2), and between countries (figure 1) suggests that there is indeed room for improvements, but hauliers within the same market segments may still face different situations that may limit the potential improvement of load factors. Detailed surveys of utilization can help identify where improvements can most easily be achieved. For example, in cases where deck space is the constraining factor, the use of double-deckers could significantly improve loading factors (box 2).

Facilitating cabotage contribute to increasing load factors by enabling international road hauliers to pick-up and deliver goods outside their own country of origin. This should to some extent prevent hauliers from driving back home empty, provided sufficient exchange of logistic information. However, despite large growth (10 times higher in 1999 than in 1991) cabotage is still very small at around 0.7 % of total transport (Eurostat, 2002b).

Comparing load factors between modes should be done with great care and best for transport of similar goods in similar situations. For example, the types of goods transported have a decisive influence on load factors (Box 3) as well as whether it is national or international transport (Table 2).

In the case of inland shipping, there is some practise of returning empty truck trailers by inland shipping, what may contribute to low load factors in certain market segments.

For air freight transport, the load factors appear to have increased, but fluctuate heavily. The increasing competition and pressure on profit margins of the aviation sector may have stimulated the increase in efficiency. The air freight transport market in Europe is dominated by a handful of companies, so changed practise in a single company can have a significant effect, what may explain the fluctuating nature of these load factors.

While there are limited policy options that *directly* address load factors, there may be more to be gained by focusing on objectives more directly related to environmental pressures. Striving to internalize external costs of transport will result in higher operating costs for transport companies, a powerful incentive to improve load factors and mitigate other inefficiencies.

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Data

Table 1 trends in empty haulage

Unit: share of vehicle-km with no load

1999	2000	2001	2002
24.4 %	23.8 %	23.9 %	23.6 %

Source: Eurostat, 2005. The average is of the following 11 EEA countries: NO, UK, FI, PT, AT, LU, IE, FR, ES, DE, DK,.

Table 2 load factors in national and international lorry transport in the Netherlands

Unit: share of available tonne-km

	1997	1998	1999	2000	2001	2002	2003
National transport	42 %	41 %	41 %	39 %	38 %	36 %	30 %
International transport	55 %	55 %	54 %	52 %	52 %	51 %	45 %

Source: CBS, 2005

Meta data

Web presentation information

1. Abstract / description / teaser:

   Load factors have declined slightly in recent years, and are generally well under 50 %. It is likely that load factors could be increased and thereby reduce the transport volume.

2. Policy issue / question:

   Are freight vehicles making full use of available capacity?

3. EEA dissemination themes:

   Transport

4. DPSIR: D

Technical information

5. Data source: Various national statistical offices

Danish data: Danmarks Statistik (Statistics Denmark)

Dutch data: CBS (Statistics Netherlands)

UK data: Department for Transport, transport statistics bulletin

Aviation data: AEA, 2005

German Data: KBA, 2004, personal communication with PCP Germany

6. Description of data:

Data covers load factors, also known as lading factors. This is expressed in percentage utilization of the available capacity, expressed in tonne-km. In all cases of lorries it concerns transport of goods on national territory. Some countries calculate load factors excluding the contribution from empty running, others don't. All data have here been harmonised and include the contribution from empty running. In all cases the data include transport on own account and hired transport.

DK: national road freight transport by Danish lorries over 6 tonnes gross weight

NL: national road freight transport by Dutch vehicles with more than 1000 kg capacity

UK: Transport of goods in Great Britain by goods vehicles over 3500 kg weight.

7. Geographical coverage: Lorries: Denmark, Netherlands, Great Britain. Air data for "Geographical Europe", an assemblage of most European countries. Inland navigation data for the Netherlands, but it includes data for trips loading or unloading in the Netherlands, a significant share of European inland waterways traffic.

8. Temporal coverage: 1990–2004 with gaps. Empty haulage data from 1999-2002. German data from 1995-2004.

9. Methodology and frequency of data collection: sample based and collected by a questionnaire. Annually or quarterly (monthly for Germany). We have disregarded sources of data determining load factors as the number of tonne-km divided by the number of vehicle-km, partly because this approach yields erratic results, partly because the developments in tonnes per vehicle may equally well be explained by changes in vehicle size rather than degree of utilization of available capacity. Also, some countries report utilization as % of available tonne-km, others report as % of tonnes, not taking into account distances travelled. These two are not equivalent and show significant differences from Danish data. Load factor data from Finland was excluded for this reason.

10. Methodology of data manipulation, including making 'early estimates':

Where load factors were given only for laden trips, a total load factor was calculated taken into account empty running if such data were available.

Quality information

11. Strength and weakness (at data level): load factors as expressed in % of maximum available tonne-km are not corrected for volume, as many trips are volume or deck space constrained. A decline in load factors may hence be due to an increase in volume constrained loads rather than reduced utilization.

12. Reliability, accuracy, robustness, uncertainty (at data level):

No issues here.

13. Overall scoring (give 1 to 3 points: 1=no major problems, 3=major reservations): 2

Relevancy: 2 (weight-based load factors do not provide the whole picture, efforts in different sub-sectors (bulk/container) cannot be compared)
Accuracy: 2 (lack of volume correction in some cases)
Comparability over time: 3
Comparability over space: 2 (definitions)

Further work required

Information on load factors for trains is hard to get, and also needs a very clear and meaningful definition of capacity utilization due to the modular character of trains; particularly: does lading factor include also the length of the train, and not how full each wagon is? Does a train with 10 fully loaded wagons have a load factor of 50 % if the train could theoretically pull 20 fully loaded wagons? In terms of emissions per tonne-km it would seem preferable to have a train extended as much as possible to make maximum use of the available capacity.

Maritime shipping is also very important, as it has a high share in tonne-km, but no data has been found.

More work is needed to develop a better indicator of freight vehicle utilisation. The *volume* of goods carried is important as truck space is often filled long before the maximum permitted weight is reached (see Box 2). Weight-based load factors therefore tend to underestimate the true level of utilisation. Statistics should, therefore, also focus on the volume of goods transported.

Further work may be needed to ensure that empty hauling is dealt with in comparable ways in national statistics.

Box 1: Case story - a 60 % increase in load rates

The French mashed potato producer VICO changed the size of its packaging boxes to improve the loading rate of the lorries rented for delivery of its products. Combined with the introduction of specialised software for journey optimisation, the loading rate increased by 60 %. This reduced the requirement for lorries in a year by 2 000 (8 000 lorries are now rented annually instead of 10 000) for the same amount of products delivered, and reduced distances travelled by 960 000 km and fuel used by 300 000 litres. The cost of the investment was about EUR 60 000 and the payback time for the investment was less than a month.

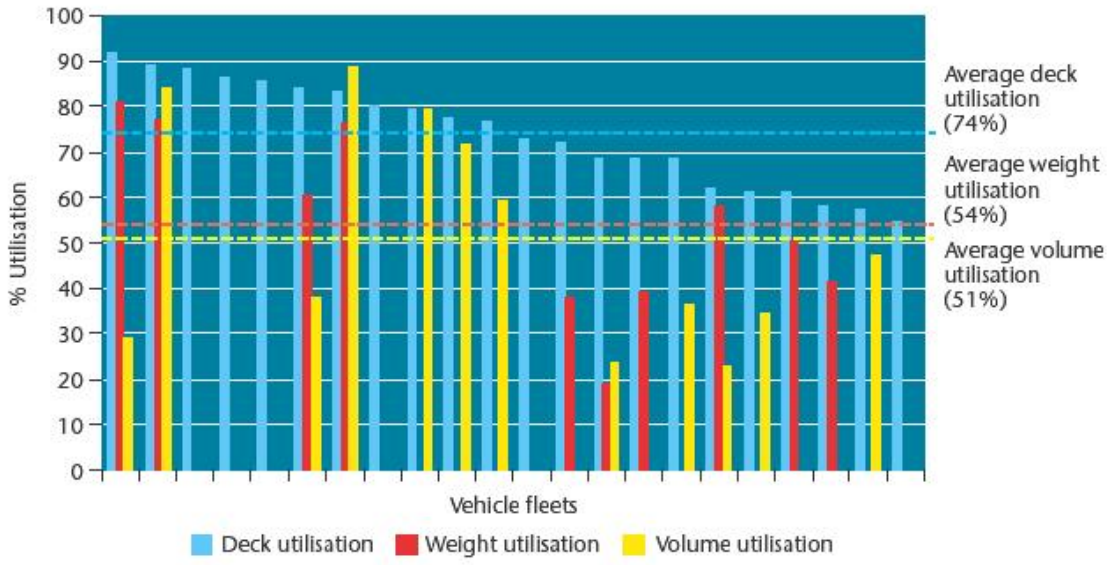
Source: European Commission, 2000.

Box 2: Volume effects and other measures of vehicle fill

Traditionally, load factors are measured as the utilization of the maximum available weight capacity of the vehicle. However, there are frequently situations where the vehicle is fully loaded, but is still far from utilizing its maximum weight capacity. High-volume/low-weight goods is a typical example. An ideal measure would take this into the account. Statistics Denmark is one of the few having started to use such a measure attempting to correct for volume. For national haulage in 2004, the standard measure provided a load factor of 37.5 per cent. Correcting for volume, this increases to 39.4 per cent. The apparently declining load factors shown in figure 1 could alternatively be explained by a shift to low density loads, but there are no data to support this.

In the United Kingdom, some surveys have investigated different measures of vehicle fill. The results showed that in most cases, the limiting factor was available deck space (usually measured in pallet numbers).

Figure 2: Percentage vehicle utilization across 22 fleets in the UK in non-food retail distribution



Source: DfT, 2003

With deck space frequently being the constraint, considerable efficiency gains could be achieved by wider use of double- or even triple deck trailers. Other measures could include improving stackability of goods or reducing vehicle height

This example illustrates the usefulness of measuring several aspects of vehicle fill in order to identify key areas in need of attention.

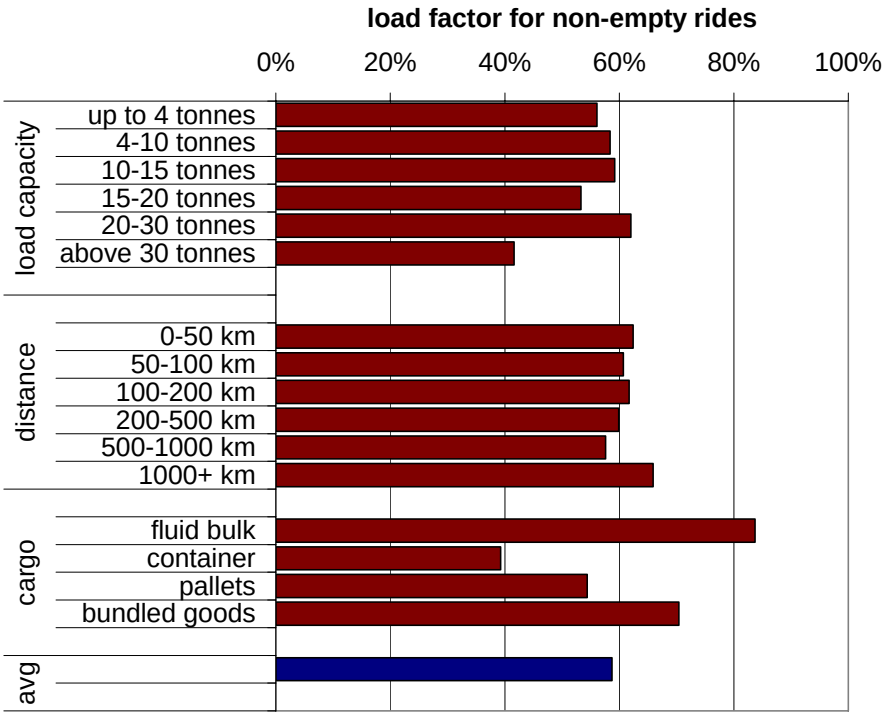
Source: DFT, 2003 and DS, 2005

Box 3: Load factors depends on more on cargo type, less on trip length and load capacity

Load factors depend not only on how good the haulier is at managing the fleet, but also on other characteristics. The type of good has the greatest influence on the load factors. Load factors for bulk goods are generally high, because of the high density of the hauled goods. The density of goods transported in containers is generally lower, resulting in a lower load factor. This does however not mean that bulk goods are transported more efficiently, but it stresses once more that load factors cannot be compared amongst sub-sectors.

There is less correlation between load capacity and the trip length and load capacity. It is striking that the load factor of long distance transport –where rail and ships compete- is relatively high. Obviously, with such long distances, goods are packed with more care.

Figure 3: Load factors for weight categories of German lorries in January 2004



Note: Load factors are calculated on the basis of tonne-km. The categories displayed in the chart have different profiles for empty haulage, but insufficient data is available on this subject, consequently empty haulage has been excluded. The category of vehicles above 30 tonne load capacity is very small and refers mainly to exceptional transport. The share of 20-30 tonnes is relatively high.

Source: KBA, 2004

Box 4 Theory and practise of improving load factors in freight transport

Distribution of goods can be organized in many ways and with differing degrees of efficiency. Distribution of freight in cities is frequently inefficient. In absence of coordination among all transport companies supplying a city, driving distances are much longer than they could be. In theory, coordination among transport companies could lead to better load factors and large transport savings. A Dutch study (Buck Consultants, 2000) estimates that if suppliers within the same supply chain would bundle their goods, the expected future doubling of vehicle-km could be reduced by 20-30 %, partly through increases in load factors. In case of bundling across supply chains the expected doubling could be completely prevented.

In response, city planners have tried realise the benefits. A major theme has been the development of centralized Urban Distribution Centres or other means to foster cooperation ('bundling') and coordination among transport companies. However, while some transport savings are usually realised, evaluations often show that greater load factors failed to materialize. Load factors rarely improve by more than a few per cent. Lack of trust and will among transport companies to cooperate and too much focus on distribution centres rather than to system-wide improvements have been identified as some important factors for the lack of striking results.

Sources: Buck Consultants, 2002; Buck Consultants, 2005; PSD, 2005