

## EXPERIENCES WITH LONGER AND HEAVIER VEHICLES IN THE NETHERLANDS

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### Abstract

After a test period of two years involving more than 150 Longer and Heavier Vehicles (25.25M/60T) on the Dutch road network, the Minister of Transport, Public Works and Water Management decided to extend the trial by a further three to five years. The new phase, called the Experience Phase, was launched on 1 November 2007. From that date on, every transport company is allowed to apply for a permit to drive with a Longer Vehicle. Only Longer, because concern for the condition of the bridges prompted a decision by the Minister to revert to a maximum weight of 50 tonnes, which is the regular maximum weight for commercial vehicles in the Netherlands. The political debate on 50 versus 60 tonnes is still ongoing. This paper will discuss not only the debate on the effect of LHVs on bridges, but also the various experiences with the introduction of this new type of vehicle in the Netherlands. The current regime of admittance that became effective on 1 November 2007 was shaped by the practical experience that the Netherlands has built up on LHVs since 2001.

**Keywords:** Heavy Vehicles, Freight transport.

### Résumé

Après une période d'essai de deux ans impliquant plus de 150 camions plus longs et plus lourds (25,25 m/60 t) sur le réseau routier néerlandais, le ministère des transports, travaux publics et gestion de l'eau a décidé d'étendre l'expérience pour 3 à 5 ans de plus. La nouvelle phase, appelée la phase expérimentale, a débuté le 1 novembre 2007. Depuis cette date, chaque société de transport peut demander une autorisation pour utiliser un poids lourd plus long, mais pas plus lourd, car les préoccupations sur les conditions des ponts ont conduit le ministre à prendre une décision rapide revenant au poids total maximum de 50 tonnes, conforme à la réglementation en vigueur pour les véhicules de marchandises aux Pays-Bas. Le débat politique sur le choix entre 50 et 60 tonnes perdure. Cet article ne se contente pas de présenter le débat sur l'effet des poids lourds plus longs et plus lourds sur les ponts, mais aussi les diverses expériences concernant l'introduction de ce nouveau type de véhicule aux Pays-Bas. Le régime actuel d'autorisation qui a pris effet au 1 novembre 2007 à partir de l'expérience pratique conduite aux Pays-Bas depuis 2001.

**Mots-clés:** poids lourds, transport de marchandises.

## **1. Introduction**

### **1.1 Initial motivation**

Forecasts that freight transport will grow by more than 50% urged the Dutch government to take measures. The accessibility of economic centres, especially the Port of Rotterdam and Schiphol Airport in Amsterdam, is already under pressure. The problem of air pollution is another contributing factor. Several building projects near motorways recently had to be stopped after they exceeded the European standards for air quality. Improving the efficiency of road freight transport by admitting LHVs is one of the possible measures. Two LHVs can carry the same load as three regular articulated vehicles. It is certainly not the only measure to be taken. As long as facilitating freight transport is policy, all transport modes will be required to keep up with the growth.

The Dutch government decided to admit LHVs under certain conditions by means of a trial. The conditions were (and still are): no deterioration of traffic safety, no reverse modal shift; no extra investments in the road network (with the exception of parking areas) and sufficient indication of interest from transport companies. The intended freight flows relate to the flow of goods that are already carried by road, substantial flows of goods from factory to distribution centres, between ports and distribution centres and among distribution centres themselves. It bears upon roads - mainly motorways and main roads - that already carry a lot of truck traffic. After some preliminary investigations, a first trial was initiated in 2001 to investigate the consequences of LHVs on the roads.

### **1.2 Content of this paper**

This paper is divided into two parts. Chapter 2 and 3 focus on the Netherlands' efforts to draw attention to the consequences of LHVs. It shows not only the results of researches and trials on several aspects like the environment, modal split, road surface, bridges, congestion and traffic safety, but also the way the public debate developed over the years. Chapter 3 is devoted entirely to traffic safety and the assessment of roads in terms of their suitability for LHV traffic. The second part deals with the situation as it currently exists. There is a discussion of the players in the LHV chain, the selected network of roads, the vehicle configurations and the permit system.

## **2. Research and Trial**

### **2.1 The public debate on LHV's in the Netherlands**

A distinctive feature of the debate on LHVs is that it is not always based on facts. Emotions play a key role in the discussion. The most important points of discussion in the Netherlands are the possible reverse modal shift and the effect on bridges and traffic safety. Despite differences of opinion and interests, the supporters and opponents are not diametrically opposed to one other. A characteristic feature of the process of introducing LHVs in the Netherlands is, in fact, the close cooperation with all stakeholders to ensure broad public support.

The supporters of LHVs can be found in the transport sector among shippers and transport companies. Calculations show that the use of LHVs can result in a cost saving of 25% per LHV roundtrip. Interest groups for inland shipping companies and terminal operators do have reservations about LHVs. Although not diametrically opposed, they are concerned about a reverse modal shift that would result in an increase rather than a reduction of air pollution.

That is the reason why non-governmental environmental organisations take a far more critical stance. As do the organisations Veilig Verkeer Nederland (Traffic Safety in the Netherlands) and the Fietsersbond (Federation of Cyclists). As their names suggest, these organisations have concerns about traffic safety, especially for vulnerable road users. They feel that there are already enough problems with commercial vehicles and that the design of the Dutch roads and the traffic volume are incompatible with the dimensions of LHV's. Some of the road authorities share the opinion of the traffic safety organisations.

The interest groups for motorists and rail freight operators take a neutral stance in the debate on LHV's. The rail freight operators do not expect much effect on the volume of goods carried by rail, especially in view of the fact that there is already a shortage of rail capacity.

## **2.2 Brief history of research and trial**

The first theoretical investigations took place in 1995. The conditions for the first trial were incorporated into the results of these investigations. Special attention was paid to the vehicle requirements related to traffic safety. The first trial was launched in 2001 and concluded in 2003. Because of the strict conditions, only four companies participated in the trial. Despite the small number of participants, the results for each of these companies in terms of fuel consumption and emissions were promising<sup>1</sup>. To gain more insight into the consequences of the admittance of LHV's on a more regular basis, the Ministry of Transport decided to launch a large-scale trial. In August 2004, the starting signal was given for a large-scale trial on LHV's. The trial was extensively monitored. Every participating company had to submit journey data for analysis. A total of 66 companies with about 100 LHV's participated in the monitoring research programme whereby they were allowed access to a number of routes, mainly motorways, on the road network.

To determine the effects on a national level, the journey data from the participants were incorporated into statistical data for four scenarios. The scenarios ranged from a strict to a more liberal regime of admittance. The exact results of the monitoring research programme will be discussed in the next sections<sup>2</sup>. The trial was concluded successfully on 1 November 2006 and the Ministry of Transport decided to prolong the trial with a new phase: the Experience Phase. A transition period of one year was slotted in to allow sufficient time to define a new regime of admittance based on the results of the monitoring research and the experiences of the large-scale trial.

Because it looked like the admittance of LHV's was getting a progressively permanent character, doubts arose among some of the stakeholders. For example, some road administrations agreed on LHV's by way of trial, but - in the light of a more definite situation - wanted more certainty about the effects of LHV's on road design and traffic safety. Since the results of the monitoring research were unable to offer this certainty on a number of subjects, additional research had to be done. The extra studies focused on the following topics: modal split, bridges, road maintenance, road design, traffic flow and traffic safety. Some researches have not yet completed their study. During the Experience Phase, all of these topics will be extensively monitored on an annual basis.

## **2.3 Effects on the environment and the modal split**

The first small-scale trial already showed substantial reduction of fuel consumption. This was confirmed by the results of the large-scale trial. Depending on the scenario, the admittance of LHV's is expected to produce a reduction of between 2,000 and 5,000 commercial vehicles. The performance per litre of fuel should improve by 33% more tonnes/kilometres. The savings on emissions depending on the scenario, are (x 1,000 kg): NOx: -1,477 to -2,825; PM10/PM25 -24 to -46; and CO2 -197,052 to -377,024. There is no longer any difference of

opinion between the supporters and the opponents of LHVs in the Netherlands about these research outcomes. The effects on fuel consumption and emissions will therefore not be subject to monitoring in the Experience Phase.

There is still uncertainty about the effects of LHVs on the modal split, although the studies that have been done on this subject seem to point to marginal side effects. Depending on the scenario, inland shipping will lose between 0.2 to 0.3% cargo tonnage to the road haulage sector, while the railways will lose between 1.4 to 2.7%. Road haulage will increase by 0.05 to 0.1% due to the admittance of LHVs. If a reverse modal shift were to take place, it would cancel out all the social benefits. Traffic volume on the road would increase instead of decrease, with all the relevant consequences.

The developments in the modal split will be measured on an annual basis during the Experience Phase. The 0-measurement will take place from January 2008 until July 2008. The studies that had been done until now indicated that there is one kind of transport relation where the risk of a modal shift can be actual: the market for container transport on a distance class of 80 to 120 kilometres. Some terminals are dependent on a small number of customers and if one pulls out, the *raison d'être* could be put at risk. As these possible shifts will not be reflected on a macroeconomic level, measurements and in-depth interviews will be taken at the terminals (about 90 in total).

## **2.4 Effects on road construction, bridges and congestion**

### ***Road construction***

Research conducted by Dutch research agency Oranjewoud<sup>3</sup> has shown that on balance LHVs do not cause more damage to the road construction than regular articulated vehicles. With an LHV, the load is divided over more axles compared with a regular articulated vehicle, so the average axle load may even be lower, which is favourable for the road burden. The reduction of the total number of journeys is also beneficial. To keep the likelihood of overloading LHVs to a minimum, it must be possible to read out the axle loads in the cabin of the truck. As an LHV must be equipped with an Electronic Brake System (EBS), the axle loads are recorded automatically anyway. Experts differ in their opinions about the effect of LHVs on the road surface, or more precisely the occurrence of rutting. Because there are several axles underneath an LHV, the succession of wheels is faster. Consequently, the healing of the asphalt has shorter intervals.

### ***Bridges***

The debate about the effect of allowing 60-tonne vehicles on bridges and viaducts is still in progress. During the large-scale trial, concern was expressed by the Building Department, the division of the Ministry of Transport responsible for public bridges and viaducts. According to the Building Department, the cross-forces that are caused by the higher vehicle weights cause damage to the construction. This applies all the more to ageing bridges and viaducts. Road transport interest groups and shippers commissioned an agency to provide a second opinion because they disagreed with the position taken by the Building Department. The second opinion revealed that LHVs do not cause any extra damage to bridges and viaducts compared with regular articulated vehicles. To break the stalemate, the Ministry of Transport engaged an independent third party. The Dutch research organisation TNO is currently examining the question. Results are expected this spring. The minister has promised to inform parliament of his position before the summer recess.

### ***Congestion***

The large-scale trial included an examination of the effect of LHVs on traffic congestion. It transpired that LHVs have no effect on traffic congestion; the tailbacks do not become any shorter. This was an expectable effect. The proportion of road haulage traffic at the start of the morning rush hour decreases sharply before increasing again in the off-peak period between the morning and evening rush hours. In the evening rush hour, the same kind of phenomenon occurs as in the morning rush hour. Road haulage vehicles avoid rush hours. Consequently, the effect of LHVs on traffic congestion will not be great. The situation is different when the total intensity of traffic is examined. The allowing of LHVs produces a reduction of between 2,000 and 5,000 commercial vehicles.

## **3. Traffic Safety**

### **3.1 Which roads are suitable and which not?**

The admittance of LHVs is not expected to cause any deterioration of road safety according to the results of studies so far conducted and the experience gained in the trials. However, there are some matters that require attention. Since 2001 there have been five accidents involving LHVs with damage confined to the vehicle bodywork. This section describes how the Netherlands examined roads that are suitable and unsuitable for LHVs.

Which roads are suitable or unsuitable for LHVs was determined during the large-scale trial based on the following line of reasoning: if an LHV performs in the same way as a regular articulated vehicle, an LHV can be driven where a regular articulated vehicle is driven. Equal performance refers, for example, to braking capacity, acceleration capacity and field of vision. To the extent that an LHV did not achieve equal performance, some additional vehicle requirements were laid down with a view to attaining the desired level of performance. As the large-scale trial progressed and the allowing of LHVs appeared to be assuming a definitive nature, the adopted line of reasoning proved insufficient for many road authorities, who tend to think in terms of the road rather than the vehicle.

### **3.2 Effects on motorways and on the secondary road network**

In the Netherlands, the guidelines for road design are drawn up by the National Information and Technology Platform for Infrastructure, Traffic, Transport and Public Space (CROW). Most traffic situations meet the basic principles formulated by CROW. CROW was engaged to establish a new guideline specifically for LHVs<sup>4</sup>. The working method of this organisation is as follows: it forms a working group with representatives of all stakeholders. The working group decides on the basis of unanimity how the guidelines will be worded. For the LHV working group of CROW this meant a decision had to be supported both by *Veilig Verkeer Nederland* and by *Transport en Logistiek Nederland* (TLN), the organisation that represents road hauliers.

The entire road network was dissected into road sections and interchange points. Interchange points are crossroads and roundabouts. The road sections and interchange points have been divided into all occurring traffic situations based on a number of characteristics, such as maximum speed, whether or not overtaking is allowed, whether or not there is a separate infrastructure for cyclists and so on. All traffic situations were assessed for their suitability for LHVs in terms of road safety, road design and traffic flow. Traffic situations found to be suitable for LHVs were placed on a green list; those unsuitable were put on a red list. An orange list contains traffic situations about which agreement does not yet exist. These are situations where an LHV turns right at a junction and the mingling of LHVs with agricultural

vehicles on roads where these vehicles are permitted. CROW will examine these two subjects in greater detail. The results of the examination are expected before summer 2008.

Besides this LHV publication, the effects of LHVs for the motorways were examined. A general observation is that LHVs do not give rise to any problems with regard to road design and road safety. Locally, problems might occur, for example if there is particularly short acceleration lane that is not followed by an emergency lane before a bridge. In addition to road design and road safety, there is a string of other consequences of LHVs that must be taken into account. If an LHV is involved in an accident, for example, two recovery vehicles instead of one will need to drive out to the scene and in due course it may be necessary to modify traffic detection systems because they do not recognize an LHV as a vehicle. Parking spaces will also need to be adapted.

#### **4. The Experience Phase**

The driving of an LHV on the roads in the Experience Phase is based on exemptions. The Department of Road Transport (RDW) is responsible for the process of granting exemptions. This section explains how the process is organised and the conditions attached to an exemption. By way of introduction, RDW needs to be explained. A potted profile of RDW: Since 1949 RDW has helped to ensure that road traffic in the Netherlands is as safe, clean, economical and orderly as possible. For this purpose, RDW performs all kinds of statutory and other duties for various ministries. RDW is the principal linking pin between private individuals, the sector and the government when it comes to vehicles and driving licences. The organisation records all details of vehicles and their owners, including the admission of new vehicles, roadworthiness tests, driving licence and information management. Mission: RDW is a professional and reliable partner for all stakeholders in the vehicle chain.

##### **4.1 Players in the LHV chain**

There are several important players in the LHV chain:

- firstly, the road authorities. These are the organisations that are responsible for maintaining roads and ensuring the flow of traffic: central government (motorways); 12 provincial governments; 400+ municipal governments; and six water boards;
- transport companies;
- RDW-TET as the central granter of permits. The TET department (admittance of exceptional transport) of RDW allows exceptional transport and LHV's;
- CROW (explained in 3.2);
- CBR/CCV. The CCV division of CBR is the examining authority in the Netherlands for virtually all examinations for truck drivers, skippers and entrepreneurs in inland shipping and logistical employees;
- interest groups such as TLN (*Transport en Logistiek Nederland*), EVO, Focwa and also *Veilig Verkeer Nederland (Traffic Safety in the Netherlands)*;
- the Ministry of Transport, Public Works and Water Management.

##### **4.2 Building up a road network for LHV's**

Use of the decision scope is an important item with regard to permits and will be discussed later. Basically, a road authority authorises RDW in respect of certain dimensions and masses to issue permits autonomously. All transport that falls within the scope may be granted permit without reference to the road authority. This construction has also been adopted for the LHVs. Road authorities have been asked for an initial the decision scope. The road authorities have used the CROW guideline to test their roads. If the green light is given, it means the road is

available to LHVs, regardless of the number of applications. The roads have been divided into the following categories:

- *Basic network*: this is the network for transport by means of LHVs. It comprises all motorways in the Netherlands. The choice of a basic network is in line with having a quality network for the transport of goods. The system chosen makes it possible to develop specific permits later on.

- *Core area*: a new feature is that at suitable sites - the “core areas” (usually industrial estates) - a set of roads or small sections of roads may be designated instead of a single address. This gives hauliers greater possibilities, while RDW does not repeatedly need to request your consent for a new loading and unloading address. This was an important addition in the Experience Phase. In the Trial Phase, use was made only of an exact location. A core area includes storage and transshipment sites, business sites, distribution centres, disconnect points for LHVs and other areas released for use by the LHV.

- *Access route*: this is a road designated for a transport firm for reaching the company (a specific route from the place of business of the transport firm to the basic network). The access route has not been included in the autonomous LHV the decision scope; the permission of the road authority is required in all instances.

The basic network is a growing model. By using core areas instead of imposed routes for each road authority, the growth of the basic network will be kept controllable and transparent. However, a situation must be avoided where transport firms take a shortcut to the next core area instead of driving via the basic network.

As mentioned earlier, the CROW publication lists the suitable and unsuitable roads. The publication was produced with the cooperation of all stakeholders in the LHV chain. An important point is that CROW operates on the basis of unanimity, so all stakeholders support the publication. Road authorities retain their autonomy in determining which roads qualify.

In practice, the main reasons for rejecting roads to date have been:

- roads fail to satisfy the CROW guideline;
- core area is located in an urban area;
- access roads leading to a core area are unsuitable;
- route contains equivalent junctions.

Roads and areas disqualified for LHVs include residential areas, 30-km zones and shopping areas, and also roads where the combination of slow traffic and LHVs gives rise to overtaking problems and poses other hazards.

### 4.3 Vehicle configurations

LHVs are able to carry more per journey. This allows a reduction of the number of journeys. The advantage is fewer transport movements and by consequence less emissions. A disadvantage of the longer articulated vehicles is their reduced manoeuvrability compared with customary articulated vehicles. One of the most striking requirements is that articulated vehicles are no longer allowed to be heavier than 50 tonnes (at a total length of 25.25 m). The transport firm is responsible for formation of the articulated vehicles.

The following configurations are allowed in the Netherlands:



A

Tractor + semitrailer + middle axle trailer

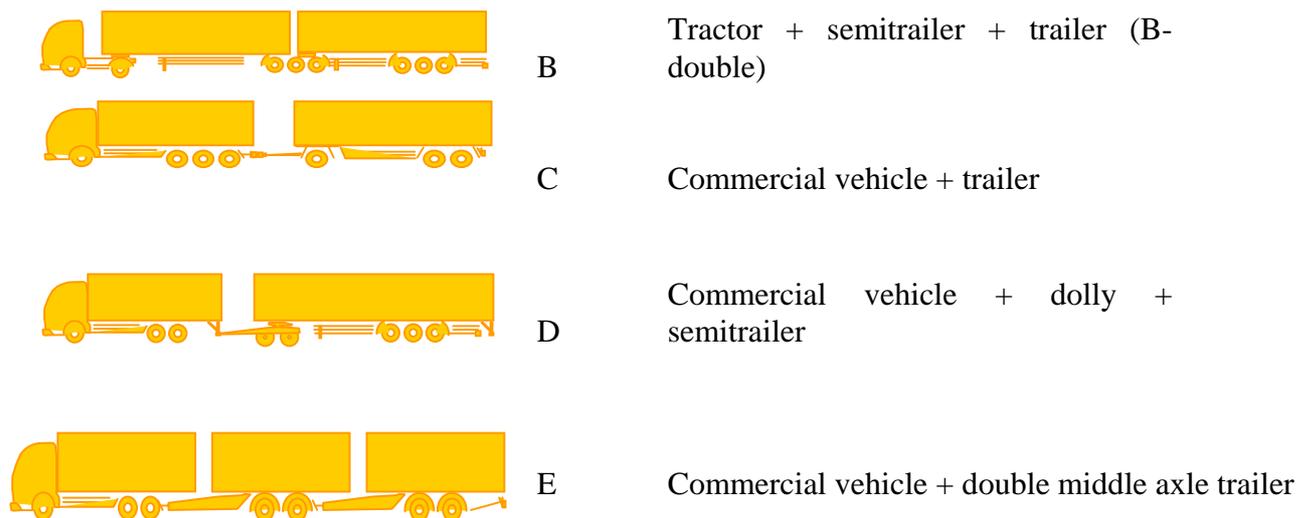


Figure 1: configurations

The categorisation found in practice is: D 56% of the fleet; A 23%; B 12%; E 6% and C 3%.

Requirements<sup>5</sup> that a new vehicle must satisfy in the Experience Phase include:

- the tractor unit must have an appropriate permit;
- the vehicles used must have a designation on the vehicle registration;
- the total mass may not exceed 50,000 kilograms. The total length of the articulated vehicle may not exceed 25.25 metres, including the load;
- the motor vehicle must be equipped with Front Underrun Protection;
- the LHV must be equipped with an Electronic Braking System (ABS/EBS);
- the LHV must be equipped with extra “vision enhancing” instruments;
- the axle loads of an LHV must be readable in the cabin or on a separate instrument down to an accuracy of 0.1 tonne. Note that this does not apply to LHVs already participating in the trial;
- the vehicle must not have any tanks intended for loads of more than 1,000 litres;
- the vehicle must be equipped with closed side protection;
- the back of the articulated vehicle must display a sign indicating the contour of the articulated vehicle and its total length in metres to alert motorists behind of the configuration they are approaching.

All vehicles used in an LHV articulated vehicle must have been approved in respect of the above requirements and other matters. If the vehicles are approved for LHV, a note will be added to the vehicle registration. This does not apply to articulated vehicles that participated earlier in the trials or to foreign articulated vehicles. They have an LHV approval certificate that states the permissible articulates and vehicles.

Traffic safety is considered very important in the Netherlands. Therefore, the driver is expected to meet extra requirements:

- besides satisfying the legal requirements, the driver must hold a valid certificate as an LHV driver;
- the driver must have at least five years’ experience of driving an articulated vehicle, and in the past three years must not have been banned or disqualified from driving or had his licence revoked.

Traffic safety is also reflected in the use of the LHV. Some examples are:

- the articulated vehicle must not have more than two turning points (in other words an LHV should consist of not more than three vehicles);
- the LHV must be able to turn on a circle with an outer radius of 14.5 metres and an inner radius of 6.5 metres;
- the articulated vehicle is not allowed to overtake other vehicles if the speed limit is higher than 45 km per hour;
- an LHV may not be used on slippery roads or if visibility is less than 200 meters;
- if an “ordinary” articulated vehicle is formed from vehicles that are also suitable for an LHV, they must satisfy the customary requirements of the Vehicle Regulations; the combined mass of two connected middle axle trailers may not exceed 1.5 times the mass of the tractor unit, while the mass of the rearmost middle axle trailer may not exceed that of the first one;
- tank containers with a capacity greater than 1,000 litres may not be carried ;
- the transport of hazardous goods is not allowed;
- if a road is not separated from cyclists, an LHV may be used provided that the distance does not exceed 5 kilometres.

#### **4.4 Permit system**

To be allowed on to the roads, the LHV must have the required permit. Transport firms request permit centrally from the RDW. A permit may be granted for roads that qualify for LHV for a period not exceeding one year and for one tractor unit. The scope for decision-making plays an important role in the permit process. The permit system for LHVs will be more closely aligned to the customary systems for granting long-term permits. This means that roads that satisfy the requirements for usage of an LHV may come into the “autonomous decision scope”. The road authority will then not repeatedly need to determine for each application whether the roads are suitable (a once-only examination is sufficient). If there is no decision scope, RDW will pass on the application to the road authority for examination and approval. The road authority may still allow decision scope in this regard.

Types of permits:

- basic document including permit for national roads;
- permit for each core area including the route to the national roads;
- possibly an access route designated for each transport firm;
- permit from training (specific to the trainer). These routes were compiled largely in consultation with CBR/CCV and the road authorities. The routes will not be released for other purposes. This permit will be granted for not more than one vehicle. Important is that the driver will encounter all possible traffic situations in these routes.

Besides the types of permits mentioned above, a permit always includes an overview of roads, the regulations a transport firm must comply with and any restrictions (such as limitation of driving time).

#### **4.5 Facts and figures of the current system**

Eighty LHV articulated vehicles are now on the roads in the Experience Phase. Following the weight restriction in the Experience Phase, the number of LHVs has decreased. These are mainly owned by container transport firms for which the reduction to 50 tonnes is not feasible or profitable.

A total of 280 road authorities were approached for decision scope. In all core areas, 450 where requested, of which 375 were allocated. In 2007, 60 permits were granted from

November onwards. The number was 30 in January 2008.

There are more permits than LHVs (60+30 versus 80 vehicles), in connection with permits from driving lessons and incidental permits. To date there have been no serious accidents involving LHVs. In many cases LHVs are not even noticeable among the rest of the traffic.

## 5. Conclusions

To date the admittance of LHVs in the Netherlands can be called a success. The key to this success can be found among an enthusiastic group of people at the Ministry of Transport and at the Department of Road Transport. They have worked hard on this project to ensure constructive cooperation between all stakeholders and a basic network of roads on which LHVs can join the traffic without any noteworthy problems. The situation in the Netherlands cannot automatically be implanted in other countries. The benefits brought by LHVs are not at issue, neither in the Netherlands nor in other countries. The doubts stem from a possible reverse modal shift, bridges and road safety. Each country will need to find its own way through these deliberations. But it is beneficial to the debate that the discussion is being conducted based on facts and not on emotions.

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