



Ministry of Transport, Public Works
and Water Management

Longer and Heavier Vehicles in practice



Longer and Heavier Vehicles in practice

Economic, logistical and social effects

Datum July 2011

Status Final

Longer and Heavier Vehicles in practice

Economic, logistical and social effects

Datum July 2011
Status Final

Colofon

Published by:	Directorate General for Public Works and Water Management (Rijkswaterstaat) – Traffic and Shipping Department
Information:	Marieke Honer and Loes Aarts
Telephone:	06 31011499 of 06 20249147
Fax	
Executed by	NEA, Manfred Kindt (project management), Arnaud Burgess and Rudy Groen.
Layout	
Date	July 2011, the original version of the report dates back from October 2010 and was written in Dutch
Status	Final

Contents

	Summary – 7
1	Introduction – 9
1.1	Background – 9
1.2	Policy – 9
1.3	Objectives and formulation of the study – 10
1.4	Reading guide – 12
2	Study 13
2.1	Study design – 13
2.2	Research progress – 14
2.3	Organisation – 15
3	LHVs: current state of affairs – 17
3.1	Size of the current LHV market – 17
3.2	LHV configurations – 18
3.3	Haulage firms, own transport and initiative by client – 20
3.4	Preconditions – 20
3.5	Exemptions – 21
3.6	Innovation – 22
3.7	Journey pattern by market segment – 22
3.8	Need for international use – 23
3.9	Expansion of the LHV fleet – 25
4	Social effects – 28
4.1	Geographical intensities – 28
4.2	Time of day – 29
4.3	Effects of LHVs – 30
4.4	Emissions – 31
4.5	Engine type – 32
4.6	Number of axles and axle load – 33
4.7	Reverse modal shift – 34
5	Market segment: retail – 36
5.1	The market – 36
5.2	LHV companies – 37
5.3	Type of vehicles – 38
5.4	Use of LHVs – 39
5.5	Savings and investments – 40
5.6	International use and future expectations – 43
6	Market segment: container transport – 46
6.1	The market – 46
6.2	LHV companies – 47
6.3	Type of vehicles – 49
6.4	Use of LHVs – 50
6.5	Investments and savings – 53
6.6	International use and future expectations – 53

7 Market segment: ornamental horticulture – 56

- 7.1 The market – 56
- 7.2 LHV companies – 58
- 7.3 Type of vehicles – 59
- 7.4 Use of LHVs – 60
- 7.5 Investments and savings – 61
- 7.6 International use and future expectations – 63

8 Market segment: waste/bulk – 67

- 8.1 The market – 67
- 8.2 LHV companies – 68
- 8.3 Type of vehicles – 69
- 8.4 Use of LHVs – 71
- 8.5 Savings and investments – 73
- 8.6 International use and future expectations – 74

9 Other market segments – 77

10 Conclusions and recommendations – 83

- 10.1 Conclusions – 83
- 10.2 Recommendations – 85

Appendix A Characteristics of LHV companies – 87

Appendix B Characteristics of non-LHV companies – 89

Appendix C Survey of companies using LHVs – 91

Appendix D Survey of companies not using LHVs – 97

Appendix E Journey analysis form – 101

Appendix F Monitoring plan – 105

Appendix G Consultative party – 107

Summary

The Dutch Minister of Infrastructure & Environment has promised the Dutch Lower House to monitor the admission of longer and heavier vehicles (LHVs) during the third trial period, the so-called 'experience phase'. The Directorate General for Public Works and Water Management has commissioned the NEA to conduct this monitoring. This monitoring study aims to give insight into the economic, logistical and societal consequences of the use of LHVs and provide insight into what effects LHVs will have on traffic volumes and emissions. The results of this monitoring research will also serve as input for the new authorisation regime in the post-experience phase.

Out of a total of 153 companies, some 118 LHV companies participated in this study. And 51 non-LHV companies provided reasons why these companies do not use LHVs.

It can be concluded that, in spite of the fact that this concerns a trial, the use of LHVs has increased in comparison to the last measurement in 2006. Since then the number of LHVs has doubled (397). The number of companies (153) that are using LHVs during the experience phase has also doubled. In accordance with one of the policy goals, LHVs will mainly be used on long routes between distribution centres, transshipment locations and ports. This concerns goods flows that are characterised by a constant pattern and accommodate sufficient volume. The use of LHVs is purely intended as a replacement for regular vehicles. This has led to an increase in road transport efficiency. In the Netherlands, LHVs are primarily used in the following market segments - retail, containers, ornamental horticulture and waste/bulk. This report also extensively examines the use of LHVs in these market segments.

LHVs are primarily used because of cost considerations. This means that the same volume is transported, but at lower costs. Furthermore, this more efficient form of transport contributes towards better environmental performances. Cost savings of up to around 20% can be achieved, and the logistics chain will only require limited modifications. The main modifications in the chain will be required with regard to the loading and unloading of LHVs.

Permitting the use of LHVs will help reduce the number of journeys and consequently the number of kilometres travelled on Dutch roads. Based on the current preconditions and the current use of LHVs, a reduction of around 20 million kilometres will be attained annually. As a result LHVs contribute towards a reduction in CO₂ emissions. The total reduction in CO₂ emissions resulting from the use of LHVs currently amounts to 16 million Kg per year. For road freight transport this is an important innovation in the effort to reduce CO₂ emissions.

With the exception of the ornamental horticulture sector, LHVs are primarily used during the day. This pattern coincides with the opening hours of clients and consumers. Therefore, LHVs only have a limited influence on congestion. However, they do have an effect on traffic volumes in general. Due to the fact that they are primarily used as a replacement for regular trucks, LHVs contribute towards a more efficient form of road transport. Based on interviews with LHV companies and the

journey analysis, it can be concluded that they do not expect or hardly expect a reverse modal shift to occur. LHVs are used throughout the Netherlands and their intensity differs per motorway. The highest number of exemption applications are submitted around the Ports of Rotterdam and Amsterdam. More exemption applications are also applied for around Tilburg, Zwolle and the auction locations in the Netherlands. This corresponds with the intensities per motorway as observed in the trial.

Based on the current number of LHVs and the expected expansion, the previous estimate of the potential size of the LHV fleet - ranging between 6 and 12 thousand - seems to have been too optimistic. However, the number of LHVs in the Netherlands is expected to show a further increase. Over the coming five years, LHV companies expect the number of LHVs to double. This means the number of LHVs in the Netherlands would increase to 1,000 vehicles, or around 1% of the entire Dutch fleet of vehicles. If international transport is permitted, this will lead to a further increase.

Nevertheless, for the time being the number of LHVs in the Netherlands is not expected to be similar in size as in Sweden, where the number of longer and heavier vehicles makes up over half of the fleet of vehicles. This is, among others, due to the fact that the Netherlands is only a small country. Consequently, this means that more effort and creativity is required to actually achieve potential gains through the use of LHVs. The use of LHVs in retail distribution, with large vehicles on transport routes to the city and small vehicles in the city, proves that the use of LHVs is also increasing via innovations on short distances.

It is safe to establish that the LHV policy is functioning accordingly. The sector's assessment of the authorisation regime varies between 'reasonable' and 'good'. The current preconditions subject to which LHVs are permitted in the Netherlands, offer transporters sufficient flexibility in terms of using their equipment. The sector has proposed a number of points for improvement; the three main points concern: improving the exemption system, expanding the number of core areas and roads, and permitting LHVs in international transport.

1 Introduction

1.1 Background

'LHVs' or 'longer and heavier vehicles' have been driving in the Netherlands since 2001. Permitting combinations of vehicles with a length of 25.25 metres on the Dutch road network was and still is completely new. In view of the fact that it was thus not possible to build on previous experience, either nationally or internationally, LHVs were introduced in the Netherlands in a step-by-step process. Although LHVs have been driving in Sweden for many years, the road network and traffic densities there are not comparable to the busier Dutch situation.

In each phase in which authorisation was further expanded, the actual and potential undesirable effects were closely examined. A first trial period was carried out between 2001 and 2004. The authorisation of LHVs was extended in a second trial period between 2004 and 2006. After a transitional phase, the experience phase for LHVs commenced on 1 November 2007. This was the first time that LHVs were introduced on such a large scale. This experience phase will continue until 1 November 2012. During the experience phase the transport businesses are not subject to a maximum number of vehicle combinations.

In 2006 Arcadis conducted a monitoring study on the use of LHVs. In the meantime there has been an increase in the number of LHV companies and corresponding LHVs, and the experience phase will enter its final year in 2012. To gain better insight into the economic and logistical effects the NEA was commissioned to conduct a new monitoring study.

1.2 Policy

LHVs can be/are being deployed to help to overcome some of the negative effects (emissions, transport movements, shortage of drivers) of the future expected growth in goods traffic. The large-scale use of LHVs is broadly based on achieving various goals:

- Improving transport efficiency
- Reducing emissions
- Reducing traffic volumes

Longer and heavier vehicles are primarily intended for larger volumes of goods flows to and from industrial sites, ports and transshipment areas. Further policy principles include: this may not have a negative impact on traffic safety; the authorisation of the use of LHVs may not lead to a reverse modal shift; and with the exception of service areas, there will be no modifications to infrastructure.

On 10 July 2007 the Dutch Minister of Infrastructure & Environment wrote a letter to the Dutch Lower House saying: "the Dutch trials and foreign research have shown that with combinations an average 33% in fuel savings can be achieved for the transport of the same quantity of cargo. Over the long term, the Netherlands could

thus achieve a 3-6% reduction in CO₂ emissions and a 2-4% reduction in NO_x emissions of goods transport. This only applies to national transport.”

1.3 Objectives and formulation of the study

The monitoring study aims to provide insight into the economic, logistical and social consequences of the use of longer and heavier (road) vehicles ('LHVs') to serve as a basis for informing the Dutch Lower House on how the use of LHVs in the experience phase is developing, and to what extent the policy goals, namely fewer vehicle kilometres, reduction of traffic volumes and a reduction in the emissions of hazardous substances and noise are being met.

The results of this monitoring research will also serve as input for the new authorisation regime in the post-experience phase. The study outlines which criteria might possibly be considered for authorising the use of LHVs in the Netherlands.

The above-mentioned goals are divided into the following sub-questions.

Goal 1: Provide insight in the economic and logistical effects of the use LHVs within the different market sectors.

- Describe the characteristics of the use of LHVs per market sector in terms of the type of company, client, goods carried, vehicle configuration and type of transport, etc. The reasons why LHVs are used by companies, clients and for different goods, etc. shall also be elaborated;
- Describe the economic and geographical characteristics of the use of LHVs in the Netherlands;
- How will the business sector benefit from the use of LHVs, and what investments will be required within the chain;
- What effects will the use of LHVs have on the logistics organisation of the chain per market sector;
- What new logistics and vehicle concepts have emerged as a result of the arrival of LHVs and what will this mean in the long term with regard to the measures and weights of longer and heavier vehicles;
- Substantiate any wishes for an adjustment of policy;
- Modal shift effects: has the use of LHVs caused any shifts between the different transport modalities (rail, inland shipping, road)?

Goal 2: Provide insight into what effects LHVs will have on traffic volumes and emissions.

- How efficient is the use of LHVs in comparison with the total transport of goods by road;
- What effect does the use of LHVs have on traffic volumes;
- What effect does the use of LHVs have on noise, air quality and CO₂ emissions?

Sub-questions for both goals:

- What are the future expectations for LHVs?
- How will LHVs relate to other transport modalities for the above-mentioned goals 1 and 2 (in broad outline)?

Requirements on the use of LHVs

Transporters are required to have a special exemption to be allowed to drive with a longer and heavier vehicle. The Government Road Transport Agency (RDW) issues these exemptions (in the case of the Netherlands). Every transport company can apply for an exemption to drive with an LHV combination. The exemptions are issued for a so-called core area. If a road administrator grants permission, then this applies to all companies that want to drive with LHVs in the core area. This is referred to as the autonomous discretion which the road administrator grants the RDW.

In view of the fact that insufficient information on the road safety of LHVs in the Netherlands is available, and to ensure road safety, as part of the trial, on top of the statutory requirements extra requirements apply to LHVs. Accordingly, LHVs are not allowed to transport livestock or hazardous materials and are equipped with the following extra facilities:

- a mirror kit in accordance with the latest European regulations;
- advanced braking systems;
- an axle load measuring system;
- side protection between the wheels;
- side markings to ensure better visibility in the dark;
- a sign on the back showing the contour of the combination and stating the length in metres.

The handling of the combination and the detailed operation of the vehicles are also subject to further requirements. In accordance with the conditions for participation, before combinations are permitted to drive on the road they require RDW approval.

In addition to equipment requirements, with regard to road safety, in order to drive an LHV the driver must comply with the following three conditions:

- the driver must have at least five years of experience driving an articulated vehicle;
- the driver must possess a specific LHV certificate.
- in the three years prior to participation in the trial, the driver may not have been disqualified from driving, have had his driving licence revoked or been required to surrender his licence due to an offence or crime.

The certificate is valid for a five-year period.

1.4 **Reading guide**

The report has been compiled as follows:

Chapter two examines the study design and progress of the study. Chapter three looks at the state of affairs of LHVs in the Netherlands. Chapter four examines the social effects. Chapters five through nine provide an in-depth look at the economic and logistical effects per market segment. Chapter ten examines the conclusions and recommendations. Lastly, appendices A and B include information from respondents that participated in the web survey. Appendices C and D show the web survey conducted among LHV companies and non-LHV companies. Appendix E describes the journey analysis. Appendix F includes the measurement plan and appendix G gives the names of the consultative group.

2 Study

This monitoring study aims to answer the research questions formulated in paragraph 1.3. This chapter outlines the method that was applied on behalf of gathering the data, and converting the available data into research results.

2.1 Study design

The structure of the study comprises the following phases:

- Phase 1: agreeing the monitoring plan
- Phase 2: the market approach
- Phase 3: analysis and assessment
- Phase 4: the report

Phase 1: agreeing the monitoring plan

The monitoring plan was drawn up in consultation between commissioning party and contracted party. The main points of this monitoring plan were:

- Equipment: type, Euronorm, visual records
- Journeys: location, time, route, decoupling points
- LHV companies: company size, number of LHVs, starting year, logistics planning
- Investments: investment items
- Start-up: problems, initiator
- Preconditions: points for improvement, exemptions
- Future: expectations
- Non-LHV companies: why no LHV, future
- Social effects: effect on distances driven, environment, traffic flows, noise

Phase 2: market approach

The second phase primarily consisted of the approach to the market. The data that was collected during this phase was used in the analysis.

The information was gathered via the following sources and techniques:

- Via the commissioning party, the RDW provided information on companies that had previously requested an LHV exemption.
- In depth interviews (20 company visits) with transporters and drivers on the use of LHVs, the start-up, investments and savings. General experiences and expectations for the future were also discussed. This was carried out via open discussions whereby a questionnaire served as a guideline. In particular, information was gathered on the circumstances under which companies operate in the chain. This concerned both the benefits and drawbacks of using LHVs.
- The in depth interviews were held with businesses representing different market segments. The market segments were selected on the basis of the size of the number of companies that operate LHVs in that market segment. This concerns the following market segments: retail, containers, ornamental horticulture and waste. Additionally, a number of companies in different market segments were contacted. The depth interviews also served as input for the web surveys.

- Both LHV companies (118) and non-LHV companies (51) were contacted via web surveys. The questionnaires are included in appendix C and D. The primary goal of these surveys was to gain insight in the aspects mentioned in the monitoring plan.
- The non-LHV companies were sent the questionnaire for the purpose of acting as a reference group. The questionnaire examined the following points among others – the needs with regard to preconditions, the reason why companies do not use LHVs, development plans, minimum required weight limit to use LHVs internationally. Companies in the NEA transport database were randomly sent an open mailing. The response from 51 respondents was in accordance with pre-set goals, however this is a relatively small group. The received information should therefore be viewed as an indication. Appendix B includes data from non-LHV companies.
- A separate journey form was created to gather data on journeys from at least 1/3 of the companies. This form is included in appendix E. The primary goal of the journey form was to gain insight in the type of journeys, the route, the start and end location, the kilometres travelled and any reduction in distance.
- Various different methods were used to gain information on the use of LHVs via members of the advisory group.

Phase 3: analysis and assessment

In the third phase the data received was checked for consistency and quality. Where possible and necessary, the companies were contacted to further explain the received data.

This was followed by the analysis, whereby data was converted into workable information. The interim results were put into perspective and tested against information made available by the sector.

The draft results were presented in a seminar with companies and verified among the business entrepreneurs. The entrepreneurs were also given the opportunity to address other points of interest.

Lastly, the results were discussed with and subsequently approved by the consultative party.

Phase 4: report

The last phase consisted of writing the final report. During this phase the feedback from the transporters, consultative and commissioning parties was processed, and resulted in the present report.

2.2

Research progress

The research was conducted with pre-determined throughput times. LHV companies were generally committed to contributing towards the project. The web survey among the LHV companies received a record response (118 of the 153 LHV companies). When more intensive contact was established regarding data on journeys, companies generally responded less enthusiastically. However, the pre-determined numbers were achieved.

The draft results were evaluated in a seminar with companies; the consultative party also assessed the results.

2.3

Organisation

The commissioning party was the Directorate General for Public Works and Water Management, Traffic and Shipping Department (Rijkswaterstaat, Dienst Verkeer and Scheepvaart (DVS) on behalf of the Directorate General for Mobility (DGMO). NEA was the contracted investigative party.

The progress of the study was safeguarded through regular consultation between the commissioning party and contracted party.

A consultative party was set up to also critically assess the results and progress. For a list of names, please see appendix G.

3 LHVs: current state of affairs

3.1 Size of the current LHV market

According to information from the RDW and research by the NEA, the LHV market in the Netherlands consists of 153 companies and 397 LHVs (status July 2010). In 2006, at the end of the large-scale trial, some 162 LHVs were participating on behalf of 72 companies. Up to this point in the experience phase both the number of companies and the number of LHVs has doubled.

A total of 118 companies with LHVs completed the questionnaire. They collectively represent 302 LHVs. In addition to the 118 companies that responded to the survey, some 20 LHVs owned by driving schools were included. There was also a group of companies that did not participate in the study. The following figures are based on information that was gathered from participants in the monitoring study.

As shown in Figure 3.1, LHV companies are made up of the following market segments. In the rest of the study a number of market segments are referred to collectively as: building materials, contract logistics, express, air freight, liquid bulk and silo.

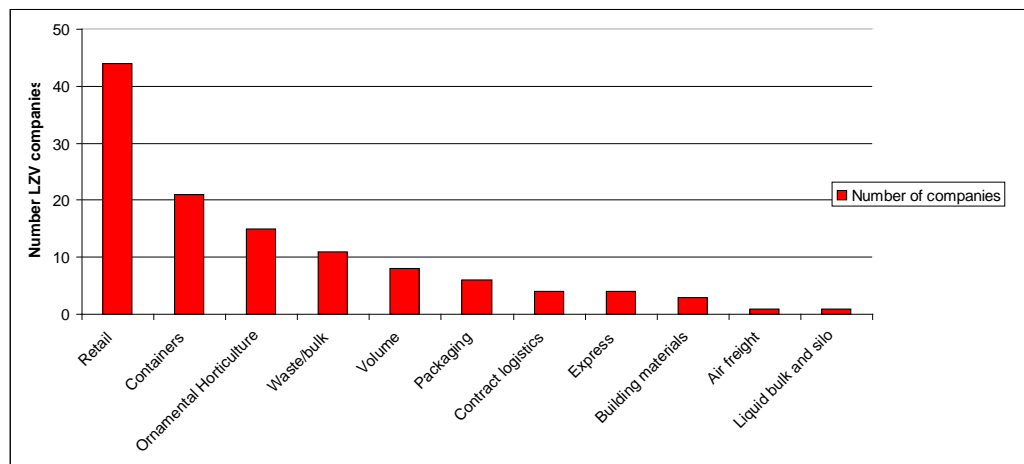


Figure 3.1
LHV companies by market segment. (LHV survey, 118 companies)

Over 40% of the companies owned one LHV. Three out of four companies owned three or less LHVs. And 15% of the companies owned five or more LHVs.

Number of LHVs per company	Number	Percentage
1	48	40.7
2	33	28.0
3	8	6.8
4	12	10.2
5	6	5.1
6	4	3.4
7	3	2.5
8	1	0.8
10	1	0.8
11	1	0.8
12	1	0.8

Table 3.1
Number of LHVs per company (LHV survey, 118 companies)

The companies were asked the question since when have they been making use of LHVs? More than half of the companies commenced using them in 2007 or later. The experience phase commenced on 1 November. The preconditions regarding the use of LHVs during the experience phase offer a greater amount of flexibility than in previous trials. A restriction on the maximum weight of 50 tonnes applied to mid-2008. Depending on the exemption and road administrator, some companies may not have been permitted to drive with 60 tonnes until the second half of 2008.

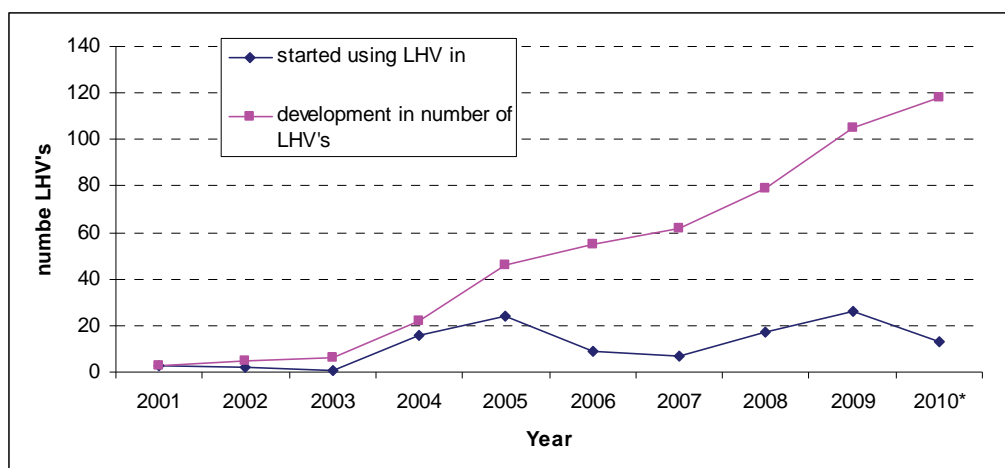
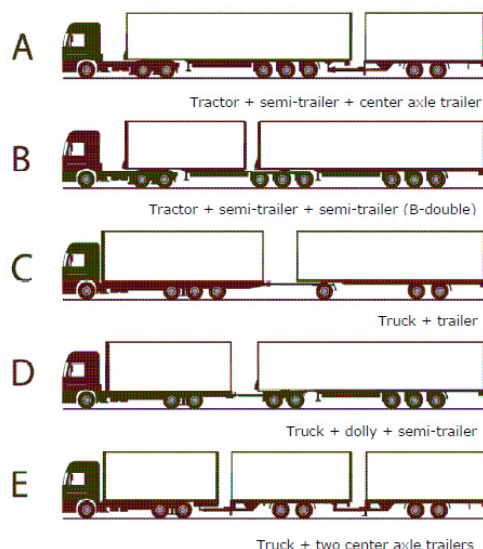


Figure 3.2
Been using LHVs since the year* concerns the first half of 2010 (LHV survey, 118 companies)

3.2 LHV configurations

In the Netherlands there are five different types of LHV configurations. Figure 3.3 provides an overview of the different types.

The following table shows that of the 118 interviewed LHV companies around two-thirds had an LHV with a D configuration (truck – dolly – trailer). Based on the total number of LHVs, the percentage of vehicles with a D configuration is lower, namely 50%.

**Figure 3.3**

Different LHV configurations

Source: RDW, *The combination of two city trailers is a new type of vehicle

Based on the total number of LHVs, 24% of the vehicles have an A configuration and 20% have a B configuration. Over 5% of the LHVs have an E configuration. The number of LHVs with a C configuration is limited to 1.5%. This configuration hardly plays a role in the Dutch fleet of LHVs. The reason that the C and E configurations are hardly used is due to the fact that the modules which these types consist of are less prevalent among regular vehicles. Additionally, types A, B and D are more efficient because they can be coupled and decoupled faster.

Configuration	Number of companies in 2010	Number of LHVs in 2010	Number of LHVs in 2006
A configuration	29 (24.6%)	72 (23.8%)	16
B configuration	24 (20.3%)	60 (19.9%)	14
C configuration	3 (2.5%)	5 (1.7%)	0
D configuration	77 (65.3%)	149 (49.3%)	63
E configuration	7 (5.9%)	16 (5.3%)	7
Total	118	302	100

Table 3.2

Number of companies and LHVs per configuration (LHV survey, 118 companies)

The 'waste/bulk' and 'volume' market segment primarily rely on the D configuration. This is among others due to the fact that regular vehicles in these market segments mostly consist of a truck plus trailer. In this way LHV configurations are determined on the basis of available equipment to minimise investments and maximise flexibility.

The 'containers' market segment mainly relies on two configurations, namely B and D. The 'ornamental horticulture' market segment also primarily relies on two configurations namely, A and D. Because of the equipment used in this market segment, the choice of these configurations is also self-evident.

Lastly, the 'distribution/retail' market segment opted for three configurations namely, A, B and D. Within this market segment, companies active in retail distribution mainly chose the B configuration.

Market segment	A configuration	B configuration	C configuration	D configuration	E configuration	Total
Retail	43	19	0	57	1	120
Containers	0	39	3	19	0	61
Ornamental horticulture	21	1	1	21	0	44
Other	4	0	0	17	9	30
Volume	3	0	1	18	0	22
Waste/bulk	0	0	0	14	1	15
Packaging	1	1	0	3	5	10
Total	72	60	5	149	16	302

Table 3.3
Number of LHVs per market segment per configuration (LHV survey, 118 companies)

3.3 Haulage firms, own transport and initiative by client

Eighty percent of companies with LHVs are haulage firms and 20% are shippers using their own transport. In nine out of ten haulage firms, the companies themselves decided to start using LHVs. And in one out of ten haulage firms, the initiative was taken by the client.

3.4 Preconditions

The majority (66%) of LHV companies are satisfied with the current preconditions under which LHVs are permitted to drive in the Netherlands. Of the companies that currently do not use LHVs, 94% indicated that they do not need the preconditions to be modified. Those companies that do want the preconditions to be modified, all want to use LHVs internationally.

Most of the suggested improvements that were put forward primarily concerned the aspect of issuing exemptions (see next paragraph).

The companies were also asked to provide suggestions regarding the use of LHVs. Seven indicated a need for more parking spaces at service areas. The parking spaces should also be indicated more clearly, and closer supervision regarding compliance is needed. During the seminar the companies clearly indicated the fact that there is a greater need for more decoupling points than more parking spaces.

3.5 Exemptions

In the questionnaire respondents were asked to indicate if there were points for improvement with regard to the issuance of exemptions. More than half of the companies (60%) felt that there were points for improvement. The following suggestions were put forward:

- The need for one exemption for all core areas and the network of roads;
- As an alternative to a single exemption, it was suggested that the period during which the exemption applies should be extended. For example to five years instead of one year;
- Shorter decision-making processes when applying for a new core area;
- A few respondents indicated the desired to receive an automatic notification just prior to the termination of the exemption; similar to the national Dutch system for driving licences and passports.

The desire to have one exemption for all core areas and network of roads was due to cost savings on the one hand, and the administrative burden and limited flexibility regarding the use of equipment on the other. The last-mentioned argument was considered the most important. Companies that served multiple destinations would welcome the reduction in administrative burden if as a result only one exemption being introduced. Additionally, some destinations were only visited a limited number of times per year which meant the effort required to submit the application was extra cumbersome.

An important reason for limiting the exemption period to one year was that the local traffic situation can (quickly) change in this period. For example, the construction of a new bicycle path or a new school could have a significant impact on the traffic pattern. This allows road administrators to assess whether a change in circumstances could get in the way of a new exemption when a company applies for an extension.

According to the companies, submitted applications take too long to process. (NB: if the RDW is given autonomous discretion regarding a specific application, then the RDW aims to grant the exemption within five working days). But the fact remains that procedures are more time consuming than companies like. Various companies in the ornamental horticulture sector indicated that when an exemption application was refused, the road administrator failed to provide reasons for the decision. Traffic safety was sometimes used as an argument to refuse an application. From the transporter's perspective some situations suggested this decision was incomprehensible. These companies would much appreciate the road administrator visually demonstrating their positions.

At the start of the survey it turned out that some companies with LHVs were driving with expired exemptions. The questionnaire also revealed that around 10% of the companies had insufficient knowledge regarding the validity of an exemption. Some of these companies indicated that it has been over a year since they applied for an exemption.

Need to expand core areas

Over 40% of the companies indicated that they had applied for an exemption for specific areas, however they had not been issued the exemption. This mainly concerned N roads and roads with railway crossings by which distribution centres and production locations are reached.

Within the retail market segment, some companies have to stock shops which are almost exclusively located in city centres. At the moment these companies must travel a lot of extra kilometres between these shops and the decoupling points outside the city. Some of these companies have indicated that if they were able to decouple nearer to the city centres they could reduce the number of kilometres travelled.

Some companies in the container market segment use LHVs on all journeys and all distances travelled, including areas without exemptions, and then decouple the LHV. If the number of core areas were to be expanded, this could lead to a reduction in the number of times that LHVs were required to decouple.

Nearly all companies in the waste/bulk market segment indicated that exemptions had been granted for nearly all areas. However, this did exclude several provincial roads to and from waste processing plants (incinerators).

3.6 Innovation

The transport sector is not typically a sector characterised by leadership in innovation. Nevertheless, the use of LHVs for road transport has proven a true innovation. The vehicle bodywork specialists have responded to the development that more and more companies and market segments are using LHVs. Real innovations have been achieved on B-configuration vehicles, in particular regarding the use of LHVs in retail distribution where vehicles are frequently decoupled. The case description on retail in chapter five provides further information on the different types of LHVs for retail distribution.

The loading and unloading system between the front and back load compartment is a somewhat older innovation that is widely used by the ornamental horticulture sector. This means that the LHV does not require to be decoupled during loading and unloading. Following on from this market segment, companies that are active in volume transport are also considering switchover to such a system.

A small number of companies are experimenting with other types of fuel. Among them, Versteijnen has several LHVs that run on natural gas. A fast-fill system is used to refuel with CNG. The Netherlands only has a limited number of CNG filling stations, however this number is on the increase.

3.7 Journey pattern by market segment

Table 3.4 shows that the use of LHVs gives small differences by journey pattern per market segment. Retail, ornamental horticulture, packaging and volume clearly show that point-to-point transport is the most common transport pattern. In the container transport sector, point-to-point transport and the combined journey (point-to-point-to-point) occur most frequently.

	Retail	Containers	Ornamental horticulture	Waste/bulk	Packaging	Volume	Other
journey pattern point-to-point	64%	57%	60%	45%	67%	88%	46%
journey pattern point-to-point-decoupling-multiple points	36%	29%	13%	9%	17%	0%	8%
journey pattern point-multiple points	16%	19%	40%	18%	17%	25%	31%
journey pattern point-to-point-to-point (combined)	14%	52%	20%	27%	33%	13%	15%

Table 3.4
Journey pattern by market segment (LHV survey, 118 companies)

3.8

Need for international use

Over 70% of interviewed LHV companies indicated that, if permitted, they would use LHVs for international transport. Even though non-LHV companies have stated that they achieve greater turnover from international transport, the percentage of companies that thinks they will use LHVs for international transport is lower than among LHV companies. The main reason why companies indicated that they do not want to use LHVs is due to the restriction on the weight limit.

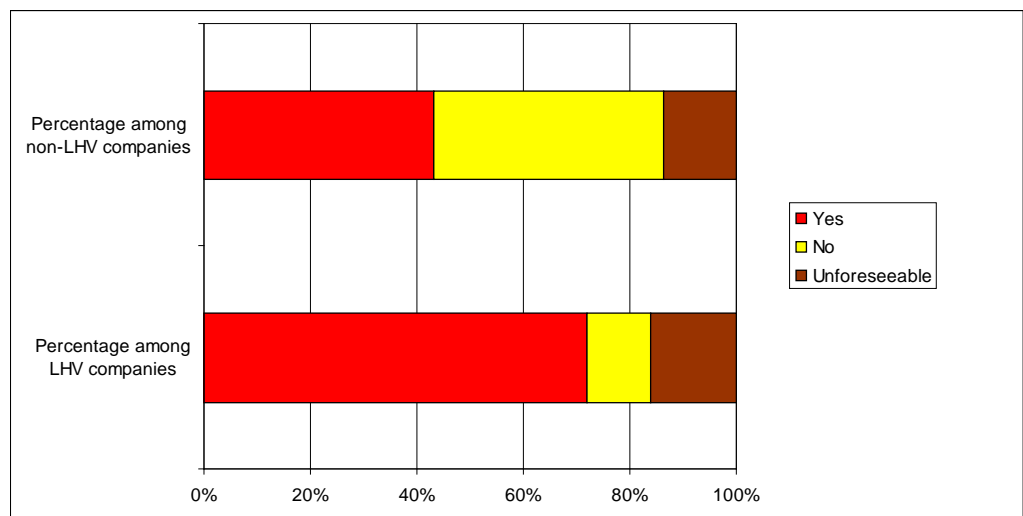


Figure 3.4
Do you think you will use LHVs internationally if this option presents itself?
(LHV survey, 118 companies and non-LHV survey 51 companies)

Not every country in Europe will permit a weight limit of 60 tonnes. This means it is important to gain insight in the minimum required weight category. According to the questionnaire the needs differ strongly. It is also striking that, among non-users of LHVs, the minimum required weight limit is higher than among LHV companies. This could be due to the fact that companies that have gained experience with LHVs see better uses than non-users, e.g. through different cargo combinations.

Required tonnage for international transport by market segment

The diagram below shows that the minimum required (total) weight in the international LHV transport differs per market segment. Because of volume density and empty weight of the equipment, in particular in the container and bulk transport sectors, the expectation is that companies would require a minimum weight of over 55 tonnes. However, the majority of container companies would be satisfied with a minimum weight that is below 55 tonnes. The waste/bulk transport sector has a large need for heavy tonnage capability. This market segment is less suited for international transport via LHVs. The ornamental horticulture sector can make do with a relatively low tonnage. The retail sector shows huge differences with regard to the required tonnage.

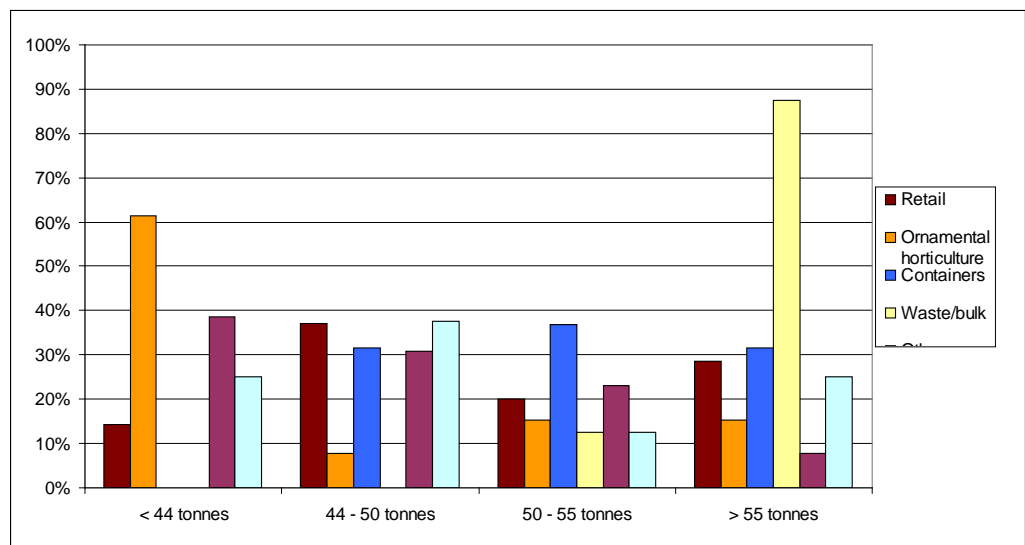


Figure 3.5

Minimum required tonnage (including empty weight) among LHV companies for international use of LHVs per market segment (LHV survey, 118 companies)

Almost half of the companies that currently do not use LHVs indicated that they thought they would require at least 55 tonnes for international transport. One in four thought that a tonnage of less than 44 tonnes would be sufficient.

3.9 Expansion of the LHV fleet

The companies that use LHVs were asked how many extra LHVs they expect to deploy up to the year 2015. These companies expected to operate a total of 339 extra LHVs. This is more than double the current number.

Of the total number of LHV companies, 25% expect to have two extra LHVs within five years. And over the coming five years, over ten percent of companies expect to be using more than five LHVs.

Among non-LHV companies around 30% expected to invest in one LHV over the coming years. Approximately 10% expected to be using more than one LHV.

In some market segments authorising the use of international transport with LHVs would be a true innovation. One express delivery company expected to be able to use at least 25 LHVs on international transport. The air freight sector would also be pleased if LHVs were used internationally. In other words, international transport via LHVs could have a huge impact on individual companies and sectors.

The majority of non-LHV companies do not expect to use LHVs. However it is important to realise that these figures are only an indication because with only 50 respondents the random check among non-LHV companies was relatively small.

The following table shows that almost 75% of LHV companies expected that their own fleet of LHVs will constitute less than 15%.

Future percentage of LHVs	% companies	Cumulative %
0-5%	37.1	37.1
5-10%	22.4	59.5
10-15%	12.9	72.4
> 15%	27.6	100.0

Table 3.5
Future percentage of LHVs as part of the fleet (LHV survey, 118 companies)

Based on the current number of LHVs and the expected expansion, the estimate in the previous monitoring study indicating that the size of the LHV fleet would range between 6 and 12 thousand vehicles appears to have been overly optimistic.

Expansion of LHVs by market segment

Figure 3.6 shows that companies whose primary market segment is the retail sector have the biggest plans with regard to expanding their LHV fleets. The retail sector is the most important market segment of around 40% of LHV companies in the Netherlands. It is therefore logical that the biggest expansions might be expected to occur in this sector; these companies indicated that to mid-2015 they would possess a total of 152 extra LHVs (45% of the mentioned development plans).

Over the coming five years the container sector expects to show a 19% (66 LHVs) increase among current users of LHVs. The ornamental horticulture sector, which represents around 13% of the total number of LHV companies in the Netherlands, expects to expand their fleet by around 39 LHVs (11.5% of the mentioned development plans).

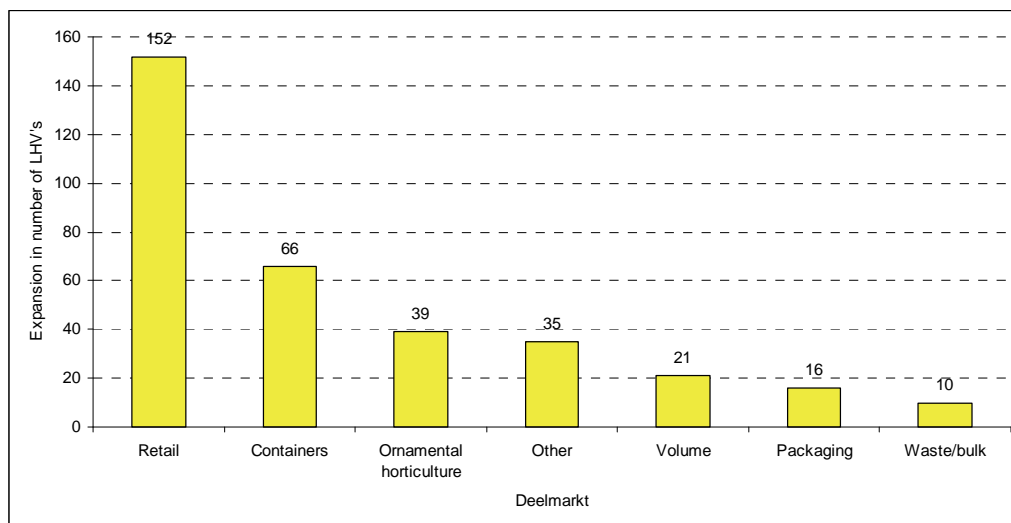


Figure 3.6
Development plans of LHV companies by market segment (LHV survey, 118 companies)

4 Social effects

4.1 Geographical intensities

Providing clear insight in the intensity of the use of LHVs on the Dutch roads is complex. A quantitative overview of the motorways based on the journey analysis can easily give a distorted picture. That is why a qualitative impression is given per market segment.

Intensity	Motorways
High	A12, A28, A50, A1, A15, A4, A27
Significant	A2, A58, A16, A7, A73, A32, A10, A20, A6
Moderate	A44, A17, A67, A59, A35, A30, A13, A9, A18, A37, A325, A31
Low	A76, A77, A65, A79, A261, A270, A5

Table 4.1

Intensity of LHVs per motorway (journey analysis, 51 companies)

In the retail market a spread of the use of LHVs can be observed across the entire network. The intensity is obviously higher on the motorways around the distribution centres of a number of leading supermarket chains. The container transport sector also makes use of the entire LHV network. Although there is a higher concentration from the port of Rotterdam to inland terminals such as that in Tilburg. The transport of ornamental horticulture products is concentrated on the motorways between auction locations in Naaldwijk, Aalsmeer, Rijnsburg, Eelde, Bleiswijk and Venlo. A higher than average intensity is observed especially between Naaldwijk, Aalsmeer and Rijnsburg. This concerns the A4 motorway. Waste transport is mainly transported to national waste depots and processing locations in the Randstad, and between slaughterhouses and meat processing plants in North Brabant/Gelderland and Friesland.

The number of exemption applications for core areas in the Netherlands has been registered. Although this is not equivalent to the traffic intensity, it does give an impression of which core areas might expect a higher traffic intensity. The following table shows that auction locations are frequently located in core areas. The Rotterdam port is divided into different areas: Botlek (70), Maasvlakte (69), Europoort (46) and Vondelingenplaat – Eemhaven (56).

Core area (city)	Industrial area	Number of exemption applications
Rotterdam	Botlek (70), Maasvlakte (69), Europoort (46) and Vondelingenplaat-Eemhaven (56)	241
Amsterdam	Westelijk Havengebied	109
Tilburg	Loven	89
Bleiswijk	Klappolder	82
Delfgauw	Ruyven	79
Honselersdijk	Tradepark Westonia	78
Aalsmeer	Bloemenveiling Aalsmeer / VBA site	77
Zwolle	Marslanden	77
Barendrecht	Dierenstein	76
Breda	Heilaar	76
Venlo	Venlo Trade Port	74

Table 4.2

Top 10 of core areas by exemption applications, source: RDW

4.2

Time of day

The following table shows the pattern of the daily use of LHVs. This shows that LHVs are primarily used during the day between 06:00 and 19:00, and that their use is lowest between 23:00 and 03:00.

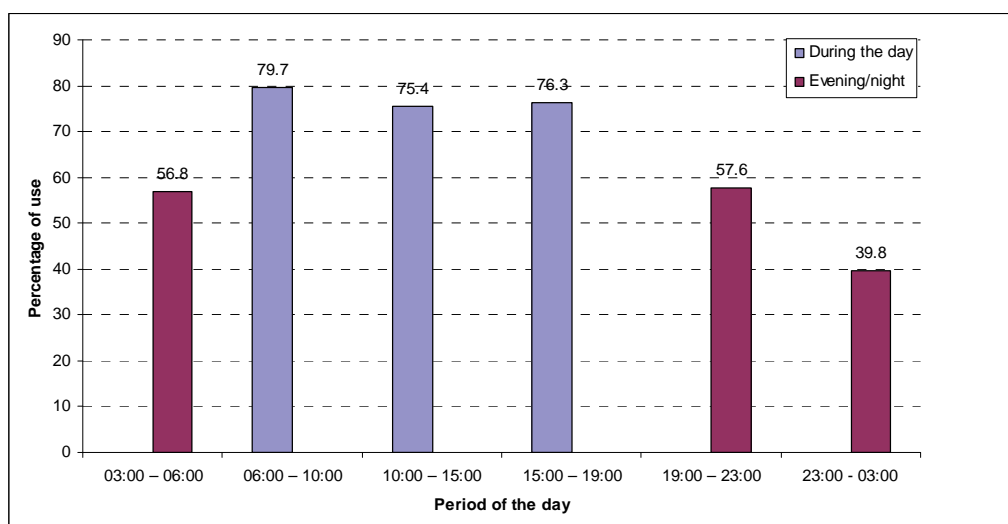


Figure 4.1

Average use of LHVs by period (LHV survey, 118 companies)

LHVs by period per market segment

Table 4.3 shows that in the ornamental horticulture market segment LHVs are regularly used during the day and at night. Where the packaging sector is concerned the LHVs are mostly used in the early morning and during the day. And in the waste/bulk market segment, the LHVs are mainly used during the day. The use of LHVs is related to the opening hours of clients and consumers.

Period/market segment	Retail	Containers	Ornamental horticulture	Waste/	Packaging	Volume	Other
03:00-06:00	57%	57%	73%	36%	50%	50%	62%
06:00-10:00	77%	90%	67%	100%	83%	88%	62%
10:00-15:00	70%	81%	67%	100%	83%	88%	62%
15:00-19:00	75%	86%	73%	100%	33%	75%	69%
19:00-23:00	61%	62%	87%	36%	0%	50%	54%
23:00-03:00	43%	24%	73%	18%	0%	25%	62%

Table 4.3
Use of LHVs by period per market segment (LHV survey, 118 companies)

4.3 Effects of LHVs

Increasing use of LHVs

The use of LHVs in the Netherlands is still in a trial phase. In other words, companies investing in LHVs face uncertainties with regard to the period during which the use of their LHVs will (continue to) be authorised. Moreover, the preconditions subject to which LHVs can be used may also be altered with each extension of this period. Until now the trial has been extended successively and, with the exception of a temporary period when the weight limit was reduced from 60 to 50 tonnes, the conditions subject to which LHVs could be used have become more flexible; all except for the strict conditions that apply with regard to safety.

In spite of this uncertainty the number of LHVs has steadily increased and some companies are still investing in new LHVs. On the one hand, this concerns companies that, based on their experiences, see possibilities to expand their fleet with LHVs. On the other hand, this stimulates competitors to consider using LHVs and, where possible, to actually start using them. The decision of various supermarket chains in the Netherlands to make greater use of LHVs has also contributed to the growth.

The following figures are based on the web survey and the journey analysis.

Of the 302 LHVs, some 275 are used on a daily basis. In other words, 9% of LHVs are not used daily. For example because the client's order flow is not based on a daily pattern. In this case regular vehicles are used.

Distances travelled

In accordance with the policy goal LHVs are mainly used between industrial sites, ports and transshipment areas. This was also underlined by the questionnaire whereby companies indicated that point-to-point transport was by far the most frequently used (60%) journey pattern.

Journey pattern	Percentage
Point – point transport	60.2%
Point – point, decoupling, multiple points	22.9%
Point – to multiple points (distribution journey)	22.0%
Point-to-point-to-point (combined journey)	23.7%

Table 4.4
Journey pattern (LHV survey, 118 companies)

This concerns journeys along relatively long distances. LHVs travel an average of 416 kilometres per day or 104,000 kilometres annually. This distance corresponds with the distance travelled by regular vehicles that previously performed this work. For domestic journeys the annual average distance travelled is above the average distance for domestic transport. Trucks drive between 80,000 and 90,000 kilometres per year. This is partly dependent on the market segment and the extent to which these vehicles travel to city centres. As the character of the distribution pattern rises, so does the annual distance travelled decrease towards 60,000 kilometres.

Load

Participating companies were asked to indicate the average LHV load on the outbound and return journeys. Despite the higher volumes the pattern was similar to that of regular vehicles.

Market segment	Outbound journey	Return journey
Retail	22 tonnes	18 tonnes
Containers	3 TEU	3 TEU
Ornamental horticulture	14 tonnes	11 tonnes
Waste/bulk	35 tonnes	empty
Volume	14 tonnes	5 tonnes
Packaging	7 tonnes	5 tonnes
Other	26 tonnes	16 tonnes

Table 4.5

The average load of an LHV on the outbound and return journey (journey analysis, 51 companies)

Reduction in vehicle kilometres

As mentioned an LHV will typically drive an average of 104,000 kilometres per year. This means that 397 LHVs will travel around 41 million kilometres in a year. With a 2:3 savings ratio this corresponds to a reduction of over 20 million kilometres annually, or the equivalent to around 200 regular vehicles per year being taken off the road. If these vehicles were to be lined up without gap between them, these 200 vehicles would collectively cover a distance of over five kilometres.

Fuel savings

LHVs consume an average of 10% more fuel than regular vehicles. Whereas regular vehicles drive an average of 3.14 kilometres per litre, LHVs drive 2.85 kilometres per litre. As a result total fuel savings amount to 5.2 million litres diesel.

4.4

Emissions

Carbon footprint

A trend can be observed among clients and shippers, in particular the big shippers, whereby, within the foreseeable future, they desire to have a carbon footprint of the transport sector. The chain must reduce its CO₂ emissions. Expectations are that the priority will mainly lie on intermodal transport, whereby as much as possible will be transported by rail and/or inland shipping. However, the road transport sector should also aim to reduce its CO₂ emissions. LHVs definitely play a role in the reduction of CO₂ emissions, both regarding road transport and in connecting to intermodal transport. Additionally, methods to reduce emissions by LHVs by using alternative fuels are currently also being investigated. LPG is one of the alternative fuels that is being experimented with.

As a result of using LHVs some 20 million vehicle kilometres are saved annually. To assess the environmental effects STREAM¹ indices have been used. The number of kilometres saved is multiplied by the average of a container/non-bulk vehicle of over 20 tonnes and a truck plus trailer.

Emission in gram/km	Container/Non Bulk > 20 tonne	Container/Non Bulk truck plus trailer
CO ₂	824	733
NO _x	9.23	7.92
PM ₁₀	0.2	0.161
SO ₂	0.013	0.011

Table 4.6

Indices to calculate emissions, source: STREAM CE Delft

The emission of contaminants is directly related to fuel consumption. A reduction in fuel consumption directly leads to a reduction in CO₂ and NO_x emissions. The production of fine particles (PM₁₀) is related to the type of engine and fuel consumption. Table 4.6 shows the savings in kilogram per emission.

Emission	Savings in kg
CO ₂	16 million
NO _x	177 thousand
PM ₁₀	3.7 thousand
SO ₂	0.25 thousand

Table 4.7

Reduction per emission

Noise effect

At the end of 2004 a noise measurement study was conducted on an LHV. This involved a B-configuration vehicle equipped for transporting three TEU sea containers. The measurements showed that this combination produced an increase of approximately 0.8 dB(A) in noise emission in comparison with the regular vehicle combination of two TEUs. These measurements were limited to sea containers and were not conducted on other cargo types. According to a calculation in 2004 a decline in the number of journeys as a result of the use of LHVs will yield a noise reduction of 0.6 dB(A). At that time the conclusion was that this would result in an almost undetectable noise reduction, as human beings are barely able to discern a reduction of 1 dB(A) or less. In other words the noise effects from the use of LHVs would be so limited that the effect from the use of LHVs can be deemed neutral.

4.5

Engine type

Looking at all market segments, nearly two-thirds of LHVs in the Netherlands are pulled by a vehicle with a euro 5 engine. Almost 29% of vehicles has Euronorm 3. This corresponds with developments in the market for regular vehicles.

¹ STREAM, developed by CE Delft, is a database containing the emissions of different transportmiddelen.

The fleet of LHVs in the retail market segment is 'cleaner' than the average fleet of LHVs in the Netherlands; four out of five LHVs in this market segment have a Euro-5 engine.

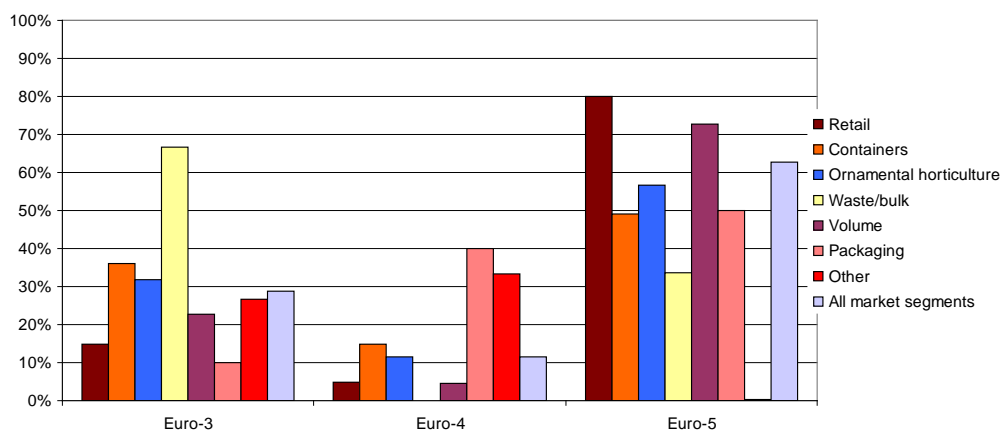


Figure 4.2
Percentage of LHVs by Euronorm per market segment (LHV survey, 118 companies)

The engine type used in LHVs in the containers market segment differs slightly from all other market segments, 36% of the LHV fleet has a Euro-3 engine, 15% has Euro-4 and 49% has a Euro-5 engine. In view of the fact that the container market has been involved in the pilot project since its introduction it is only logical that the fleet of LHVs in this market segment is slightly older than in other segments. The engine type in the LHV within this market segment is similar to that used in all market segments.

The 'waste/bulk transport' market segment differs strongly from the other market segments. Two-thirds of the LHV fleet has a Euro-3 engine and one third has a Euro-5 engine. The low percentage of LHVs with a Euro-5 engine could be due to the age of the LHV fleet in this sector: only 18% of LHVs in this sector were recently purchased. Furthermore, the loading and unloading locations are generally situated on industrial sites that generally do not have environmental zones.

4.6 Number of axles and axle load

The number of axles under a vehicle is dependent on the transported weight. The lighter the transported goods (bulk goods like rock wool, ornamental horticulture, air freight, express and electronic products) generally the lower the number of required axles.

Just under 75% of LHVs belonging to the interviewed companies in the retail market segment had seven or eight axles. Only one company – a transporter of light household products – had an LHV with five axles. Twenty-five percent of companies had one or more LHVs with six axles. The weight of cargo in this market segment differed strongly, varying between four and 40 tonnes.

The LHVs in the container transport sector consist of vehicles with both nine and ten axles. The benefit of vehicles with ten axles is that they have a lower axle load which makes it easier to load the vehicle up to the maximum weight of 60 tonnes. The 20ft sea containers, in particular, are relatively heavy and this makes it easier to transport them.

Nearly all LHVs in the ornamental horticulture market sector have six axles. Because of the low relative density of the cargo, this is sufficient. The weight of the cargo of a fully loaded LHV varies between six and 15 tonnes. The LHV companies in this market segment do not have any operational problems with regard to staying under the permitted weight. Only one company had an LHV with nine axles. This concerned an LHV of the B configuration category which has three steerable axles. In addition to ornamental horticulture products, the company also transports vegetables and fruit. In order to make flexible use of these vehicles in different market segments, the LHV is required to have more than six axles.

LHVs that primarily transport industrial and household waste are generally equipped with seven or eight axles. LHVs that transport offal have eight or nine axles.

Figure 4.3 shows the average axle load per market segment. LHVs in the waste/bulk market segment have the highest axle load. Given the fact that waste products generally have a high specific gravity, this is in accordance with expectations. LHVs in the container transport segment generally have a relatively low axle load. This corresponds with the higher number of axles that LHVs in this sector are generally equipped with. It is also evident that LHVs in the ornamental horticulture sector, which have a low axle load and a relatively limited number of axles, transport products with a low relative density.

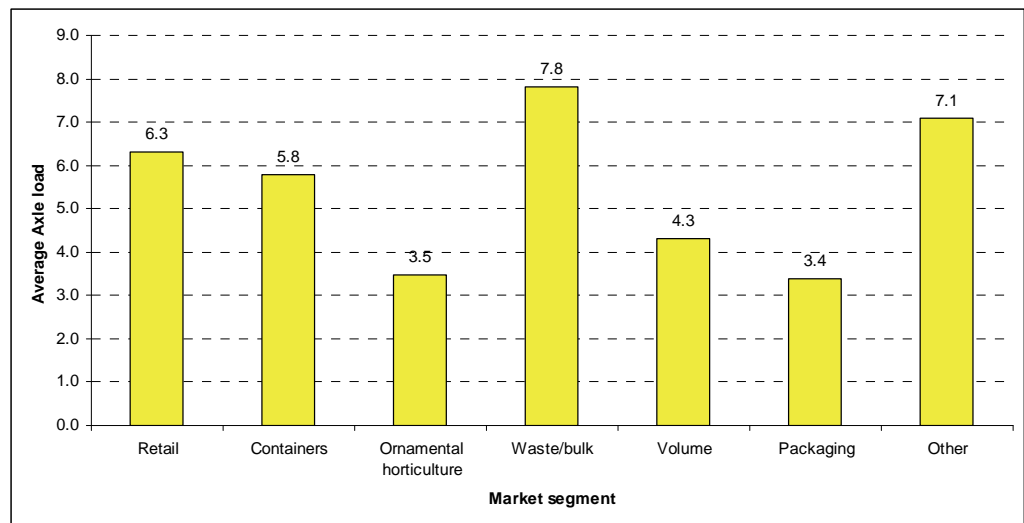


Figure 4.3
The average axle load per market segment (journey analysis, 51 companies)

4.7

Reverse modal shift

A reverse modal shift refers to a situation in which goods are first transported by rail or inland shipping and subsequently transported by road transport. During the interviews respondents were asked whether they considered a reverse modal shift to be likely. The transporters unanimously agreed that a reverse modal shift would

not occur. This is also evidenced by the journey analysis. LHVs are only used as a replacement for regular road transport. Among the majority of companies two LHV journeys correspond to three regular journeys. Because this concerns regular goods flows, for example from a production location or supplier to a distribution centre, the LHVs are used in a similar way as regular vehicles. This means an increase in road transport efficiency. The transported volume remains the same, but, where empty vehicle kilometres on the return journey used to be frequent, due to the use of LHVs the number of empty vehicle kilometres has declined.

The fact that road transport is dominant in the retail and ornamental horticulture market segments is due to aspects such as speed and accessibility. For the transport between seaports and inland terminals, the container transport sector mainly relies on inland shipping and rail. Due to the need for rapid delivery (for example for high value products) a small percentage is transported via road.

If international transport with LHVs is authorised, then the container transporters do not expect any competition between rail and road transport on long distances either. This is mainly because, from an economic standpoint, a good intermodal connection will continue to be more appealing than road transport with LHVs.

The previous monitoring study also showed that a reverse modal shift is unlikely to occur.

5 Market segment: retail

One of the innovations of the B configuration: a truck with two city-trailers with normal rear closure loading flaps whereby it makes no difference which trailer is coupled in front and in the rear.



The retail market segment is the fastest growing market segment in the Dutch LHV transport. Looking at the future, the greatest growth is also expected to occur in this area. Some 44 transporters and shippers that are active in the retail sector participated with a total of 120 LHVs.

5.1 The market

Within this market segment, LHVs are used on three route types:

- Firstly, the route between the manufacturer and their distribution centre and/or – if the distribution activities are outsourced – the logistical service provider's distribution centre.
- Secondly, the route between the manufacturer's and/or logistics service provider's distribution centre, and the retailer's distribution centre.
- Thirdly, the route between the retailer's distribution centre and, after being decoupled, the retailer's shops.

Products in the retail market that are transported with LHVs can broadly be divided into foods and household articles. Thus far, companies within this market segment have rated the use of LHVs as varying between good and very good. The presence of large transport flows between the hubs mentioned proved to be an important reason for using LHVs.

Clients in this market segment are mostly supermarket chains, retail chains for household articles, and food wholesalers. These companies include Albert Hein, C1000, Spar, and Jumbo, but also Blokker and Zeeman.

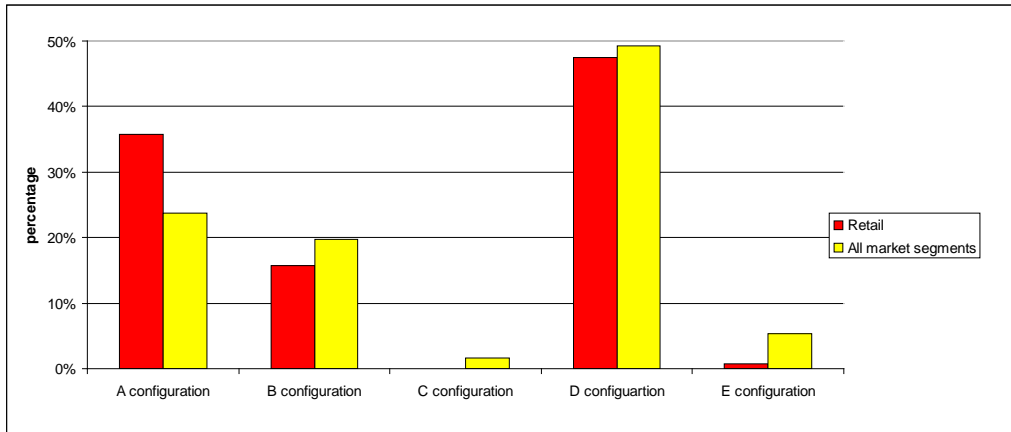


Figure 5.1
Percentage of LHVs by configuration, container market segment and all market segments (LHV survey, 44 companies)

5.2 LHV companies

Companies that are active in the retail sector are characterised as a mixed group. This includes transport companies that have specialised in a market segment such as vegetables and fruit, but also companies that work directly for supermarket chains. And lastly, companies that transport products from the non-food sector. It is nearly always the transporters themselves who have taken the initiative to start using LHVs.

Most companies have between one and ten LHVs, and nearly 50% of them have one LHV.

Number of LHVs	Number of companies in retail
1	19
2	9
3	1
4	6
5	4
6	2
7	2
10	1

Table 5.1
Number of companies by number of LHVs (LHV survey, 44 companies)

From 2004 onwards at least one company has started purchasing LHVs. The year 2009 was a peak year. In that year 15 companies started using an LHV.

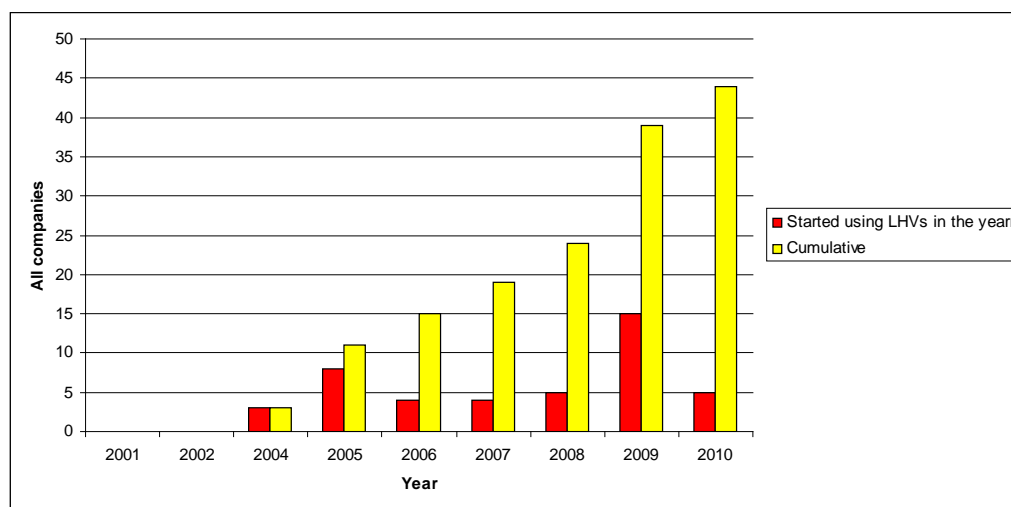


Figure 5.2
Development of the number of LHV retail companies per year (LHV survey, 44 companies)

5.3 Type of vehicles

The configuration types that are most widely used in this market segment are the A and D configuration. The LHV B configuration is also used. Transporters that used the last-mentioned configuration all operate in the retail distribution sector, this concerns a relatively recent innovation. The C and E configurations are hardly used. The interviewed companies that indicated that they use a B configuration vehicle – eight in total – said that they had purchased the following versions:

- D-Tec Burgers
- 2-City
- Combitrain
- triCS

D-Tec Burgers, a bodywork specialist, has introduced two types on the market, namely one with a front trailer 8.20 metres in length and a rear trailer, with two or three axles, that is 13.60 metres in length. The second type is a combination with two 10.5 metre long city trailers. The LHV can also be fitted with steerable axles. The trailers are coupled via a dolly with one or two axles.

In 2009 a group of bodywork companies, Van Holten/Stam/Broshuis, introduced the 2-City type with two 10.4 m long trailers. Both trailers are steered, which means that goods no longer have to be transferred from the LHV to city trailers or other vehicles on behalf of city distribution. The two identical trailers are coupled via a single axle steered dolly.

Over the past years manufacturers, suppliers and rental companies have started putting a new version of the B-configuration LHV on the market. This concerns an LHV without a separate dolly. One such rental company is Twan Heetkamp. This company introduced a type with a short extendable trailer with two axles. A 7.80 metre long container is positioned on the trailer. After locking the trailer's brakes and unlocking the sliding system, the driver can extend the trailer. This allows it to function as a dolly. A normal 13.60 metre trailer can now be coupled to the turntable. In addition to a version with two rigid axles, another version has a steered rear axle.

In 2009 the manufacturer Tracon Trailers put the Combitrain on the market. This type of LHV has a front trailer that is equipped with an extendable axle system. When the axle is retracted one or two axles are lifted to create a city trailer. If the axle is extended and lowered a successive trailer can be coupled. The rear trailer can be a standard City trailer.

Two other suppliers, Jumbo and Heiwo, have put the 'TrICS' type on the market. The axles of the front trailer can be moved backwards to reveal a turntable for the second trailer. TrICS stands for Trailer Integrated Coupling System. Both axles on the first trailer and the two rear axles on the second trailer can be steered electronically.



Figure 5.3
The combitrain variant

5.4

Use of LHVs

The use of LHVs within this market segment corresponds to the average use of LHVs in the Netherlands. Three-quarters of the companies use the LHV during the day – between 06:00 and 19:00. Around half of the companies use the LHV during the night-time hours. The night-time is mainly used for transport between distribution centres. During the day, the LHVs are also used for retail distribution.

Period/market segment	Retail	All market segments
03:00-06:00	57%	57%
06:00-10:00	77%	80%
10:00-15:00	70%	75%
15:00-19:00	75%	76%
19:00-23:00	61%	58%
23:00-03:00	43%	40%

Table 5.2
Use of LHVs by period (LHV survey, 44 companies and 118 companies)

Around two-thirds of the transporters said that they use LHVs in shuttle format (point-to-point transport). This form of transport essentially comprises shuttling between two distribution centres. This percentage is similar to that across all market segments. The LHVs generally decouple during the journey and subsequently drive to multiple points. This occurs more frequently in this market segment than on average in all market segments as a whole. This is explicable due to the fact that in addition to driving between distribution centres, the LHVs are also used for retail distribution. Combination journeys to multiple loading /unloading points is a rare occurrence in this market segment. The routes are spread out throughout the Netherlands. Both short and long journeys are made. With the exception a few companies, all respondents stated that they transport return cargo from the

destination and/or the vicinity of the destination to the point of departure and/or vicinity of the departure point. This return cargo often includes a combination of retail products (returned articles or other kinds of consumer articles) and packaging materials.

This market segment did not require any drastic changes within the logistical chain to be able to accommodate LHVs. However, shippers and recipients must take into account that they provide sufficient space for LHVs to load and unload at the loading docks. Some clients in the retail market admitted that they prefer to receive LHVs instead of regular combinations. These companies increasingly organised their logistical process to accommodate the shipping and receipt of goods via LHVs. Communication within the chain is very important, among these companies but particularly among companies that have not yet made adjustments. If a company fails to give timely notification regarding the loading or unloading of an LHV this can place a huge burden on the logistics planning, for example on the available space.

	Retail	All market segments
journey pattern point-to-point	64%	60%
journey pattern point-to-point-decoupling-multiple points	36%	23%
journey pattern punt-multiple points	16%	22%
journey pattern point-to-point-to-point (combined)	14%	24%

Table 5.3
Journey pattern of LHVs (LHV survey, 44 companies and 118 companies)

5.5 Savings and investments

Two-thirds of interviewed companies indicated that most cost savings are made on the costs of drivers. One quarter of companies said that they save most on fuel. LHVs in this market segment use around 5% to 10% more fuel than a regular combination. But as LHVs can carry 50% to 60% more volume than regular transport vehicles, this results in considerable savings. In the supermarket distribution – whereby the wheeled container is the primary carrier – the volume benefits of the newest variant of the B configuration can reach over 60%. Nevertheless for some companies especially in retail distribution, savings are too modest. This is primarily due to the fact that the distance between decoupling points and shops is so large that this reduces the savings, and that the purchase price of the new LHV configurations is much higher than of the old configurations.

For D configurations the main investment concerns the purchase of the dolly, which costs approximately 20,000 euro. For companies using A-configuration vehicles, depending on the available equipment, the conversion costs can vary between 3,500 and 8,500 euro. In any case, the required extra facilities must be installed. These include an axle load measuring system, side protection between the wheels and a mirror kit in accordance with the latest European regulations.

The supermarket distribution sector faces potentially high costs. This is certainly true for chilled/frozen cargo. New configurations, with or without a truck, require investments of between 200,000 and 300,000 euro. Bodywork specialists offer a huge range of products. An important aspect here is the distance between the axles, as this determines whether a steerable system is required due to the extra fifth

wheel coupler pressure. The costs of trailers vary between 65,000 and 100,000 euro, depending on the type of cooling, loading flap and the type and number of axles.

	Retail	All market segments
Fuel costs	27.3%	28%
Driver costs	65.9%	61%
Other cost item	6.8%	11%
Total	100%	100%

Table 5.4

Percentage of LHV companies by greatest cost saving through the use of LHVs (LHV survey, 44 companies and 118 companies)

Peter Appel Case

Peter Appel, established in Middenmeer, has a fleet of seven LHVs. In 2005 the company started with two LHVs, and from September 2010 it had three D configuration LHVs. The company's current fleet also includes four B configuration LHVs, one of which with a separate dolly and three with a so-called automatic extending system. The last-mentioned vehicle does not require a separate dolly. These four LHVs all have a Euro-5 engine. Peter Appel operates in the retail market segment. After stocking distribution centres, the LHVs decouple and then stock supermarkets. D-configuration LHVs provide the transport between distribution centres, and B-configuration vehicles are used for retail distribution. All LHVs are used to their maximum capacity: if possible seven days a week and 24 hours a day. In the Netherlands, the LHVs drive between distribution centres in a north to south direction, and vice versa. The cargo consists of a mix of products that are sold in the supermarket. The distribution journeys to the supermarket(s) differ per trip. After being loaded at a distribution centre, the LHV drives to a decoupling point at the edge of a city (Venlo, Maastricht and Amsterdam areas). At this location the LHV is split into two, the vehicle drives on to a supermarket in a nearby city. Another vehicle transports the second (city) trailer to a different store. After unloading, both vehicles return to the decoupling point carrying return goods and packaging material. The trailers are subsequently re-coupled to form a single LHV and then drive back to the distribution centre. The efficiency gains are achieved with the automatic extending system instead of using a separate dolly. The distribution centre must be prepared for the LHV's arrival. This is because some distribution centres only have a limited number of loading docks to process LHVs. Next to return goods and packaging material from the shops, the LHV also frequently transports cargo from manufacturers based in the surrounding area. To maximise savings the LHV should only be used on distances with a radius of at least 150 kilometres.

The company's experiences with the LHV are positive, and the management is considering expanding the LHV fleet. However, a large part of Peter Appel's fleet cannot be replaced by LHVs. This is because the majority of the transport occurs on short distances, and therefore the savings will be too low to justify the investments. Because of its versatility, the company considers the B-configuration vehicle to have the biggest potential for distribution transport.



5.6 International use and future expectations

Over two-thirds of the interviewed LHV companies in this market segment indicated that, if authorised, they would use LHVs for international transport. This percentage is in line with the average across all market segments. This desire to use LHVs internationally is remarkable, because two-thirds of the interviewed companies presently make less than 25% over their turnover from international transport. Within this market segment there are certainly opportunities for using LHVs for international transport. Over 16% of the companies in this market segment – which is slightly higher than average across all market segments – indicated that they will not use the opportunity to use LHVs internationally.

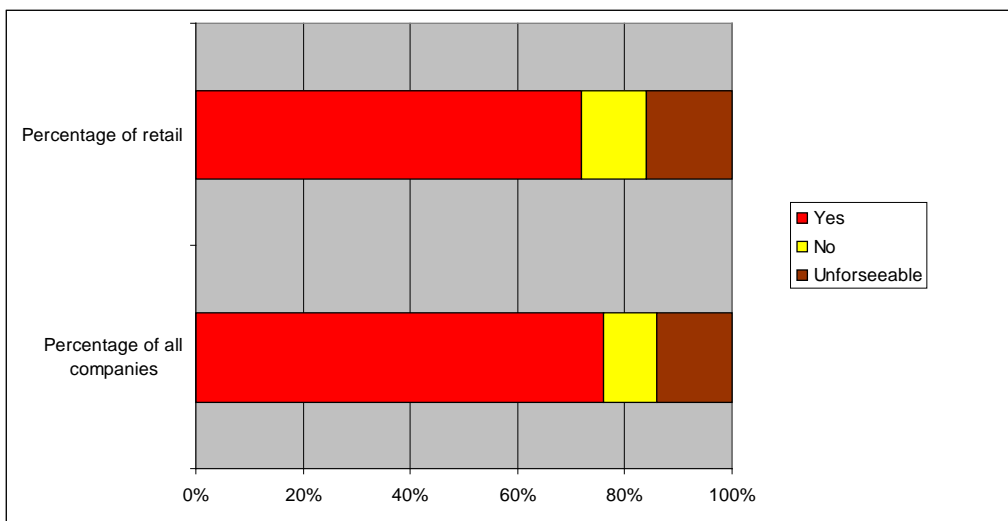


Figure 5.3
International use of LHVs (LHV survey, 44 companies and 118 companies)

The survey showed that companies are divided on the question of what the minimum required weight for LHVs on international transport should be. Half of the companies think that a weight of less than 50 tonnes will suffice, whereas the other half require at least 50 tonnes to use LHVs internationally. The division in this market segment is similar to the average picture across all market segments.

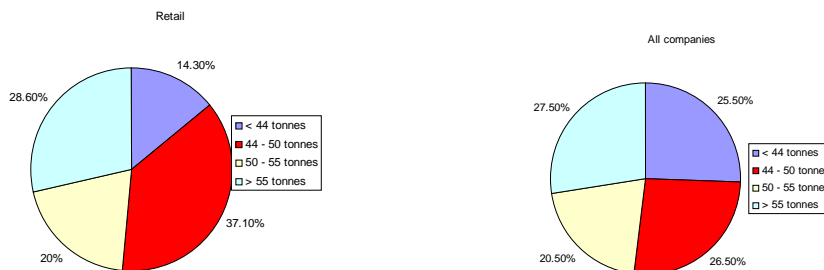


Figure 5.4
Minimum required weight limit for international transport (LHV survey, 44 companies and 118 companies)

Companies in this market segment that currently use LHVs were asked how many extra LHVs they expect to deploy until the year 2015. According to the responses they collectively expect to deploy 152 extra LHVs.

This expected expansion is more than double the current number and in absolute numbers – across all market segments – this is by far the biggest increase. This growth is primarily expected to occur in transport between the manufacturer and retailer, and between distribution centre and, after decoupling, and shops. However, the biggest growth is expected to occur among companies in retail distribution.

The figure below shows that around half of the LHV companies expect the percentage of LHVs to remain under 5% of the total fleet of vehicles. One quarter of the companies indicated that they expect the percentage of LHVs to increase to more than 15%. These are mainly companies that are active in retail distribution.

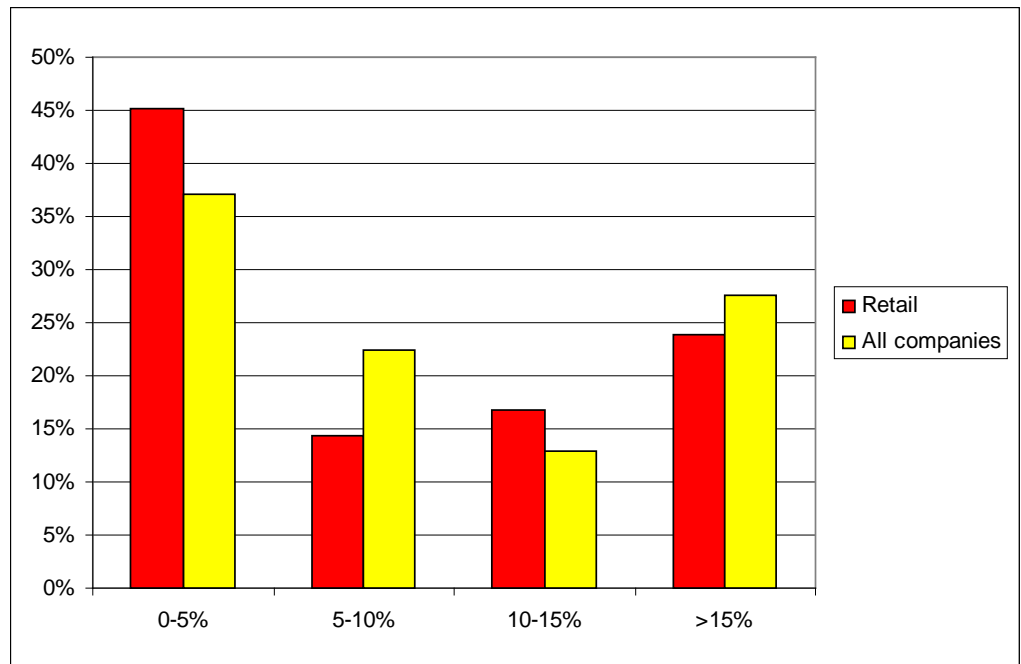


Figure 5.5
Future percentage of LHV transport (LHV survey, 44 companies and 118 companies)

6 Market segment: container transport

The photo below shows a B-double with ten axles, this is the most widely used type of LHV in the container transport sector.



Within this market segment, a total of 21 companies and 61 LHVs are taking part in the trial. One of the companies is established in Germany and drives its LHV in the Netherlands.

6.1 The market

In the Netherlands, the container transport sector took the initiative to start using LHVs. Koos Overdevest (KOV) Vervoer, a transport company from Nootdorp pioneered this initiative and directly participated in the first trial in 2001. The part of the road network that was used for the trial was limited to a number of designated routes. During the first years this route ran from the port of Rotterdam to Bodegraven. Various other transport companies subsequently started using LHVs. According to the state of play, based on the questionnaire that was conducted for this study, 21 companies in the container transport sector currently make use of LHVs.

Figure 6.1 shows the number of container transport companies that use LHVs. The years 2004 and 2008 saw a rise in the number of new participants. Upon commencement of the second trial phase in 2004, five companies registered, and during the course of 2008, when the weight limit once again increased from 50 to 60 tonnes, another six companies joined. According to the interviews the reason that other companies postponed their investment in an LHV was because of the weight restriction. In the other years, the increase in registrations fluctuated between one and two companies.

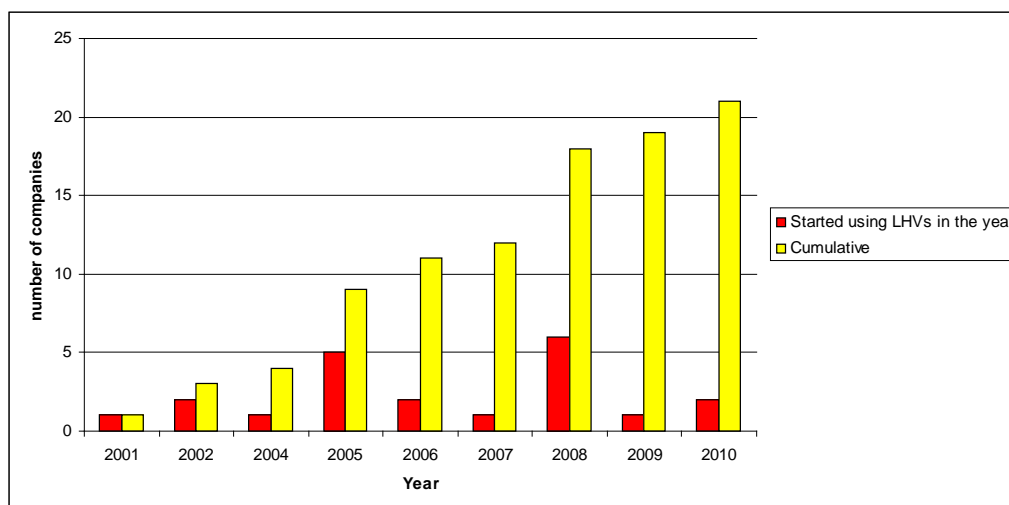


Figure 6.1

Development of the number of LHV container companies per year (LHV survey, 21 companies)

It can be concluded that all companies that deploy LHVs operate in the maritime container segment. The companies indicated that they are not active in the continental container/loading unit segment because they are not permitted to use LHVs to transport 45ft containers. The companies use the ports as a base of operations to organise journeys. All journeys are carried out from Rotterdam.

The most frequently used combination of loading units on the LHV is a 20ft and 40ft container. Companies are permitted to transport 45ft containers, however in accordance with the preconditions, the vehicle will need to be modified first. [Om aan de "kingpin setback" te voldoen some shipping companies have afgehoekt] the 45ft containers.

As the container transport sector generally ships heavy cargo, a number of companies put off their investments in LHVs until it was certain that the maximum cargo capacity would be set at 60 tonnes. The container transport sector considers a maximum cargo capacity of 50 tonnes to be too restrictive. In this case, because of the vehicle's own weight – which ranges between 20 and 25 tonnes - the cargo capacity is too limited. Some companies even consider 60 tonnes to be too restrictive. Transporters are often confronted with a vehicle that is loaded too heavily because the shipper has failed to give the correct weight of the cargo in the container.

6.2 LHV companies

The container transport sector that uses LHVs can be divided into three types of companies:

1. the transport companies that exclusively use LHVs in the Netherlands, and manage to achieve a gains in efficiency by combining journeys to customers;
2. the mainly small transport companies that manage to achieve a gains in efficiency by combining journeys to customers, and also transports goods/products internationally, whereby the LHVs are decoupled at the Dutch border;
3. the terminal operator in the hinterland that, in addition to transport by train and/or inland vessels, manages part of the port-related transport via road transport;

The transport companies mentioned under points 1. and 2. organise their journeys in such a way that they can serve multiple customers with just one LHV. This is done by delivering a full or empty container and collecting the full or empty container several hours later on the same day. Unlike in other forms of road transport, vehicles in the container transport sector hardly ever 'run empty', meaning the vehicle returns without cargo. This is for the simple reason that empty containers also cost money to transport. Companies often lack the time to organise the journeys in one day, especially where long journeys are concerned. In these cases, the vehicle is loaded on the evening before the journey. The transport companies indicated that LHVs hardly ever serve just one client. During the round trip the LHVs generally serve multiple clients, usually two. Clients rarely offer more than one container for transport. Even though, in some cases, transporters offer a discount for LHV transport, clients hardly make use of this. Another striking fact is that the large transport companies almost exclusively operate nationally.

The small transport companies, as mentioned under point 2, use LHVs for international transport, primarily to the Ruhr area in Germany and occasionally also to Belgium. When conducting international transport, the LHVs decouple at the Dutch border and continue their journey in smaller units. After delivery, they return to the decoupling point and then pick up the next container. The distances travelled beyond the border are usually limited to 60 kilometres.

On behalf of two terminal operators in the hinterland, the third type of transporter (namely Barge Terminal Tilburg (BTT) and Container Terminal Twente (CTT)), LHVs are deployed between the terminal and Rotterdam. Eighty percent of the cargo shipped via the aforementioned operators is transported by rail and/or inland shipping. The other 20% is shipped via road transport; around 5 to 10% of which via LHVs and the rest via conventional road transport. LHV cargo is always taken directly to the terminal. Whereas vehicles on conventional journeys generally drive straight to the client.

During weekdays both terminals have two LHVs that constantly drive between the terminal and Rotterdam. Part of the containers are always shipped via the road, this is because of the processing of "fast" containers from and to the port. So-called fast containers are containers that must be delivered to the client shortly after arrival in the port. In this case, the client is literally waiting for their cargo. In opposite direction, some containers must be delivered to the port in the short possible time because, in accordance with the container service's sailing schedule, they must be ready for shipping on time. LHVs are ideal for point-to-point transport. The LHV is always loaded or unloaded at the inland terminal. During the stage prior to and after transport by LHV the client is served with a conventional vehicle. Due to a lack of space or storage facilities at their own site, most clients do not want LHVs to drive to their location.

The following table shows the number of LHVs that the 21 companies have. Twenty companies have five or less LHVs. One of the terminal operators has 12 LHVs. It should be remarked that some of the equipment is regularly exchanged and not all vehicle units are used as LHVs on a daily basis.

Number of companies in the container market	Number of LHVs
6	1
5	2
4	3
4	4
1	5
1	12
21	61

Table 6.1
Number of companies by the number of LHVs (LHV survey, 21 companies)

LHV companies in the container transport sector generate a large part of their revenue from international transport, eight of the 21 (38%) companies generate over 25% of their total turnover from international transport. The other 13 (62%) companies generate 0-25% of their turnover from international transport. It is striking that two of the large companies (over 100 vehicles) almost exclusively operate domestically.

6.3 Type of vehicles

According to the survey, 21 container companies deploy 61 LHVs. Around 64% of the configurations comprise B-type vehicles; these are also referred to as B-doubles. Around 31% of the LHVs consist of D-configuration vehicles. And vehicles with a C configuration only make up 5% of the total deployed LHVs.

Another recent development observed in this sector is the combined use of combi-trailers and normal 40ft trailers. In this case the trailer is only used for 40ft containers. The trailer is relatively light, allowing for heavier cargoes to be transported. During the interviews that were conducted on behalf of this study, the companies indicated that the purchase costs of this configuration are lower, and according to expectations will be used more frequently in the future. Until now, B-doubles with two combi-trailers are mainly used to load and unload the three 20ft containers. A B-double with two 2 combi-trailers requires an investment of 100.000 Euro more than the amount invested in a regular truck. A B-double with a conventional 40ft trailer costs 80.000 Euro extra.

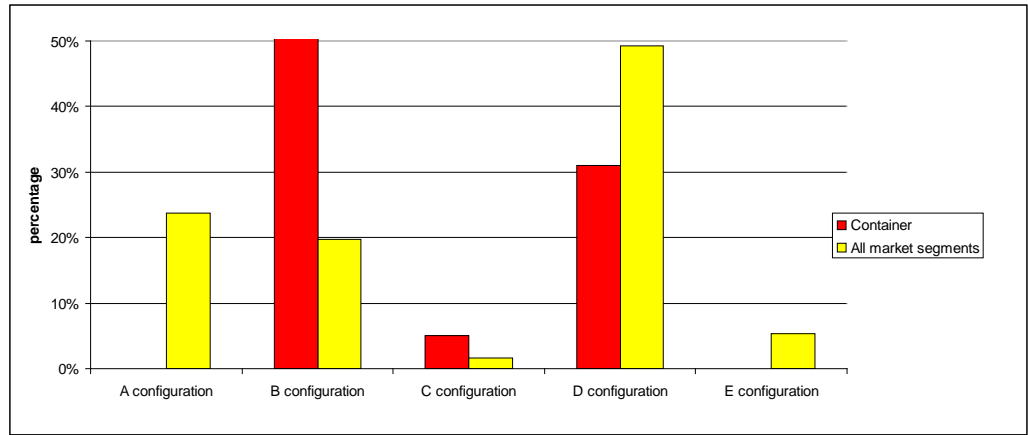


Figure 6.2
Percentage of LHVs by configuration, the container market segment and all market segments (LHV survey, 21 companies and 118 companies)

6.4 Use of LHVs

The following table illustrates how LHVs are used during the day, whereby companies broadly indicated the periods when the LHVs are used. Generally speaking, LHVs in the container transport sector work long days. The use of LHVs in this sector is slightly higher than the average across all market segments. This is due to the long hours that the LHVs make. The LHVs head out early to avoid early-morning congestion.

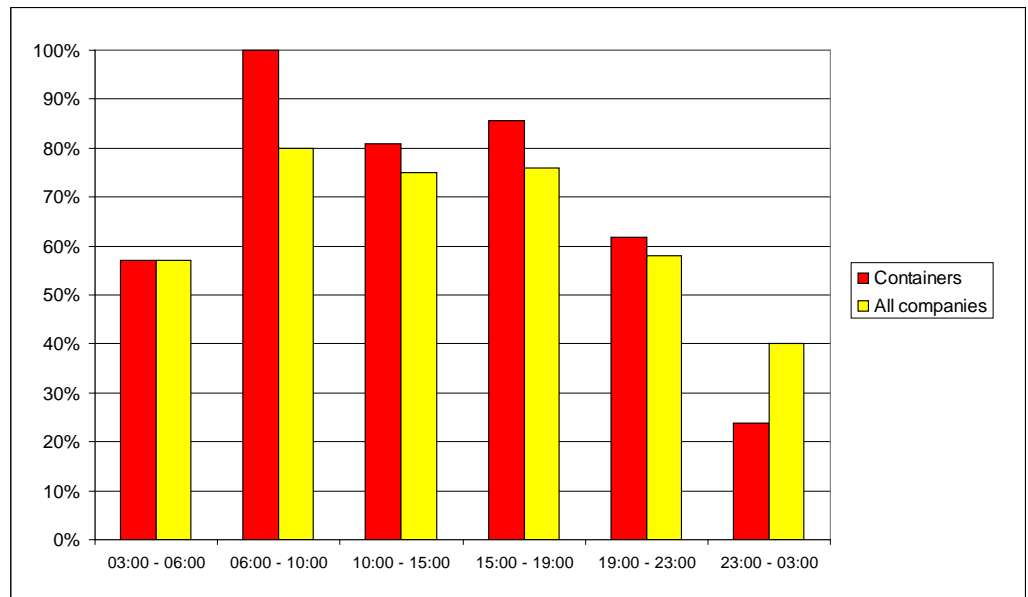


Figure 6.3
Use of LHVs by period (LHV survey, 21 companies and 118 companies)

Fifty-seven percent of the transporters indicated that they use LHVs for point-to-point transport. When viewed across all market segments, this percentage is slightly higher. Next to point-to-point transport, a lot of combined journeys are made. Recipients hardly ever receive multiple containers in one journey. On regular journeys, the transporter generally serves numerous clients during a single journey.

Companies that use LHVs to transport containers and serve multiple clients will often load the vehicle in the evening. As a result the distribution journey can be completed in one day.

Ports are increasingly better equipped to handle the transport of LHVs. Most ports have modified loading facilities where LHVs can be loaded.

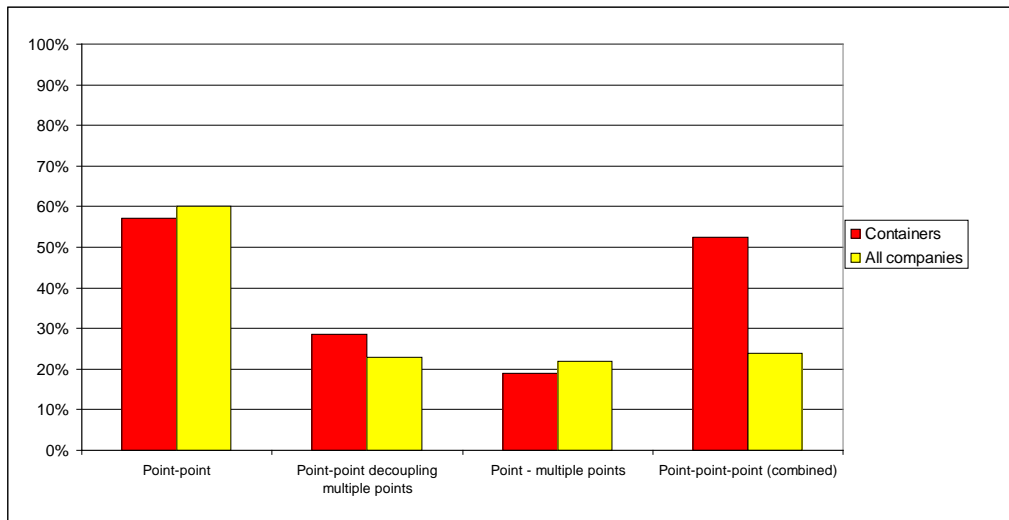


Figure 6.4
Journey pattern of LHVs (LHV survey, 21 companies and 118 companies)

Routes

By combining journeys to multiple clients, LHVs can manage to save on other costs. This is where efficiency gains are achieved. However, the container market is faced with relatively low margins, so using LHVs is one way to increase returns in a difficult market. Now that the LHV has become a familiar concept margins are also declining here, and shippers are responding to this development.

Barge Terminal Tilburg Case

Most of BTT's (Barge Terminal Tilburg) clients are located in the Brabant region. A relatively high share of the goods shipped via containers consist of high-grade goods (electronics from Philips, Sony, Samsung, etcetera). The company focuses on intermodal transport: 75% is shipped via rail or inland shipping, 25% is shipped via the road. In total around 10% is shipped by LHVs. The LHVs are only used on the route to Rotterdam. The LHVs are 100% utilised with full /empty containers. BTT's main clients are situated in the port of Rotterdam, a very small share of the goods is transported via the port of Antwerp. BTT processes some 120,000 containers per year.

BTT serves a large part of regional clients by road transport, a small share is transported by rail to Eindhoven and beyond. Shipments to and from regional clients are primarily carried out with one or two TEU trucks, LHVs are only rarely used for shipments to clients. This is because they do not want to receive three containers at a time. One container is delivered on demand, so in this sense BTT fulfils a storage function.

BTT uses road transport, and so also LHVs, for containers that need to be shipped to and from the port of Rotterdam within the shortest possible time. If the use of LHVs would be authorised for international transport the company would use them for transport to and from the port of Antwerp.



6.5 Investments and savings

Investments

All companies in the container market sector indicated that equipment constitutes the biggest share of their investments. To use the D configuration, the company must purchase a separate dolly (around €20,000) and trailer. The extra costs amount to €100,000. The standard B configuration also requires an extra investment of €100,000. A B-configuration vehicle plus a standard 40ft trailer are often used to reduce costs. The sector increasingly relies on combinations of 20 and 40ft containers, as a result of which this cheaper option is more appealing. This option costs €80,000.

Savings

LHV companies in the container transport sector indicated that they save most on driver costs and subsequently on fuel. Savings on fuel costs through the use of LHVs vary between 10% and 15%. The 'other cost items' usually include a combination of driver costs and fuel costs.

	Container	All market segments
Fuel costs	33%	28%
Driver costs	52%	61%
Other cost item	15%	11%
Total	100%	100%

Table 6.2

Percentage of LHV companies by biggest saving through the use of LHVs (LHV survey, 21 companies and 118 companies)

6.6 International use and future expectations

Seventy-six percent of interviewed LHV companies in this container market indicated that, if authorised, they will seize the opportunity to use LHVs for international transport. This percentage is higher than the average across all market segments. Some of the companies already use LHVs for transports to Germany, mainly the Ruhr area. The LHVs will decouple among others at Venlo and Arnhem.

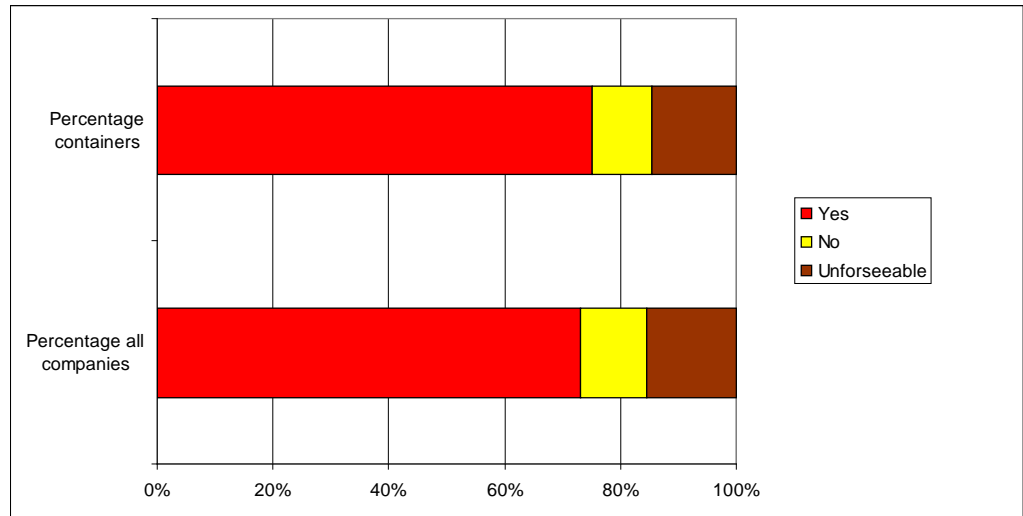


Figure 6.5
International use of LHVs (LHV survey, 21 companies and 118 companies)

Vehicle weight is an important aspect in the debate on the use of LHVs for international transport. Because of the different views of European member states, a maximum vehicle weight of 60 tonnes will not be politically feasible. According to expectations the potential maximum weight will 44 tonnes, and might even be as high as 50 tonnes. According to most transporters, this is too low. The survey revealed that there is clearly a need for an allowable weight of over 50 tonnes. Companies that expressed an interest in international transport were asked to state the minimum required weight. According to the answers, one in three companies would consider a total weight of between 44 and 50 tonnes to be sufficient, around four out of ten indicated that the optimal vehicle weight would be between 50 and 55 tonnes, and one third said that they would require more than 55 tonnes. The companies also explained that it is possible to combine cargoes. Empty containers play an essential in planning journeys.

Transporters also observed that, on long distances, in the international markets, LHVs are barely or not able to compete with intermodal rail transport. According to expectations, it is more likely for the modalities to supplement each other than to compete with each other. The road transport companies do not consider themselves to be an alternative for rail or inland shipping on longer distances.

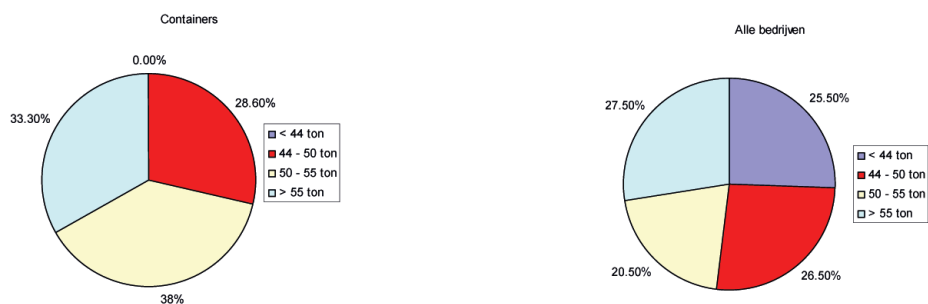


Figure 6.6
Minimum required weight limit for international transport (LHV survey, 21 companies and 118 companies)

Companies that currently use LHVs were asked how many extra LHVs they expect to deploy until 2015. The following table shows that over four out of ten LHV companies expect LHVs to constitute more than 15% of the total fleet. In other words, for companies in the container market the LHVs serve to replace part of their regular fleet of vehicles. The respondents did express the expectation that the international road transport of containers will serve as a catalyst to use LHVs.

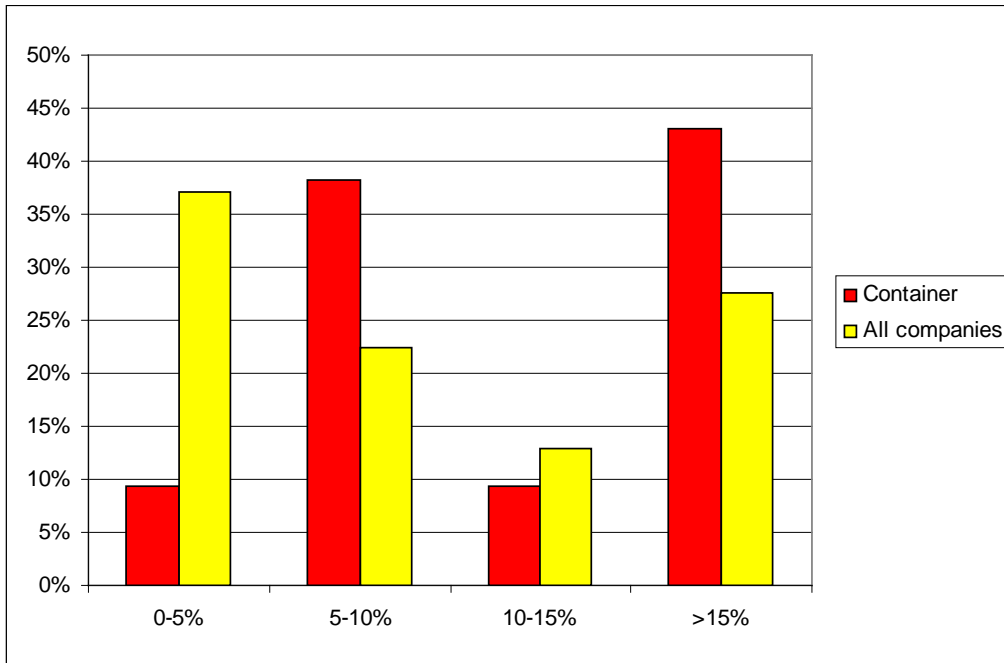


Figure 6.7
Future percentage of LHV transport (LHV survey, 21 companies and 118 companies)

7 Market segment: ornamental horticulture

Fifteen companies in the ornamental horticulture sector participated in the study. They collectively deploy 44 LHVs. This sector mainly relies on A- and D-configuration vehicles. The use of the A configuration, consisting of a truck plus trailer and tipping trailer, is characteristic of this sector. The tipping trailer usually has a loading and unloading system.



7.1 The market

Figure 7.1 shows a diagram of the logistics chain of the ornamental horticulture sector. Around 90% of cut flowers grown in the Netherlands are transported to auctions, the remaining 10% is shipped directly to exporters and the retail trade. At the auction, the products are auctioned together with imported ornamental horticulture products and subsequently transported to the buyers (exporters). The LHVs are mainly used between the flower auctions and exporters, between growers and flower auctions and also between the Dutch airports. In practice, the transport between the flower auction and exporter concerns transport between the different flower auctions themselves (inter-auction transport), because the exporters are generally located on the site of the flower auctions.

So far, companies in this market segment have responded positively to the use of LHVs. The development of 'long-distance buying' proved an important cause of the increased use of LHVs. As buyers are no longer physically present at each flower auction, they now buy products simultaneously from all the flower auctions from one location. This means that companies using their own form of transport has declined in favour of haulage firms. Haulage firms transport products collectively between auctions, thus making it easier to combine flows of ornamental horticulture products. Because of the constant flow of ornamental horticulture products to the different flower auctions and the low relative density of the cargo, it is very appealing to use LHVs on these routes. As LHVs can carry over 60% more volume than regular vehicles, this offers a significant savings potential. Furthermore, the interviewed companies in this sector indicated that client retention and gaining a leading over competitors were two important aspects that played a role in the

decision to purchase LHVs. The clients in this market segment are growers/market gardeners for the transport from production locations to the flower auctions and exporters with regard to the so-called 'inter-auction transport'.

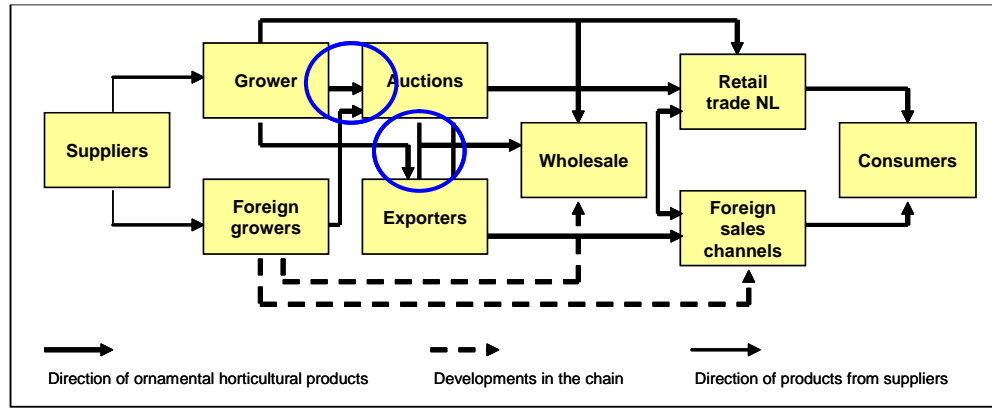


Figure 7.1
The ornamental horticulture chain
Source: the economic strength of agricultural food in the Netherlands (2007), FloraHolland (2009)

The main ornamental horticulture production centres are located in the Westonia, Aalsmeer, Rijnsburg and in the triangle of Bleiswijk, Berkel and Rodenrijs, and Bergschenhoek. The flower auctions are located in Aalsmeer, Bleiswijk, Eelde, Naaldwijk, Rijnsburg and Venlo. This year, the auction location in Venlo will be shut down and relocated to Herongen in Germany. This is close to the current location in Venlo. Figure 7.2 provides an overview of the flower auction locations.



Figure 7.2
Auction locations in the Netherlands

7.2

LHV companies

The following diagram shows the 18 companies that currently operate one or more LHVs. The number of LHVs varies per company and ranges from one to 11. Twenty percent of these companies have one LHV. The transporter is responsible for taking the initiative to purchase the LHV. From 2004 onwards at least one company started purchasing LHVs.

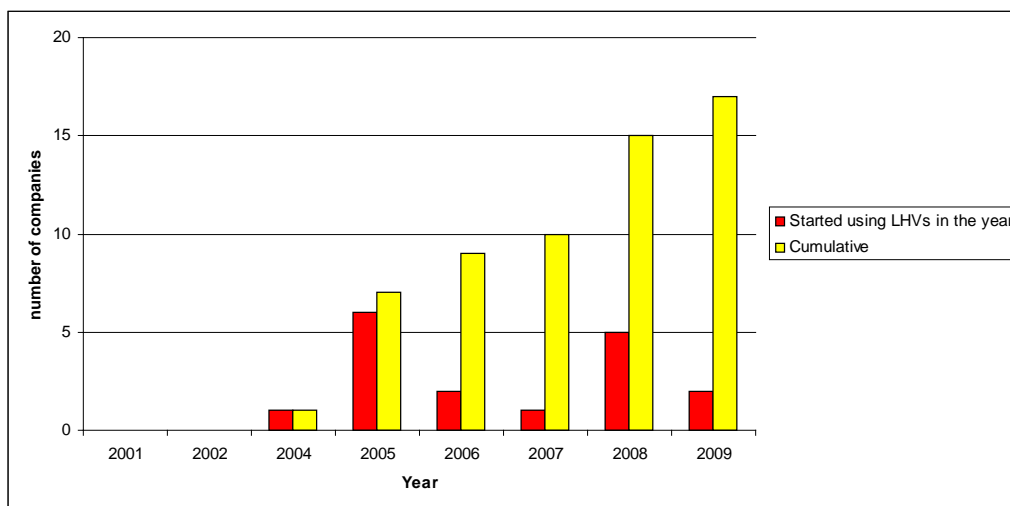


Table 7.3
Development of the number of LHV ornamental horticulture companies per year (LHV survey, 15 companies)

Number of companies in the ornamental horticultural market	Number of LHVs
3	1
7	2
2	3
1	4
1	6
1	11

Table 7.1
Number of companies by number of LHVs (LHV survey, 15 companies)

7.3 Type of vehicles

The A and D configurations are the most widely used types in this market segment. Around half of the LHVs in this market segment fall under the A configuration category, and the other half in the D configuration category. Several companies indicated that they are experimenting with both configurations, and will subsequently choose one of the available options. One company has an LHV from the category B configuration and one company an LHV from the category C configuration. These configurations are both strongly similar to the D configuration, the only difference being that the front loading section does not include a truck but a trailer (B configuration) and the LHV is slightly shorter than 25.25 metres (C configuration).

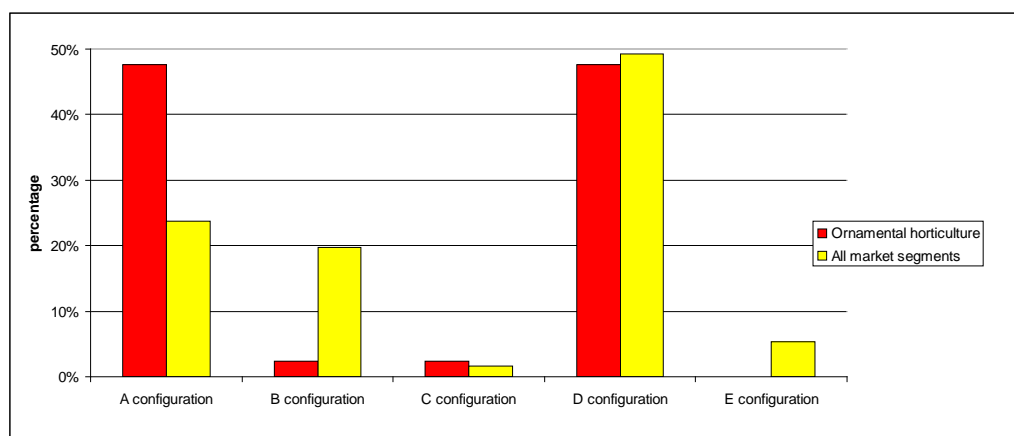


Figure 7.4
Percentage LHVs by configuration (LHV survey, 15 companies and 118 companies)

7.4 Use of LHVs

Within this market segment, LHVs were constantly deployed during the week. Their daytime use differed from the overall picture across all market segments. During the night-time hours the LHV was used (much) more intensively than as observed on average across all market segments. Within the ornamental horticulture market segment, the LHV was used less frequently during the day than during the evening and night. Three-quarters of the companies used LHVs throughout the night. Furthermore, at least two-thirds of the companies used LHVs during the day. The night-time was mainly used to transport ornamental horticulture products from the grower to the auction. The daytime was primarily used to ship products from the auction to the buyer (inter-auction transport). Where inter-auction transport was concerned, the LHV was nearly always fully loaded with ornamental horticulture products, and sometimes also empty carriers (auction carts and packaging).

Slightly more than half of the transporters indicated that they used LHVs for point-to-point transport. This percentage corresponds with the percentage across all market segments. As opposed to the picture across all market segments – in this market segment the vehicles hardly ever decoupled during the journey and subsequently drove to multiple points. One of the companies that indicated that they do apply this journey pattern is hardly active in the auction transport sector, however they do operate in a niche market in the ornamental horticulture sector, namely the transport of fertilisers between different distribution centres. Additionally, slight over 50% of the companies indicated that they drove between more than two auctions.

Most of the required modifications to accommodate LHVs within this market segment's logistics chain concerned the auctions. This involved a technical modification to the street section for the loading docks. Furthermore, several LHV companies were required to relocate to a different area on the auction site offering sufficient space for the large number of auction carts that are ready to be loaded. The loading and unloading facilities for LHVs at the growers' locations could also be improved.

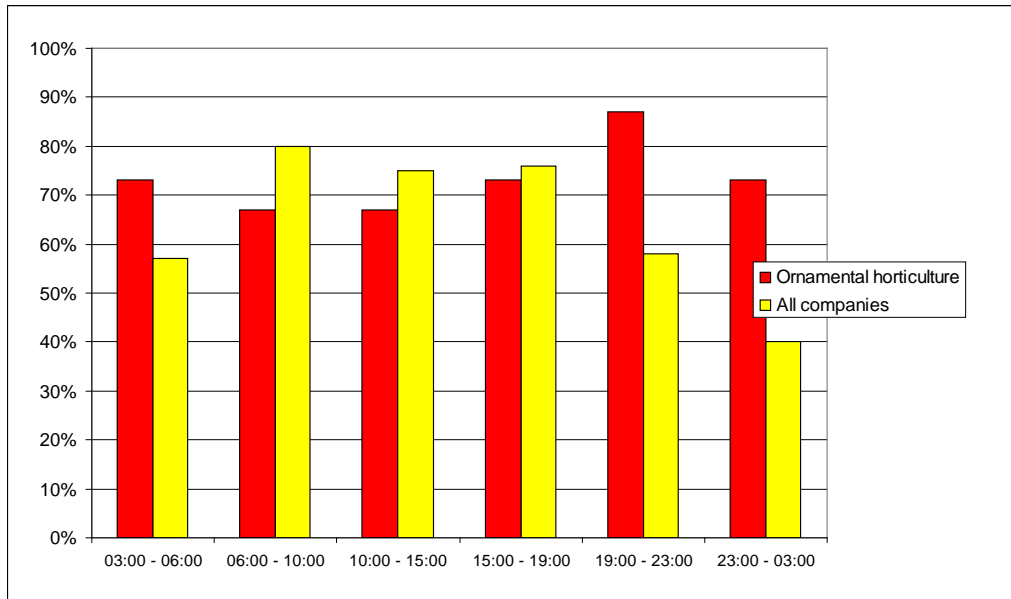


Figure 7.5
Use of LHVs by period during the day (LHV survey, 15 companies and 118 companies)

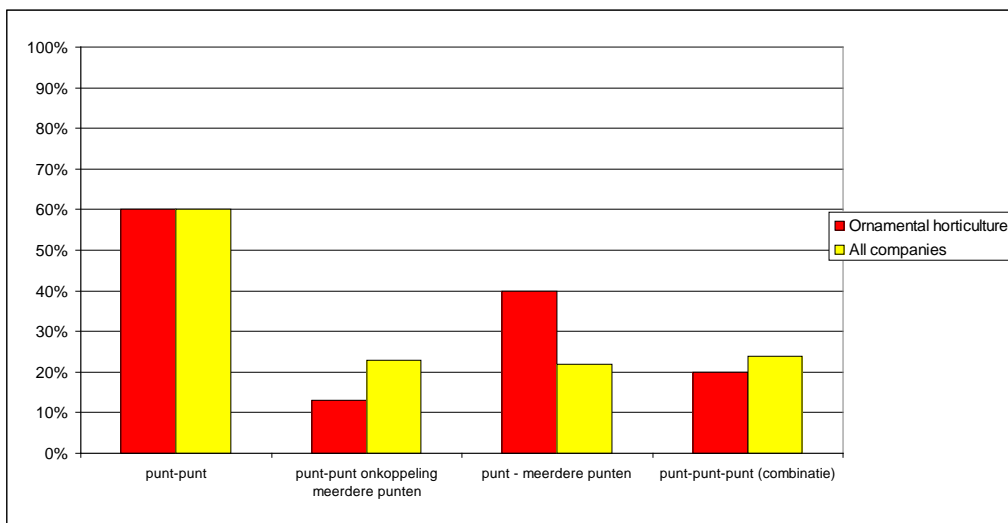


Figure 7.6
LHV journey pattern (LHV survey, 15 companies and 118 companies)

Routes

Most of the routes run between the different auction areas. This mainly concerns the area between Aalsmeer, Rijnsburg, Bleiswijk and Naaldwijk, and also between these locations and the auctions and/or horticultural areas in Eelde and Venlo. The LHVs are deployed between Maastricht Airport and Schiphol Airport.

7.5 Investments and savings

Around half of all LHV companies in this market segment achieved the greatest cost savings on the costs of drivers. The following table clearly demonstrates this. Across all market segments, this percentage is slightly higher. A quarter of the companies in this sector indicated that – in line with the picture across all market segments – they save most on fuel costs. The LHVs in this market segment hardly consume more fuel than regular combinations. As a result, this can lead to considerable fuel savings per transported product. Just over 25% of the companies indicated that their greatest cost savings come from other cost items. Examples of these cost items include savings on the purchase of extra equipment (regular trucks) and hiring charters.

LHVs can carry 50 to 60% more volume than regular transport vehicles in this sector. By using the system of loading and unloading doors, the loading and unloading of the LHV only requires several minutes longer than regular vehicles do.

	Ornamental horticulture market segment	All market segments
Fuel	27%	28%
Drivers	47%	61%
Other cost item	26%	11%
Total	100%	100%

Table 7.2

Percentage of LHV companies by greatest saving from the use of LHVs (LHV survey, 15 companies and 118 companies)

Investments

Around 80% of the companies indicated that the equipment constitutes the largest share of the investment in terms of deploying the LHV. A few companies indicated that organisational coordination and the cost of drivers constitute the biggest investments. This is reasonably in line with the overall picture across all market segments.

Case: Wematrans



Wematrans is a transporter of ornamental horticulture products whose fleet mainly consists of LHVs. The company currently deploys 12 LHVs, and 13 other LHVs are about to commence operation. In 2005 the company started using an A and D configuration vehicle, its current fleet consists of eleven A configuration LHVs and one D configuration. It initially took a while for the company to decide on which configuration would be most efficient in accordance with its logistics concept. The A configuration proved the best option. The LHVs are deployed 24 hours a day and 7 days a week. At night they mainly serve the ornamental horticulture sector and drive from the growers to the flower auctions, and during the day they mainly drive between the different flower auctions. This 'inter-auction' transport consists of transporting ornamental horticulture products, purchased by the buyers to their locations at the different auctions. Wematrans is benefiting from the ongoing development of 'remote purchasing'. The company transports the products for various buyers. By combining cargoes this offers very favourable conditions to deploy LHVs. The LHVs have loading and unloading doors, and can transport 36 auction carts in total. Compared to regular transport, this means an extra loading capacity of almost 60%. As it only takes a fraction longer to load and unload the extra auction carts, this can result in considerable savings. The LHVs used for inter-auction transport are to (almost) maximum capacity both on the outbound and return leg of the journey. Because the LHV does not need to decouple, the vehicle is not dependent on minimum number of kilometres travelled between the loading and unloading location in order to achieve these savings. The company's experiences with the use of LHV are very positive. It is not without reason that the majority of its fleet consists of LHVs. For a company like Wematrans, it is extremely important to be able to use LHVs on international transport between the Netherlands and Germany. As a result of the flower auction's relocation from Venlo to Herongen, the LHV must decouple at the border. This will undoubtedly have an effect on savings and efficiency.

7.6 International use and future expectations

Well over half of the respondents in this market segment indicated that, if permitted, they will seize the opportunity to deploy LHVs internationally. This percentage is considerably lower than the average across all market segments. At the time of the interview a quarter of the companies in the market segment – slightly higher than the average across all market segments – were unable to assess whether they will seize the opportunity to use LHVs internationally if this possibility becomes a reality. In spite of the fact that the ornamental horticulture sector is one of the few market segments where the debate on a restricted maximum weight for international transport hardly plays a role, the sector, as a whole, did not jump at the opportunity to start using LHVs internationally.

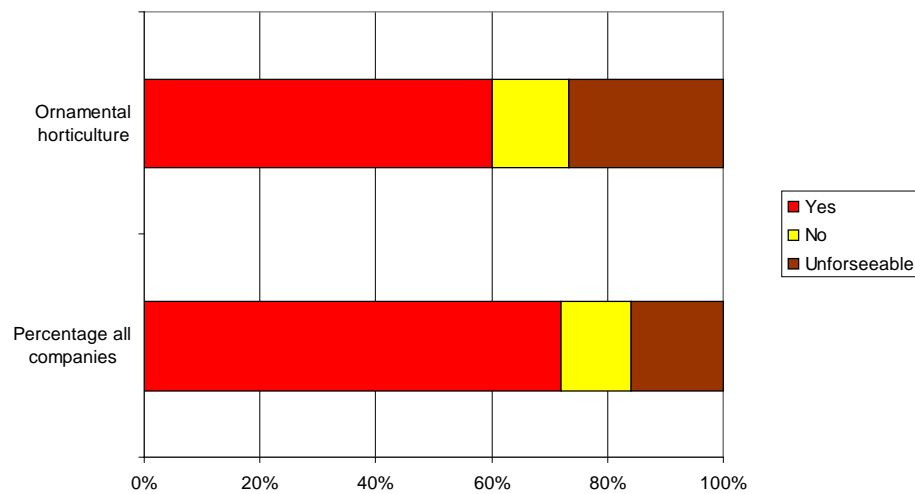


Figure 7.7
International use of LHVs (LHV survey, 15 companies and 118 companies)

According to the survey two-thirds of the respondents in the sector would manage with an allowable weight of below 44 tonnes. This is also logical because of the low relative density of ornamental horticulture products. However, one-third of the respondents considered a weight of at least 50 tonnes or more as a limit value. The flexibility to be able to transport products internationally for other market segments is considered an important reason to introduce a higher weight limit. The desire to introduce a higher weight limit was observed among all market segments.



Figure 7.8
Minimum required weight limit for international use of transport via LHVs (LHV survey, 15 companies and 118 companies)

Companies that currently use LHVs were asked how many extra LHVs they expect to deploy until 2015. The companies in this market segment expect to deploy a total of 39 extra LHVs. This amounts to almost double the current number. This expected expansion is in line with the average across all market segments. The aim is to achieve this by combining transport flows between growers, auctions and buyers. Several companies also stated that they will only seriously consider purchasing extra LHVs if the neighbouring countries will give the 'green light' to use the vehicles internationally. This applies in particular to companies that are active in the transport of ornamental horticulture products between airports in the Benelux and Germany.

The following figure shows that one third of the LHV companies expects the share of LHVs to remain under 5% of their total fleet. Nearly half of the respondents indicated that they expect the percentage of LHVs to increase to over 15%. Some companies in this market segment do not just want to supplement their package of services by using LHVs, they hope that their regular road vehicles will eventually be replaced by LHVs. Some companies already exclusively possess LHVs. In this case the occasional, regular road transport vehicles will be used in addition to their fleet of LHVs.

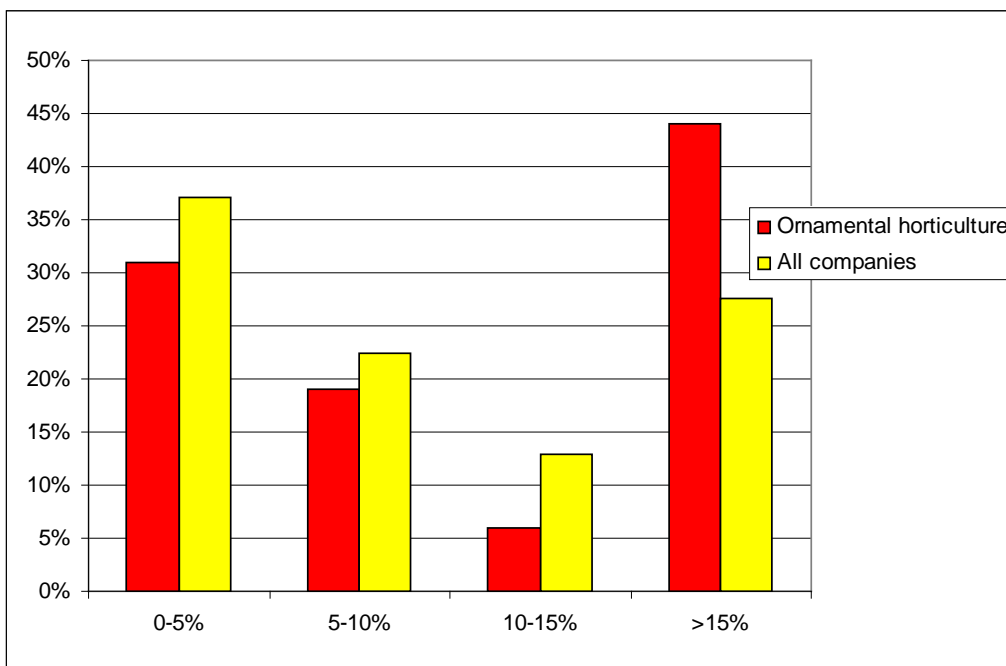


Figure 7.9
Future percentage of LHVs as part of the entire fleet (LHV survey, 15 companies and 118 companies)

8 Market segment: waste/bulk

Eleven waste/bulk companies with 15 LHVs participated in the trial. The LHVs used in this market segment primarily concern the D configuration. Zuidema Transport, which transports offal, is an exception. For this type of transport it is important for the vehicle to be equipped with loading platforms that are easy to rinse. The last trailer of the LHV (depicted in the photo below) can be extended for this purpose. This allows all the platforms to be raised simultaneously for cleaning.



8.1 The market

The transport of waste via LHVs can be divided into three main flows. 1) A flow of **industrial and household waste** from waste depots to other waste depots and/or to incineration plants, 2) a flow of **discarded electronic appliances** from collection points of the Netherlands Association for the Disposal of 'Metaelectro' Products and 3) a flow of **offal** between meat processing plants and offal processors.

The clients in this market segment are waste collection companies, municipalities, the Netherlands Association for the Disposal of 'Metaelectro' Products (NVMP) and offal processors. Further clients include sister companies that are responsible for collecting the waste.

Industrial and household waste

Industrial and household waste is first collected and then either directly transported to the incineration plant via a truck, or taken to a transshipment point where it is subsequently sorted or transhipped. At these locations the waste is sometimes first compressed and then transhipped in closed ISO containers, open-top waste containers or containers with a moving floor. The waste is subsequently transported via the road, inland shipping or rail to recycling companies, incineration plants or dumps. The LHVs are mostly used on the routes to the incineration plants. The main players in the Dutch industrial and household waste market are:

- AVR / Van Ganswinkel
- Essent
- SITA
- Shanks

The transport of waste can be split into two geographic parts, namely international waste transport (mainly recycling) and domestic waste transport. The latter mainly concerns household and industrial waste to waste processing plants (12) and dumps (22). The waste processing location in Rijnmond is a major player in this sector. In 2008 most of the Dutch household and industrial waste was incinerated at this plant. Essent milieu is the second biggest player and processes 23% of the waste.

The Amsterdam Waste and Energy Company processed around 15% of incinerated waste. In 2008 HVC Alkmaar also processed 15% of the incinerated waste.

Discarded electronic appliances

Since 2004 all discarded electronic appliances in the Netherlands must be collected and processed in an environmentally responsible manner. To this end, manufacturers and importers collectively set up a system to collect and recycle discarded appliances in an efficient and environmentally responsible way. The Netherlands Association for the Disposal of 'Metaelectro' Products is the implementing body that is responsible for executing the efficient and effective collection and processing system for discarded electronic and electrical appliances on behalf of manufacturers and importers.

The discarded appliances are handed in at the designated municipal site and/or the shop if the person is purchasing a similar new appliance. Transporters collect these appliances from the municipalities and shops, and ship them to Regional Sorting Centres (RSCs). At these locations, all appliances are sorted by type (white goods, televisions and small electrical appliances). The sorted appliances are then transported to specialised processing companies that recycle the products. The LHVs are used on the last part of the process.

Offal

Offal is shipped from slaughterhouses to processing companies. The meal and fat that is produced during processing is used as fuel. The main offal processors in the Netherlands are Storteboom, Sonac and Rendac. The LHVs are used, among others, between slaughterhouses in Epe, Boxtel, Helmond, Apeldoorn, Putten, Groenlo and Gildehaus (just across the Dutch border at Oldenzaal) and the offal processors in Burgum and Son.

8.2

LHV companies

The transport of industrial and household waste is characterised by the heavy nature of the cargo. LHVs carry three (waste) containers, meaning the vehicle has a high empty weight. Due to the high relative density, companies are generally not really interested in transporting this waste and, consequently, LHVs are less flexible where the transport of waste is concerned. This is strengthened by the fact that at least three (waste) containers with a maximum weight must be ready at the loading locations (depots) before the LHV will visit the location. One transporter has even purchased smaller containers because the total weight of the standard waste containers exceeded the 60-tonne maximum. The specific equipment that is used means there is no return cargo, this is another characteristic of this market segment.

The following diagram shows the companies that currently drive around with one or more LHVs. Companies in this market segment only have a limited number of LHVs, typically one or two. In nearly all cases the transporter took the initiative to purchase the LHV. The LHVs were purchased during three periods, namely in the year 2001, in the years 2004/2005 and recently in the years 2009/2010. No LHVs were purchased in 2008, because in that year the maximum allowable weight was reduced to 50 tonnes. This maximum weight is generally too low to deploy LHVs in this market segment.

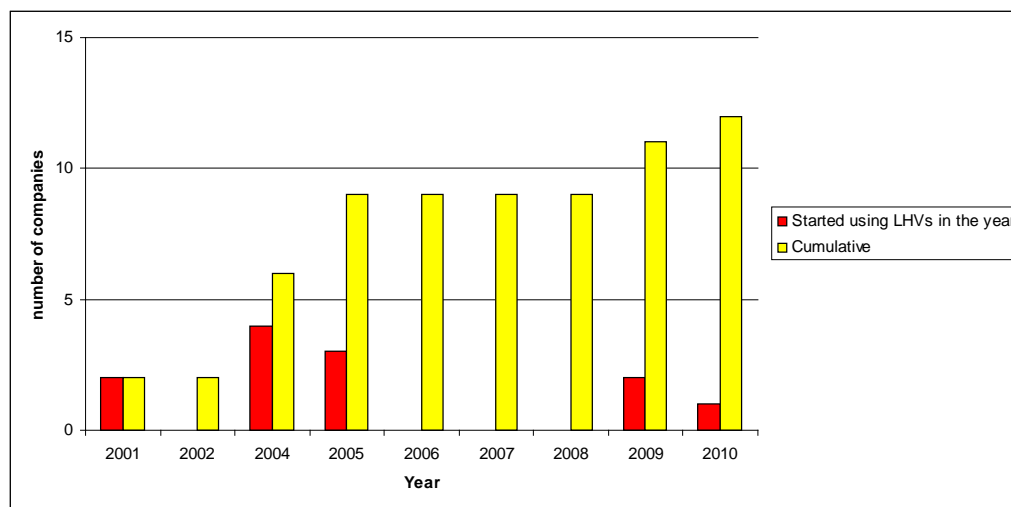


Figure 8.1
Development of the number of waste/bulk LHV companies per year (LHV survey, 11 companies)

The motivation behind using LHVs is that the transport flows in the household and industrial waste sector can be combined such that high volumes can be transported in a single journey between waste depots and processing plants. (Waste) containers are generally loaded at waste depots, and it only takes several more minutes to load an extra (waste) container. Because of the extra container, it only takes a few more minutes to unload (dump) the containers at the processing locations. This makes it extra appealing for companies to ship an extra container. The LHV can carry 50% more volume. In most cases the logistics companies took the initiative to purchase the LHV.

The fact that the LHV is able to accommodate the expansion in capacity was also mentioned as a reason to use them. This avoids the need to purchase more trucks. In the offal sector the vehicles usually drive to multiple points during the journey. Here the volume benefits also result in extra turnover per journey. Flexibility towards the client was also mentioned as a reason. Different types of offal must be transported separately, as a result the LHV can carry three types (instead of two).

Number of companies in the waste market	Number of LHVs
7	1
4	2

Table 8.1
Number of companies by number of LHVs (LHV survey, 11 companies)

8.3 Type of vehicles

The D configuration is the most widely used type in this market segment. Over 90% of all LHVs in this market segment fall under this category. The A, B and C configuration do not occur in this market segment. It is highly likely that companies primarily use the D configuration because of the equipment used in this sector, namely combinations (trucks with a trailer). The purchase of a dolly and a trailer seems to be the logical next step.

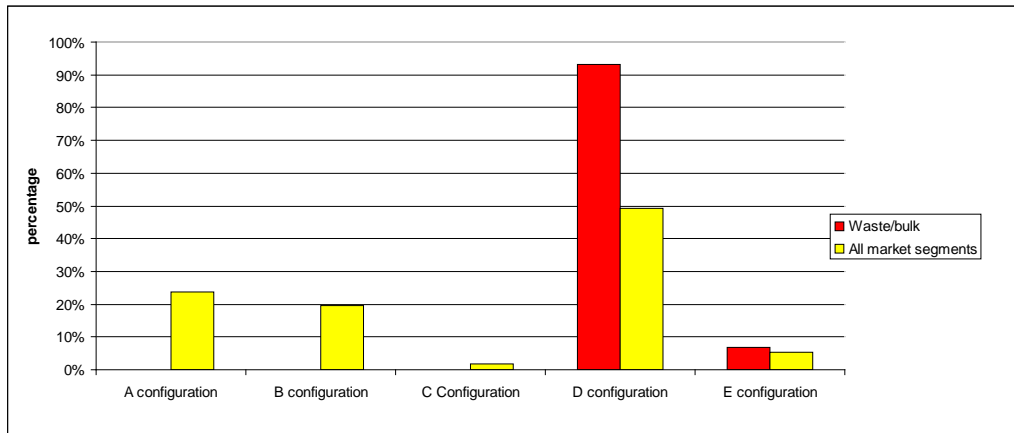


Figure 8.2
 Percentage of LHVs by configuration, waste/bulk market segment and all market segments
 (LHV survey, 11 companies and 118 companies)

One company in the waste sector has an LHV with an E configuration, whereby the rear trailer has a steerable rear axle. This is not limited specifically to this sector. In this case, the transporter wanted a more manoeuvrable vehicle. This also reduces the wear on tyres. The offal market is a niche market with loading units that require regular cleaning. The E configuration has an extendable central axis trailer to enable the loading units to be cleaned quickly and efficiently in the washing facility. The containers and/or platforms can tilt to discharge the waste water. The rear container is positioned close to the middle container so an extendable central axis trailer is used to create sufficient room to help it tilt.

Hoogers Transporten bv. Case

Hoogers, a subsidiary of the Van Gansewinkel Group, operates in the waste-transport sector. The company has been using an LHV since 2005. This D-configuration vehicle currently mainly drives on behalf of one client and transports discarded consumer electronics from collection depots to waste processing locations. The loading locations are scattered throughout the Netherlands and use of the LHV differs per day and the cargo offered at that point in time. In order to fill the three waste containers, the loading location must have sufficient cargo. This type of cargo is perfectly suited for transport via LHV, because of its relatively low density and the high volume of cargo



Offered. The LHV is normally used on a daily basis. As opposed to regular combinations, the LHV can carry three instead of two containers. This result is in 50% more loading capacity (volume). In order to be more efficient than regular transport, the company applies a minimum distance of around 60 kilometres. The LHV can carry out multiple journeys per day, but always returns empty to the waste processing location. Because of the specific character of the market in which Hoogers operates, and the limited maximum weight of the cargo it is very difficult to find suitable return cargo for the LHV. Two vehicles are registered as LHV; this is because the continuity of the use of the LHV must be safeguarded.

8.4 Use of LHVs

The use of LHVs during the day differs from the trend across all market segments because the vehicle is only used on a limited scale at night. The fact that LHVs are primarily used during the day is due to the opening hours of the loading and unloading locations. Around half of the transporters stated that they used LHVs for point-to-point transport. The percentage across all market segments is slightly higher. Unlike as observed across all market segments, in this market segment the vehicles hardly ever decouple to drive on to multiple points. The logistics chains in this market segment did not require any concrete alterations to the loading and unloading locations to accommodate LHVs.

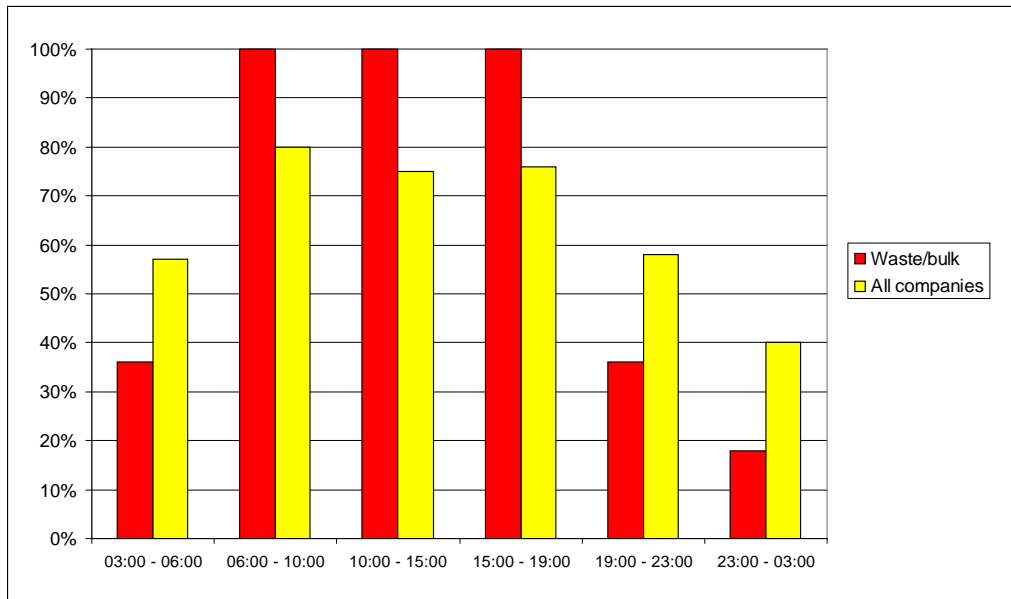


Figure 8.3
Use of LHVs by period (LHV survey, 11 companies and 118 companies)

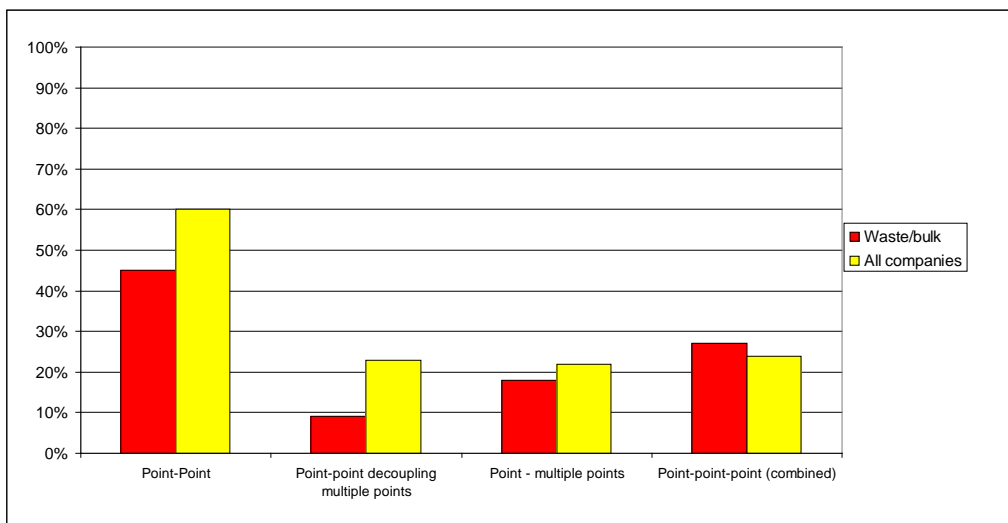


Figure 8.4
LHV journey pattern (LHV survey, 11 companies and 118 companies)

The following figure shows the main routes that LHVs use in the waste/bulk market segment. These mainly consist of routes between waste depots that are nationally spread and processing locations in the Randstad, and between slaughterhouses in North Brabant/Gelderland and offal processors in Friesland.



Figure 8.5
Main LHV routes in the waste/bulk market segment

8.5 Savings and investments

Nearly all LHV companies in the household and industrial waste sector achieved the greatest cost savings on the costs of drivers. The following table clearly demonstrates this. Measured across all market segments, the percentage of LHV companies that save most on driver costs is slightly lower. In spite of the fact that these vehicles consumed 10% to 15% more fuel per kilometre, they did manage to save on fuel costs. Cost savings were also achieved in the offal sector, however it is not yet clear how much the total savings amounted to. As this is a fairly new concept it is presently unclear how high the maintenance costs will be. An increase in turnover was also generated through extra cargo space.

	Waste/ bulk	Percentage all market segments
Fuel	18%	28%
Drivers	82%	61%
Other cost item	0%	11%
Total	100%	100%

Table 8.2
Percentage of LHV companies by greatest savings through the use of LHVs
(LHV survey, 11 companies and 118 companies)

Around 90% of the companies indicated that the biggest investments concern equipment. These investments concern the purchase of a separate dolly (around €20,000) and a trailer (instead of a trailer for a regular combination). For the transport of offal the extra investments usually concern the rear trailer of the E-configuration LHV. This is an extending system and a steerable axle. A small group of companies (10%) indicated that 'driver costs' constituted the largest share of investments. This is reasonably consistent with the picture across all market segments. However, viewed across all market segments, a small number of the companies considered investments in organisational coordination (with clients, suppliers and policymakers) to constitute the largest cost item. None of the companies in the waste/bulk market segment considered this to be the largest investment.

8.6 International use and future expectations

Nearly half of the interviewed LHV companies in this market segment indicated that, if permitted, they will seize the opportunity to deploy LHVs internationally. This percentage is lower than observed across all market segments. This could be explained by the fact that companies in this market segment focus heavily on domestic transport. Furthermore, the lower maximum weight that applies to international transport with LHVs also plays a role in terms of the feasibility of using LHVs in this market segment.

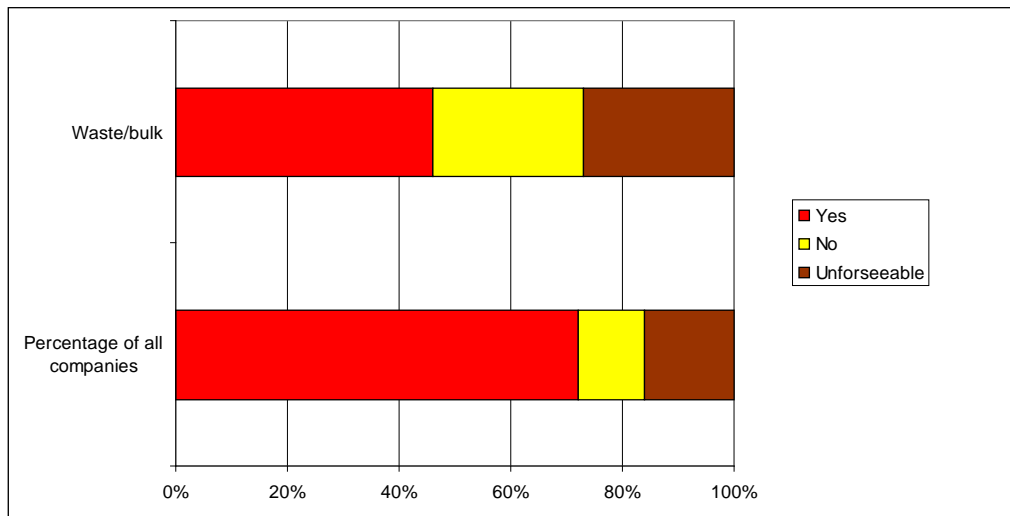


Figure 8.6
International use of LHVs (LHV survey, 15 companies and 118 companies)

Many European countries will not permit a weight limit of 60 tonnes. Therefore, it is important to gain insight in the minimum required weight category for companies. According to the survey, the allowable weight must be over 55 tonnes. Not a single company indicated that they could manage with a total weight of less than 50 tonnes. This is due to the high relative density of the cargo and the empty weight of the LHV (equipment including the containers). All players in this niche market said they could use the LHV to a certain degree if the maximum weight were to vary between 50 and 55 tonnes. Taking into account all market segments, the LHV's minimum required total weight differs strongly.

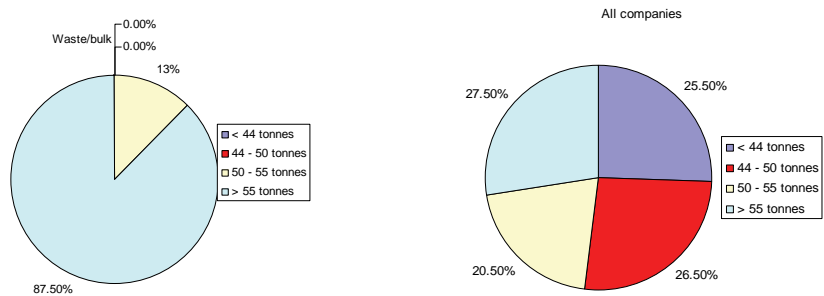


Figure 8.7
Minimum required weight limit for international transport (LHV survey, 11 companies and 118 companies)

Companies that currently use LHVs were asked how many extra LHVs they expect to deploy until 2015. In total the companies in this market segment collectively expect to use 10 extra LHVs. This is an increase of over 50% compared to the current total number. This expected expansion is below the average among all market segments.

The following table shows that around three-quarters of LHV companies expect that LHVs will constitute less than 5% of the total fleet. In other words, for companies in the waste/bulk market, the LHV is a supplement to the package of services but does not yet serve as a replacement for the majority of the regular fleet.

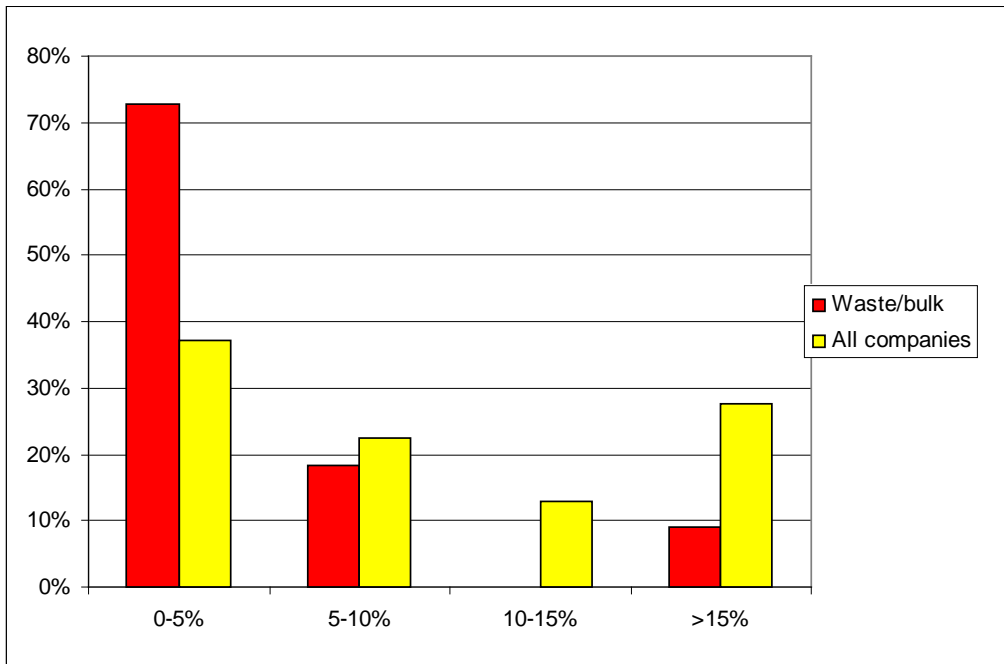


Figure 8.8
Future percentage of LHVs, waste/bulk market segment and all market segments
(LHV survey, 11 companies and 118 companies)

9 Other market segments

The other market segments are smaller than the four previously examined market segments. The other market segments include: building materials, contract logistics, express, air freight, liquid bulk and silo, packaging and volume.



This concerns 27 companies in total, or 23% of the total number of companies.

Together they have 62 LHVs, or 21% of the total number of LHVs. It is an interesting fact that this mixed group of companies use relatively many E-configuration vehicles. Of the total of 16 E-configuration vehicles, 14 are deployed by other market segments.

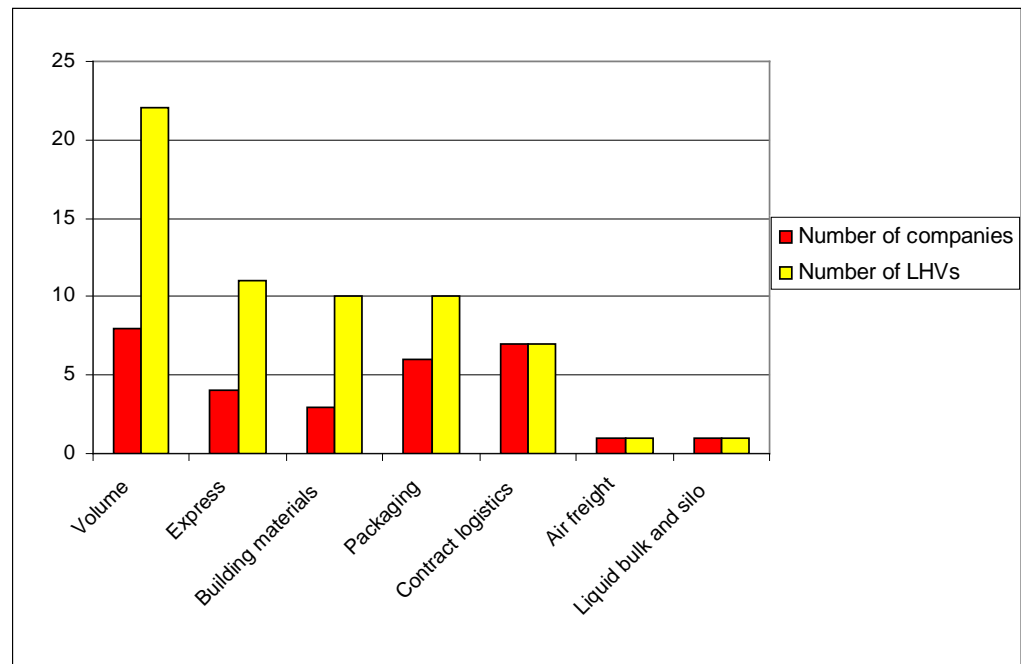


Figure 9.1
Number of companies and LHVs in the other market segments (LHV survey, 27 companies)

Volume market segment

Volume transporters are companies that transport relatively light goods whereby the vehicle's loading area constitutes the limiting factor. These companies mainly require longer vehicles. Permitting the use of LHVs would be a boon for these companies. Within this group of other market segments, this sector constitutes the largest group with 22 LHVs owned by only eight companies. These are generally medium-sized to large companies that own multiple LHVs. Eighty percent of which drive a D-configuration vehicle, so a truck plus dolly and trailer.

Case: Weerter Transport Onderneming (WETRON)

WETRON has a three trucks (type EURO 5) that are suitable for LHV transport. The LHVs drive as a D configuration, WETRON has two dollies and six trailers. Two LHVs are constantly deployed, the third one serves as standby. According to the company's philosophy the equipment must be exchangeable. This means that if it is not used as an LHV it will be used in a normal combination vehicle (truck and trailer). The company uses trailers that have been upgraded to LHVs; the spray mats, heavier clutch, side underride guards/side protection and axle load meters will be installed in the company's own workshop. The trailers are subsequently inspected by the RDW.



WETRON currently deploys its LHVs on behalf of a manufacturer of insulating material. The LHVs are mainly used for long-distance transport from the production location to the depots. The return goods consist of general and mixed cargo.

WETRON is ready to expand its fleet on behalf the international segment. The company already transports a substantial part of cargo destined for Italy via intermodal transport. Trailers and platforms are put on the train in the Netherlands, and in Italy they transported by road from the terminal. WETRON does not think that the introduction of LHVs will cause a change in the modal split, 50% of the transport is already intermodal and this share will increase. Using LHVs to transport the platforms and trailers in Italy could help reduce the costs of the intermodal chain. The intermodal transport is limited because of the imbalance in transport flows. Return goods generally require a detour. The use of LHVs would make it more efficient to collect the return goods for intermodal transport. This could help reduce the imbalance to the intermodal flows.



Liquid bulk and silo tank cargo

Bulk products include liquid bulk and silo tank cargo. This market segment generally does not rely on the use of LHVs. However, there is one company, Limpens from Elsloo, that drives an LHV combination. This concerns the transport of dry bulk goods. The LHV can transport 100m³ in a single journey, or around 30% more than the transported volume during a regular journey with bulk goods.

International use

Some of the companies that currently do not rely on LHVs do see opportunities to use them for international transport. This concerns a huge range of companies. Some companies that are active in the air freight and express delivery sector would clearly welcome the use of LHVs for international transport. This is because they mainly transport bulky products. They see opportunities to use LHVs for a substantial part of their inter-depot journeys.

Interesting examples of the desire to use LHVs for international transport were also observed in other market segments. The following case describes the example of Bring logistics.

Case: Bring logistics

Bring logistics is a joint-cargo transporter, based in Zwijndrecht. The transport is mainly directed towards Scandinavia, but also Spain, England, Turkey and France. Bring only operates international and therefore no LHVs are used in the Netherlands. Bring frequently uses LHVs in Sweden, and in the future it will deploy LHVs in Scandinavia for cross-border traffic. The company's logistics concept also includes rail transport, if necessary in combination with LHVs. In Sweden, the company uses LHVs whereby a dolly is used to deploy the regular 'hückerpack' cooled trailers within the intermodal concept.

LZV in combination with rail.

Since 2008, a train with trailers has been travelling between Rotterdam and Oslo on a weekly basis. In early September 2010, a second train was deployed. In this case a maximum train weight of 1400 tonnes must be taken into account. This is due to the cost structure of rail transport. If the train were heavier this would require an extra locomotive to be used between Sweden and Norway, which would greatly increase the costs. An optimal mix of vehicles is used, as a result of which the train weighs 1400 tonnes, the rest is transported via road. A lot of conditioned cargo is transported from Scandinavia to Europe (fish products), a large part of which is transported from Rotterdam to Paris (Rungis). All kinds of joint-cargo, including building materials, is transported on the return journey to Scandinavia. Temperature-controlled goods that are transported to Norway include foods, a large part of which is fruit.



Weight is an important criterion here, the company would preferably use LHVs that are 50 tonnes or more, this would offer more possibilities to adapt this into the logistics concept. If the permitted weight were 44 tonnes the company would only be able to use vehicles with light cargo. This would mean a slightly one-sided pattern with regard to the train cargo. It should be noted that an LHV could help accommodate the “logistic upgrade” in intermodal transport, in the case of Bring this could help with the step from one to two trains. So the LHV would offer a solution to make the company’s transport more efficient.



10 Conclusions and recommendations

10.1 Conclusions

This monitoring study aims to provide insight into the economic, logistical and social effects of the use of LHVs.

It can be concluded that, in spite of the fact that this concerns a trial, an increase in the use of LHVs has been observed since the last measurement in 2006. The number of LHVs has more than doubled (397) since then. The number of companies (153) that deploy LHVs also doubled during the experience phase. In accordance with one of the policy goals, LHVs will mainly be used on long routes between distribution centres, transshipment locations and ports. This concerns goods flows that are characterised by a constant pattern and accommodate sufficient volume. In the Netherlands, LHVs are primarily used in the following market segments - retail, containers, ornamental horticulture and waste/bulk. This report also extensively examined the use of LHVs in these market segments.

Based on the current number of LHVs and the expected expansion, the previous estimate of the potential size of the fleet of LHVs - ranging between 6 and 12 thousand - seems to have been too optimistic. Over the coming years, the number of LHVs in the Netherlands is expected to show a further increase. The increase is not expected to be exponential, it is more likely that this will double the current number of vehicles. This increase can be further stimulated by expanding the number of core areas and introducing the possibility to use LHVs for international transport.

Nevertheless, for the time being the number of LHVs in the Netherlands is not expected to be similar in size as in Sweden, where the number of longer and heavier vehicles makes up over half of the fleet of vehicles. This is, among others, due to the fact that the Netherlands is only a small country. Consequently, this means that more effort and creativity is required to actually achieve potential gains through the use of LHVs. The use of LHVs in retail distribution, with large vehicles on transport routes to the city and small vehicles in the city, proves that the use of LHVs is also increasing via innovations on short distances.

Permitting the use of LHVs will result in a reduction in the number of journeys and consequently the number kilometres travelled on the Dutch roads. Based on the current preconditions and the current use of LHVs, a reduction of around 20 million kilometres will be attained annually. As a result LHVs contribute towards a reduction in CO₂ emissions. Currently, the total reduction in CO₂ emissions as a result of the use of LHVs amounts to 16 million Kg per year. For road freight transport this is an important innovation in the effort to reduce CO₂ emissions.

With the exception of the ornamental horticulture sector where a constant spread between day and night-time hours can be observed, LHVs are primarily used during the day. This pattern coincides with the opening hours of clients and consumers. This is the same reason why regular transport vehicles are only active on a limited scale at night. This means that LHVs only have a limited influence on congestion. However, LHVs do have an effect on traffic volumes in general. Due to the fact that they are primarily used as a replacement for regular trucks, LHVs contribute towards a more efficient form of road transport. Based on interviews with LHV companies

and the journey analysis, it can be concluded that they do not or hardly expect a reverse modal shift to occur.

Based on the above-mentioned points it is safe to establish that the LHV policy is functioning accordingly. The sector's assessment of the authorisation regime varies between 'reasonable' and 'good'. The current preconditions subject to which LHVs are permitted in the Netherlands offer transporters sufficient flexibility in terms of using their equipment. The sector has proposed a number of points for improvement; the three main points concern: improving the exemption system, expanding the number of core areas and roads, and permitting LHVs in international transport.

According to the surveyed companies, due to the increase in the number of core areas the guidelines on exemptions should be revised. Firstly, companies want the exemptions that are currently issued per core area, thus requiring multiple applications per LHV, to be replaced by one exemption for all core areas in the Netherlands. Additionally, the majority of companies using LHVs want an extension of the duration of the exemption. For example, from one to three or five years. Secondly, various companies want the exemptions to drive with LHVs to also include secondary roads (N roads) and railway crossings. The primary goal is to be able to access more industrial sites and make the use of LHVs more effective. Lastly, companies want to use LHVs for international transport. This would help in making road transport more efficient. This would be a true innovation for some market segments because this would make the transport flows to and from depots much more efficient. Examples of these flows include transport between airports or depots of express delivery companies, but also flows in the ornamental horticulture sector. These flows currently already occur via road transport.

The transport companies and their clients will mainly benefit from increases in efficiency which will lead to cost reductions and contribute towards reducing CO₂ emissions. Innovations to increase the environmental performance of LHVs are currently taking place. Some LHV vehicles use alternative fuels like LPG. As a result, cost savings can be as high as 20% of the cost of regular transport. Companies that can rely on existing equipment only need to make limited investments to start using LHVs. However, the main new innovation, an LHV combination with two city trailers for supermarket distribution, is relatively expensive and can amount to between 200,000 and 300,000 euro. One of the main reasons why LHVs are not expected to experience exponential growth is because in order to be cost effective the LHV must be able to rely on larger volumes and constant goods flows. A number of container companies have tried to influence smaller volume goods flows by giving discounts of up to 20% on their rates to ensure that the LHV is "fully booked" by the shipper. However, this was met with a moderate response. In other words: it is possible to convert smaller goods flows into larger goods flows, but it is not easy to achieve this.

Companies mentioned that they want more decoupling points. They frequently use industrial sites for this purpose. Decoupling and continuing to the client as a regular vehicle is not always an option. This is possible with empty containers, however because of the risk of theft it is not recommended to do this with high-grade goods.

10.2 Recommendations

Based on this study we recommend the following measures:

- Simplify the procedure for issuing exemptions so that one exemption applies to all core areas in the Netherlands.
- Continue the current efforts by the Dutch Ministry of Infrastructure & Environment to help make international transport via LHVs a reality.
- A strict regime for railway crossings: look at the shippers that are situated behind the railway crossing.
- Just prior to the expiry of an exemption, send a letter notifying the party concerned that the exemption period has nearly expired.
- Consider the option of further stimulating the transfer of information between road administrators on authorisations and experiences with LHVs. This to ensure a higher level of uniformity regarding the application of preconditions to authorise LHVs in a core area.
- A number of companies are trying to combine LHVs with intermodal transport. This is a slow process because it is new and involves international chains. A government policy that is aimed at stimulating this process (by stimulating initiatives, knowledge transfer and development) could contribute towards new innovations to use LHVs for intermodal transport.

Appendix A Characteristics of LHV companies

The survey consisted of several general questions to gain a clear picture of the companies that use LHVs. It appears that relatively many large companies use LHVs. Across all market segments, companies with over 50 exemptions make up around 3% of the number of companies and 36% of the number of exemptions. According to the survey 62% of companies with LHVs have over 50 employees.

Number of employees	Percentage of companies	Cumulative percentage
1-9	11.1%	11.1%
10-19	6.0%	17.1%
20-49	20.5%	37.6%
50-99	23.1%	60.7%
100-250	21.4%	82.1%
>250	17.9%	100.0%

Table A.1
Size of LHV companies (number of employees) (LHV survey, 118 companies)

Number of employees	Percentage of companies	Division based on national licensing certificates
1-9	11.1%	75.2%
10-19	6.0%	10.5%
20-49	20.5%	7.1%
>50	62.4%	3.0%

Table A.2
LHV companies compared against national division by size, licensing certificates) (LHV survey, 118 companies)

The transport companies indicated where they generate the greatest share of their turnover. As expected the emphasis lies on activities in the Netherlands, 60% of companies generate more than 75% of their turnover in the Netherlands.

Turnover percentage abroad	Percentage of companies	Cumulative percentage
0-25%	60.2%	60.2%
25-50%	25.8%	86.0%
50-75%	4.3%	90.3%
75-100%	9.7%	100%

Table A.3
Percentage of turnover generated abroad (LHV survey, 118 companies)

Clients are primarily based in the Netherlands.

Location	Percentage
In the Netherlands	66.0%
In Western Europe	25.5%
In Europe	7.4%
In Europe	1.1%

Table A.4
Location of main clients (LHV survey, 118 companies)

Some of the companies operate on a broader scale than just the Netherlands. However, the following table shows that the emphasis of the activities lies on the Dutch market.

Country	Percentage
Netherlands	97.9%
Belgium	69.1%
Germany	66.0%
France	34.0%
Italy	18.1%
Spain	11.7%
Switzerland	10.6%
Denmark	10.6%
England	14.9%

Table A.5
LHV companies are active in the following countries
(only countries with a share of
> 10%) (LHV survey, 118 companies)

The transport companies are active in the road transport sector and some companies also focus on product storage.

Activity	Percentage
Road transport	98.9%
Rail transport	5.3%
Inland shipping	2.1%
Short sea	2.1%
Storage	38.3%

Table A.6
Activities (LHV survey, 118 companies)

Appendix B Characteristics of non-LHV companies

A total of 51 companies participated in the study of companies that currently do not deploy LHVs. Of the 51 companies, 92% are transporters and 8% are shippers or own-account transporters. Even though the number of respondents was limited, and therefore caution should be exercised when interpreting these figures, they do offer a reasonably accurate picture of the group of non-LHV companies.

The following data on companies was compiled.

Number of employees	Percentage of companies	Cumulative percentage
1-9	3.9%	3.9%
10-19	9.8%	13.7%
20-49	23.5%	37.3%
50-99	31.4%	68.6%
100-250	27.5%	96.1%
>250	3.9%	100.0%

Table B.1

Company size by number of employees in non-LHV companies (LHV survey, 51 companies)

Number of employees	Percentage of companies surveyed	Division based on national licensing certificates
1-9	3.9%	75.2%
10-19	9.8%	10.5%
20-49	23.5%	7.1%
>50	62.8%	3.0%

Table B.2

Non-LHV companies compared to national division, by company size (employees, licensing certificates) (LHV survey, 51 companies)

The transport companies indicated where the main share of their turnover is generated. Unlike in LHV companies, non-LHV companies have a much larger stake in international transport.

Turnover percentage abroad	Percentage of companies	Cumulative percentage
0-25%	25.5%	25.5%
25-50%	10.6%	36.2%
50-75%	14.9%	51.1%
75-100%	48.9%	100.0%

Table B.3

Percentage of turnover generated abroad (LHV survey, 51 companies)

The clients of these companies are also primarily established in the Netherlands.

Location	Percentage
In Netherlands	66.0%
In Western Europe	25.5%
In Europe	7.4%
Outside Europe	1.1%

Table B.4

Location of most important clients (LHV survey, 51 companies)

Almost all companies that participated in the survey indicated that they are active in the Netherlands. The picture is reasonably similar to that of LHV companies.

Country	Percentage
Netherlands	93.6%
Belgium	55.3%
Germany	74.5%
France	51.1%
Italy	14.9%
Spain	10.6%

Table B.5

Non-LHV companies are active in the following countries
(only countries with a percentage > 10%) (LHV survey, 51 companies)

Activity	Percentage
Road transport	95.7%
Rail transport	4.3%
Inland shipping	2.1%
Short sea	0%
Storage	42.6%

Table B.6

Activities (LHV survey, 51 companies)

Market segment	Number	Percentage
Retail	10	19.6%
Containers	5	9.8%
Ornamental horticulture	1	2.0%
Waste/bulk	3	5.9%
Packaging	1	2.0%
Volume	3	5.9%
Other	28	54.9%
Total	51	100.0%

Table B.7

Non-LHV companies by market segment (LHV survey, 51 companies)

Appendix C Survey of companies using LHVs

A. General questions

1. a) How many employees does your company have in total? (Please tick the answer)

- 1 – 9 employees
- 10 – 19 employees
- 20 – 49 employees
- 50 – 99 employees
- 100 – 250 employees
- Over 250 employees

b) Of which drivers: _____ (please state the number)

2. Are you a haulage firm or an own-account transporter?

- Haulage firm
- Own-account transporter (please go to question 8)

3. What percentage of your turnover do you generate from international transport? (Please tick the answer)

- 0 to 25%
- 25 to 50%
- 50 to 75%
- 75 to 100%

4. Our company focuses on the following activities: (multiple answers are possible)

- Road transport
- Rail transport
- Inland shipping
- Short sea
- Storage

Similar activities, like: _____

5. In which market segment(s) are you active? (multiple answers are possible)

- Local-level distribution
- Conditioned
- Intermodal
- Bulk
- Liquid bulk and silo tank cargo
- Air freight
- Joint-cargo/ general and mixed cargo
- Container transport
- FTL/contract transport
- Warehousing/ VAL
- Express/ packages
- Other, namely _____

6. Where are your five most important clients established?

- The Netherlands
- Western Europe
- Europe
- Outside Europe

7. Our company mainly transports to the following countries (multiple answers are possible)

- Netherlands
- Belgium
- Germany
- France
- Italy
- Spain
- Portugal
- Greece
- Switzerland
- Austria
- Denmark
- Sweden
- Finland
- Norway
- England
- Ireland
- Poland
- Czech Republic
- Hungary
- Latvia
- Estonia
- Lithuania
- Romania
- Bulgaria
- Turkey
- Ukraine
- Russian
- Other, namely _____

B. LHVs

8. Does your company own LHVs (Longer and Heavier Vehicles)?

- Yes
- No

9. How many LHVs do you have?

- 1
- 2
- 3
- 4
- 5
- 6
- 7

- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- Over 15

9. How many of them are used daily?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- Over 15

10. What are your LHV configurations? and how many types of LHVs do have?

- A: truck + trailer + central axis trailer state the number of LHVs _____
- B: truck + trailer + trailer state the number of LHVs _____
- C: Truck + trailer state the number of LHVs _____
- D: Truck + dolly + trailer state the number of LHVs _____
- E: Truck + double central axis trailer state the number of LHVs _____

11. If you have a B configuration, which type do you have?

- Container type state the number of LHVs _____
- 2city state the number of LHVs _____
- Combitrain state the number of LHVs _____
- Parrator/Heiwo state the number of LHVs _____
- D-tec-Burgers state the number of LHVs _____
- Jumbo/Heiwo/VSE (TriCS) state the number of LHVs _____
- Other, namely _____

12. What is the Euronorm of your LHV's pulling unit?

- Euronorm 3
- Euronorm 4
- Euronorm 5

13. Our company has been using LHVs since?

- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010

14. The initiative to start using LHVs came from?

- Our own company
- The client, namely _____

15. During which part of the day are the LHVs usually used?
(multiple answers are possible)

- From 03:00 to 06:00
- From 06:00 to 10:00
- From 10:00 to 15:00
- From 15:00 to 19:00
- From 19:00 to 23:00
- From 23:00 to 03:00

16. What is the LHV's typical journey pattern? (multiple answers are possible)

- From point to point
- From point to point, decouple then to multiple points
- From point to multiple points (multiple stops in one journey)
- From point to point to point (combined journeys)

17. What is the biggest investment regarding the LHV?

- Investment in equipment
- Investment in a driver
- Internal and external organisational coordination to make the use of LHV possible
- Infrastructure (modifications to loading and unloading dock for example)

18. Where do you achieve the greatest savings when using LHVs?

- Driver costs
- Fuel costs
- Other, namely _____

19. Why do you use LHVs?

20. Innovation regarding the use of LHVs still predominantly lies on equipment, and insufficiently on the combination of journeys within the company or in combined efforts with fellow transporters?

- Agree
- Disagree
- Don't know

21. When did you last apply for an exemption for an LHV?

- Less than one year ago
- One year ago
- More than one year ago

22. How long did the exemption apply?

- Until the end of the trial period
- 1 year
- Unlimited
- Don't know

23. Would it be possible to further improve the exemption procedure?

- Yes, namely _____
- No

24. Are there areas in the Netherlands where you would like to use an LHV, but for which you do not yet have an exemption?

- Yes, namely _____
- No

25. Would you use LHVs for international transport, if permitted?

- Yes
- No
- Unsure

26. What would your company consider the minimum allowable tonnage for international use of LHVs should be?

- 44 tonnes or less
- 44 to 50 tonnes
- 50 to 55 tonnes
- Over 55 tonnes

27. Within five years we expect to be driving (please enter a number) extra LHVs.

28. What is the maximum percentage of LHVs that my company will be using in the future?

- 0 to 5%
- 5 to 10%
- 10 to 15%
- Over 15%

29. How pleased are you to be using LHVs?

30. Do you want the preconditions to be altered?

- Yes
- No

31. Do you have other suggestions or comments regarding LHVs (for example in relation to decoupling points, service areas)?

Company: _____
Contact: _____
Telephone number: _____
E-mail: _____

Appendix D Survey of companies not using LHVs

A. General questions

1. a) How many employees does your company have in total? (Please tick the answer)

- 1 – 9 employees
- 10 – 19 employees
- 20 – 49 employees
- 50 – 99 employees
- 100 – 250 employees
- Over 250 employees

b) Of which, how many drivers: _____ (enter a number)

2. Are you a haulage firm or an own-account transporter?

- Haulage firm
- Own-account transporter (please continue with question 8)

3. What percentage of your turnover do you generate from international transport? (Please tick the answer)

- 0 to 25%
- 25 to 50%
- 50 to 75%
- 75 to 100%

4. Our company focuses on the following activities: (multiple answers are possible)

- Road transport
- Rail transport
- Inland shipping
- Short sea
- Storage

Similar activities, like: _____

5. In which market segment(s) are you active? (multiple answers are possible)

- Local-level distribution
- Conditioned
- Intermodal
- Bulk transport
- Liquid bulk and silo tank cargo
- Air freight
- Joint-cargo/ general and mixed cargo
- Container transport
- FTL/contract transport
- Warehousing/ VAL
- Express/ package
- Other, namely _____

6. Where are your five most important clients established?

- The Netherlands
- Western Europe
- Europe
- Outside Europe

7. Our company mainly transports to the following countries (multiple answers are possible)

- Netherlands
- Belgium
- Germany
- France
- Italy
- Spain
- Portugal
- Greece
- Switzerland
- Austria
- Denmark
- Sweden
- Finland
- Norway
- England
- Ireland
- Poland
- Czech Republic
- Hungary
- Latvia
- Estonia
- Lithuania
- Romania
- Bulgaria
- Turkey
- Ukraine
- Russia
- Other, namely _____

B. LHVs

8. Have you ever considered using LHVs?

- Yes
- No

9. Please explain your answer to the previous question.

10. We cannot use LHVs, but could do so if we would work together with other transporters with similar transport routes?

- Yes
- No
- Maybe

11. Have you ever applied for and been refused an exemption?

- Yes (question 11)
- No (question 12)

12. Why did you not receive the exemption?

- Location was outside a core area.
- Other reason, namely _____

13. Would you use LHV for international transport, if permitted?

- Yes
- No
- Unsure

14. Please explain your answer to the previous question

15. What would your company consider the minimum allowable tonnage for international use of LHVs should be?

- 44 ton or less
- 44 to 50 tonnes
- 50 to 55 tonnes
- Over 55 tonnes

16. Do you expect your company to use LHVs over the coming years?

- Yes, please indicate the number of LHVs _____
- No

17. Please explain your answer to the previous question.

18. Do you have any further suggestions or comments regarding LHVs?

Company: _____
Contact: _____
Telephone number: _____
E-mail: _____

Appendix E Journey analysis form

To gain insight in the routes that LHVs travel in the Netherlands, companies are requested to note down five representative journeys. In addition to insight in the routes, we also want to be able to estimate the total effect in kilometres (and the environmental effects) and hours for the current LHV fleet in the Netherlands.

Please use the following form to enter this information. You can print the form and fax it to 079-3222382 or e-mail it to mki@nea.nl attn. Manfred Kindt.

- A. What are the total number of kilometres on which your company used LHVs over the past years? If you cannot remember the exact number please give an estimate.

2007: _____

2008: _____

2009: _____

- B. Give an estimate of the savings potential through the use of LHV compared to regular vehicles for one /two clients.

Client/situation 1:

LHV situation (per year/per journey)

Total number of kilometres: _____

Total number of driving hours: _____

Total fuel consumption: _____

Old situation (per year/per journey)

Total number of kilometres: _____

Total number of driving hours: _____

Total fuel consumption: _____

Client/situation 2:

LHV situation (per year/per journey)

Total number of kilometres: _____

Total number of driving hours: _____

Total fuel consumption: _____

Old situation (per year/per journey)

Total number of kilometres: _____

Total number of driving hours: _____

Total fuel consumption: _____

Company: _____

Contact: _____

Telephone number: _____

E-mail: _____

REPRESENTATIVE JOURNEY

Start location (please enter city/town): _____

Type of location: at one's own industrial site

- Client's distribution centre
- Auction
- Inland terminal
- Port site
- Waste depot
- Other, namely _____

Date and day of the week: _____

Starting time of journey at start location: _____

Via destinations: _____

Final destination (please enter the city/town): _____

Type of location:

- Own industrial site
- Client's distribution centre
- Auction
- Inland terminal
- Port area
- Waste depot
- Service area used as decoupling point
- Decoupling point, namely _____
- Other, namely _____

Date and day of the week: _____

End time of journey at destination: _____

Special circumstances during journey: _____

Distance of entire journey (in Km): _____

Which motorways do you use (circle where applicable)

A1	A2	A4	A5	A6	A7	A8	A9	A10	A12
A13	A15	A16	A17	A18	A20	A22	A27	A28	A29
A30	A31	A32	A35	A37	A38	A44	A50	A58	A59
A65	A67	A73	A76	A77	A79	A200	A205	A208	A256
A261	A270	A325	A326	A348	Anders, namely				

What type of journey does this concern?

- Shuttle service
- Distribution journey
- Shuttle in combination with distribution

Does the vehicle stop at a service area during the journey?

- Yes
- No

How was the vehicle loaded on the outbound and return journey (please state the weight (tonnes) and volume (m3/pallet/TEU):

Outbound		Return	
_____	in tonnes	_____	in tonnes
_____	in m3,	_____	in m3,
_____	in pallet places,	_____	in pallet places,
_____	in TEU.	_____	in TEU.

What type of product does this concern?

What carrier do you use?

Pallet

Danish cart /auction cart

Wheeled container

Other, namely_____

How many axles does the LHV combination have?_____

What is the average axle load?_____

Appendix F Monitoring plan

Aspect?	What?	How?	In?	Who?	When?
Equipment	Configuration type Specifications of hauled equipment	Survey In-depth interviews Survey	Type A, B, C, D, E Innovations per type Name sub-types	* C G LHV companies Selection (min. 15) * C G LHV companies	June Apr, May June
	Specifications hauling equipment	Survey In-depth interviews	Euronorm Euronorm/Engine power	* C G LHV companies Selection (min. 15)	June Apr, May
	Visual records	In-depth interviews	Photos (3 MB, no copyright)	Selection (min. 15)	Apr
Journeys	Route	Journey overviews/ journey analysis form	Start location, end location, type of motorways (names), distance in Km, journey type (distribution/point-point) Daytime / night Decoupling points (yes, no type of locations)	Selection (min. 15) Selection (min. 15) * C G LHV companies * C G LHV companies	Apr, May, Jun, Jul, Aug Apr, May, Jun, Jul, Aug June June
LHV companies	Characteristics	Survey	Company size (number of employees) Type of market segment	* C G LHV companies * C G LHV companies	June June
	Number of LHVs Participant since	Survey Survey	Number Year	* C G LHV companies * C G LHV companies	June June
Investments	Largest investment Invested amounts	Survey In-depth interviews	Equipment/personnel/infrastructure/ training/other Euros	* C G LHV companies Selection (min. 15)	June Apr, May
Start-up	Initiator Decision to use LHVs	Survey In-depth interviews	Shipper/transporter Which consideration, difficult/simple	* C G LHV companies Selection (min. 15)	June Apr, May
Preconditions	Need for conditions to be altered	Survey In-depth interviews	Yes/no motivation Yes/no motivation	* C G LHV companies Selection (min. 15)	June Apr, May
	Core areas	Survey In-depth interviews	Use/no exemption Use/no exemption	* C G LHV companies Selection (min. 15)	June Apr, May
Future	Development in number of LHVs	Survey In-depth interviews	Increase/decrease Increase/decrease	* C G LHV companies Selection (min. 15)	June Apr, May
	Required tonnage for int. transport	Survey In-depth interviews	In tonnes In tonnes	* C G LHV companies and non-LHV Selection (min. 15)	Apr, May
Non-LHV companies	Considered participating	Survey	Yes/no	Non-LHV companies (min. 50)	Apr, May, June
	Reason for not using	Survey	Explanation	Non-LHV companies (min. 50)	Apr, May, June
	Considered int. use	Survey	Yes/no	Non-LHV companies (min. 50)	Apr, May, June
	Minimum required tonnage	Survey	In tonnes	Non-LHV companies (min. 50)	Apr, May, June
	Future expectations use of LHVs	Survey	Development (increase/same/decrease)	Non-LHV companies (min. 50)	Apr, May, June
	Applied for exemption once	Survey	Yes/no	Non-LHV companies (min. 50)	Apr, May, June
Reason for rejection	Survey	Explanation	Non-LHV companies (min. 50)	Apr, May, June	
Social effects	Distance travelled (less)	Analysis	Km	Based on response to journey	July, Aug
	Emission	Analysis	CO2	Based on response to journey	July, Aug
	Effects on traffic	Analysis	Vehicles	Based on response to journey	July, Aug
Evaluation		Round-table Advisory group		Companies and organisations Members of advisory group	Sep Sep

* C G LHV companies = complete group of LHV companies

Appendix G Consultative party

The consultative party consisted of the following parties:

- Binnenlandse Container Terminal Netherlands (BCTN) - *(Netherlands Domestic Container Terminal)*
- Kennisplatform voor infrastructuur, verkeer, vervoer and openbare ruimte (CROW) - *(Knowledge platform for infrastructure, traffic, transport public areas)*
- EVO - *(Network Organisation for Logistics and Transport)*
- Inspectie Verkeer and Waterstaat (IVW) - *(Transport, Public Works and Water Management Inspectorate)*
- Korps Landelijke Politie Diensten (KLPD) – *(National Police Services Agency)*
- Koninklijk Netherlands Vervoer (KNV) – *(Royal Netherlands Transport)*
- Rijksdienst voor het Wegverkeer (RDW) – *(Government Road Transport Agency)*
- Stadsregio's in het kader van Verkeer and Vervoer (SKVV) – *(Urban regions within the framework of traffic and transport)*
- Stichting Wetenschappelijk onderzoek Verkeersveiligheid (SWOV) - *(Independent Scientific Institute for Traffic Safety)*
- Transport and Logistiek Nederland (TLN) – *(Netherlands Transport and Logistics)*
- Veilig Verkeer Nederland (VVN) – *(Dutch Traffic Safety Association)*
- Vereniging van Nederlandse Gemeenten (VNG) – *(Association of Dutch Municipalities)*



This is published by

Rijkswaterstaat

For more information visit
www.rijkswaterstaat.nl/en

Telephone +31 800 - 8002
(toll free number, in the Netherlands only)

Augustus 2011 | DVSO811RE141