Transport and mobility 2016

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Explanation of symbols

.	Data not available
*	Provisional figure
**	Revised provisional figure (but not definite)
x	Publication prohibited (confidential figure)
–	Nil
–	(Between two figures) inclusive
0 (0.0)	Less than half of unit concerned
empty cell	Not applicable
2015–2016	2015 to 2016 inclusive
2015/2016	Average for 2015 to 2016 inclusive
2015/'16	Crop year, financial year, school year, etc., beginning in 2015 and ending in 2016
2013/'14–2015/'16	Crop year, financial year, etc., 2013/'14 to 2015/'16 inclusive

Due to rounding, some totals may not correspond to the sum of the separate figures.

Publisher
Statistics Netherlands
Henri Faasdreef 312, 2492 JP The Hague
www.cbs.nl

Prepress: Textcetera, The Hague and CCN Creatie, The Hague
Printed by: Tuijtel, Hardinxveld-Giessendam
Design: Edenspiekermann

Information
Telephone +31 88 570 70 70
Via contact form: www.cbs.nl/infoservice

Where to order
ISBN: 978-90-357-2056-5
Price: € 20 (excluding postage)

Foreword

In this second edition of Transport and mobility, Statistics Netherlands again presents facts and trends about traffic and transport in the Netherlands. The focus is on various aspects of the mobility of individuals and goods transport: traffic and transport flows, infrastructure, means of transport, energy use, environmental effects, traffic accidents and the economic significance of transport.

The first nine chapters provide an up-to-date overview of the broad terrain of traffic and transport. Next, several articles elaborate on specific aspects. We are grateful for the contributions by authors from outside Statistics Netherlands. Wendy Weijermars and Niels Bos of SWOV deal with the aftermath of traffic accidents in their article Injuries and burden of injury of serious road injuries. Gerben Geilenkirchen of PBL contributed to the article on nitrogen oxide emissions by diesel cars.

During the production process of this publication we benefitted from the feedback on the first edition, which experts provided at our request. This feedback allows us to focus even better on topical subjects in this new edition.
The data used in the figures of this publication are published on StatLine, the electronic database of Statistics Netherlands.

Director General
Dr. T.B.P.M. Tjin-A-Tsoi

The Hague/Heerlen/Bonaire, September 2016

Inhoud

Summary

The Netherlands is an international logistics hub, for goods as well as passengers. Large amounts of raw materials and goods arrive from all over the world in the port of Rotterdam.
A large share is transported to the European hinterland by road, inland waterways and rail. Because of its unique location, the Netherlands serves as the gateway to Europe, for goods going in and out. Rotterdam is Europe's largest sea port and the ninth largest in the world. The Netherlands has several other major sea ports as well, including the port of Amsterdam. Amsterdam Schiphol Airport is one of Europe's major airports. Schiphol functions as a stopover for many transfer flights, for passengers as well as cargo. Regional airports are increasingly popular, especially Eindhoven.

Motives for mobility: people and businesses

Traffic and transport are found wherever people and companies are active: whether going to school, to work, visiting family and friends, shopping, using sports clubs, consulting a doctor or going to hospital. Manufacturers order raw materials and deliver products. Companies in construction, trade and the hotel and catering industry also need goods. This leads to domestic economic activity and international trade, resulting in traffic and transport within the Netherlands and abroad.

Most kilometres covered by car, short distances mostly by bicycle or on foot

Dutch people travelled a good 11 thousand kilometres domestically in 2014, holidays and business trips not included. People covered over 70 percent of this distance by car, either as drivers or as passengers.
For distances up to 5 kilometres Dutch people of all ages usually take their bicycle or walk. Most children and students ride their bicycles to school or university. Dutch people cycle an average of 1,000 kilometres a year. Electric bicycles (e-bikes) are becoming more popular especially among seniors: one in five bicycles sold is an e-bike, and 10 percent of the total biking distance is covered by e-bikes.

Daily commutes take a good half-hour on average. Cars cover 77 percent of the commuting distance, 10 percent is done by train and 6 percent by bicycle. Men commute on average 40 minutes, women 12 minutes less. The distance men cover is almost double: 30 compared to 16 kilometres. Because women more often work part-time or have no job at all, they commute less often. Moreover, women tend to live closer to work.
Commuting accounts for most of the distance travelled, while social and leisure activities take up most of the travel time. Almost half of all travel time relates to leisure, including visits. Shopping accounts for well over a fifth of all trips. These tend to be short and brief.

Goods transport mainly by road within the Netherlands

Over 73 percent of the 570 million tonnes of goods entering the Netherlands arrive by sea. Of the 440 million tonnes of goods leaving the Netherlands 42 percent go by sea, one third by inland waterways and over one fifth by road. Almost 82 percent of all domestic goods transport, that is almost 630 million tonnes, go by road and almost 18 percent by inland waterways. Rail and air transport are relatively less important in terms of weight: 2 and 1 percent respectively. Nevertheless, these are still huge flows of goods. Nine million tonnes of goods enter and 26 million leave the country by rail. Aircraft carry 0.9 million tonnes of the goods coming in and about 0.8 million tonnes leaving the country.

Busy traffic, especially cars

On average a Dutch car is driven 13 thousand kilometres a year. Cars account for 78 percent of the total distance by motor vehicles on the Dutch roads, vans for 13 percent and heavy freight vehicles for 5 percent. Since 2005, car kilometres have increased while kilometres driven by vans and heavy freight vehicles have decreased. Foreign heavy freight vehicles cover 11 percent of the total distance by heavy freight vehicles within the Dutch territory. Of these, 30 percent have a German license plate and almost 20 percent are registered in a Middle or Eastern European country.

Leisure

Driving is a holiday favourite, both domestically and abroad. However, flying is becoming more popular: during the last decade 33 percent more people flew to their holiday destinations. This is partly because low cost carriers offer cheap tickets. Coaches have become less popular for longer holidays abroad. On the other hand, trains are used more than before for domestic holidays. Within the Netherlands, the water sports regions and the North Sea beach resorts are popular tourist destinations. Longer holidays abroad are mostly spent in Germany, France and Spain.

More cars, electric cars cautiously gaining ground

There were 8.1 million cars in the Netherlands in January 2016, exceeding 8 million for the first time. Almost 80 percent of the cars run on petrol and 16 percent on diesel. The number of diesel cars has been declining in the last few years. There are now almost 211 thousand electric and hybrid cars, an increase of 35 percent on 2015. Plug-in hybrids more than doubled in number, in part due to a favourable fiscal regulation. In 2015 new car sales increased by almost 16 percent on 2014, reaching almost 449 thousand. This is the first rise after three years of declining sales figures.

Sales of vans and heavy freight vehicles gain momentum

By January 2016 the numbers of vans and heavy freight vehicles had increased, for the first time since 2011, to 828 thousand vans, 72 thousand tractor-trailers and 62 thousand lorries. Apparently, companies are investing more in transport vehicles as a result of growing confidence in the economy. In 2015, 11.5 percent more new vans and 33.7 percent more heavy freight vehicles were sold than in 2014. Nevertheless, sales did not yet reach their 2008 levels.

Bikes first

There is a remarkable number of bicycles in the Netherlands in comparison with other countries: there are more bicycles (22 million) than inhabitants (17 million). Moreover, people own over 1 million mopeds and over 650 thousand motorcycles.

Cyclists and pedestrians: vulnerable in traffic

Traffic accidents caused the deaths of 621 people in 2015. This figure is 9 percent higher than that of 2014 when there were 570 fatalities. The shares of fatalities among male drivers and elderly men in mobility scooters rose in particular. Traffic fatalities had been decreasing for years.
The number of seriously injured people has gone up in the last 15 years, particularly among bicyclists and pedestrians. Older people are vulnerable in traffic, especially on a bicycle. Although there were 20,700 serious injuries, Dutch traffic safety compares favourably to that of many other countries.

Consequences of traffic accidents: injury load

Traffic accidents often have a long aftermath. Many seriously injured people still have physical problems nine months later; one fifth will be permanently disabled. Analyses of the injury load indicate bicyclists, pedestrians and people riding powered two wheelers (PTW) as the main focus groups.

More traffic, less energy

Fuel use by traffic and transport rose constantly until 2012, followed by a decline, even though there was more traffic on the roads. This is because cars became much more energy efficient. Within the EU, targets have been set for ecological driving: 10 percent of fuels used in transport have to be renewable by 2020. One measure taken to reach this target is to mix fuel with renewables at the filling stations.

Emissions: less nitrogen oxides and particulate matter, carbon dioxide more or less stable

Emissions of nitrogen oxides and particulate matter by road traffic can cause problems for the air quality in towns and risks to health. Since 1990 these emissions have greatly decreased in spite of heavier traffic, mainly due to technical improvements especially the application of catalytic converters and diesel particulate filters. Moreover, several towns introduced environmental zones were old polluting diesel cars are banned. This is an effective method of reducing the number of such cars, as was demonstrated in Utrecht.

Transport industry: employing almost half a million people

Logistics is big in the Netherlands. This is reflected in Dutch employment figures. The transport industry employs almost 490 thousand people. It contributes 4.5 percent to GDP. Freight transport by road dominates employment within the transport industry. Sea shipping, inland shipping and transport by air also create much economic activity and therefore employment. In terms of turnover, transport services are increasingly important.
Besides freight transport, passenger transport, which includes public transport – rail, bus, tram and metro – as well as taxis, forms a key part of the transport industry.

Emission of nitrogen oxides by diesel cars exceeds limits in practice

Type approval tests for diesel cars and diesel vans do not reflect their actual emissions of nitrogen oxides (NO_x). In 2014 actual emissions were about 20 million kg higher than could be expected on the basis of type test requirements. Total NO_x emissions for road traffic in the Netherlands reached over 80 million kg. Diesel cars that have to comply with the Euro 6 standards exceeded these by a factor 4 on average. Remarkably, heavy-duty vehicles do meet the most recent European standards. Air quality requirements were exceeded because of these disappointing NO_x emissions. The application of particulate filters makes that all vehicles comply with particulate matter standards.

Key figures

	Unit	2000	2010	2013	2014	2015	Source
Mobility (on Dutch territory)							
Total	**Km pppd**	.	30.3	30.5	30.7	.	CBS
car driver	**Km pppd**	.	15.3	15.6	15.6	.	CBS
car passenger	**Km pppd**	.	7.3	6.8	6.7	.	CBS
public transport	**Km pppd**	.	3.4	3.9	3.6	.	CBS
slow traffic	**Km pppd**	.	2.6	2.7	3.0	.	CBS
walking	**Km pppd**	.	0.9	0.8	0.9	.	CBS
other	**Km pppd**	.	0.8	0.8	1.0	.	CBS
Aviation	**Million passengers**	40.8	48.6	58.0	60.9	64.6	CBS
Goods transport (from, to and in the Netherlands)							
Total	**Million tonnes**	1502	1717	1717	1746	.	CBS
road transport	**Million tonnes**	669	705	691	696	.	CBS
sea shipping	**Million tonnes**	424	568	558	570	.	CBS
inland shipping	**Million tonnes**	275	302	307	318	.	CBS
pipelines cross-border	**Million tonnes**	104	106	123	122	.	CBS
rail transport	**Million tonnes**	28	33	37	38	.	CBS
aviation	**Million tonnes**	1	2	2	2	2	CBS
Distance covered (Dutch vehicles)							
Cars	**Km/year *1,000**	.	13.2	13.0	13.0	.	CBS
Lorries	**Km/year *1,000**	.	36.9	36.3	36.2	.	CBS
Road tractors	**Km/year *1,000**	.	81.1	76.6	77.7	.	CBS
Vans	**Km/year *1,000**	.	17.9	17.7	18.0	.	CBS
Vehicles (NL licence plate)							
Cars	***mln**	6.3	7.6	7.9	7.9	8.0	CBS
Vans	***1,000**	696	872	832	815	815	CBS
Lorries	***1,000**	83	73	67	65	63	CBS
Road tractors	***1,000**	57	72	70	71	71	CBS
Mopeds	***1,000**	.	.	1081	1097	1120	CBS
Motorcycles	***1,000**	414	623	653	654	652	CBS
Buses	***1,000**	11	12	10	10	10	CBS
Infrastructure							
Roads	**1,000 km**	.	137	138	139	139	CBS
Railroads	**Km**	.	3013	3013	3032	3031	CBS
Waterways	**Km**	.	6220	6242	6251	6261	CBS
Proximity to amenities							
Proximity to main road entrance	**Km**	.	1.7	1.7	1.7	1.8	CBS
Proximity to train station	**Km**	.	5.1	5.0	5.0	5.0	CBS
Proximity to secundary school	**Km**	.	2.4	2.4	2.4	.	CBS
Proximity to hospital	**Km**	.	4.8	4.7	4.7	.	CBS
Proximity to general practitioner	**Km**	.	0.9	0.9	1.0	1.0	CBS

Key figures (end)

	Unit	2000	2010	2013	2014	2015	Source
Traffic safety							
Deaths in traffic	**Number**	1166	640	570	570	621	CBS
Road injuries	* **1,000**	15	19	19	21	.	SWOV
Energy use							
Use of fuel in road traffic	**PJ**	434	473	447	418	419	CBS
Use of fuel in railway traffic	**PJ**	7	8	7	7	7	CBS
Use of fuel in shipping	**PJ**	565	590	542	497	528	CBS
Use of fuel in aviation	**PJ**	142	145	148	153	161	CBS
Environment							
Emissions CO_2 road traffic	**Billion kg**	28	30	29	29		CBS
Emissions NO_x road traffic	**Million kg**	155	108	90	82		CBS
Emissions PM_{10} road traffic	**Million kg**	11	7	5	5		CBS
Emissions NMVOS road traffic	**Million kg**	66	32	28	27		CBS
Transport sector							
Employment	**Persons employed** * **1,000**	.	497	490	488		CBS
Net turnover	**Billion euros**	.	67	75	78		CBS
Government income related to transport							
Car tax	**Billion euros**	2.8	5.1	5.0	5.4	5.5	CBS
Excise on petrol	**Billion euros**	3.2	4.1	4.0	4.0	4.1	CBS
Excise on other mineral oils	**Billion euros**	2.1	3.6	3.6	3.8	3.8	CBS
BPM	**Billion euros**	2.9	2.1	1.2	1.1	1.4	CBS

1. Mobility – Dutch people on the move

32 km average daily travel distance in 2014

73% of the distance covered by car in 2014

10,000,000 commuter trips made on weekdays in 2013/2014

Dutch people travel more than 11 thousand kilometres a year, on average. This includes trips within the Netherlands and cross-border trips, but excludes holidays and professional journeys (such as driving a taxi, train or truck). Most kilometres are made commuting, usually by car, but for short distances people often ride their bicycle. Many kilometres are made to visit friends or relatives, and for sports, hobbies and other leisure activities. This adds up to almost 50 percent of the total travelling time. Although the most common means of transport is the car, the Netherlands is a real bicycle country: Dutch people own 22 million bicycles and ride nearly 1,000 kilometres a year per person. The e-bike is gaining ground, especially among people over 45: 10 percent of all bicycle kilometres is covered on e-bikes.

1.1 Introduction

People travel for a variety of reasons: students go to school, employees go to work and most people regularly go shopping, visit family or friends and undertake other leisure activities. All these are travel motives for people.
This chapter presents the daily travel behaviour of the Dutch population. It involves both domestic and cross-border trips. Holidays and business travel are not included. It describes how often people travel, to which destination, how many kilometres are covered, on which days and times the travelling takes place, and how people travel: on foot, by bicycle, by moped or scooter, in the car as the driver or as a passenger, by public transport or by other means.

Survey Onderzoek Verplaatsingen in Nederland (OViN)

The figures for mobility of people in this chapter are largely based on the survey Onderzoek Verplaatsingen in Nederland (OViN) that the CBS carries out for the Ministry of Infrastructure and the Environment. It is a survey on domestic trips among the Dutch population in private households.
The figures in this chapter are slightly different from those in StatLine:

1. **StatLine publishes only trips within the Netherlands, and only counts the domestic part for cross-border trips. In this chapter, however, cross-border trips are *fully included*. This way, border provinces are more comparable to provinces in the middle of the country.**

2. **Unlike StatLine the travel kilometres in this chapter *do not include* occupational kilometres per year and the estimated domestic tourism kilometres. This is done to establish the relationship between annual and daily figures. Occupational kilometres are made in the context of work, such as journeys as the driver of a taxi, bus, train or lorry, or trips to visit clients or patients.**

The figures presented mostly concern the year 2014. For the analyses of travel behaviour, we used the averages for the years 2013 and 2014. This was done to increase the reliability and stability of the figures.

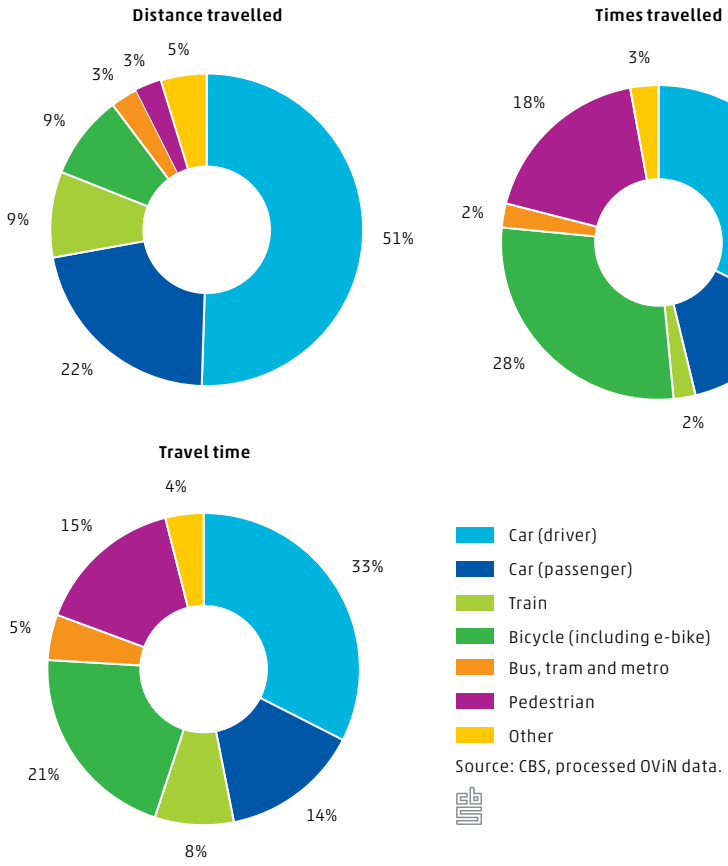
1.2 How much and how do Dutch people travel?

A Dutch person travels more than 11 thousand kilometres a year

In 2014, the Dutch population travelled 185 billion kilometres for daily trips within the Netherlands, in and out of the country. This is 619 times the distance to the sun and back. Per person this amounts to more than 11 thousand kilometres, holidays and professional journeys excluded.

People travel nearly three-quarters of the total number of kilometres by car as drivers and nearly a quarter as passengers. Per person this is 8,000 kilometres in the car. In terms of travel time, trips by car cover a smaller portion, namely less than half. The car is mainly used for longer distances. For short distances people often take the bicycle or walk. Of the total number of trips, almost half are done by car and an equal share by bike or on foot. Other means of transport are used in less than a tenth of the time. People annually cover almost 1,000 kilometres by bicycle and 300 kilometres on foot. Together, cycling and walking account for one third of the total travel time.

1.2.1 Mobility of Dutch people by means of transport, 2014



Inhabitants of Drenthe travel most kilometres

There are large regional differences in distances travelled. On average, Dutch people travel nearly 32 kilometres a day, taking 63 minutes of travel time. An inhabitant of Drenthe travels by far the greatest daily distance: more than 37 kilometres. This is followed by people living in Flevoland, Zeeland, Utrecht and Friesland with 35 kilometres per day. Someone from Zuid-Holland travels the least (28 kilometres), followed someone living in Noord-Holland or Limburg (both 30 km).

An inhabitant of Utrecht differs from the inhabitants of the other provinces in making the most trips as well as the most kilometres by bicycle and train. People from Drenthe cover the most kilometres by car. People from Zuid and Noord-Holland travel the shortest distance by car, mostly because of the relatively low number of car trips and small distances covered. Limburg is characterized by

the shortest travelling distance by car and in addition, people from Limburg travel the least by bicycle and bus.

Regional differences are related to the proximity of facilities

The difference in distance is related to the proximity of major facilities. A resident of Drenthe has to travel more than twice as far to reach a general practitioner as someone from Zuid-Holland: 1.6 versus 0.7 kilometres. The distance to the nearest supermarket or school is about double in Drenthe. In the three provinces where people average the most kilometres per day – Drenthe, Flevoland and Zeeland – they have to travel relatively large distances to commute, shop, study and go to leisure activities.

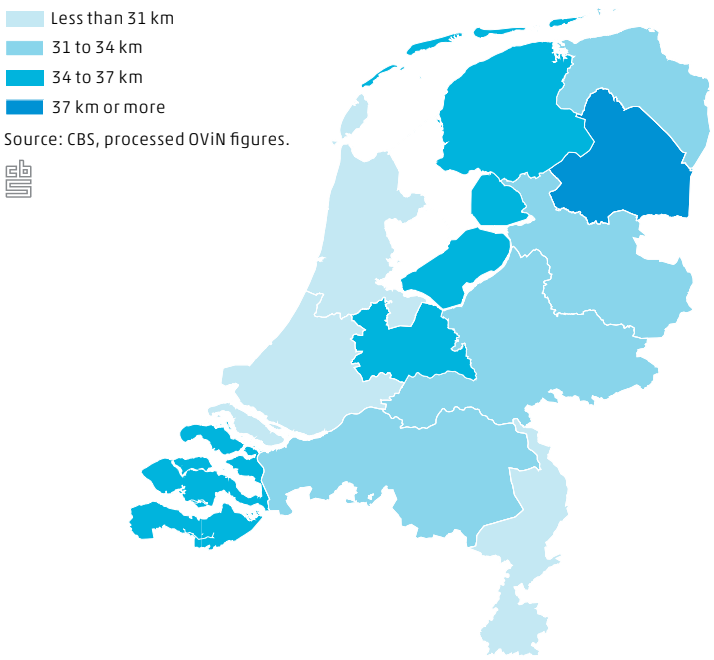
Total kilometres travelled per year is highest in Zuid-Holland

Inhabitants of Zuid-Holland travel greatest distances, with almost 35 billion kilometres annually. Although this province records the lowest number of kilometres a day, it has the largest population. In Drenthe, Flevoland and Zeeland, the provinces with the smallest populations, the total number of kilometres travelled is lowest.

Men travel longer distances than women

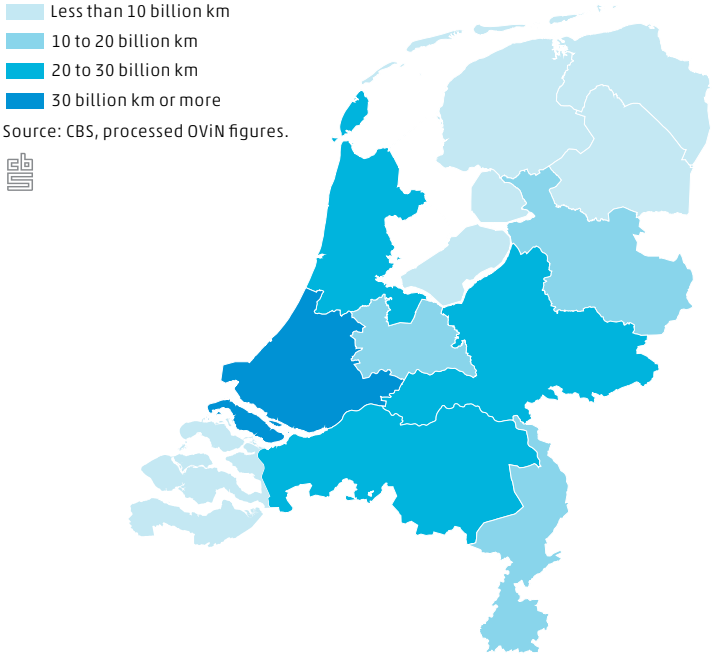
Men and women differ in travel behaviour. In 2013/2014 the male population aged over 12 travelled 39 kilometres a day, for women this was 10 kilometres less. Women travel more often than men, but the trips are shorter and slower. Per day women spend a full hour on the road, men 7 minutes longer.
Men drive cars a quarter more often than women, but double the number of kilometres. The distance men travel as car drivers is more than 1.5 times higher than for women: 22 versus 14 kilometres. There is less difference between men and women in the distance travelled as car passengers. Both men and women travel longer distances as passengers than as drivers, but this difference is much greater for women. Because women are 2.5 times more likely to be passengers in a car as men, they travel double the number of kilometres as passengers.

1.2.2 Travel distance by home province, per person per day, 2013/2014



Source: CBS, processed OViN figures.

1.2.3 Total annual travel distance by home province, 2013/2014



Source: CBS, processed OViN figures.

Women take the bicycle or walk more often

Women take the bicycle more often than men, but men travel longer distances by bike: 3 versus 5 kilometres. Men ride a quarter more kilometres than women and spend a little more time on the bike. On the other hand, men ride faster: despite the longer average distance they arrive sooner at their destinations. Women walk a quarter more often than men and walk more kilometres, which takes them a little more time.

The Dutch and their sacred cow

In 2014, more than 6.6 million Dutch people aged 18 and older owned a car. That is over half the adult population. Men are more often car owners than women: 65 versus 37 percent. For men, however, this share decreases while for women it increases.
Car ownership is also rising among the older population. In contrast, people under 45 less often own a car.
71 percent of all households own at least one car. This is more often the case for households with a high income (more than 9 out of 10) than in households in the lowest income group (less than 4 in 10). Households in the highest income group usually own several cars. The share of households owning a car in rural areas is 84 percent, which is higher than in urban areas. Cars are also used more frequently in rural areas.

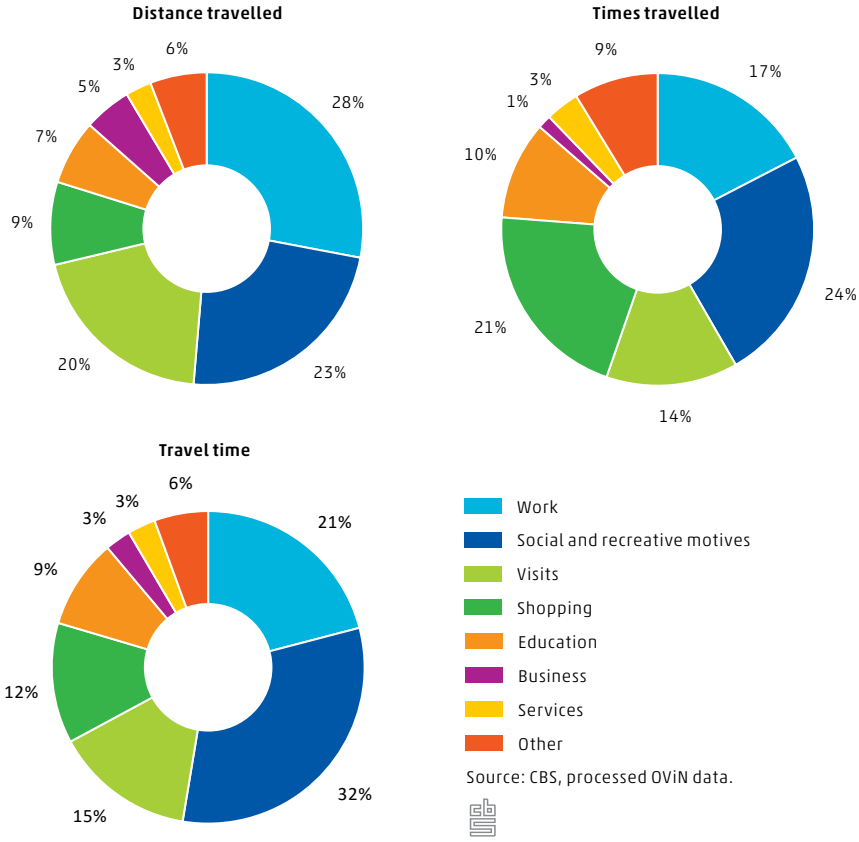
1.3 Destinations: why do Dutch people travel?

Most of kilometres to travel to work

Participation in traffic is not an end in itself, but is done for a reason. The main reasons for travelling are going to work, schools, colleges and university, shops, go to service providers such as the dentist or hairdressers, visit family or friends and going to social and recreational activities such as sports, hobbies, hiking and touring.

The most kilometres are travelled to commute to work. The longest trips are made for social and recreational purposes. Almost half of the travel time is associated with leisure activities, including visits. Errands and shopping accounted for more than a fifth of all journeys. They usually involve short trips that take little time.

1.3.1 Mobility of Dutch people by motive, 2014



Source: CBS, processed OViN data.

Nearly 10 million commuter trips on a weekday

The daily trip to and from work is responsible for much of the travel and travel time and also contributes for the peak times every weekday resulting in rush hours. On an average day in the period 2013–2014 there were almost 10 million trips to work. Workers travel an average of 24 kilometres to and from work on aweekday, taking 34 minutes. On the weekends, commuter trips are down to less than one fifth.

Some 77 percent of the commuter trips are made by car, mostly as drivers (72 percent). The train is used for 10 percent of commuter kilometres, especially for long home to work distances. People ride their bicycles in a quarter of the commuting trips, usually for short distances. This amounts to 6 percent of the commuter kilometres in total.

34 minutes commute by working persons on weekdays in 2014

Commuting in the rush hour

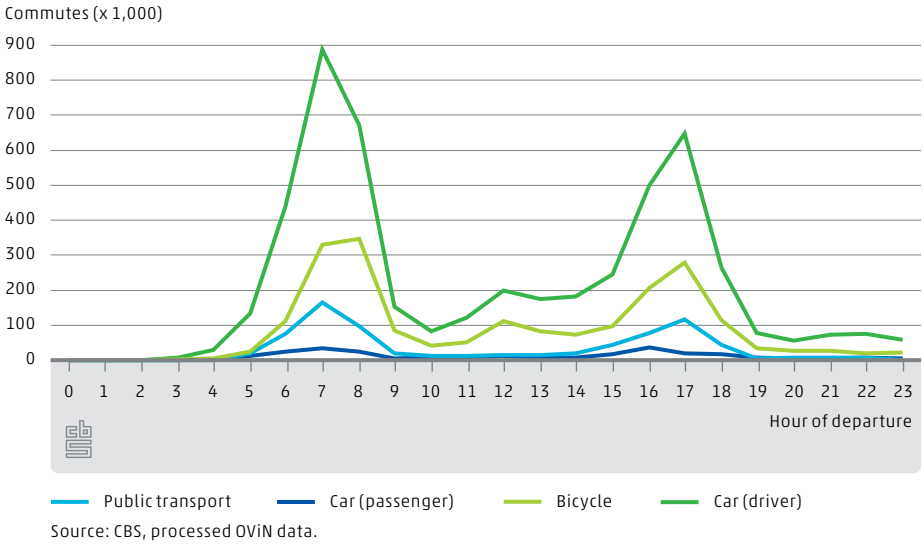
The daily rush hours are between 7 and 8 in the morning and between 5 and 6 in the afternoon. The weekdays with the most commuter traffic are Monday, Tuesday and Thursday. Travel to work is relatively more time consuming in urban areas. Workers living in highly urbanized areas travel shorter distances to work, yet they are on the road longer than workers in less urban areas. This is not only caused by heavy traffic, but also by the choice of transport: in cities people often use public transport and bicycles.

Men travel longer and greater distances to work than women

On a weekday men commute on average 40 minutes and women 12 minutes less. Men commute almost double number of kilometres, 30 versus 16 kilometres for women. Because women often have part-time jobs or do not work, they travel less often to work than men. Women also tend to live closer to work. The difference in commuting distance between male and female employees is 40 percent.

The greater distance to work also creates differences between men and women in the vehicle that they use to commute. Men more often take the car and the train, while women more often take the bicycle. Men and women travel equally often as car passengers to and from work. With almost all vehicles men travel considerably greater distances than women, except for bus, tram and metro.

1.3.2 Commuting by working persons on normal weekdays, 2013/2014

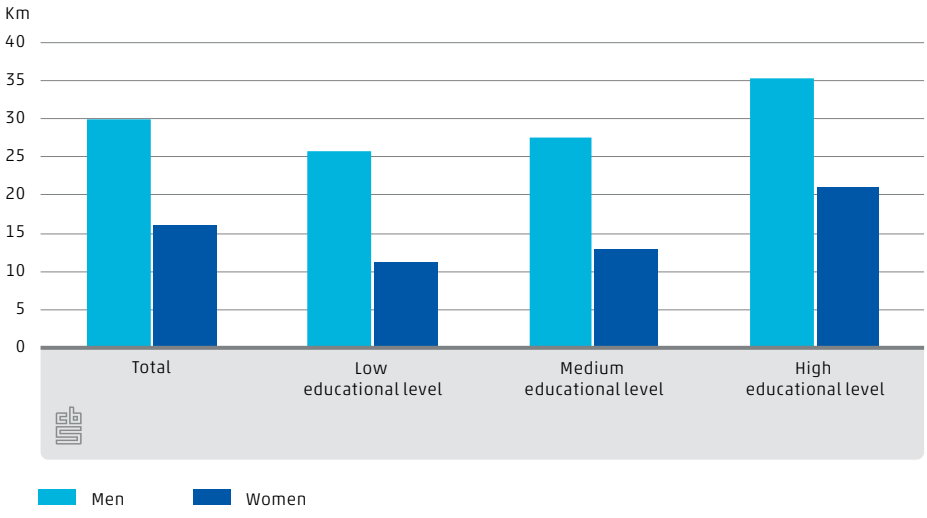


Source: CBS, processed OViN data.

Highly educated workers commute greatest distances

Highly educated men and women with jobs commute considerably more than workers with low- and medium level education. This is mainly because there is a greater distance between the home address and the place of work for highly educated workers than for the less educated workforce. For women this difference is the strongest. The distinction between men and women, however, is greater than the difference in level of education: a man with a low education level commutes 21 kilometres on a weekday, which is slightly more than the 19 kilometres a highly educated woman travels.

1.3.3 Commuting distance travelled by working persons on normal week days, 2013/2014



Source: CBS, processed OViN data.

Pupils mainly ride their bicycle to school

Children under 12 usually ride their bicycle to school or walk. If the school is a little further away they are usually brought by car. Between ages 12 and 15 students have to travel double the distance to and from school (9 km) which takes them on average 36 minutes. They ride their bicycles en masse (80 percent). After age 15, the travel distance rises even further, so students use public transport more often in addition to the bike.

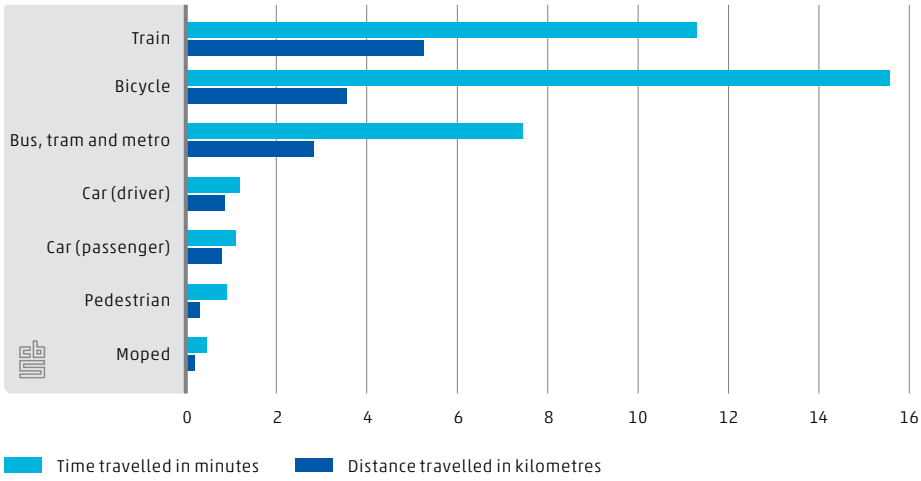
Students usually take public transport

Young people over 18 have usually finished secondary school and continue their education at a MBO, HBO or university. They spend an average 45 minutes travelling for their studies on a weekday. They often have a student pass for public transport, which they use over half of the time for their study. They take the train to cover over half the distance, and bus/tram/metro for almost a quarter. They ride their bicycle for more than a quarter of the trips covering 8 percent of the distance, so bicycles are used for the shorter distances. The train trip is often preceded or followed by a bike ride to or from the station: these bicycle trips are not counted separately.

Longest distance for studies travelled by train

Pupils and students aged over 12 years ride their bicycles most and longest to their studies. They use the train to cover the longest distance. Their peak hours differ from commuters: later in the morning, between 8 and 9, and earlier in the afternoon, between 2 and 4. This is because an average school day is shorter than the average working day.

1.3.4 Distances and times travelled by students and school children aged 12 or more for their studies on normal weekdays, 2013/2014



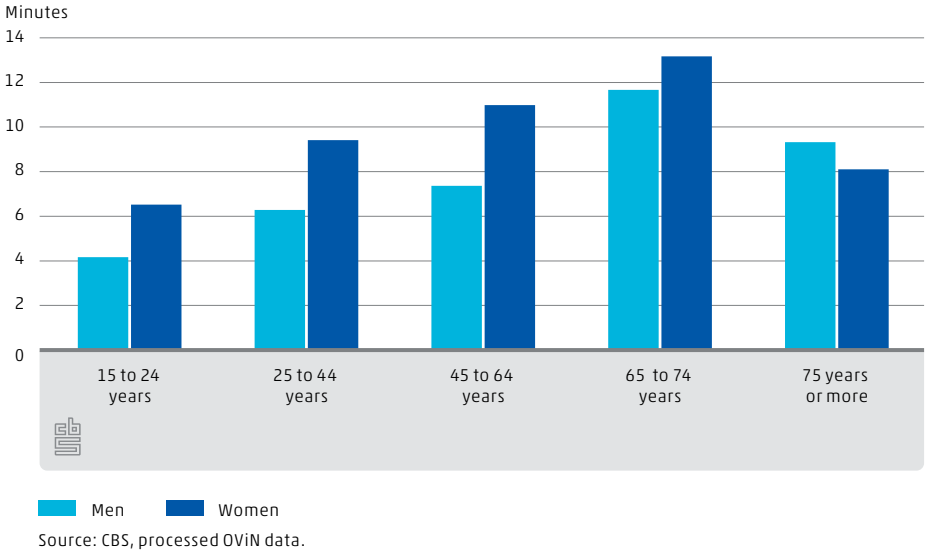
Source: CBS, processed OViN data.

Longest Saturday trips are made for shopping

There is less need to go to the supermarket and other shops at specific times than there is with the daily commute to work or school. People go shopping slightly more often between 9 and 12 in the mornings and 2 and 4 in the afternoons. Shopping also takes place in the evenings, but to a lesser degree.
Shopping is far the most widely used travel motive on Saturdays: taking on average more than 14 minutes per person. The opening hours of shops and supermarkets have expanded considerably in recent years to include evenings and Sundays.
On Sundays, people travel more than three minutes per person to shop. This is done more frequently by residents in urban than in rural areas.
People often walk or ride their bicycles to go shopping short distances.
The average travel time for shopping by bicycle and on foot is almost 4 minutes per day, as much as by car.

Women do almost 50 percent more shopping than men. Visiting shops rises with age among both women and men aged up to 75 years.

1.3.5 Travel time for shopping per person per day, 2013/2014



Source: CBS, processed OViN data.

Leisure activities account for over 4,600 kilometres a year

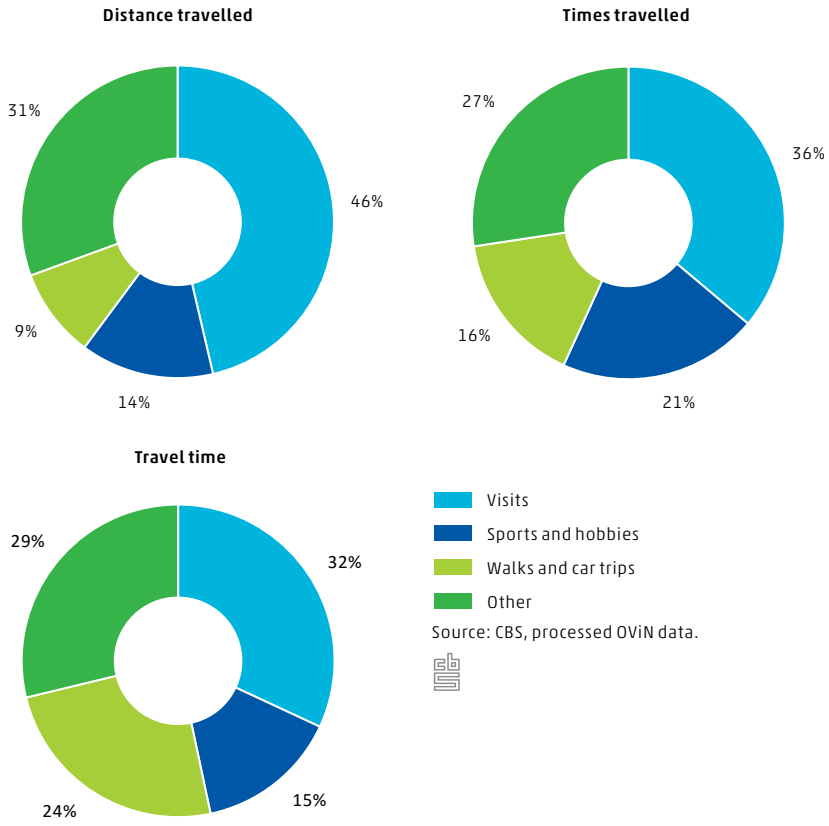
On average a Dutch person travels almost 30 minutes and more than once a day for leisure activities. This is on regular days, not holidays. Leisure activities include visiting and staying with friends and relatives, sports and hobbies, touring and hiking and other activities, such as visiting pubs or restaurants, as well as cultural and religious activities.

Annually a Dutch person averages over 4,600 kilometres for leisure. Trips to visit friends and relatives account for nearly half this distance. The most kilometres for visits are covered by car, as drivers or passengers. People also take the train for longer distances.

Leisure trips typically take place on weekends: touring and hiking mainly on Sundays. People visit all year around, but do so most in July and December.

For sports and hobbies the summer months and December are the quiet months.

1.3.6 Leisure mobility by Dutch people, 2013/2014



Source: CBS, processed OViN data.

Women travel more often for visits

Men and women do not differ much in the number of trips and travelling time involved for leisure. Women are more often on de road, men cover a slightly greater distance. Visiting friends or relatives is the favourite leisure activity for both men and women with respect to the number of trips, the distance travelled and the travel time. Women do this a fifth more often than men. Men, on the other hand, travel a quarter more often for hobby and sports, which takes over 50 percent more travelling time.

800 travel km for sports and hobbies per year by men and 500 km by women in 2013/2014

People aged under 25 years and between 65 and 75 years travel most frequently for leisure activities. The young people travel mostly for sports and hobbies, visits and other leisure activities. They spend most of their travel time on this. People between 45 and 75 years make the most kilometres for visits and for other leisure activities. Over 75, mobility decreases. Touring and walking is considerably more popular with people over 45 than with young people, and continues to be so even after people turn 75.

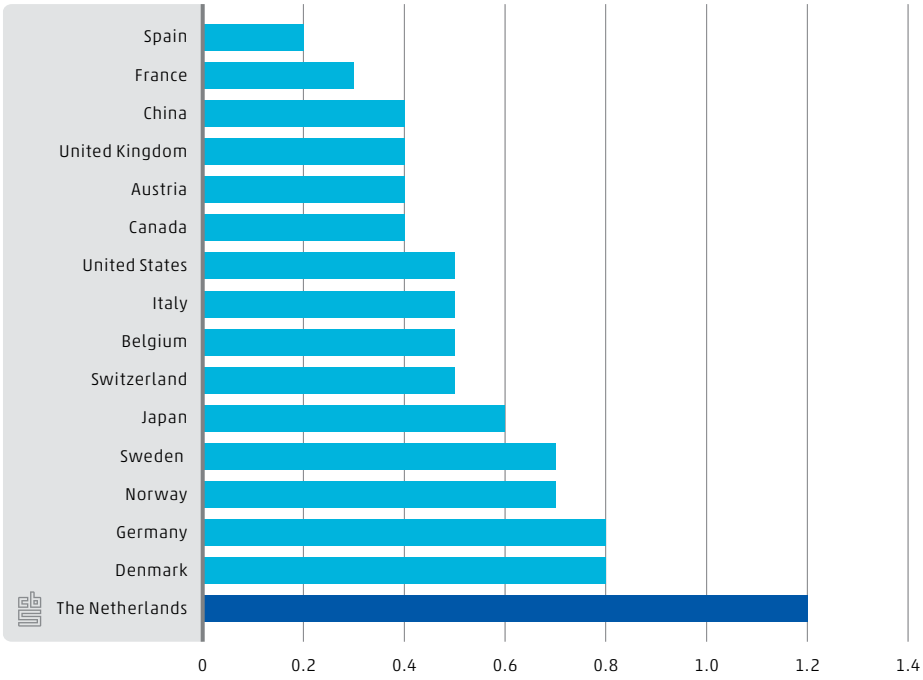
Netherlands bicycle country

The Netherlands has 22 million bicycles, about 1.2 bicycles per inhabitant. It has the highest 'bicycle density' in the world. In terms of distance, the bicycle is the third means of transport. In 2014 Dutch people travelled 16.3 billion kilometres by bicycle nationally. That comes down to nearly 1,000 kilometres per person. Men cycle more than women: 3.1 versus 2.5 kilometres a day. In urban areas people cycle more than in rural areas. Cycling is also strongly related to age. While 12 to 18 year-olds ride 6.5 kilometres a day, it is just 1.5 kilometres for people over 75.

The electric bicycle is growing popular. More than a tenth of all cycling kilometres are covered on an e-bike: more than half for recreational purposes. People also often use e-bikes to go to work and shop: in either case 20 percent of the cycled kilometres. People cover 1.5 times more distance with an e-bike than with a standard bike. However, the e-bike is also increasingly used for shorter distances.

Their users are often a bit older: nearly 90 percent of kilometres by e-bike is travelled by people over 45, half by pensioners. A third of the total number of kilometres cycled by pensioners was with the e-bike, for disabled this was a quarter.
Due to the mild weather in 2014, people cycled more than in 2013, using mainly 'normal' bikes.

Bicycles per inhabitant, internationally, 2014



Source: BOVAG-RAI Mobiliteit (2015).

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2. Goods transport

91% of all goods transported by rail cross the border

1,400,000 tonnes of goods transported daily on Dutch roads

18% of domestic transport in 2015 by inland waterway

More than 560 million tonnes of goods arrive in the Netherlands each year, of which nearly 72 percent through sea ports.[1] Of the almost 450 million tonnes of goods leaving the Netherlands, 42 percent is shipped out by sea. Over 630 million tonnes are transported within the Dutch borders: nearly 82 percent by road and nearly 18 percent by inland waterways. A mere 2 percent are transported by rail and less than 1 percent by air. Inland waterways are mainly used to transport bulk cargo and containers to destinations within easy reach. Containers are increasingly used, because shifting containers from sea ships onto lorries, inland ships and trains is relatively simple.

2.1 Introduction

For centuries, the Netherlands has been a major gateway to the rest of Europe due to its geographical location by the sea. Trade and transport play a prominent role in the Dutch economy, in addition to national production. Raw materials, semi-manufactured goods and products from all over the world find their way to destinations in Europe through the Netherlands. Conversely, for companies in the European 'hinterland' the route through the Netherlands forms an important way to reach customers. The Ruhr area is one such important industrial and commercial hinterland area. The Netherlands has become a major transport country with relatively many trading companies and companies operating in transport and logistics services.

This chapter describes the transport of goods in terms of transport modes. The nature of the goods, but above all the origin and destination of the goods determine the mode of transport chosen. We distinguish domestic, continental and intercontinental transport. In domestic transport, loading and unloading takes place in the Netherlands. In intercontinental transport, the origin or destination of the goods lies outside Europe, while in continental transport goods remain in Europe.

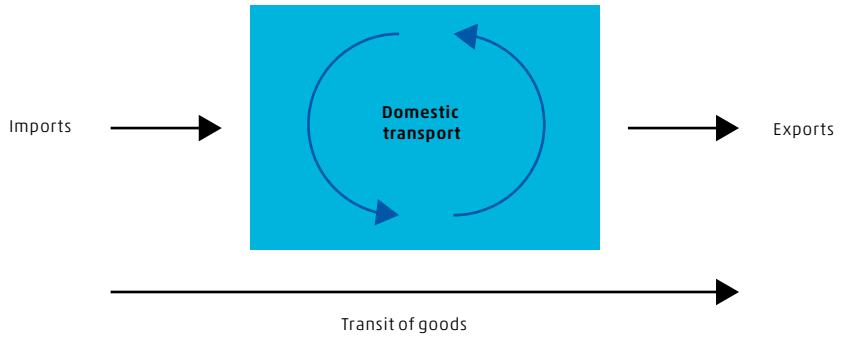
[1] The data presented here are preliminary and therefore subject to change.

2.2 Flows of goods and modes of transport in the Netherlands

Flows of goods

Part of the imported goods are to be processed or consumed in the Netherlands, the rest is directly transported to other countries. This flow of transit goods is included under imports as well as exports. This causes double counting in total transport. In domestic transport double counting may also arise from shifting between transport modes. For example, a container that enters the Netherlands by sea ship is commonly transported within the Netherlands by lorry. This container is included in imports but also in domestic transport.

Incoming, domestic and outgoing goods transport

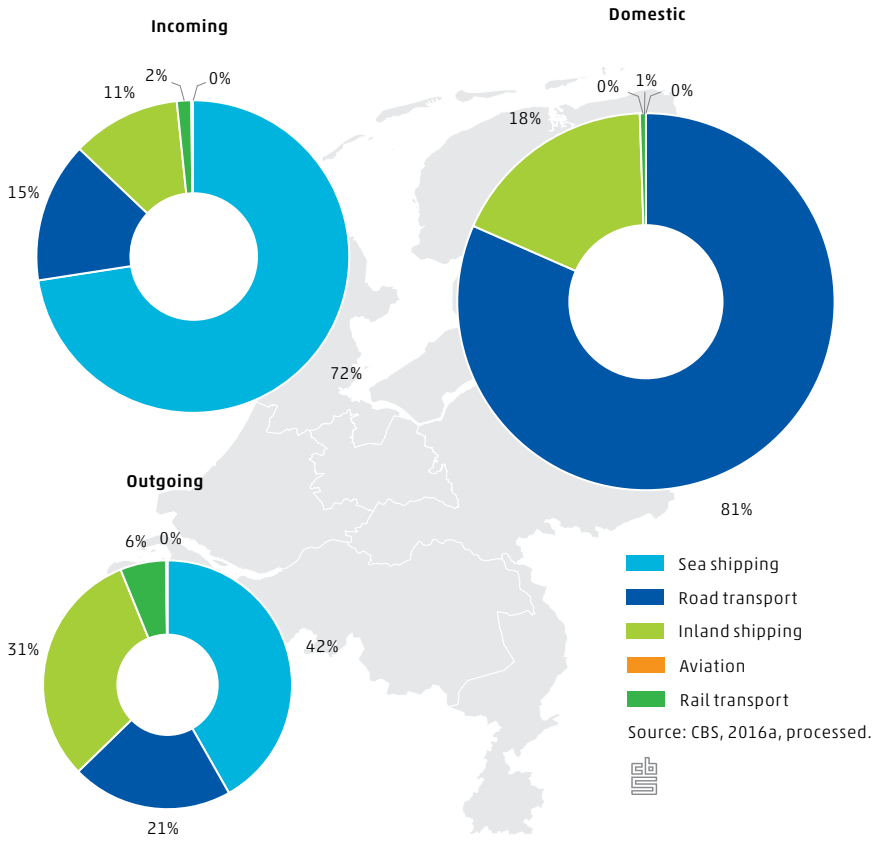


Domestic transport dominant

Annually more than 560 million tonnes of goods are transported into the Netherlands, of which some 55 percent are in transit or re-exported directly to another country. The rest is imported for national consumption or will be processed by Dutch companies.
Almost 450 million tonnes of goods are transported abroad, which is less than the volume of goods entering the Netherlands. Incoming goods are often raw materials for consumption or processing in the Netherlands, such as coal, crude oil

and oil products and raw materials for construction and manufacturing. They are also often products for consumption in the Netherlands (food, cars) or investments (machinery, lorries). Over 630 million tonnes of goods are transported within the Netherlands.

2.2.1 Goods transport (in tonnes) in the Netherlands, 2015



Different modes of transport by origin and destination

Goods can be transported via different transport modes. In domestic transport 81.6 percent is transported by road, 17.8 percent by inland waterway and 0.6 percent by rail. Intercontinental goods transport, which usually covers long distances, is mainly by sea or air. Continental transport usually covers shorter distances to the hinterland, and is mostly by road, rail or inland waterway. Each of these modes is discussed below. Transport by pipeline is excluded.

2.3 Intercontinental transport

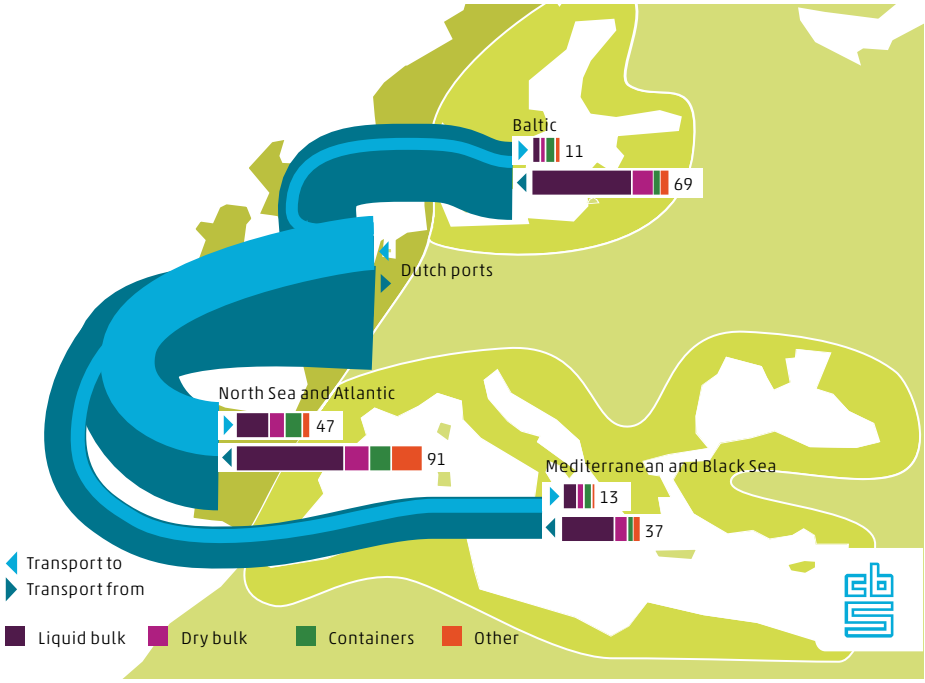
Sea shipping and aviation are the most common long distance transport modes. They hardly compete with each other. Aviation is a lot faster but also a lot more expensive, and therefore only suitable for a limited range of goods.

Sea shipping: much short sea shipping of oil

Nearly 410 million tonnes of goods entered the Netherlands via its sea ports in 2015. This is 72 percent of all incoming goods. These goods are either transported from the port of entry to a location in the Netherlands, or onwards to the European hinterland, by various modes of transport.
Nearly 190 million tons of goods, 42.1 percent of outgoing goods, leave the Netherlands through its sea ports. Rotterdam, was the largest port in Europe in 2014, and the eighth largest in the world behind Ningbo-Zhoushan, Shanghai, Singapore and other major Chinese ports. Other major Dutch sea ports are Amsterdam, Vlissingen and Terneuzen.

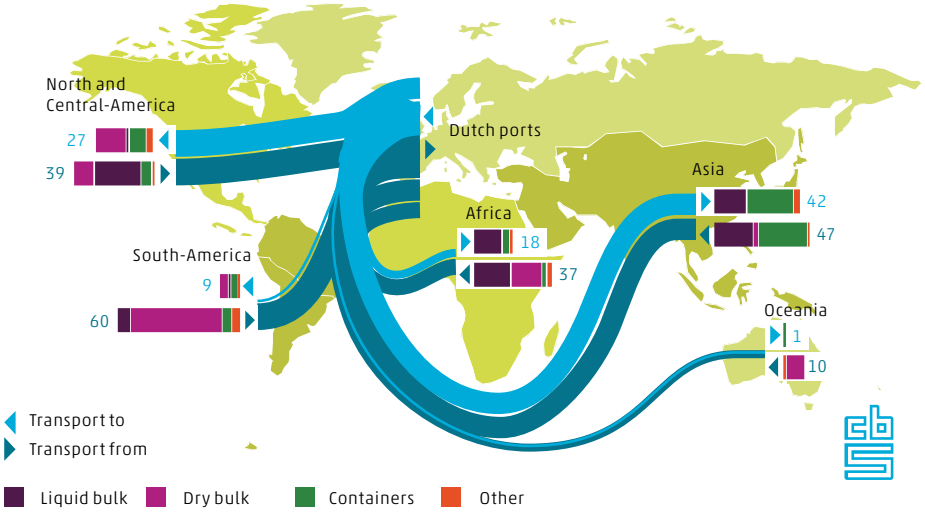
Almost half of the goods processed by the Dutch ports are transported via coastal shipping. This is called short sea shipping. The remainder of the goods crosses the oceans. Goods transported by short sea shipping originate from, or are destined for areas around the Baltic Sea, the Mediterranean and the North Sea. Nearly 60 percent of this short sea transport consists of liquid bulk, especially crude oil. The largest short sea oil flows originate from Russia (Baltic Sea) and Norway (the Atlantic). Short sea transport is regarded as an alternative to transport by road, rail or inland waterways.

2.3.1 Short sea shipping to and from Dutch ports 2014, gross weight in million tonnes



Source: CBS, 2016b, processed figures.

2.3.2 Deep sea shipping to and from Dutch ports 2014, gross weight in million tonnes



Source: CBS, 2016b, processed figures.

Deep sea transport, with goods crossing the oceans, deals with more diverse goods than short sea shipping. The share of dry bulk and containers is larger. The largest deep sea goods flows are coals from Colombia and iron ore from Brazil.

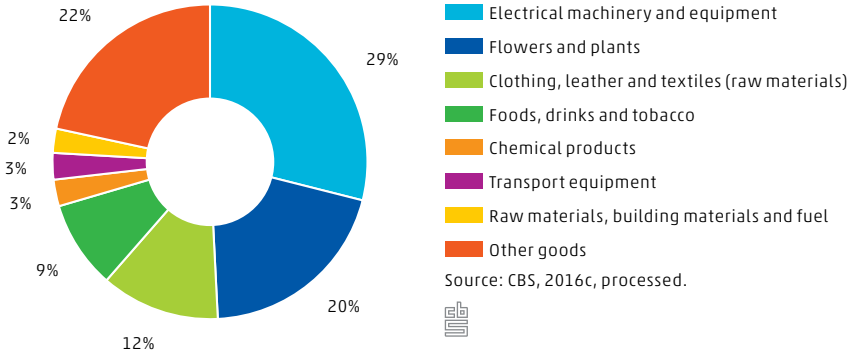
Aviation: Schiphol Europe's third largest cargo airport

Another suitable way to transport goods over long distances is by air. Expressed in weight, only a fraction of imported goods enters the Netherlands by air, 0.9 million tonnes. About 0.8 million tonnes of goods are transported by air to other countries. Almost 97 percent of the goods flown in come through Amsterdam Schiphol Airport. The rest comes through Maastricht Aachen Airport. In Europe, Schiphol is the third largest cargo airport for goods, after Frankfurt and Paris Charles de Gaulle..

19% **of the goods flown in came from China in 2014**

Airplanes are often used to transport high-quality products, express deliveries and special shipments. These are often lighter, valuable goods. Goods arriving by plane mainly come from China and the United States. They consist mainly of electrical appliances and components for planes and trains. Kenya, Russia and Ecuador are also major origins of air cargo. Kenya and Ecuador mainly supply agricultural products such as flowers, fruits and vegetables.

2.3.3 Goods (in tonnes) entering the Netherlands by air, 2014



Source: CBS, 2016c, processed.

2.4 Continental and domestic transport

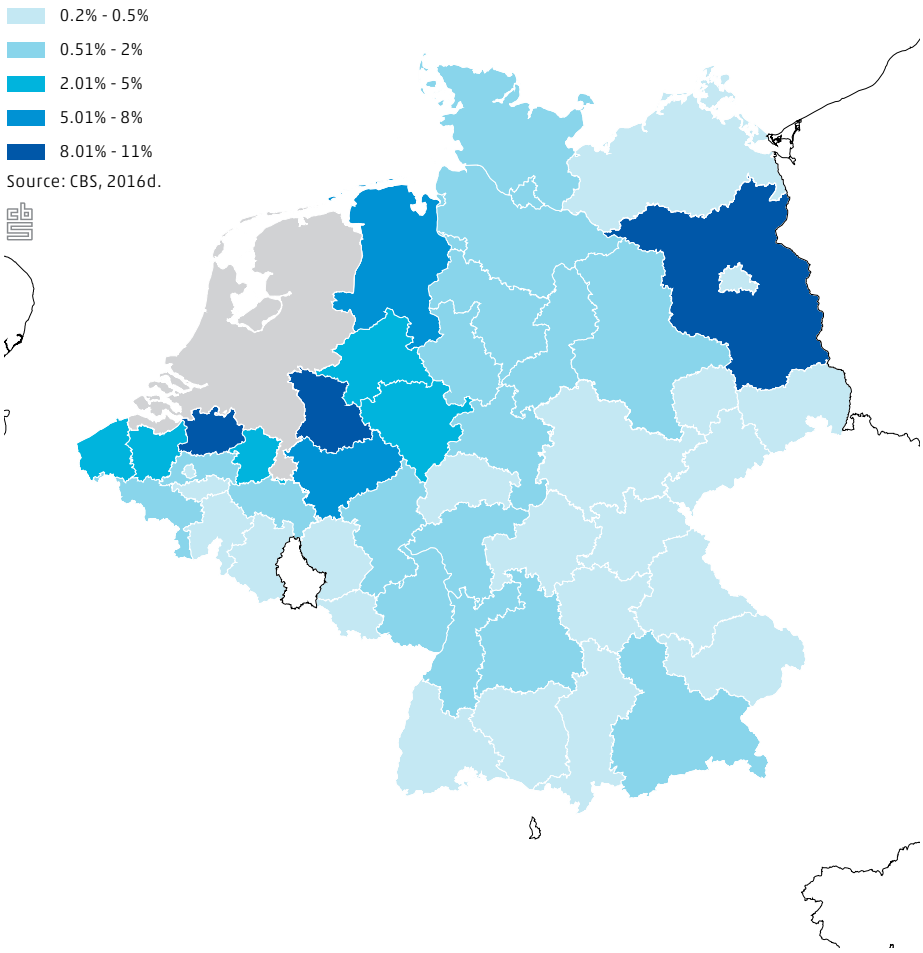
Road, inland waterways and rail are the main modes of transport for transport within Europe. There is some competition between them in cross-border transport because many goods can be transported either by lorry, ship or train. The choice of transport mode is determined by how fast and easy a destination can be reached and the availability of good infrastructure. Domestic transport is mainly by road.

Road transport: increasing foreign competition

Almost 84 million tonnes of goods enter the Netherlands by road, and 93 million tonnes leave it that way. Road transport dominates domestic goods transport: 515 million tonnes are transported mainly by lorries. This is almost 82 percent of total domestic transport.

Many goods stay within the Randstad. Three-quarters of the goods transported cross-border will remain in Belgium (Antwerp) and Germany (Düsseldorf). Food, agricultural products, general cargo and construction materials are the most important goods transported by road. Foreign transport companies have become more active in the Netherlands, accounting for over 40 percent of the cross-border transport.

2.4.1 Share of goods (in tonnes) transported cross-border by road, 2014



Source: CBS, 2016d.

Inland shipping: large Dutch share in Europe

Many goods from the hinterland enter the Netherlands via inland waterways. In total 64 million tonnes of goods in 2015. Also, many goods that entered the country through sea ports, leave the country via inland waterways: 137 million tonnes of goods in total. In the third quarter of 2015 there was less goods transport because of low water levels.

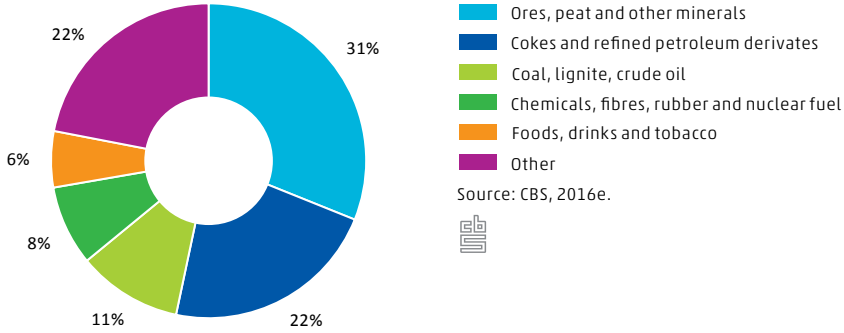
Domestically, 112 million tonnes of goods are transported through inland waterways every year. Large rivers, especially the Rhine and the Danube, are crucial for European inland waterway transport. Here Dutch ships play an important role. They provide 55 percent of the total goods transport by inland waterways in Europe. German and Belgian ships are in second and third place.

Goods are mainly loaded in the ports of Rotterdam and Amsterdam. Many goods remain in the Netherlands or go to Germany. Inland shipping mainly transports bulk goods such as sand, gravel and diesel. Piece goods are t sported in containers.

55% **of European inland transport is provided by Dutch ships**

The Dutch inland shipping fleet consists of almost 5,200 ships. This number decreases slightly, but the capacity of ships remains fairly constant (see also section 4.8).

2.4.2 Goods (in tonnes) transported by inland shipping, 2015



Source: CBS, 2016e.

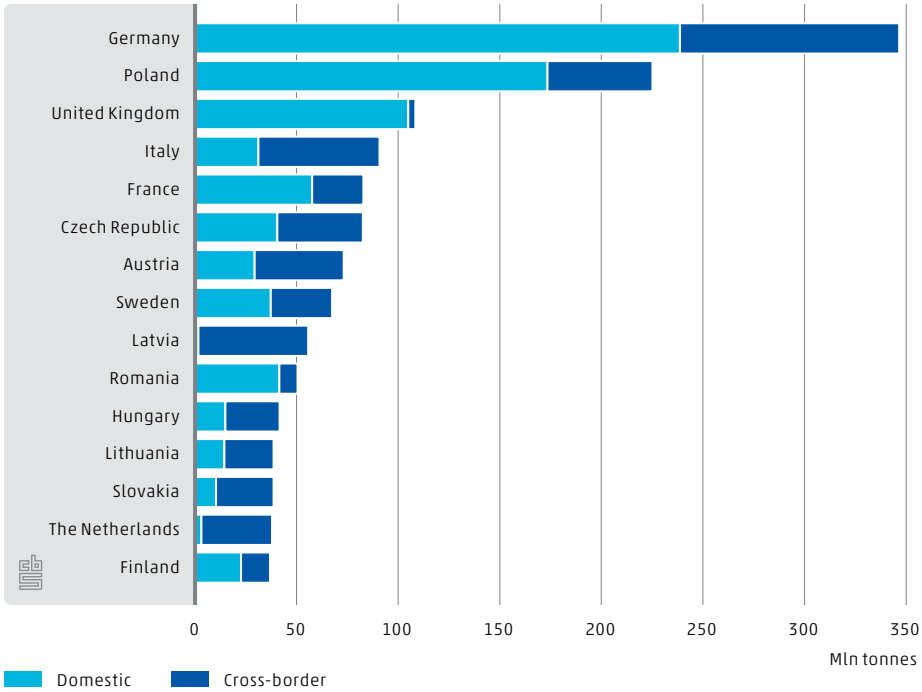
Rail transport: more coal to Germany

Rail transport plays a more modest role in goods transport than sea or inland shipping and road transport. More than 9 million tonnes of goods enter and 27 million tonnes of goods leave the Netherlands by train. Trains transport only 4 million tonnes within the Netherlands.

Within Europe, the importance of Dutch transport of goods by rail is also modest. In 2014, Dutch trains processed only 2.5 percent of the total European rail transport. However, Dutch rail transport is more internationally oriented. For other European countries the average of goods transported by trains cross borders is 40 percent, but for the Netherlands this is more than 90 percent.

The relatively small role of rail transport in the Netherlands is due to the fact that its rail network is the busiest in Europe and is mainly used for passenger transport. Also, the Betuwe line is not yet connected to the German railway system. In addition, inland shipping provides a good alternative, which lacks in most other countries.
Railways mostly carry sea containers and bulk goods such as coal and ores.
In the last couple of years, more coal has been transported to Germany.
Container transport has soared as well.

2.4.3 Top-15 European countries; goods transport by rail, 2014



Source: Eurostat, 2016e.

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CBS, 2016b: Shortsea shipping naar regio en verschijningsvorm, 2014 (maatwerk bij figuur 2.3.1 en 2.3.2)

CBS, 2016c: Aangevoerde luchtvracht naar land van herkomst en goederensoort 2011–2014 (maatwerk bij figuur 2.3.3)

CBS, 2016d: Wegvervoer; vervoerd gewicht naar provincie van laden en lossen. http://statline.cbs.nl/Statweb/publication/?VW=T&DM=SLNL&PA=83082NED&D1=0,4&D2=0&D3=a&D4=8&HD=150521-0829&HDR=T&STB=G1,G2,G3 (cijfers bij figuur 2.4.1)

CBS, 2016e: Binnenvaart; goederenvervoer, vervoerstroom, soort lading. http://statline.cbs.nl/Statweb/publication/?VW=T&DM=SLNL&PA=83019NED&D1=0&D2=1-3&D3=a&D4=101&HD=160412-1632&HDR=T,G2&STB=G1,G3 (cijfers bij figuur 2.4.2)

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3.

Traffic

131,000,000,000 km
covered by motor vehicles on Dutch roads

114,000,000,000 km
driven in Dutch cars in 2014

65,000,000 passengers
travelled via Dutch airports in 2015

Road traffic in the Netherlands is dominated by cars. Almost 4 of each 5 kilometres made by motor vehicles on Dutch roads are car kilometres. After 2005 cars drove more, while vans and heavy freight vehicles drove less. On average a Dutch car drove 13 thousand kilometres a year in the Netherlands and abroad.
Dutch airports transported almost 65 million passengers in 2015; most – 58 million – travelled via Schiphol. Sea ships entered Dutch ports almost 35 thousand times in 2014.

3.1 Introduction

Dutch and foreign motor vehicles covered about 131 billion kilometres on the Dutch roads, slightly more than in 2005. Cars cover by far the largest part: 78 percent. Heavy freight vehicles are responsible for 5 percent, with Eastern European freight vehicles increasing their share.
Dutch airports are growing busier all the time, partly due to price fighters. Most ships that enter the Dutch sea ports are conventional freight ships, tankers and container ships. The last group uses increasingly large ships.

In this chapter we focus on traffic in the Netherlands. First of all, we describe the road traffic by Dutch and foreign vehicles, with the emphasis on cars and heavy freight vehicles. Then we describe how many kilometres Dutch cars drive in the Netherlands and abroad. Subsequently, passenger transport by air is dealt with. Finally we discuss ships entering Dutch ports to unload and load freight or to disembark and board passengers.

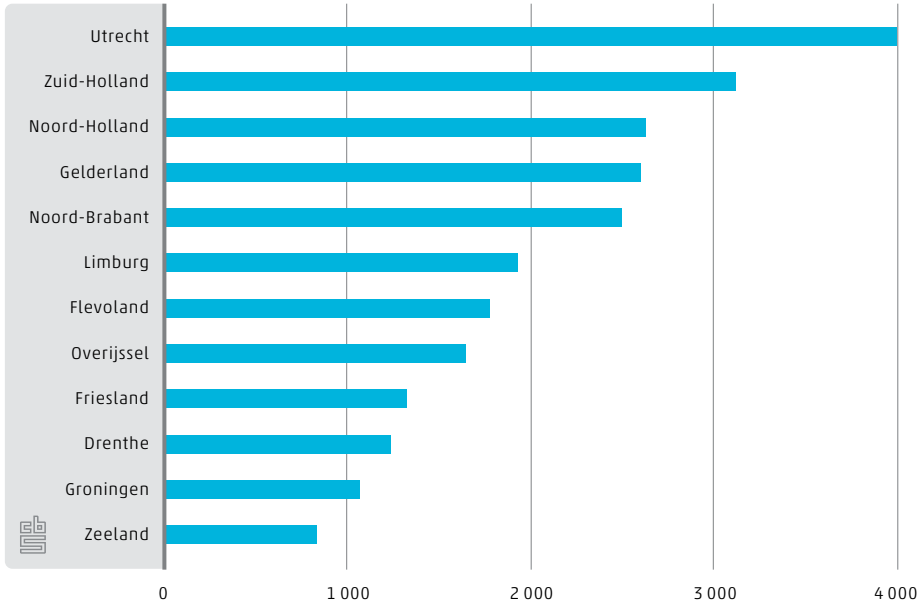
3.2 Traffic on Dutch roads

National roads busiest in Utrecht

A large share of traffic uses main roads or national roads, of which the Netherlands possesses almost 5.3 thousand kilometres. Although this represents but a small share – 4 percent – of the total road network, it is a share that is very intensely used. On average 2.3 thousand motor vehicles per hour drove on Dutch main roads in 2014, with considerable regional variations. In Utrecht, the busiest province,

the average was 4 thousand cars, freight vehicles, buses and motorcycles per hour, almost five times as much as in Zeeland, the quietest province, with an average of 830 motor vehicles per hour.

3.2.1 Motor vehicles per hour on main roads, 2014



Source: CBS, NDW 2016a: Verkeersintensiteiten op rijkswegen.

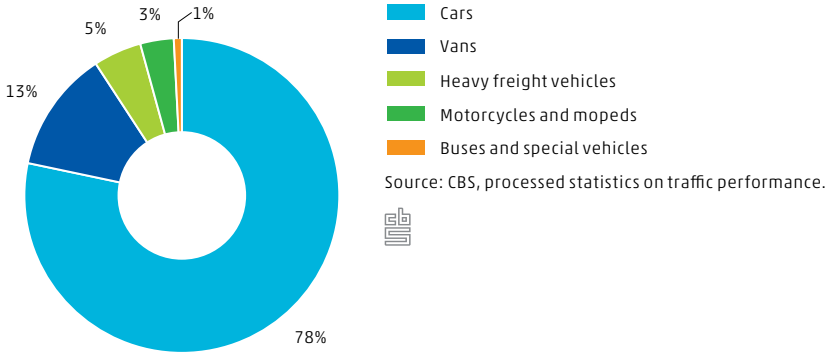
Sleet halved traffic in the North

The weather can influence traffic density considerably. For example, sleet halved the traffic in the northern provinces on the first three working days of 2016. On these days an average of 600 motor vehicles per hour drove on the six main roads in Friesland, Groningen and Drenthe, compared to an average over the last four years of 1,200 per hour.

Longest distance covered by cars

Dutch and foreign cars covered the longest distance on Dutch roads in 2014. They drove 78 percent of the total distance covered, almost 103 billion kilometres, an increase of 3.5 percent compared to 2005. Vans and heavy freight vehicles drove almost 23 billion kilometres in the Netherlands, a decrease of 7.3 percent compared to 2005.

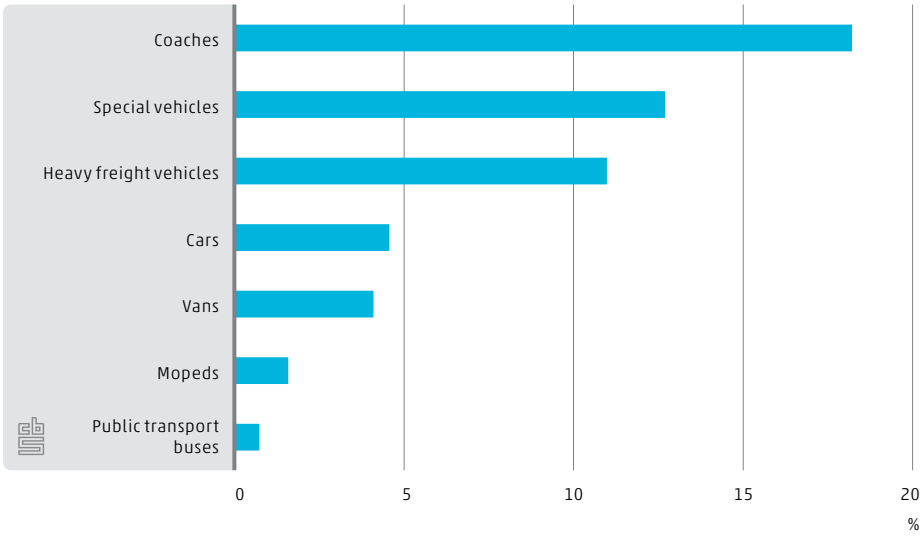
3.2.2 Distance covered in the Netherlands by type of motor vehicle, 2014



Source: CBS, processed statistics on traffic performance.

Foreign motor vehicles cover almost 5 percent of the total distance of all motor vehicles in the Netherlands. Different means of transport show large variations: foreign coaches make up 18 percent of the total distance of coaches, whereas the share for public transport buses is only 1 percent.

3.2.3 Share of foreign motor vehicles in distance covered in the Netherlands, 2014



Source: CBS, processed statistics on traffic performance.

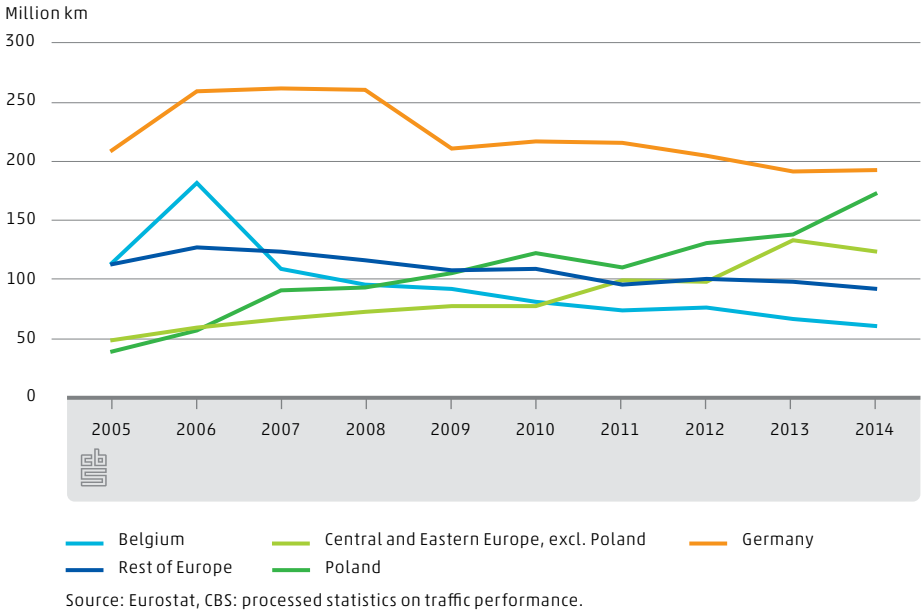
Dutch and foreign heavy freight vehicles – lorries and tractor-trailers – covered almost 6.5 billion kilometres within the Dutch borders in 2014. The majority of this distance, 5.8 billion kilometres, was made by Dutch vehicles, a decrease of 5.6 percent compared to 2005.
About 715 million kilometres, 11 percent of the total distance, relates to foreign heavy freight vehicles. The main part concerns loading and unloading of freight in the Netherlands, the other part is transport via the Netherlands, without loading or unloading.

11% of all freight kilometres in the Netherlands covered by foreign vehicles in 2014

Eastern European transporters gaining ground

European lorries and tractor-trailers, loading and unloading freight in the Netherlands, increasingly often use Dutch roads. The distance they covered in the Netherlands in 2014 was over 23 percent more than in 2005. Especially the share of transporters from Central and Eastern European countries increased significantly during this years. Among these countries are Poland, Hungary, the Czech Republic, Slovakia, Slovenia, Latvia, Lithuania, Romania and Bulgaria. Polish vehicles cover over a quarter of the total distance of all foreign vehicles together; they now drive 4.5 times as much on the Dutch roads as they did in 2005.
In addition to Poland, the other Central and Eastern European countries started driving considerably more in the Netherlands as well. The share of these countries in foreign transport to and from the Netherlands is almost 20 percent now, compared to 7.5 percent in 2005.
Hungarian vehicles showed the biggest increase in distance covered on Dutch territory. Although the share of these vehicles is only 4 percent, this is five times as high as it was in 2005.

3.2.4 Distance covered by foreign heavy freight vehicles in the Netherlands



Source: Eurostat, CBS: processed statistics on traffic performance.

Importance of German and Belgian transporters decreasing

Though still dominating, the interest of heavy freight vehicles with German license plates has diminished considerably, partly due to the rise of Central and Eastern European transporters. In 2005 the Germans still made 40 percent of all foreign kilometres, in 2014 this had dropped to 30 percent. The distance covered by Belgian heavy freight vehicles plummeted as well, from 22 percent in 2005 to less than 10 percent in 2014.

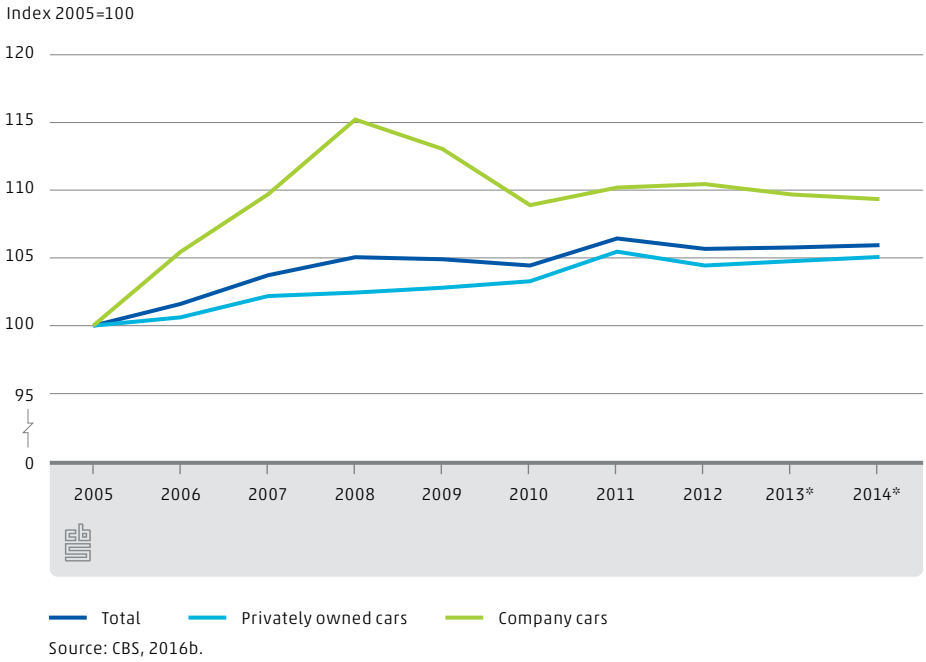
3.3 Distance covered by Dutch cars

Dutch cars drove more

Dutch motor vehicles (excl. mopeds) drove in total almost 141 billion kilometres in 2014, in the Netherlands and abroad. This is 2.8 percent more than in 2005. Most kilometres are made by car: over 114 billion kilometres in 2014, up 6 percent on 2005. On average a Dutch car makes about 13 thousand kilometres a year. Almost 80 percent of the car kilometres, about 90 billion, were driven by private individuals, which is 5.9 percent more than in 2005. This increase is caused by two opposite effects: the number of private cars rose from 6.9 million in 2005 to 7.9 million in 2014, while the distance covered fell by 700 kilometres to 11.5 thousand kilometres a year in 2014.

13,000 km covered
by the average Dutch car in 2014

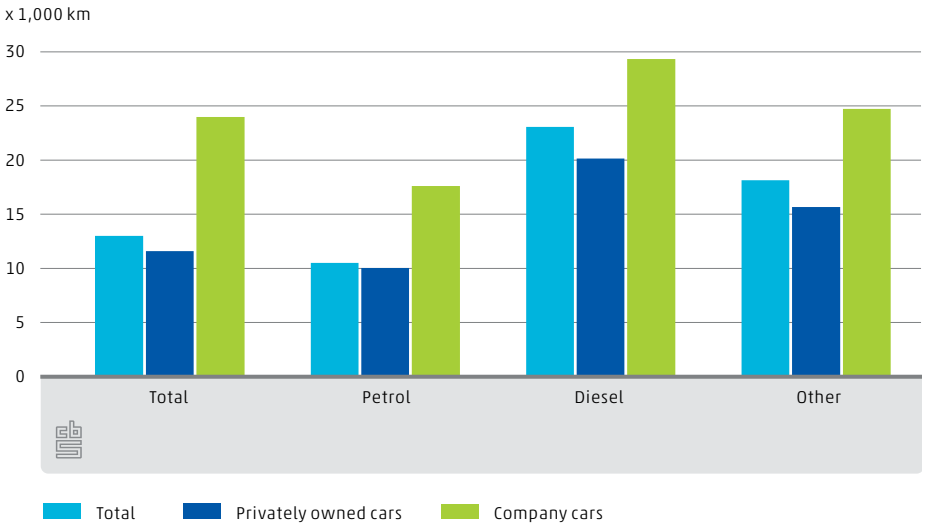
3.3.1 Distance covered by Dutch cars in the Netherlands and abroad



Source: CBS, 2016b.

Over a million cars were company cars in 2014, almost 200 thousand more than in 2005, a rise of 14 percent. Company cars also include lease cars. Compared to 2005 company cars covered 9.3 percent more kilometres in 2014. The distance driven increased sharply between 2005 and 2008. In the next two years we saw a decrease. The economic crisis led to a drop in the number of company cars as well as the average number of kilometres driven. In 2005 an average company car made almost 25 thousand kilometres, in 2014 this was reduced to less than 24 thousand kilometres. However, company cars still cover twice as much distance as privately owned cars.

3.3.2 Average kilometrage a year of Dutch cars, 2014



Source: CBS, 2016c.

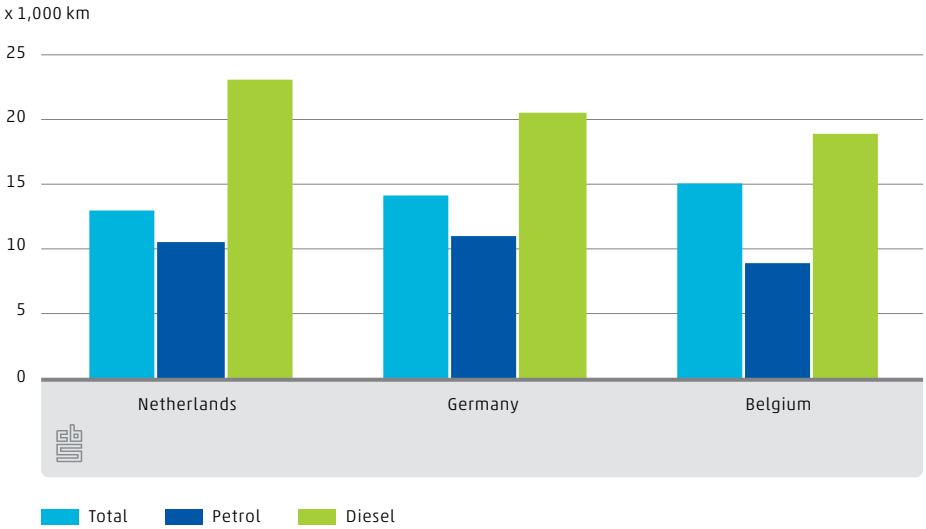
Average kilometrage of Dutch cars lower than in neighbouring countries

Dutch cars drive a shorter distance than cars in the neighbouring countries. They drove 13 thousand kilometres in 2014, over 2 thousand kilometres less than Belgian cars and over one thousand kilometres less than German cars.

Dutch diesel cars average most kilometres

Diesel cars form an exception: Dutch diesel cars average more kilometres than Belgian and German cars. Dutch diesel cars drive 23 thousand kilometres on average, compared to 18.8 thousand for Belgian and 20.5 thousand kilometres for German diesel cars. Heavy company diesels of 1–2 years old average most of all: almost 40 thousand kilometres.
In the Netherlands a diesel car is only economically attractive when the owner drives a lot. The purchasing value and road tax are considerably higher for a diesel than for a petrol car. In the neighbouring countries driving a diesel is economically viable at much lower kilometrages. Accordingly, diesel cars have a much lower share in the total number of cars (16 percent) in the Netherlands than in Belgium (over 60 percent) and Germany (about 30 percent).

3.3.3 Average kilometrage a year of Dutch, German and Belgian cars, 2014

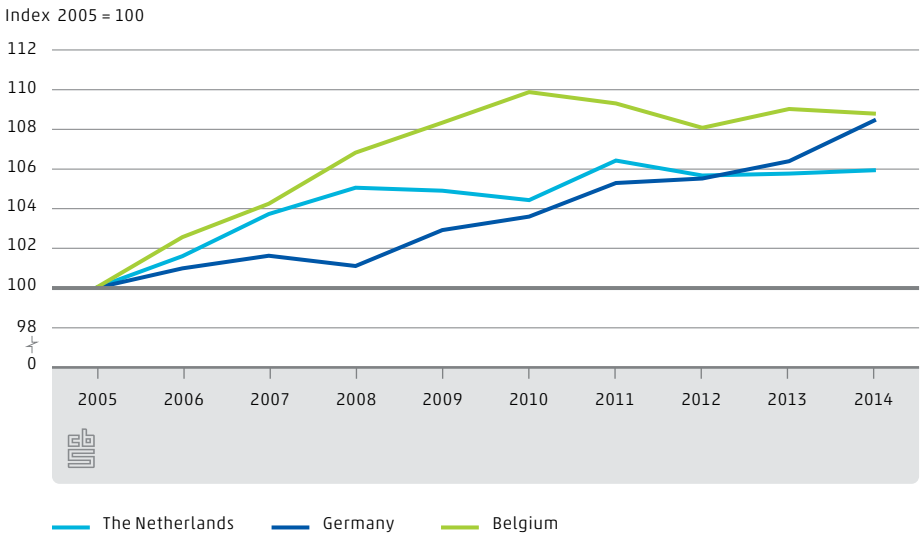


Source: CBS, 2016c; BMVI; Federale overheidsdienst mobiliteit en vervoer.

Stronger increase car kilometres in neighbouring countries

The total distance covered by cars increased faster in Belgium and Germany than in the Netherlands.
Dutch cars travelled 6 billion kilometres more in 2014 than in 2005, a rise of 6 percent. German cars travelled 8 percent more, up to 627 kilometres. Germany has over 44 million registered cars, almost 5.5 times as many as the Netherlands. The 5.6 million Belgian cars drove 9 percent more kilometres than in 2005.

3.3.4 Distance covered by Dutch, German and Belgian cars



Source: CBS, 2016d, Federale overheidsdienst mobiliteit en vervoer, BMVI.

3.4 Air traffic

More and more passengers at Dutch airports

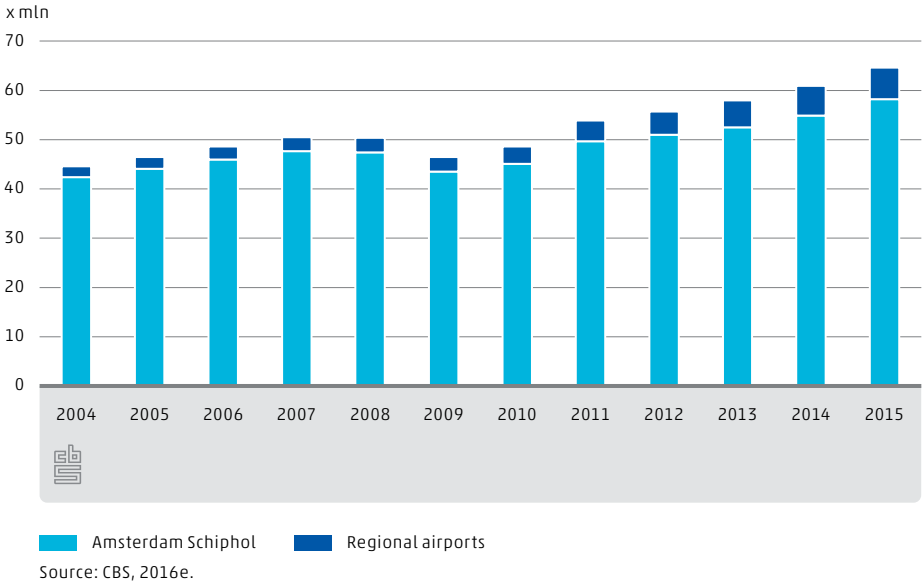
In 2015 almost 65 million air passengers travelled to or from the Netherlands, an increase of 6 percent compared to the year before. Compared to 2004 the number of passengers grew by 45 percent. Ninety percent of the passengers flew via Amsterdam Airport Schiphol, the rest via one of the regional airports.

Schiphol processed over 58.2 million passengers in 2015

A record number of over 58.2 million passengers travelled through Amsterdam Airport Schiphol in 2015, this is 6 percent more than in 2014. Schiphol reached the number of 200 thousand passengers a day for the first time in 2015. This happened on 11 days that year.
From Schiphol people could fly to 320 destinations in 2015; the favourites among them were London Heathrow and Paris Charles de Gaulle.

The largest group of passengers (44 percent) travelled through Schiphol for holidays or city trips in 2014. Over 30 percent of the travellers had a business motive. For 17 percent the main motive was visiting family or friends, whereas 4 percent went for studies or a congress (Ministerie van Infrastructuur en Milieu/ Kennisinstituut voor Mobiliteitsbeleid, 2015).

3.4.1 Passengers Dutch airports



Source: CBS, 2016e.

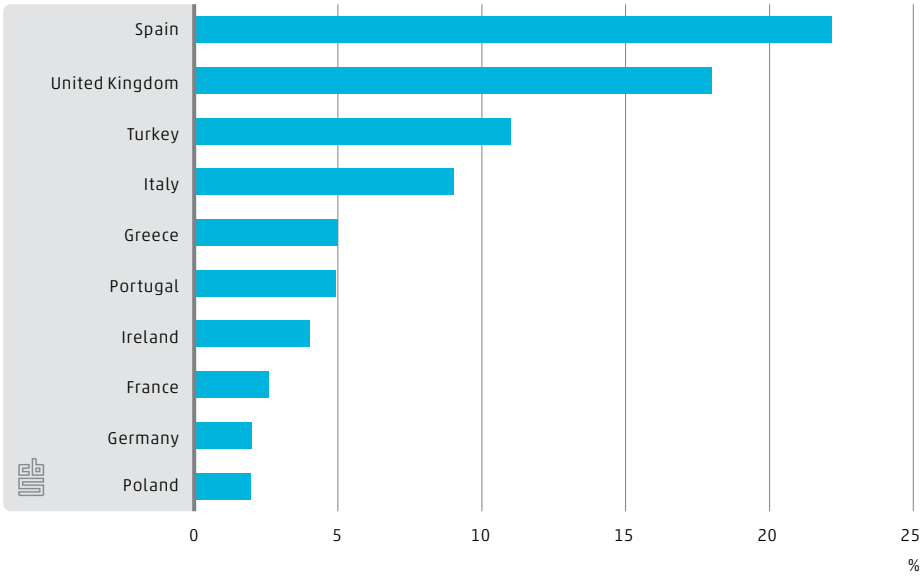
Substantial growth of Eindhoven airport due to price fighters

A major share of the increase in passenger numbers on Dutch airports can be attributed to price fighters. Since 2004 their number of passengers has more than doubled, to 22 million. The rapid rise of these low-cost carriers has greatly stimulated the growth of the regional airports in the Netherlands (Eindhoven, Rotterdam, Maastricht and Groningen). The number of passengers travelling through these airports has almost tripled since 2004. Eindhoven Airport showed a particularly rapid growth: in 2015 almost 7 percent of all air passengers in the Netherlands travelled through Eindhoven, compared to a mere 1.6 percent in 2004.

Price fighters' holiday destinations most popular

The top 10 most popular destinations of low-cost carriers are dominated by the favourite holiday countries. Spain is leading with almost 4.9 million passengers in 2015, more than 2.5 times as many as in 2004. Turkey takes the third place, followed by Italy, Greece and Portugal (see 13.3). London is the most important city destination of price fighters, with 2.1 million travellers.

3.4.2 Top 10 destinations of low-cost carrier passengers, 2015



Source: CBS, processed statistics air traffic.

3.5 Sea ports

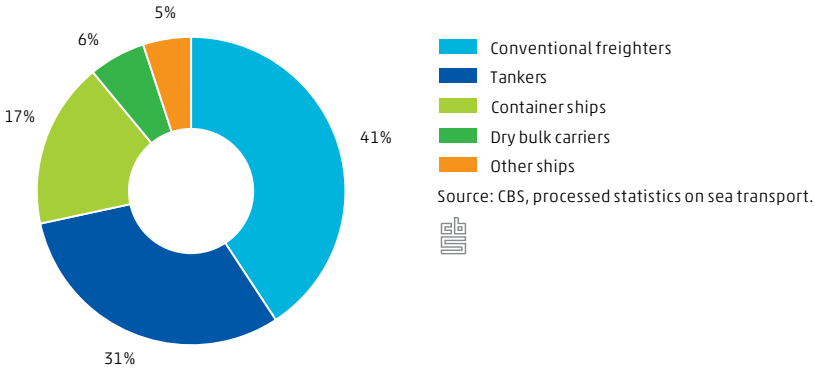
Most sea ships to Rotterdam port area

Sea ships entered the Dutch ports almost 35 thousand times in 2014, to unload and load freight or to disembark or board passengers. The port area of Rotterdam, including the ports of Moerdijk, Dordrecht and Vlaardingen, were entered most often: over 23 thousand times. The sea ports in the North Sea Canal area (Amsterdam, Velsen, Beverwijk and Zaanstad) were entered 5 thousand times, Vlissingen and Terneuzen over 4.5 thousand times.

Most ships in Dutch ports are conventional freighters

Of all the ships entering the Dutch ports, 41 percent in 2014 are conventional freighters: freighters that can transport different types of loads, such as containers, piece goods, dry bulk cargo and cars. Piece goods are counted by piece and are transported in boxes, crates, barrels and bales. Bulk cargo is counted in weight. Conventional freighters entered Dutch ports more than 14 thousand times in 2014, a decrease of 10 percent compared to 2011.

3.5.1 Ships entering Dutch ports, 2014



Source: CBS, processed statistics on sea transport.

Crude oil more than half of the inbound tanker transport

Tankers, ships equipped for the transport of liquids and gas, entered the Netherlands almost 11 thousand times in 2014 to unload liquid bulk. These can be oil tankers, gas tankers, tankers for chemicals, but also tankers for fruit juice. More than half of the liquid bulk transported into the Netherlands, is crude oil.

Fewer but larger container ships

Container ships mainly enter the port of Rotterdam. They entered the Netherlands 6 thousand times in 2014, a decrease of 9 percent compared to 2011. In spite of this, the quantity of unloaded freight increased by 4 percent from 2011 to 2014, partly due to the use of larger ships in sea shipping.
Furthermore, dry bulk carriers – used for ore, cereals and coal – entered Dutch sea ports over 2 thousand times in 2014.

Sources

CBS, 2016a: Verkeersintensiteiten op rijkswegen.
http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=82855ned
(figures for 3.2.1)

CBS, 2016b: Gemiddeld jaarkilometrage personenauto's naar eigendom.
http://statline.cbs.nl/Statweb/publication/?VW=T&DM=SLNL&PA=71107NED&D1=0&D2=a&D3=0&D4=0&D5=0&D6=4-13&HD=160211-0946&HDR=T,G3,G5,G4&STB=G1,G2 (figures for 3.2.5)

CBS, 2016c: Gemiddeld jaarkilometrage personenauto's naar eigendom en brandstof, 2014.
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(figures for 3.2.6 and 3.2.7, Dutch cars only)

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(figures for 3.2.8)

CBS, 2016e: Luchtvaart; maandcijfers
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4.

Vehicles

11,000,000 vehicles
in the Netherlands at the start of 2016

2 times as many plug-in hybrid cars
on 1 January 2016 as on 1 January 2015

16,700 17 year-olds
with drivers licences for cars

Individuals are mostly transported by motorised vehicles (cars, motorcycles, buses, mopeds), airplanes and bicycles. The Netherlands is also a major goods transporter. The vehicles used to transport goods by road are heavy freight vehicles and vans. The many vans in the Netherlands are used to transport small loads. Heavy freight vehicles are less common. These are used to transport bigger loads, often across longer distances. Transport across large distances also often takes place by air or inland waterways.

4.1 Introduction

In 2016 the number of cars in the Netherlands increased and crossed the 8 million mark for the first time. Sales of new cars rose faster than the average growth of sales in the European Union. The number of heavy freight vehicles and vans also increased in 2016, for the first time since 2011. The number of buses on the other hand decreased for the sixth year in a row. The growth in the number of mopeds is caused by light mopeds, whereas the number of classic mopeds and micro cars has been falling for years.
This chapter deals with vehicles in the Netherlands. This includes motor vehicles, bicycles, airplanes and inland ships. Information about trains and sea ships is not included in this chapter. Special attention will be paid to electric and (plug-in) hybrid cars and electric mopeds. Also we will zoom in on the municipality of Utrecht, which was the first of the four major cities to institute an environmental zone for diesel cars and vans built before 2001. Utrecht also has an attractive scrapping scheme. How did this affect the vehicles of Utrecht? And what are the differences with the three other major cities?

4.2 Motor vehicles – an overview

On 1 January 2016, there were nearly 11 million motor vehicles in the Netherlands. This is 1.5 percent more than the year before. The number of cars, vans and heavy freight vehicles have all increased compared to early 2005. There are fewer buses, however. The increase in the number of motor vehicles is partially driven by rising sales of new vehicles. In 2015 over 532 thousand new motor vehicles were sold.

4.2.1 Motor vehicles on 1 January

	2007	2010	2013	2014	2015	2016
	x 1,000					
Totaal number of motor vehicles	9,569	10,292	10,693	10,707	10,771	10,937
Cars						
Total	7,230	7,622	7,916	7,932	7,979	8,101
Petrol	5,811	6,070	6,277	6,290	6,332	6,402
Diesel	1,184	1,290	1,340	1,320	1,314	1,323
LPG + other	227	223	208	193	178	165
Electric and (plug-in) hybrid	8	40	91	130	156	211
Commercial vehicles						
Vans	849	872	832	815	815	828
Lorries	76	73	67	65	63	62
Tractor trailers	71	72	70	71	71	72
Special purpose vehicles	58	65	63	62	61	60
Buses	11	12	11	10	10	9
Motorcycles	568	623	653	654	652	653
Mopeds	712	956	1,085	1,102	1,125	1,151

Source: CBS 2016a, RDW.

[1)] Campers constructed after 1 May 2009 are registered as cars or buses depending on the number of seats. Older campers are registered as special purpose vehicles.

4.3 Cars

Crossing the 8 million mark

The number of cars in the Netherlands is increasing. Car numbers are up by nearly 28 percent since the start of this century, increasing by 1.5 percent in 2015 as well. On 1 January 2016, there were 8.1 million cars in the Netherlands, crossing the 8 million mark for the first time. The 7 million mark was crossed a decade ago. 1963 saw over one million cars for the first time in Dutch history.

8.1 million cars at the start of 2016

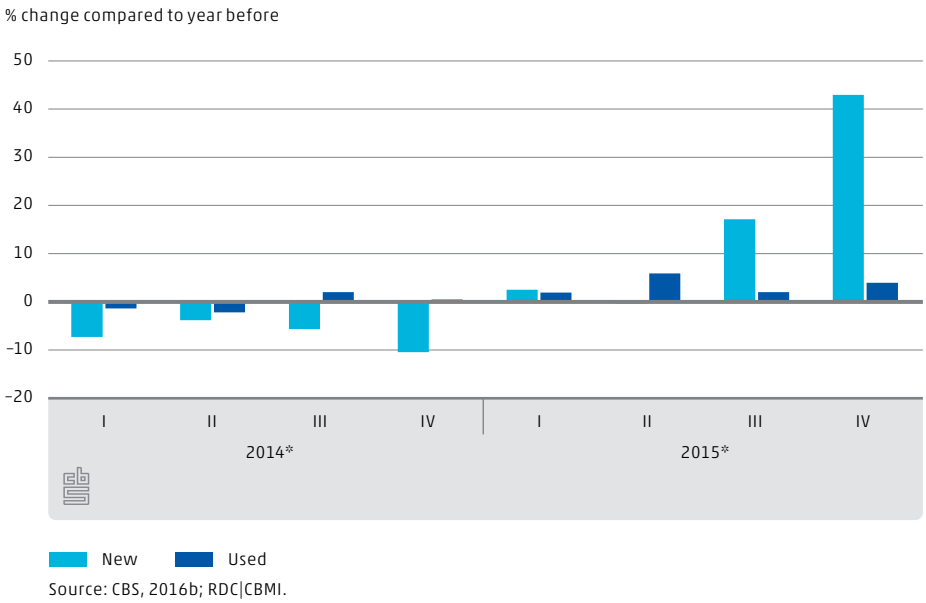
More new cars sold

New car sales increased by nearly 16 percent in 2015, compared to 2014, to a total of 449 thousand cars. This is the first increase after three years of falling sales. Particularly striking was the sharp increase during the fourth quarter of 2015, when 148 thousand new cars were sold. Sales skyrocketed in December, the last month before new fiscal legislation was put in place. Before 1 January 2016 the additional tax liability for buyers of new cars was lower, which is why many company car drivers made their purchases then. Nearly 69 thousand cars were sold in December, 90 percent more than during December 2014.
The sales of used cars increased as well in 2015: 1.9 million, compared to 1.8 million in 2014. This is a 3.5 percent increase.

Growth of Dutch car sales above EU average

New car sales in the Netherlands in 2015 grew more than the average of the European Union. Over 13.7 million new cars were sold in the EU, 9 percent more than in 2014. In the Netherlands, sales rose by 16 percent to a total of 449 thousand.
The Netherlands comes seventh in the European ranking of countries with the fast growing car sales. In other countries with traditionally high sales figures, such as Germany, the United Kingdom and France, car sales did not grow as much.

4.3.1 Car sales



Source: CBS, 2016b; RDC|CBMI.

Most cars run on petrol

Petrol, with a share of 79 percent, is the most common car fuel. Over 16 percent of all cars run on diesel. The number of cars running on LPG has been decreasing. Compared to five years ago, their number is down by 57 thousand. Electric and hybrid passenger cars on the other hand have become more commonplace, although with 2.6 percent, they still have a relatively small share in the total of Dutch vehicles.

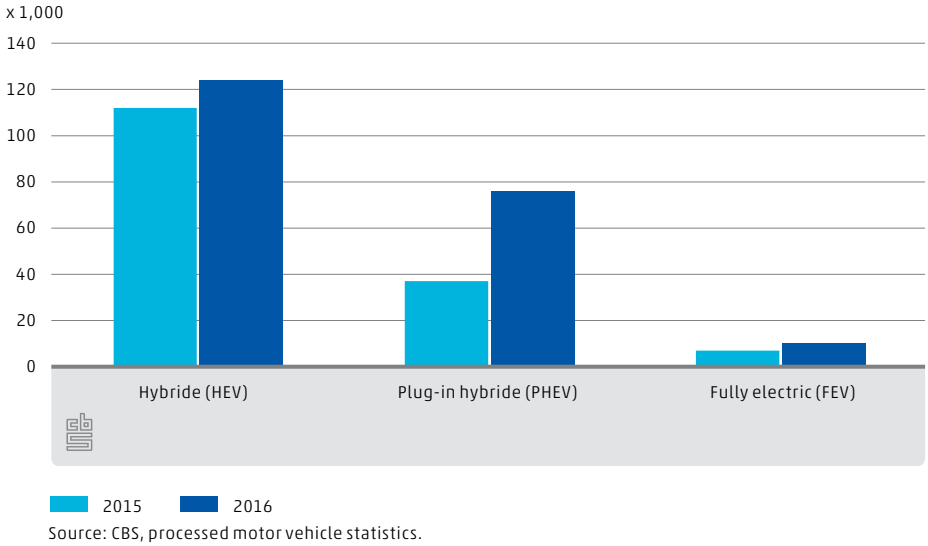
Almost 211 thousand electric and hybrid cars

On 1 January 2016 nearly 211 thousand electric and hybrid passenger cars were registered in the Netherlands. The majority of this group, 124 thousand, consisted of 'regular' hybrid cars. There were also 76 thousand plug-in hybrids. Hybrids have both an electric and a combustion engine. A plug-in hybrid is also equipped with a plug to charge the battery. Besides hybrids, there are also nearly 10 thousand fully electric cars, with just an electric engine.

Far more plug-in hybrids

In 2016 the number of electric and (plug-in) hybrid cars was up by 35 percent on 2015. The largest increase was in plug-in hybrids, which more than doubled within a single year. The number of 'regular' hybrid cars and fully electric cars increased by 10 and 34 percent respectively.
Hybrid and electric cars appeal to company car drivers because of the low additional tax liability. These cars are relatively often owned by (lease)companies. Of every 10 'regular' hybrids, 4 are owned by a company. In the case of fully electric cars this ratio is 8 out of 10, and for plug-in hybrid cars it is nearly 9 out of 10. In comparison: companies own just 1 out of 10 of all cars in the Netherlands.

4.3.2 Electric and (plug-in) hybrid cars on 1 January



Source: CBS, processed motor vehicle statistics.

Additional tax liabilities

The purchase of electric and hybrid cars has been stimulated for years through advantageous additional tax liabilities. For a fully electric car with 0 gram CO_2 emissions, the additional tax liability was 4 percent in 2015, for plug-in hybrids it was 7 percent. For cars in the most polluting category, this is 25 percent. The additional tax liabilities have become stricter. At times this resulted in peaks in car sales, for example in December 2015. For plug-in hybrids purchased at the

time, an additional tax rate of just 7 percent applied. From 1 January 2016 onwards, this became 15 percent.

Additional tax liabilities 2015		Additional tax liabilities 2016	
0 gram CO_2	4%	0 gram CO_2	4%
0–50 grams CO_2	7%	0–50 grams CO_2	15%
50–82 grams CO_2	14%	50–106 grams CO_2	21%
82–110 grams CO_2	20%	Over 106 grams CO_2	25%
Over 110 grams CO_2	25%		

Source: Dutch tax authorities, 2016.

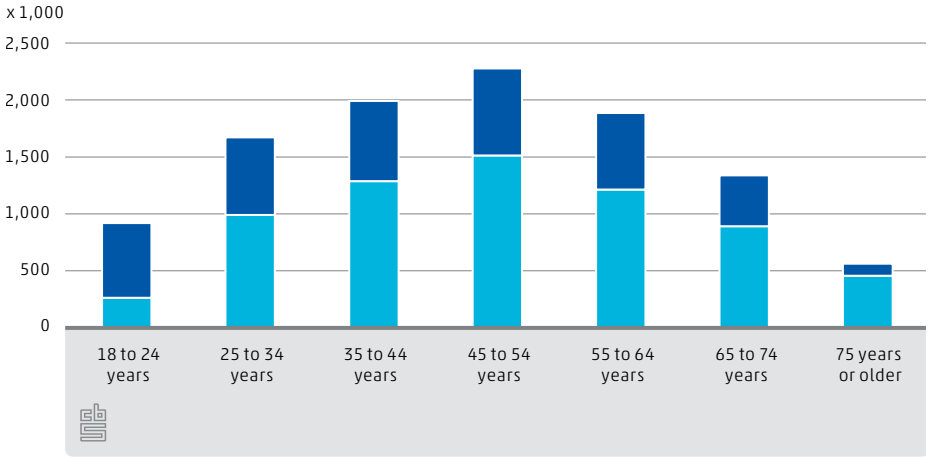
Almost 11 million Dutch citizens have a driver's licence

In the Netherlands 80 percent of the adult population have a driver's licence. They are allowed to drive cars and mopeds. Young people less often have a driver's licence or own a car than older people.

17 year-olds allowed to drive

Ever since the start of the experiment '2 to drive' in 2011, young people can start their driving lessons at the age of 16.5, and they can obtain a driver's licence at 17. These 17 year-olds are only allowed to drive under the supervision of an experienced 'coach'. Only when they turn 18 are they allowed to drive on their own. The number of 17 year-olds with a driver's licence has increased from 12.8 thousand in 2014 to 16.7 thousand in 2016.

4.3.3 Driving licence holders with and without cars, 2014



Source: RDW, processed by CBS.

Car ownership among young people continues to decrease

Car ownership among people under 45 continues to decrease. The sharpest decrease came about in the age group under 25. Of all under-25's, 18 percent owned a car, 1 percentage point less than in 2013, and 3 percentage points less than in 2010. The share of students who own a car decreased from 11.9 percent in 2010 to 10.5 percent in 2014.
Car ownership increased on the other hand among the population over 45. The largest increase in car ownership compared to 2010 was among people over 80. In 2014 this concerned 211 thousand people, in 2010 just 164 thousand. This increase is due to the fact that elderly people have become more mobile, and often have driver's licences. Slightly more than 50 percent of the men and 1 out of 8 women aged over 80 own a car.

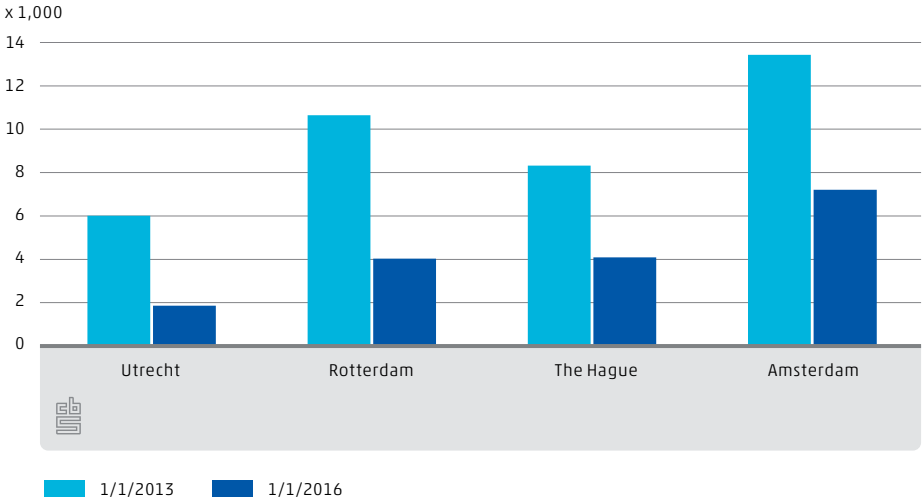
Low emission zones

Low emission zones, which limit entry for specific vehicles, were introduced in several major cities to comply with European air quality standards. This applies to vehicles which produce large amounts of particulate matter and nitric oxides. 13 of the larger Dutch municipalities currently have low emission zones for heavy freight vehicles. Low emission zones for cars and vans came into effect in a few cities on 1 January 2015.

Big drop in the number of old, polluting cars in Utrecht

Utrecht was the first of the four big cities to set up a low emission zone on 1 January 2015 for diesel cars and vans built before 2001. Utrecht also has implemented a financially advantageous scrapping scheme since the end of 2013. These measures helped cause a 69 percent drop in the number of diesel cars built before 2001: from over 6 thousand in 2013 to 1.9 thousand in 2016. Over 2,300 old diesel cars and vans were scrapped, and 2000 were exported.

Vans and cars running on diesel, built before 2001



Source: CBS, processed motor vehicle statistics.

Decreases in Rotterdam, Amsterdam and The Hague as well

Diesel cars built before 2001 and petrol cars built before July 1992 have been banned in the low emission zones in Rotterdam since January 2016. This plus a favourable scrapping scheme also led to a rapid, 60 percent decrease in the number of registered old diesel cars in Rotterdam between 2013 and 2016. The number of polluting petrol cars fell by 36 percent during this period, whereas the Netherlands as a whole saw a decrease of 20 percent.

The Hague has no plans for a low emissions zone for cars and vans as yet. Nonetheless, the number of polluting diesel cars decreased by 50 percent due to a scrapping scheme.

Amsterdam intends to introduce a low emissions zone for all diesel vans built before 2000 on 1 January 2017. There are no plans for cars, nor is there a scrapping scheme. Nonetheless the number of diesel vans built before 2001 has decreased by 40 percent since 2013 in the capital: from nearly 4.9 to 3 thousand.

On 1 January 2013 nearly 350 thousand diesel vans and cars built before 2001 were registered in the Netherlands as a whole. This was down by 46 percent by 1 January 2016.

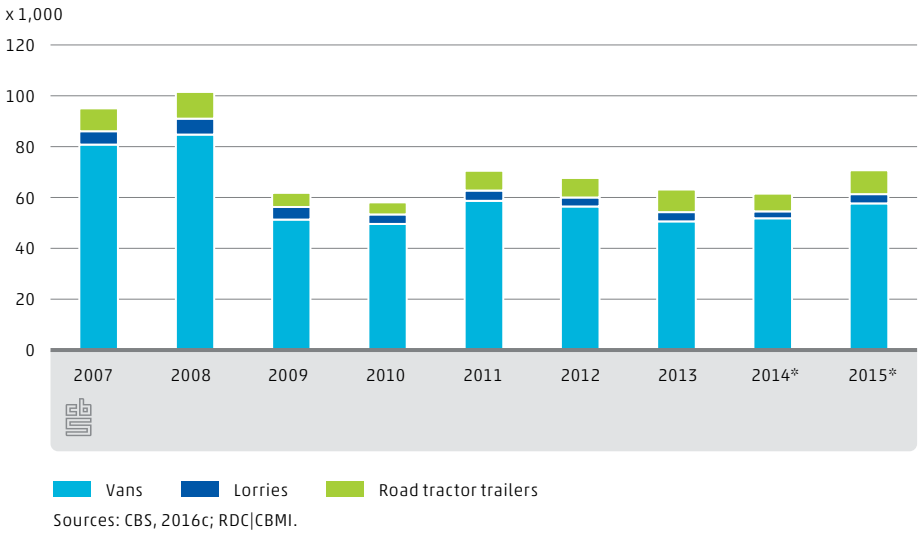
4.4 Vans, heavy freight vehicles and buses

Increase in vans and heavy freight vehicles

2016 saw the first increase in the number of vans and heavy freight vehicles since 2011. In January 2016 there were 13.4 thousand more vans than in January 2015. The number of heavy freight vehicles increased by almost 800 vehicles during that period, but only in the number of tractor-trailers: there are fewer traditional lorries than at the start of 2015.

After the economic crisis started in 2008, sales of new heavy freight vehicles and vans plummeted from 101.6 thousand in 2008 to 58.2 thousand in 2010. In 2011, the sales of new heavy freight vehicles increased for a while, but then the total number fell every year. But as trust in the economy grew, investment in vehicles rose. In 2015, an additional 11.5 percent of new vans and 33.7 percent of heavy freight vehicles were sold in comparison to 2014. The sales level of 2008, however, has yet to be matched.

4.4.1 Sales of new vans and heavy freight vehicles



Sources: CBS, 2016c; RDC|CBMI.

The number of buses decreased for the sixth year in a row. In January 2016 there were 9.4 thousand buses, whereas in 2010 there were still 11.6 thousand.
By far the largest share of Dutch company owned vehicles run on diesel: well over 90 percent. Petrol is the most prevalent after diesel. CNG (compressed natural gas) is emerging as a popular fuel for vans and buses. The number of electric and hybrid vans and buses is still relatively small.

4.5 Motorcycles, mopeds and bicycles

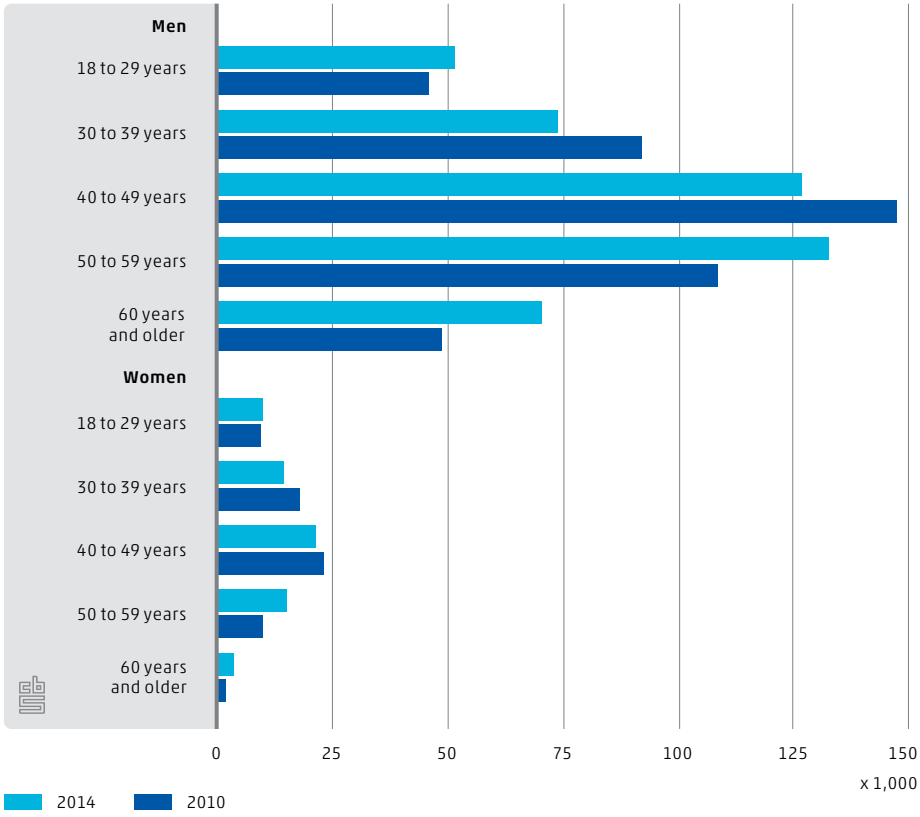
Number of motorcycles stabilises

At the start of 2016 there were nearly 653 thousand motorcycles in the Netherlands, slightly more than the year before. Between the start of the century and 2012 the number of motorcycles increased rapidly, by 56 percent. After 2012 it has remained more or less stable.
In 2015 over 11 thousand new motorcycles were sold, a thousand more than in 2014. So the recovery that started in 2014 continued.

More female motorcycle owners aged over 50

In 2014, 1 out of 25 adults owned a motorcycle. Compared to 2010, ownership was concentrated among people aged over 50. The motorcycle owners in this group grew by 30 percent in the previous 4 years to a total of nearly 222 thousand. Although only 8 percent of the motorcycle owners aged 50 and older is a woman, their motorcycle ownership increased more strongly than for men. In 2014 there were one and a half times more female motorcycle owners aged over 50 than in 2010.

4.5.1 Motorcycle owners by age group and sex



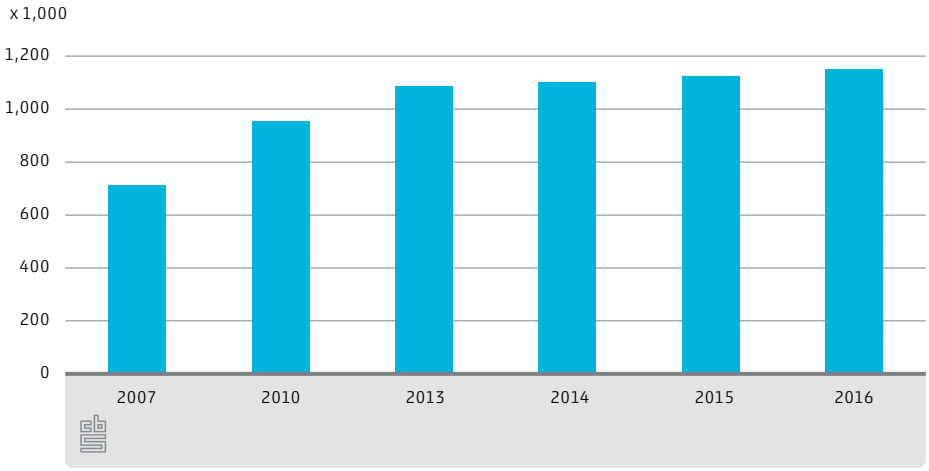
Sources: CBS, 2015a; RDW.

There has been a decrease in the number of motorcycle owners in the 30 to 50 age group. In 2014 there were 236 thousand motorcycle owners in this age group, 16 percent less than in 2010.

More light mopeds, fewer classic mopeds

The number of vehicles with a moped licence plate had expanded again in January 2016. The number of mopeds increased by 2.3 percent compared to the year before. This group of vehicles consists of classic mopeds, light mopeds and micro cars. Since 2007 licence plates are obligatory for mopeds and ever since then the number of vehicles with a moped licence plate has increased every year. Since 2011 the increase can fully be attributed to the light mopeds, as the number of classic mopeds and micro cars has decreased.

4.5.2 Mopeds on 1 January



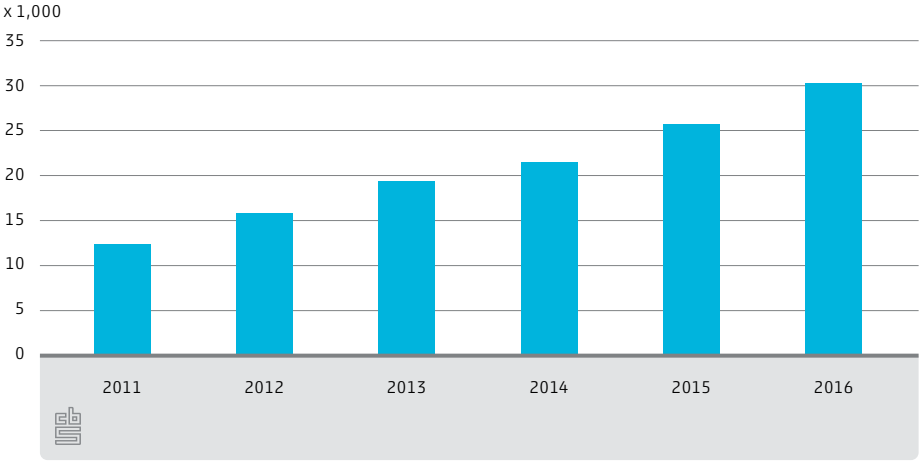
Source: CBS, 2015b; RDW.

More electric mopeds

The number of electric mopeds increased during the previous years to a total of 30.3 thousand. Compared to 5 years ago, there are 2.5 times as many electric mopeds. But the share of electric mopeds remains rather small, 2.3 percent, on the total number of mopeds. The most common fuel for mopeds is petrol

30,300 electric mopeds
in the Netherlands in January 2016

4.5.3 Electric mopeds on 1 January



Sources: CBS 2015b, RDW.

More bicycles than people in the Netherlands

Bicycles are the most common vehicles in the Netherlands. There are 22 million bicycles in the country, 1.2 per person. The electric bicycle is becoming increasingly popular. In 2015 nearly 1 million bicycles were sold. One out of four of these bicycles was an e-bike.

4.6 Airplanes and inland ships

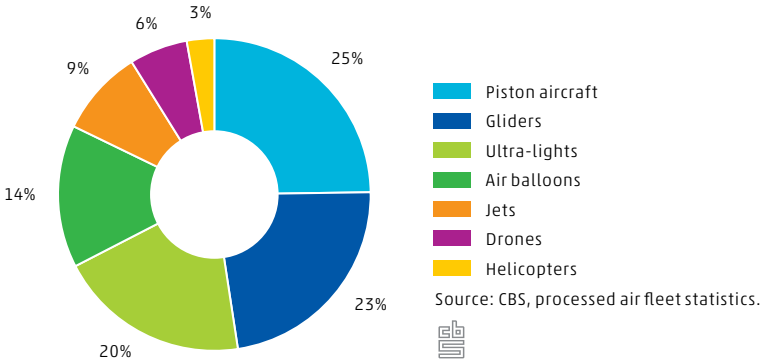
260 large airplanes for commercial transport

The Dutch air fleet consists of over 260 large airplanes for the commercial transport of passengers and cargo. There are also around 700 smaller aircraft, used for training, sightseeing and private flights, and 530 micro lights mostly for recreational use. There are nearly 490 gliders and 150 motor gliders.

Far more registered drones

In recent years the number of registered drones (remote controlled unmanned aircraft) has increased rapidly. In December 2012, less than 10 drones were registered. Currently their number has reached 170, and they comprise 6 percent of the Dutch air fleet. These drones are for professional use, amongst others for inspections and by emergency services. A pilot's licence is required for flying drones professionally.
Besides, the air fleet comprises 420 hot air balloons and 80 helicopters.

4.6.1 Air fleet, 31 December 2015



Source: CBS, processed air fleet statistics.

Nearly 5,200 inland ships

Inland ships navigate along the coast and on rivers and channels. These ships are not built to go out on open sea. In 2015 there were almost 5,200 Dutch inland ships used for goods transport. Half of these are motor freighters, used to carry dry bulk (such as coal and sand) and containers. The size of Dutch inland ships increases. In 2008 only 8 percent of the motor freighters had a loading capacity of over 3 thousand tonnes, this share had increased to 13 percent in 2015. The share of motor freighters with a loading capacity of a thousand tonnes or less decreased during the same period from nearly 51 to 43 percent.
Dry bulk and containers can also be transported in barges. These barges do not have engines but have to be pushed or pulled by a pusher tug. Over 19 percent of Dutch inland ships are barges. Besides these there are also 850 tankers and 730 other inland ships.

Sources

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5. Infrastructure


139,000 km of roads
3,000 km of railways
6,300 km of waterways

139 thousand kilometres of paved roads, 6 thousand kilometres of waterways, 3 thousand kilometres of railways and 35 thousand kilometres of bicycle lanes have been constructed for transport in the Netherlands. This is nearly 11 meters of infrastructure per inhabitant. By infrastructure we mean the total network intended for passenger and/or goods transport.

5.1 Introduction

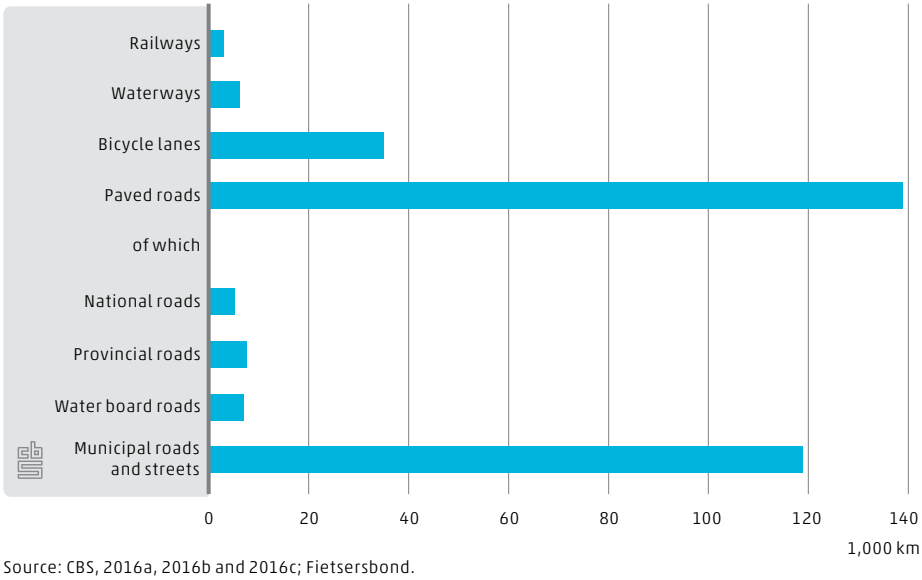
Infrastructure connects us. Whether you want to travel by road, rail, water or air, the Netherlands offers enough possibilities to reach your destination, despite traffic jams and delays.
Through the centuries much time, money and effort has been invested in Dutch infrastructure. Now there are over 183 thousand kilometres of paved roads, railways, waterways and bicycle lanes, which, if all put together, is just about half way to the moon. On average Dutch people live less than 2 kilometres from a main road entrance and only 5 kilometres from a train station. In this chapter the infrastructure of the Netherlands is mapped, including average distances to main road entrances and train stations.

5.2 Infrastructure networks

The intricate road network

The Netherlands has nearly 139 thousand kilometres of paved roads. Municipal roads and streets make up 86 percent of all roads. The national roads connect the regions and the hinterland, provincial roads connect the different provincial regions. Together these constitute the main roads. Municipal roads mainly consist of streets and roads connecting neighbourhoods. Water board roads form a separate category: they link the water board controlled flood defences found mostly in the western provinces. So the road network is finely meshed, which has a positive outcome on the transport and mobility options.

5.2.1 Road traffic infrastructure

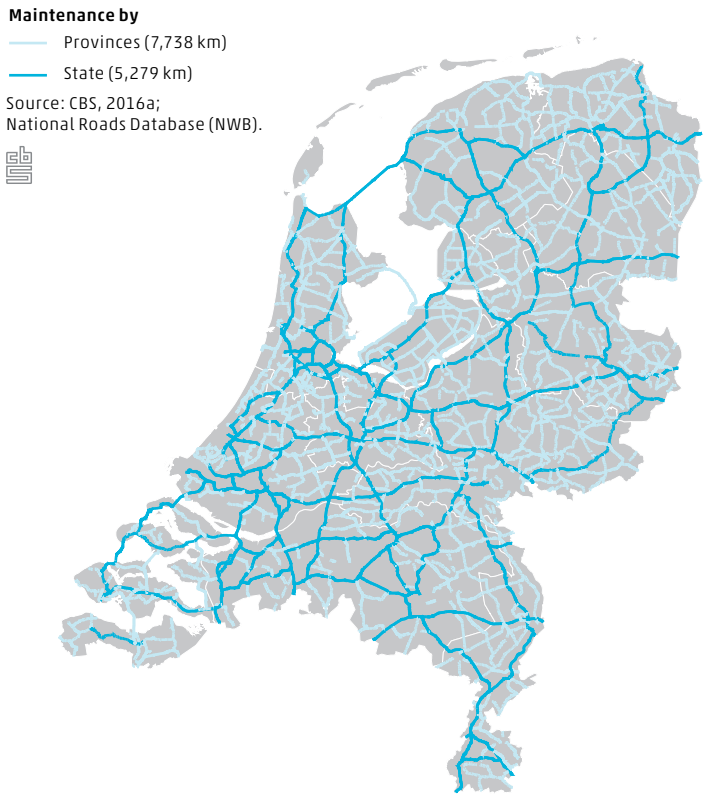


Source: CBS, 2016a, 2016b and 2016c; Fietsersbond.

Main roads

Crucial issue is who controls the maintenance of the roads, the state or the province. National roads are controlled by the national government, these can be A roads or N roads. Provincial roads are controlled by the province: most are N roads, some of them A roads, depending on the registration in the Nationaal Wegenbestand of Rijkswaterstaat

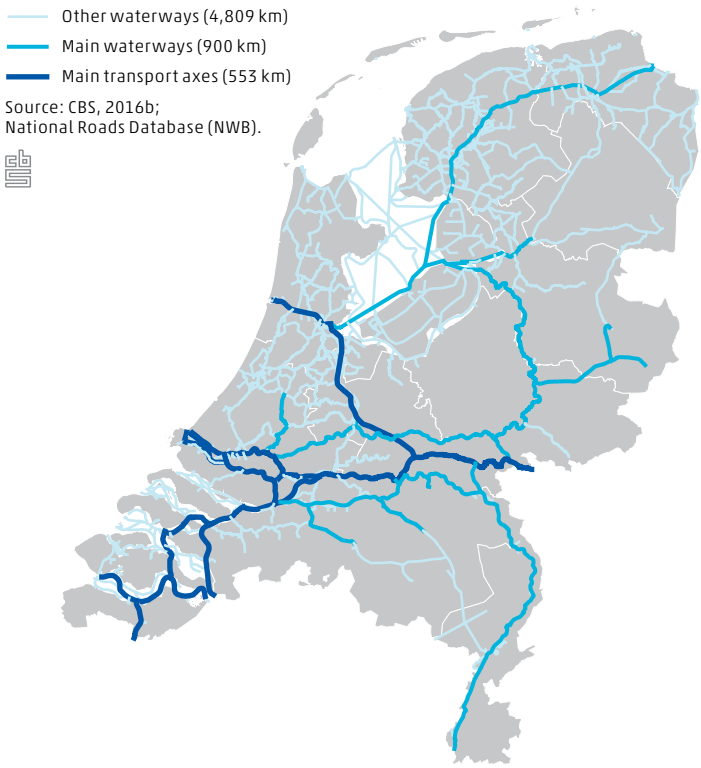
5.2.2 Main roads



Waterways located mainly in the west and north

The Netherlands has 6.3 thousand kilometres of waterways, mainly concentrated in the west and north. The waterways often originated out of the need for agricultural land and for draining peat moors when used to cut peat. In order to discharge excess water, waterways and canals where connected to existing rivers and canals, thus creating a whole network of waterways. This network was initially used to carry supplies from the rural areas to the cities in the vicinity, and to dispatch peat in the north. Back in the days, the most comfortable way to travel was across water because the roads were of poor quality. Nowadays the waterways are often used for recreational activities in addition to shipping.
The main transport axes, the 'great rivers' Rhine and Meuse, the 'Amsterdam-Rhine Canal' and the 'Rhine-Scheldt connection', are mainly used for the transit of goods from the sea ports in Rotterdam and Amsterdam to Germany and Belgium by professional shipping. The main waterways unlock the country for water transport.

5.2.3 Waterways by economic significance



Railway network: 70 percent double or multiple track

The Dutch railway network is over 3 thousand kilometres long. In 1839 the first train connected Amsterdam and Haarlem. A decade later the four major cities had been connected and the first rail connection to Germany realised. In the 25 years that followed, the country was further unlocked and the provincial capitals were connected to the network. Over 3 quarters of the current rail tracks are electrified and 70 percent is double or multiple track. The non-electrified tracks are mainly located in the Northern and Eastern part of the country. The network includes 399 railway stations, one for every 7.6 kilometres of track.
The railways are used for passenger and goods transport. The Betuwe line (160 kilometres) from Rotterdam Europort to Germany is used solely for goods transport. The same goes for the track from Terneuzen to Belgium. The high-speed track (109 kilometres) from Amsterdam through Rotterdam and on to Bruxelles and Paris is used only for passenger transport.

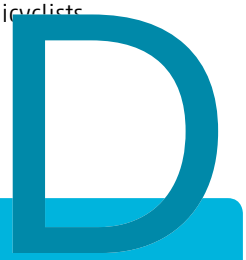
7.6 km is the average distance between train stations

5.2.4 Railways

Source: CBS, 2016c;
National Roads Database (NWB).

Almost 35 thousand kilometres of bicycle lanes

There are 22 million bicycles in the Netherlands. This means there are more bicycles than people (Chapter 1), which shows the popularity of the bicycle as a means of transport. According to the cycling association there are nearly 35 thousand kilometres of cycling lanes.
All those kilometres of cycling lanes are not just used for commuting, but also for recreational activities. The four day bicycle tour known as the 'fietsvierdaagse' is very popular and attracts thousands of bicyclists.

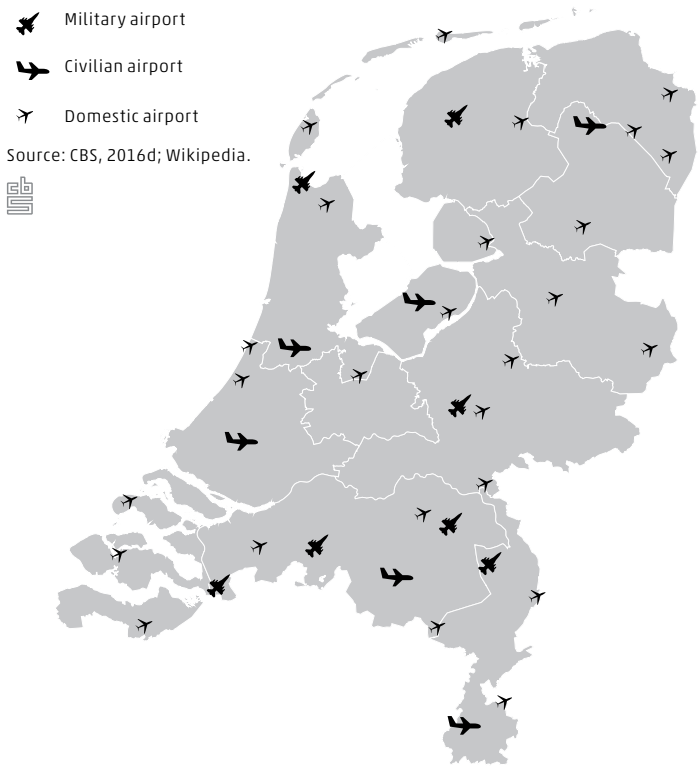


35,000 km of bicycle lanes

Schiphol main airport

Schiphol is by far the largest airport of the country for both passengers and cargo. Other civilian airports are Eelde/Groningen, Eindhoven, Maastricht/Aachen and Rotterdam/The Hague. There are an additional 25 airports across the country mostly for recreational use, and 7 military airports.

5.2.5 Airports



Source: CBS, 2016d; Wikipedia.

5.3 Proximity of main road entrances and train stations

Inhabitants of the Wadden islands furthest away from a main road entrance

The average distance from home to a main road entrance in the Netherlands is 1.8 kilometres. The Wadden islands have no main roads and no entrances, so the greatest distances are there. In the northern part of Groningen entrances are close to home addresses. The dark blue spot in the centre of the map shows Zederik which has no provincial roads within its municipal borders, and the nearby A27 national road only has two entrances situated at the ends of the municipal border.

5.3.1 Proximity to main road entrances

Main roads maintenance by

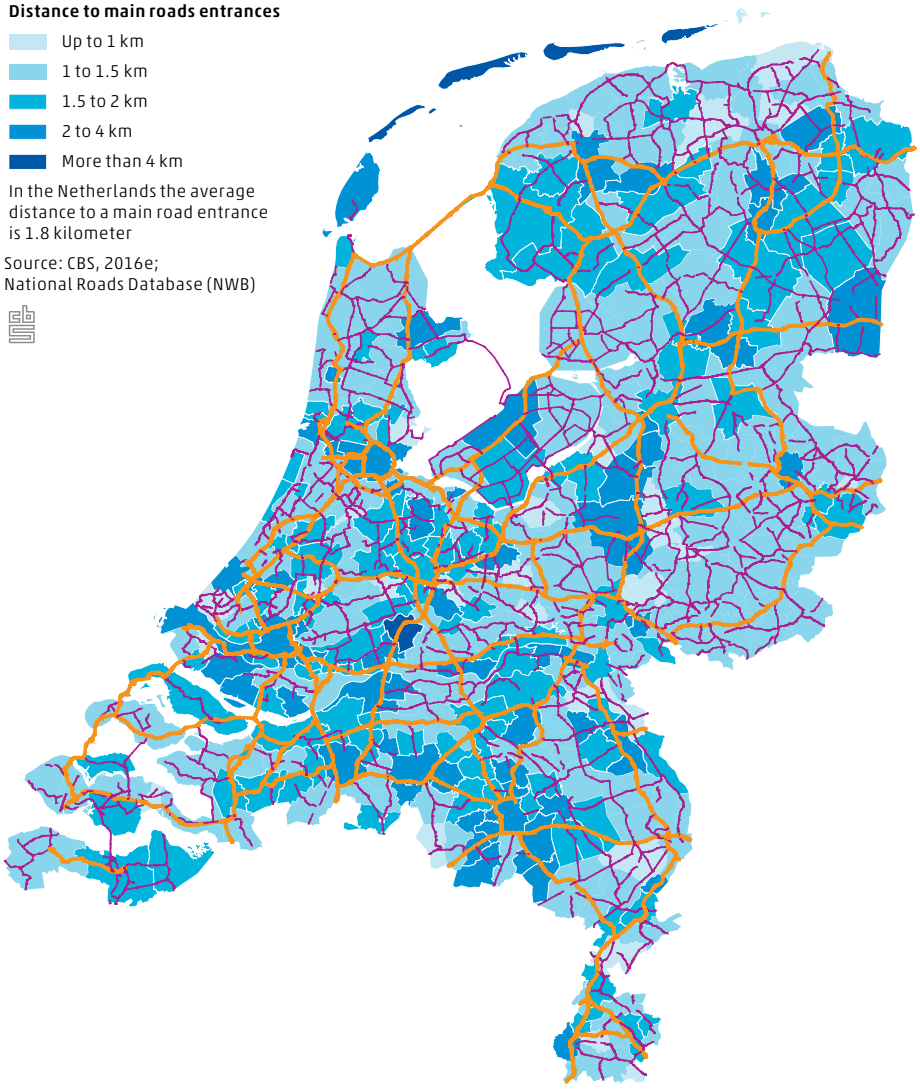
- Provinces (7,738 km)
- State (5,279 km)

Distance to main roads entrances

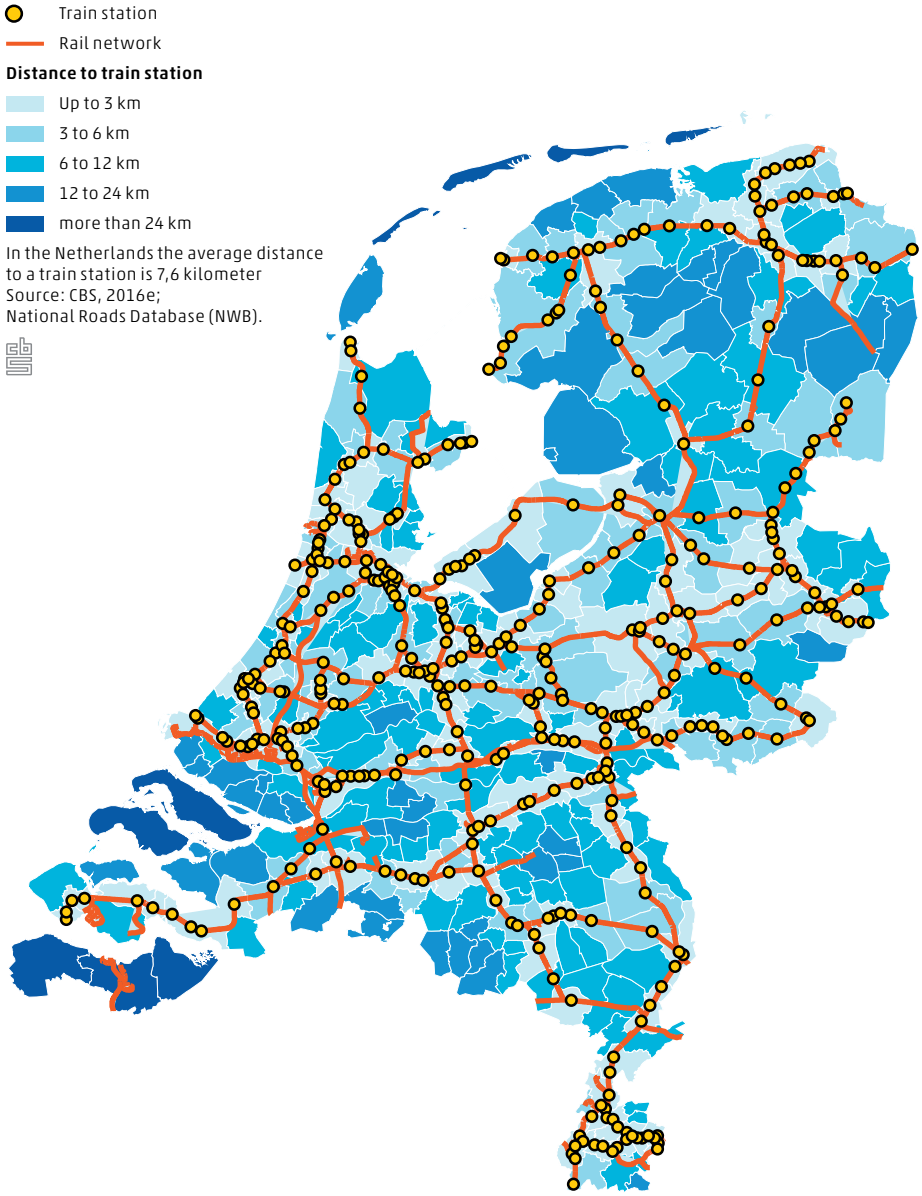
- Up to 1 km
- 1 to 1.5 km
- 1.5 to 2 km
- 2 to 4 km
- More than 4 km

In the Netherlands the average distance to a main road entrance is 1.8 kilometer

Source: CBS, 2016e; National Roads Database (NWB)



5.3.2 Proximity to a train station



In the Netherlands the average distance to a train station is 7,6 kilometer
Source: CBS, 2016e;
National Roads Database (NWB).

1.8 km is the average distance to a main road entrance

Proximity

Vicinity statistics describe the average traveling distance from home addresses to the amenities by road such as doctors, theatres, libraries and supermarkets. The statistics also include the average traveling distance to the nearest main road entrance and train station. This is interesting for the mobility options from the home address. These figures are available at the neighbourhood level.

Distance to train stations 5 kilometres on average

On average Dutch people have to travel 5 kilometres to reach a train station. The situation for train stations is similar to that of road entrances: the Wadden islands have no railways and are therefore furthest away from any train stations. The same goes for the islands Goeree-Overflakkee and Schouwen-Duiveland and for Zeeuws-Vlaanderen which only has a railway dedicated to goods transport from the industrial area in Terneuzen to Belgium.
The north of Groningen is again characterised by short distances. In the south of Limburg the distance to train stations is also relatively short. The same goes for the municipalities of Utrecht and others to the east and north-east, like Arnhem, Apeldoorn, Zutphen, Almelo, Hengelo and Enschede.

Sources

CBS, 2016a: Lengte van wegen; wegkenmerken, regio
http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=70806NED&D1=0,2,5,8,14&D2=0,4,7,15,28,46,116,357,388,438,512,601&D3=0,6,13-14&HDR=T,G2&STB=G1&VW=T
(figures for 5.2.1 and 5.2.2)

CBS, 2016b: Lengte van vaarwegen; vaarwegkenmerken, regio.
http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=71531NED&D1=0,16-18&D2=0,2,5,9,13&D3=0,5,9-10&HDR=T,G2&STB=G1&VW=T (figures for 5.2.1 and 5.2.3)

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http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=70262NED&D1=0%2c4&D2=0%2c4-5%2c7%2c33%2c39%2c49%2c471%2c600%2c672%2c695&D3=0%2c3%2cl&VW=T (figures for 5.2.5)

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6. Traffic accidents


458 men and 163 women
died in traffic in 2015
20,700 people were
seriously injured in traffic in 2014
41 people died in accidents with
a motorised vehicle for disabled people

The number of road fatalities has almost halved since the beginning of the century; in 2015, 621 people died in traffic. After years of decline, the number of deaths increased again for the first time, in 2015, by 9 percent. The number of seriously injured people meanwhile rose, especially among cyclists. Compared to most other countries the Netherlands is a safe country in terms of traffic.

6.1 Introduction

Traffic accidents usually mainly cause material damage, but often they cause injuries and death as well. In this chapter we provide information about road fatalities and serious injuries. Material damage and minor injuries cannot be considered because lack of data. In this chapter we will focus on road accidents. Accidents in air and rail traffic or sea and inland shipping, will not be addressed.

6.2 Traffic accidents in the Netherlands

More road fatalities in 2015

After years of declining numbers of fatal accidents, 621 people died in traffic in 2015, which is 51 more than the year before. The death toll was particularly high among male car drivers and elderly men on mobilility scooters (CBS, 2016a, Rijkswaterstaat 2016b). Notwithstanding the increase in 2015, the number of deaths is almost half that of the year 2000. However, the number of seriously injured people increased between 2000 and 2014, as did the number of vehicles on the road (see chapter 4).

The steady drop in the number of deaths up until 2015 went together with increased use of safety belts, child's car seats and airbags in cars. The share of drivers wearing seat belts rose during the last two decades from 78 percent to 97 percent in 2010. About the same is true for front seat passengers. The use of seat belts worn by back seat passengers rose even more spectacularly, from 20 percent in 1990 to 82 percent in 2010 (SWOV, 2012).

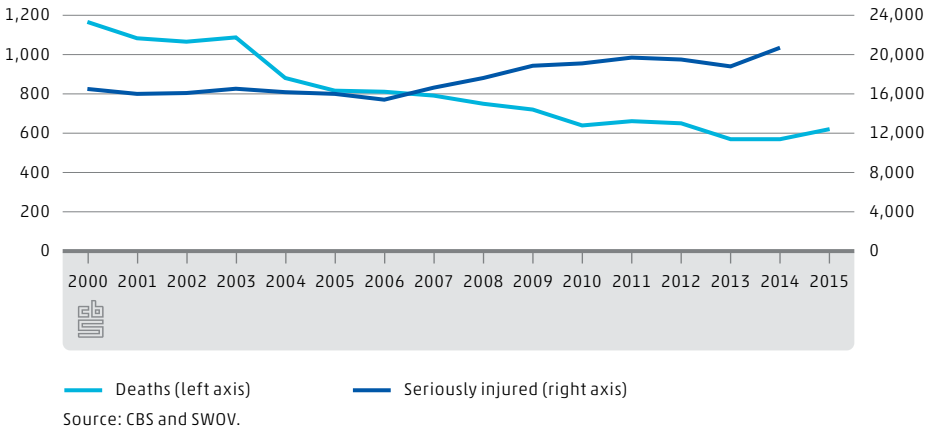
Moreover, the infrastructure is more protective of vulnerable groups like bicyclists and pedestrians with roundabouts, low traffic residential areas, speed bumps. Also the speed limits were lowered on many roads (30 km/h and 60 km/h zones), though not on main roads, and education campaigns and enforcement aim to reduce the use of alcohol in traffic.

Determining the number of road injuries

The estimate of the number of seriously injured is based on two data sources:
- **Bestand geRegistreerde Ongevallen in Nederland (BRON), in which the Ministry of Infrastructure and Environment collects police data on traffic accidents, and**
- **the Landelijke Basisregistratie Ziekenhuiszorg (LBZ), in which hospitals record injury data. However, in practice it appears that not all persons injured in traffic are recognized and recorded as such.**

The number of serious road injuries is estimated by combining data from these two sources. Accidents without a motor vehicle involved are not always recorded in BRON. After 2009 the quality of BRON has declined, since then only hospital data are used (SWOV, 2015c).

6.2.1 Road fatalities and serious injuries in the Netherlands



Source: CBS and SWOV.

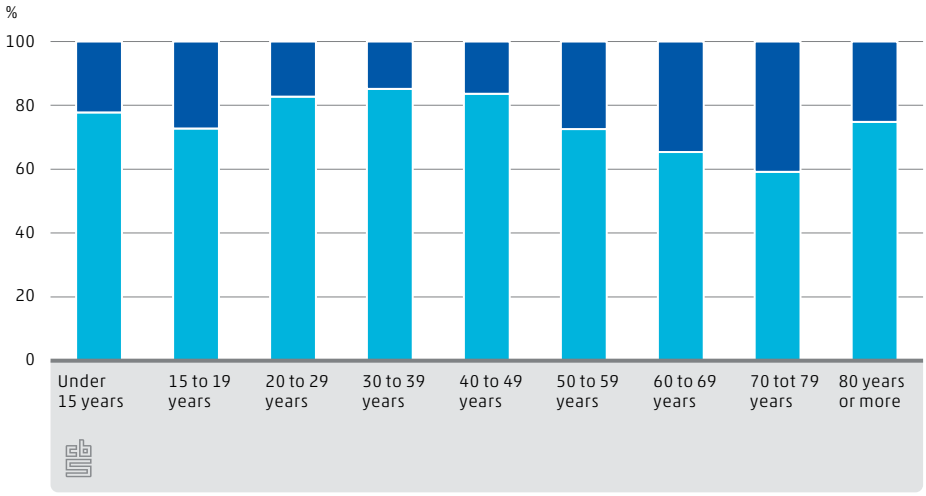
In 2015 the number of road fatalities increased for the first time in quite a while. It rose from 570 in 2014 to 621. In this century traffic fatalities have decreased by 47 percent. However, the number of serious road injuries increased, with some fluctuations, by more than a third. After 2011 the estimated number of seriously injured people fell to just below 19 thousand, but in 2014 it rose to 20,700, the highest number this century.
People are registered as seriously injured when they hospitalised after a traffic accident with a minimal injury scale score of MAIS2 or more, and do not die within 30 days. MAIS means Maximum Abbreviated Injury Scale: the value on the scale indicates how serious the injury is. The score is diagnosed in hospital (Reurings, 2010). Examples of MAIS2 injuries are bone fractures and concussion with loss of consciousness.

34% **of all road fatalities in 2015 were aged over 70**

More men died in traffic

More than seven out of ten people who died in traffic accidents were men. The male-female ratio has been stable for some time; 458 men and 163 women died in traffic in 2015, which is 47 more men and 4 more women than in 2014.

6.2.2 Road fatalities by sex and age group, 2015



Source: CBS, 2016b.

Older people are vulnerable road users

This century saw a reduction in road fatalities, except for people aged over 80. In this group road fatalities rose by 53 percent, while their share in the population went up by 47 percent. The mortality rate – the number of fatal accidents per 100 thousand inhabitants – of people aged over 80 increased from 15.5 in 2000 to over 16 in 2015. Other age groups saw a faster declining mortality rate. Relatively many older people die in traffic, particularly on bicycles: 63 percent of all bicycle fatalities were older than 65 years. For people aged over 80 the number of deaths in traffic rose from 78 in 2000 to 119 in 2015.

Older people are vulnerable in traffic. Physically they will often be more seriously injured than younger people when involved in an accident with the same level of collision impact. Medication and dementia can also be risk factors for this group. SWOV calculated that for people aged over 75 the risk of a fatal traffic accident per kilometre is 11 times higher than average. The risk for the 60 to 70 year-olds is considerably lower, but still above average (SWOV, 2015b).

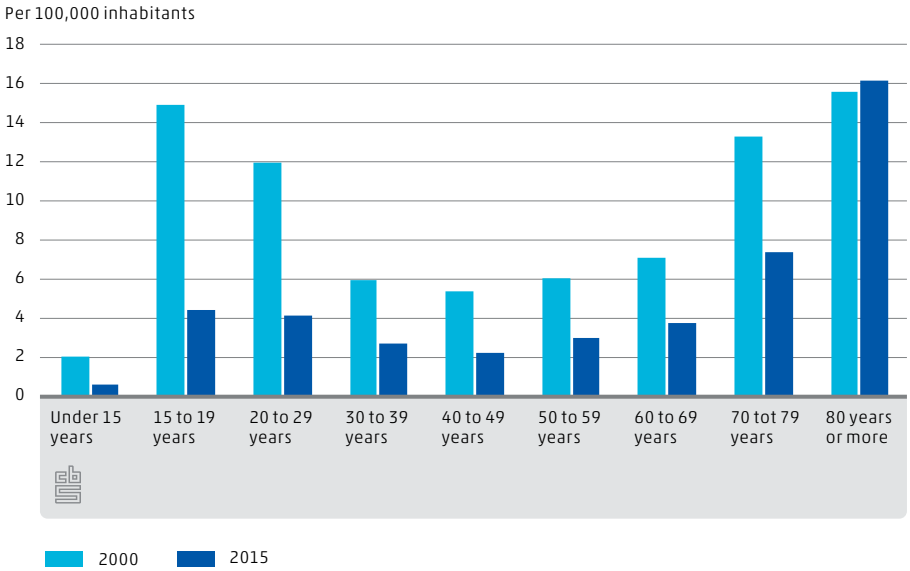
As the ageing of the population is expected to continue over the next decades, the participation by older people in traffic will grow and so will the number of accidents involving them.

63% of all road fatalities in 2015 were bicyclists aged 65+

Strongest reduction of road fatalities among young people

The number of road fatalities is lowest in children under 15. In 2000, 59 children died in traffic, in 2015 this was down to 18. The share of children under 15 in the population has decreased since 2000, but the number of road fatalities fell even faster. Safety measures are in place, especially for young children. The use of child's car seats for children smaller than 1.35 metres, safety belts for back seat passengers and helmets for bicyclists younger than 6 years has increased. Children aged between 10 and 15 face the highest risks in traffic as they often participate in traffic on their own, mainly on bicycles (SWOV, 2009). Almost 13 percent of the total distance children under 12 travel, they cover on a bicycle (on their own or as passengers), for 12 to 15 year-olds this was even a third. The mortality rate is lowest for the 15 to 20 year-olds, and decreased from 15 per 100 thousand inhabitants in 2000 to 4.4 in 2015.

6.2.3 Road fatalities by age group



Source: CBS, 2016c and 2016d; Rijkswaterstaat.

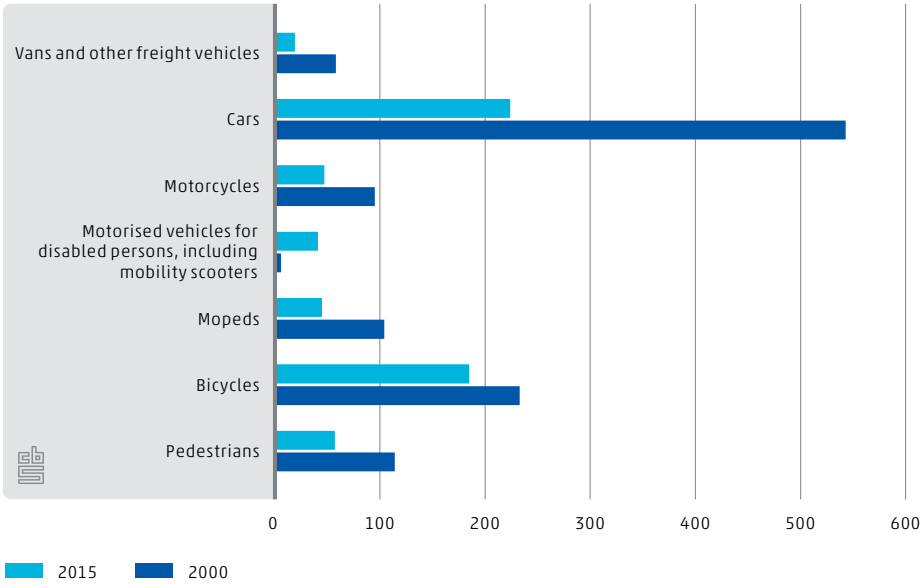
People aged over 60 are strongly represented among the seriously injured as well. Most older victims are bicyclists or pedestrians. Young people are more often injured in motorised vehicle accidents, most of them moped drivers aged 16 or 17 and car drivers aged 18 and 19. These inexperienced drivers run a higher risk of accidents, partly also due to 'wild oats' and the feeling of 'nothing will happen to me' during this age (SWOV, 2015c). Within the group of children under 15, the 10 to 15 year-olds are most frequently injured in traffic.

Most road fatalities are car passengers

The number of motor vehicles rose to about 11 million since 2000. The total distance covered has been more or less stable for years (see chapter 1), but this does not hold for all means of transport. Bicycles were used 9 percent more in 2014 than in 2000, partly due to the e-bikes. The number of deaths among bicyclists decreased by one fifth.

The largest decrease in road fatalities since 2000 took place among passengers of motor vehicles, with the exception of users of motorised vehicles for disabled people. The number of persons dying in these types of vehicles, including mobility scooters, increased from 6 to 41 in the period 2000–2015. The number of deaths among car passengers more than halved since 2000 and almost equalled that of bicyclists: 187 and 185 respectively in 2014. However, in 2015 the number of road fatalities among car passengers increased to 224, while that among bicyclists remained stable.

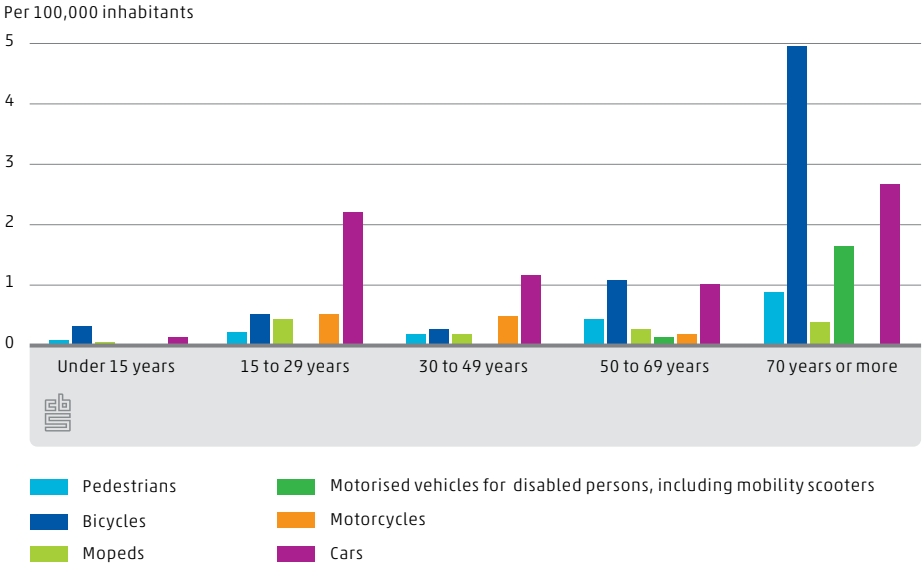
6.2.4 Road fatalities by mode of transport



Source: CBS, 2016e; Rijkswaterstaat.

The recent government safety measures apparently have had less impact on bicyclists and pedestrians. Because of their physical vulnerability it is more difficult to protect these groups than drivers and passengers of motorised vehicles.
For pedestrians crossing the street is most dangerous. The most deaths among pedestrians occur while crossing the street. Cars and lorries are the most involved in collisions with pedestrians (SWOV, 2015c).

6.2.5 Road fatalities by means of transport and age, 2015



Source: CBS, 2016f and 2016g.

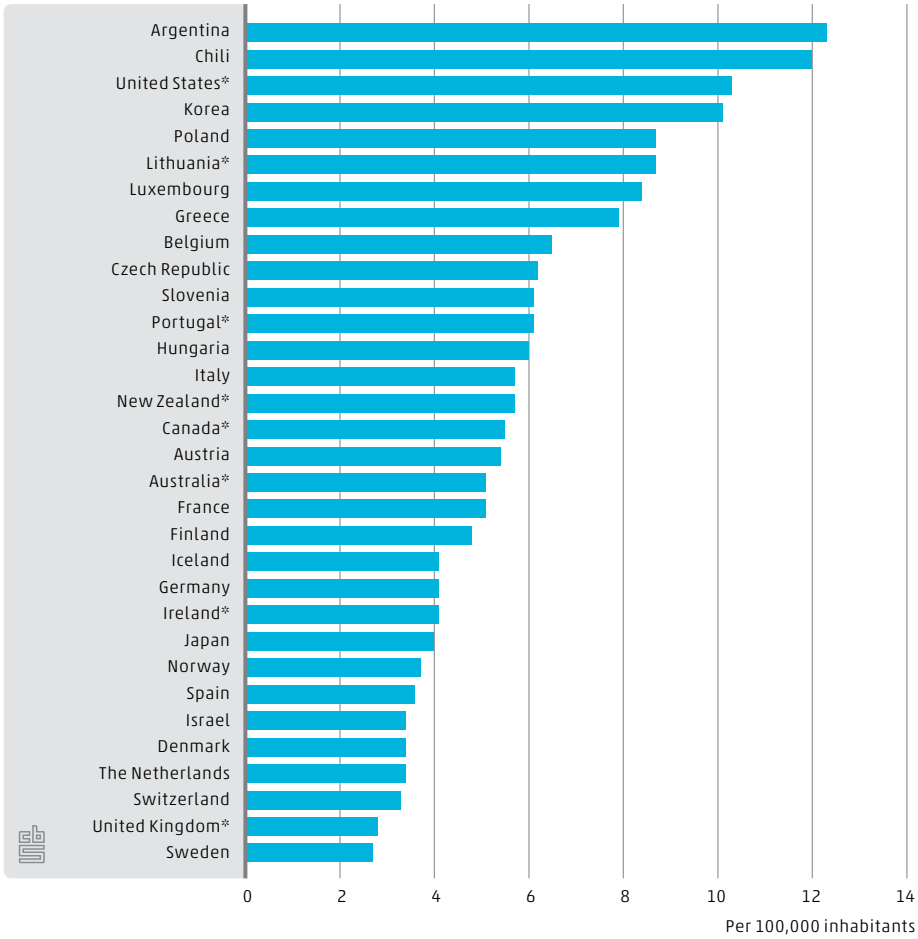
6.3 Road fatalities in an international perspective

International decrease in fatal traffic accidents

Traffic safety has improved during the last few years in almost all countries for which data are collected on a regular basis in IRTAD: the International Road Traffic and Accident Database. Between 2010 and 2013 the number of road fatalities decreased by high percentages in most countries. On the other hand, the mobility, expressed in vehicle kilometres, increased in the 20 countries for which data are available (IRTAD, 2015). To compare traffic safety between countries we use the mortality rate: the number of fatal accidents per 100 thousand inhabitants. Countries with the lowest mortality can be found in Europe. Sweden and the United Kingdom reported mortality rates under 3, some countries have mortality rates over 10. The Netherlands ranks fourth, together with Denmark and Israel.

IRTAD indicates that mortality should preferably be used to compare countries with comparable levels of development and motorisation and not for international ranking (IRTAD, 2015).

6.3.1 Road fatalities, international IRTAD figures, 2013



Source: IRTAD, Annual report 2015.

Since 2012 the number of road fatalities has decreased less, especially for bicyclists and pedestrians. Internationally, bicycling is becoming more popular and the distances covered increase. Some countries have encountered an increase in road fatalities among bicyclists. And most road fatalities are men, also internationally (IRTAD, 2014).

Sources

CBS, 2016a: Doodsoorzaken; doden door verkeersongeval in Nederland, wijze deelname
http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=71936NED&D1=0&D2=0&D3=0&D4=8-19&HDR=T&STB=G1,G2,G3&VW=T (figures for 6.2.1)

CBS, 2016b: Doodsoorzaken; doden door verkeersongeval in Nederland, wijze deelname
http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=71936NED&D1=0&D2=a&D3=a&D4=4,l&HDR=T&STB=G1,G2,G3&VW=T (figures for 6.2.2)

CBS, 2016c: Doodsoorzaken; doden door verkeersongeval in Nederland, wijze deelname
http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=71936NED&D1=0&D2=0&D3=a&D4=4%2cl&HDR=T&STB=G1%2cG2%2cG3&VW=T (figures for 6.2.3)

CBSStatistics Netherlands, 2016d: Bevolking; geslacht, leeftijd, burgerlijke staat en regio, 1 januari
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CBS, 2016e: Doodsoorzaken; doden door verkeersongeval in Nederland, wijze deelname
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CBS, 2016f: Doodsoorzaken; doden door verkeersongeval in Nederland, wijze deelname
http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=71936NED&D1=a&D2=0&D3=a&D4=l&HDR=G3%2cG2%2cG1&STB=T&VW=T (figures for 6.2.5)

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7.

Energy consumption by vehicles

78% diesel in motor fuel sales

45% lower sales of high sulphur fuel oil in shipping since 2005

53% biodiesel in mixed biofuels

Motor fuel sales rose constantly until 2008, but there has been a downward trend ever since. The main driver behind this decrease is the sale of more energy efficient cars. There have been European Union directives regulating environmentally friendlier fuels. In 2020 renewable fuels must constitute 10 percent of all motor fuels used. This requires fuel mixes at the filling stations.

7.1 Introduction

Transport and energy are inextricably linked. Cars, ships, airplanes are all powered by energy. There are over 8 million cars in the Netherlands and over a million commercial vehicles. There are thousands of inland ships and more than a thousand of airplanes depart every day. Many vehicles use oil products as fuels, some use electricity, such as trains and trams.

7.2 Road traffic

Diesel is main fuel used in road transport

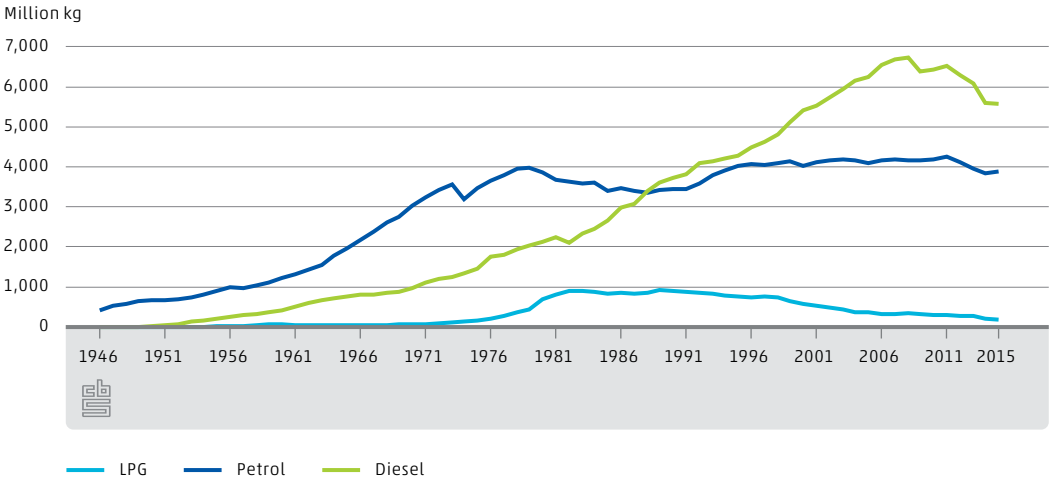
Road transport consists of personal and goods transport. Although most cars run on petrol, diesel is used most. This is because lorries and vans mainly run on diesel, as do most company cars.
LPG is becoming less popular. This is mainly because diesel engines have become more energy efficient and therefore cheaper to run, which makes them commercially interesting. LPG also has some disadvantages, such as the loss of room in the luggage compartment and forfeiting the factory warranty when using LPG.

2% of all fuels sold for road traffic are LPG in 2015

Downward trend in energy consumption in road transport

Although fuel consumption by traffic and transport rose constantly in the Netherlands until 2008, it has decreased ever since. The drivers behind this decrease are numerous. The main factor is the sale of energy efficient cars since 2006, as a result of tax incentives. The most fuel efficient cars are almost tax exempt. Therefore new cars sold in the Netherlands are the cleanest of all EU countries. Most countries provide fewer tax incentives (Ministry of Finance, 2014). The latest fiscal policy measures are published in a document from the ministry of finance called the 'Autobrief2'.

7.2.1 Motor fuels for road vehicles



Source: CBS, 2016a.

Crude oil prices have dropped

Motor fuels like gasoline and diesel are derived from crude oil. The price of a barrel of crude oil has dropped by more than 50 percent. Gasoline price did not drop 50 percent in price because in the breakdown of the cost price of motor fuels the refining costs, taxes and margin of the retailer are also important factors.

Alternative fuels

Biofuels

The directive of the European Union (EU, 2009) states that the share of renewable energy for the transport sector must be 10 percent by 2020. Dutch regulations require that, from 2007 onwards, a growing percentage of the energy of the total consumption of petrol and diesel for transport must be renewable. This is called the blending requirement. It means that all fuel supplied to the market in the Netherlands must contain a certain percentage biofuel, which increases every year.

7.2.2 Blending requirement for petrol and diesel

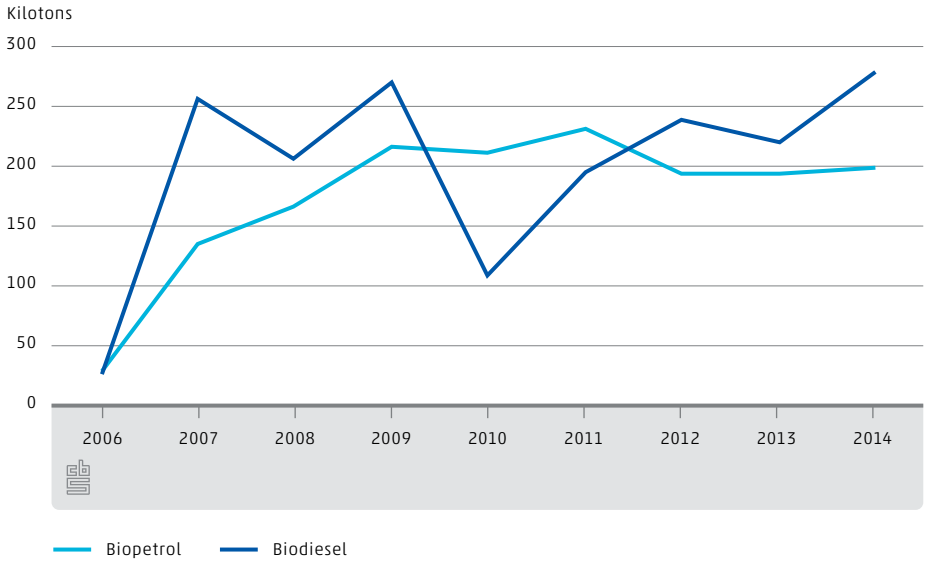
	2015	2016	2017	2018	2019	2020
	%					
Share of renewable energy	6.25	7	7.75	8.5	9.25	10

For 2016 the required share of renewable energy is 7 percent. This share will gradually increase to 10 percent in 2020.

Ever since the introduction of the blending requirement there has been a discussion about how sustainable biofuels actually are, because farmland is needed for their production for which forests are often cut. Furthermore growing crops for biofuels competes with growing food crops over scarce arable land, causing higher food prices. This has led to tighter regulations for blending requirement. Technically and environmentally improved biofuels were developed that count double in the required percentage. One example is discarded cooking oil that can be transformed into bio diesel. The share of double counted fuels has risen quickly to more than 70 percent of the total in 2014.

The measured quantities of blended biofuels are visualized in the graph below. Companies can decide for themselves how to blend the percentage biofuel, either in gasoline or diesel. As long as they have blended the required 7 percent biofuel on energy basis at the end of the year. This also means that the retailers supplying the fuels are also obliged to add an amount of biofuel to fulfil the requirements of the EU. They can leave some batched entirely as fossil fuel, and add more biofuel to other batches. They can also trade the requirement with other retailers.

7.2.3 Blended quantities of fuels by energy content

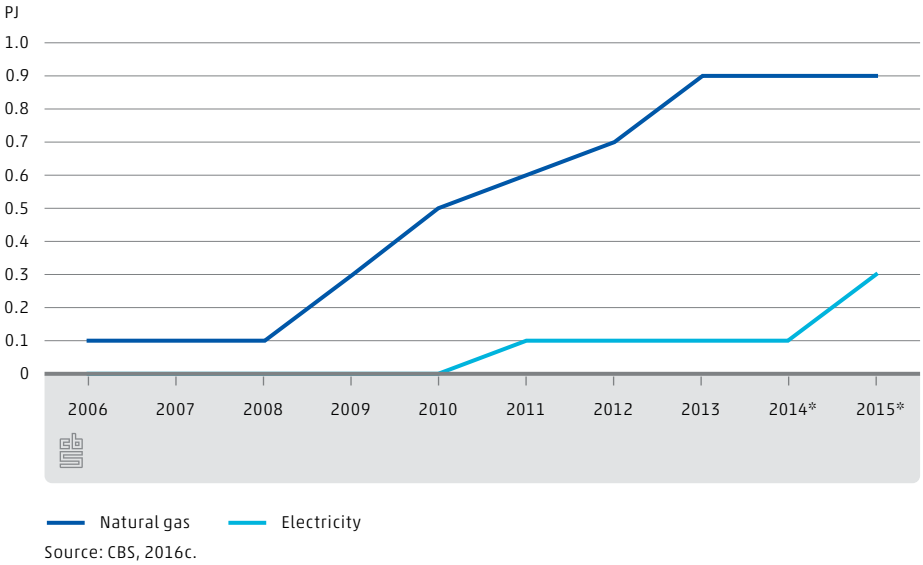


Source: CBS, 2016b.

Natural gas and electricity

Electric cars are rapidly gaining popularity, partly because of the tax incentives. The top ten in car brands sold in 2014 included plug-in hybrids, cars with a petrol engine and an electric motor that can be charged at a charging point. Cars or lorries can be converted to bi-fuel vehicles running on compressed natural gas (CNG). The advantages are the low purchasing cost of natural gas and the low CO_2 emissions. The disadvantages are the limited availability and low energy density, requiring a larger tank to cover the same driving distance. The latest development from 2015 is the possibility to use liquid natural gas (LNG), which requires a less voluminous tank. Although the share in the total sales is not yet large (0.02 percent), the sales of electricity and natural gas for road traffic is growing.

7.2.4 Motor fuels for transport; natural gas and electricity

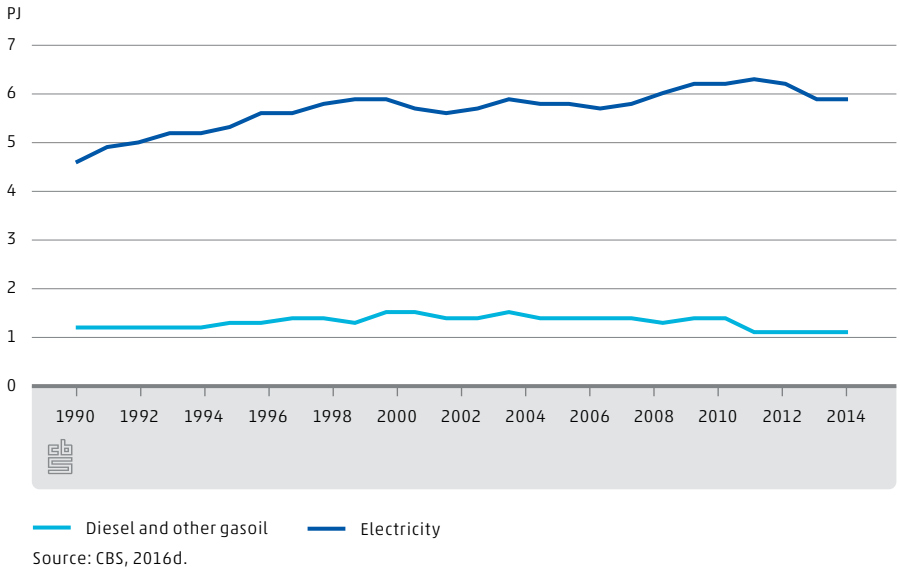


Source: CBS, 2016c.

7.3 Rail traffic

Since the first Dutch railway came into operation in 1839, trains have used energy: steam trains using coal and then, after World War II came trains running on diesel and electricity. Diesel or gasoil is still used for shunting locs and for routes where electrification is unprofitable. Electric trains have operated in the Netherlands since 1909.
To illustrate: electricity consumption increased from 4.3 thousand kWh in 1909 (Rotterdam-The Hague-Scheveningen railway) to 48 thousand kWh in 1929 (Randstad railways) and 140 thousand kWh in 1938. Current electricity consumption by rail traffic amounts to 1.7 billion kWh.

7.3.1 Energy use by rail traffic



Source: CBS, 2016d.

7.4 Shipping

The Dutch shipping sector is huge, thanks to the country's location near the North Sea and its many inland waterways. Coal-fired steam ships operated until the 1950s, but other oil-based fuels have been used ever since.

The river Rhine connects the Netherlands with the hinterland, and carries a great deal of freight. Inland ships mainly use (excise duty free) sulphur-free diesel because of environmental requirements. Several EU regulations lay down conditions fuels have to meet in order to reduce the emission of sulphur dioxide. In the guidelines the sulphur content was limited to a maximum of 10 ppm per January 2010 in coastal waters, ports and inland waterways (EU, 1999; IenM, 2015).

13% of fuel sales in shipping are light heating oils

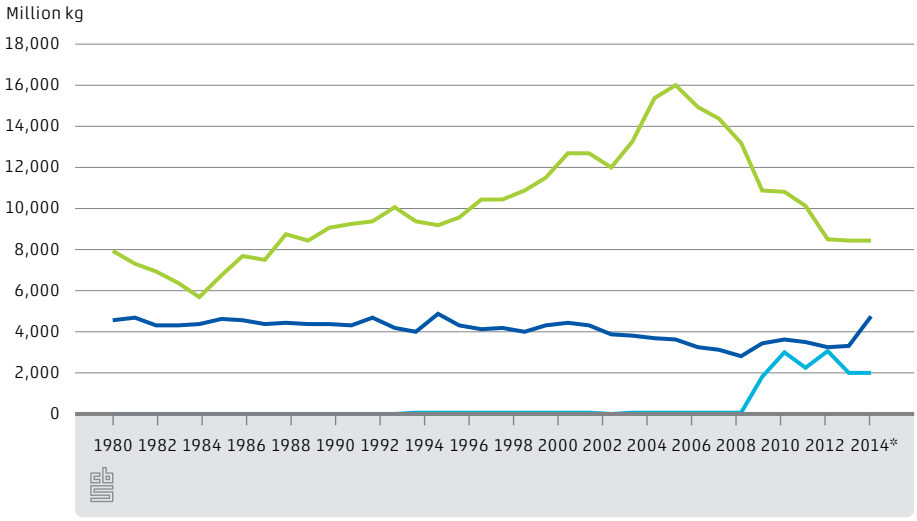
The Port of Rotterdam is a large international sea port, receiving many ships that go on to travel the world. Rotterdam is used as a fuelling station where ships bunker diesel and fuel oil (see Bunkering). The latter is a cheap, high viscosity liquid crude oil product used to generate power in very large engines. A fraction of the fuel oil bunkered is used within the Netherlands, but most is used in international waters. Fuel oil is impure, containing lots of sulphur and other contaminations.

Bunkering

Bunkering is the delivery of fuel for the international shipping and aviation. This concerns ships and aircraft departing from Dutch ports and airports to destinations elsewhere. In the energy balance bunkering is seen as exports because the fuel is not available for domestic consumption. A distinction is made for aviation bunkering dated before and after 1978. Before 1978 the bunkers were calculated as final consumption.

The result of the increasingly stringent regulations on sulphur emissions by ships is that more ships use low sulphur fuel oils. In annex VI of the Marpol Treaty (Marpol=Maritime Pollution), the international shipping organisation IMO (International Maritime Organisation) agreed a sulphur limit of 0.1 percent for fuels used in the Emission Control Areas (ECA: North Sea and Baltic Sea) as per 2015 (IMO, 2014). This is a tightening of the regulations by a factor ten compared to the 2010 regulations. These rules do not yet apply in international waters. Marine fuels used outside the ECA may contain up to 3.5 percent sulphur. Future legislation after 2020 will require cleaner fuels in international waters as well (see ILT, 2014).
A new development in maritime fuels is the use of liquefied natural gas (LNG).

7.4.1 Bunkering sea and inland shipping



Source: CBS, 2016e.

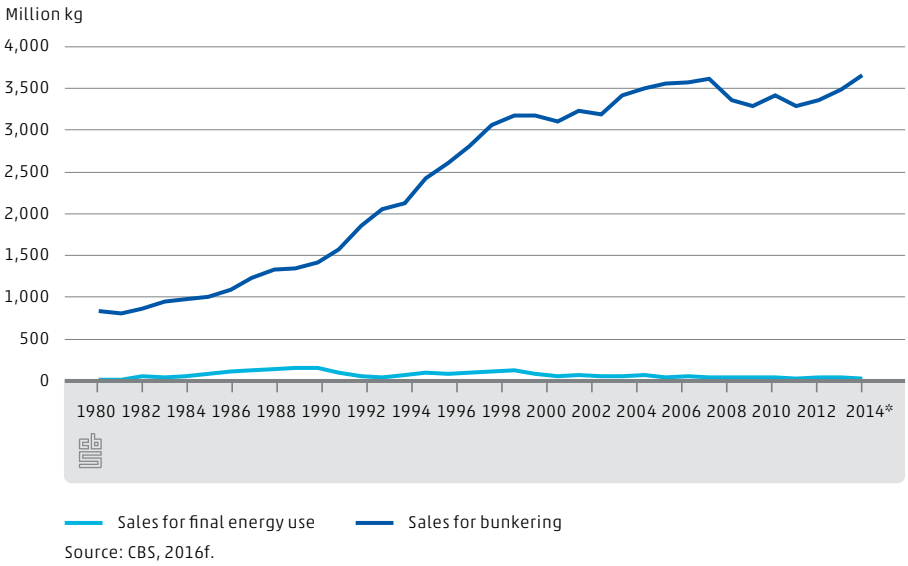
7.5 Aviation

Aircraft use kerosene to power their jet engines. Kerosene must meet very high demands. Aircrafts have to be able to take off from a +50 °C hot runway in Qatar and climb to a 10 km altitude where the temperature is -60 °C. The strong increase in the international air traffic is clearly shown by the figure on kerosene sales. In 2004 the cause was the new runway at Amsterdam Schiphol Airport (Polderbaan).

Jet fuel and aviation gas

Jet fuel based on petrol is a lighter kerosene no longer sold since 1988. Avgas is used by piston engine powered aircraft. This type of engine resembles a car engine and is mainly used in small (private) aircraft.

7.5.1 Use of aviation fuel



Source: CBS, 2016f.

The number of inland flights has been stable for years and the amount of fuel used has decreased thanks to more efficient engines. For aviation it is more difficult to switch to alternative fuels than for other modes of transport because a low take-off weight is essential and the energy density of kerosene is high. In the future biofuels will also be used in aviation but because of the great demands made on aviation fuels these will have to be thoroughly tested first.

99% of the sales of kerosine by aviation are bunkered

Sources

CBS (2016a): StatLine: Motor fuels for transport; deliveries by petajoule, weight and volume (figures for 7.2.1)

CBS (2015): StatLine: Liquid biofuels for transport; supply, consumption and blending (figures for 7.2.2)

CBS (2016b): StatLine: Liquid biofuels for transport; supply, consumption and blending (figures for 7.2.3)

CBS (2016c): StatLine: Motor fuels for transport; deliveries by petajoule, weight and volume (figures for 7.2.4)

CBS (2016d): StatLine: Motor fuels for transport; deliveries by petajoule, weight and volume (figures for 7.3.1)

CBS (2016e): StatLine: Petroleum products balance sheet; supply, consumption and stock (figures for 7.4.1)

CBS (2016f): StatLine: Motor fuels for transport; deliveries by petajoule, weight and volume (figures for 7.5.1)

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8. Environmental aspects of transport

40% decrease in NO_x emissions by traffic and transport during 1990-2014

60% decrease of PM_{10} emissions by traffic and transport during 1990-2014

4% decrease of CO_2 emissions by traffic and transport during 2012-2014

Emissions of nitrogen oxides have decreased by 42 percent and particulate matter emissions by 58 percent since 1990, despite growing traffic and transport intensity during 1990–2014. These decreases are the result of measures taken about vehicles. Nevertheless carbon dioxide emissions increased by almost 25 percent in the same period. Although there had been a 4 percent decrease between 2011 and 2013 the emissions in 2014 remained more or less at the same level as in 2013.

8.1 Introduction

Traffic and transport not only bring many benefits but also several disadvantages. The negative side effect are casualties in traffic and noise pollution as well as the emission of harmful substances. The latter leads to the deterioration of air quality which affects public health (WHO, 2006). Moreover, emissions contribute to the greenhouse effect and climate change (KNMI, 2015).
Nitrogen oxides (NO_x) and particulate matter – also known as PM_{10} or fine dust – have the greatest effect on air quality and the quality of life. Of the greenhouse gases, carbon dioxide (CO_2) is by far the most crucial.
This chapter describes the share of traffic and transport in the total emissions of these three substances on Dutch territory, the share of the various means of transport, the emission trends from 1990 onwards and the trends in the emissions per vehicle kilometre of road traffic.
The graphs show road traffic broken down into passenger and goods transport. Passenger transport includes transport using cars, buses, motorcycles and mopeds. Goods traffic covers the following vehicle categories, lorries, tractor-trailers, vans and special vehicles. Passenger transport over inland waterways includes recreational sailing. Emissions by sea ships refer to ships within the national boundaries as well as on the Dutch part of the continental shelf.

8.2 Nitrogen oxides

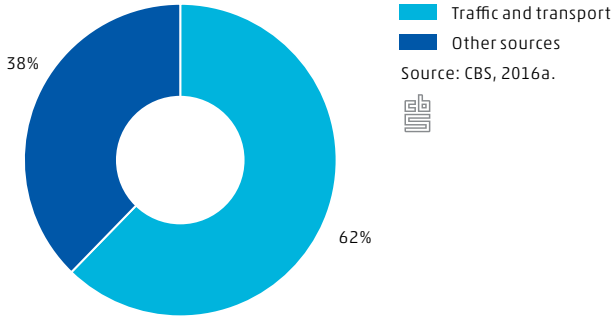
Nitrogen oxides (NO_x) is the collective noun for nitrogen monoxide and nitrogen dioxide. NO_2 is the most harmful of the two for public health. Exposure to NO_2 can lead to respiratory complaints and diseases or aggravates them.

Nitrogen oxides result from the combustion of motor fuels, when nitrogen (N_2) from the ambient air is converted into NO_x under the influence of high temperatures in the engines. Air consists of nearly 80 percent nitrogen. Catalytic converters must be used to comply with legal requirements for nitrogen oxide emissions by road vehicles. At first this only concerned passenger cars or vans running on gasoline or LPG, which have been fitted out with three-way catalytic converters since the late '80s. More recently, nitrogen oxides are also being removed from the exhausts of diesel engines using SCR catalytic converters. SCR stands for Selective Catalytic Reduction by using urea (AdBlue). Apart from SCR to reduce nitrogen oxides emission from diesel engines exhaust gas recirculation (EGR) is used. A combination of EGR and SCR is applied to comply with the most recent legal requirements.

Traffic and transport have largest share in total NO_x emissions in the Netherlands

Over 60 percent of the nitrogen oxide emissions in the Netherlands are caused by the sector of traffic and transport.

8.2.1 NO_x emissions in the Netherlands, 2014



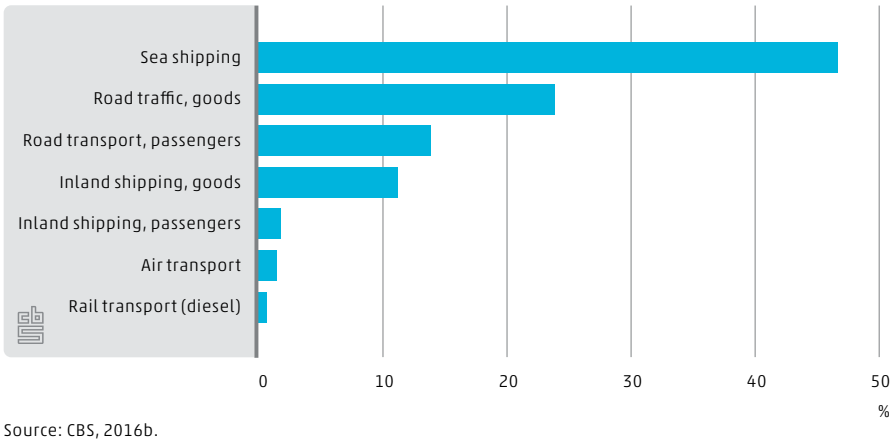
Source: CBS, 2016a.

NO_x emissions predominantly by sea shipping and road traffic

The nitrogen oxide emissions by traffic and transport are mainly caused by sea shipping (47 percent) and road traffic (38 percent). Inland shipping is also a major source, impacting on the air quality in the vicinity of the waterways used.

47% of the NO_x emissions by transport caused by sea shipping

8.2.2 NO_x emissions by traffic, 2014

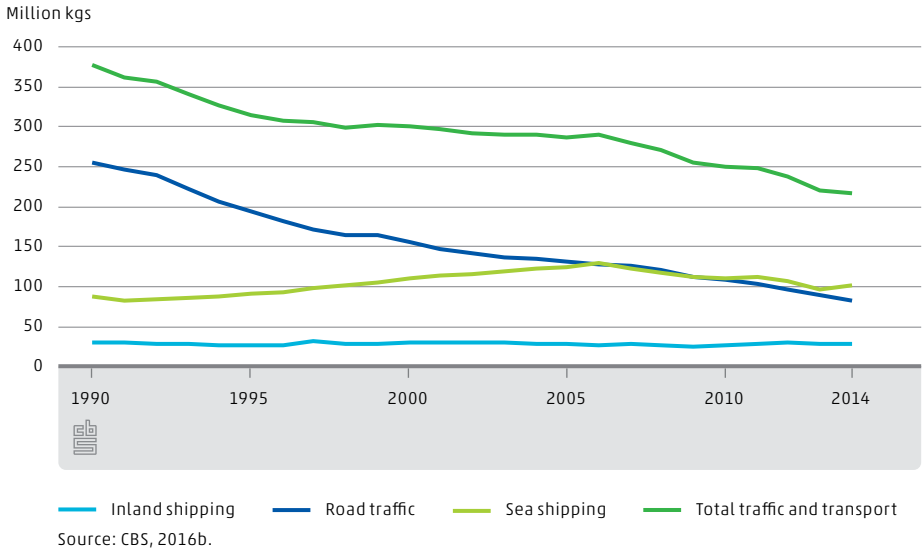


Source: CBS, 2016b.

NO_x emissions by traffic and transport 40 percent lower

The NO_x emissions by traffic and transport fell by over 40 percent in the period 1990–2014, despite an increase in traffic. This is due to cleaner engines meeting ever more stringent European emission requirements for new vehicles. The NO_x emissions of road traffic in 2014 are a third of the emission levels in 1990.

8.2.3 NO_x emissions by traffic and transport in the Netherlands

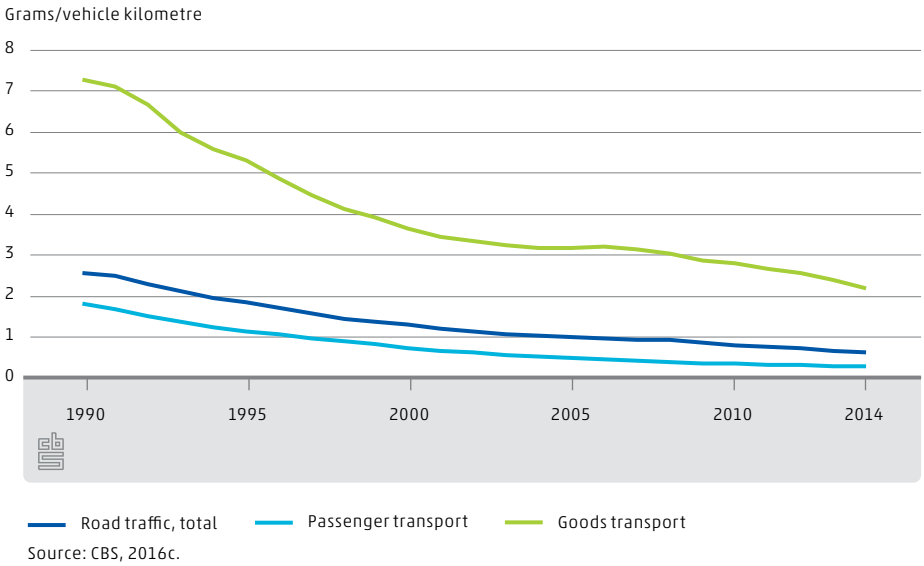


Source: CBS, 2016b.

Substantial decrease in NO_x emissions per vehicle kilometre

Due to cleaner road vehicle engines, the average NO_x emission per vehicle kilometre has decreased by three-quarters in the period 1990–2014.

8.2.4 NO_x emissions per vehicle kilometre



Source: CBS, 2016c.

8.3 Particulate matter

Particulate matter, or fine dust, is the combination of all liquid and solid particles in the atmosphere. Previously these used to be called aerosols or floating particles. Particulate matter is often abbreviated as PM_{10} where 10 indicates the maximum size of the particles (diameter in micrometres).

Particulate matter in the atmosphere can negatively affect public health. Therefore the European Union defined limits for particulate matter in 1999. In 2008 the regulation was extended with limits and goals for a finer grade of particulate matter ($PM_{2.5}$).

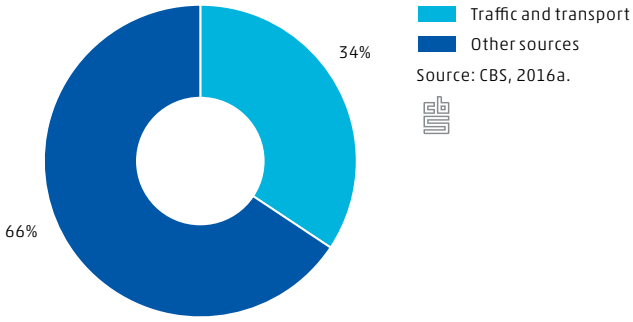
The most important sources of PM_{10} for traffic and transport are the exhaust emissions by fuel combustion, and the particular matter that originates from the wear and tear of tires, breaks and road surfaces.

The emissions of particulate matter (PM_{10}) by road traffic were initially mainly reduced thanks to motor engineering improvements. A further reduction, mostly after 2005, was accomplished by the introduction of particle filters (DPFs). In 2011 almost all new diesel vehicles were produced with a DPF. Many existing models have been retrofitted so that by the end of 2014 there were over 80 thousand cars and vans and nearly 27 thousand heavy commercial vehicles with retrofitted filters.

Over one third of total PM_{10} emissions by traffic and transport

Over one third of the total emissions of particular matter in the Netherlands is caused by the sector of traffic and transport.

8.3.1 PM_{10} emissions in the Netherlands, 2014

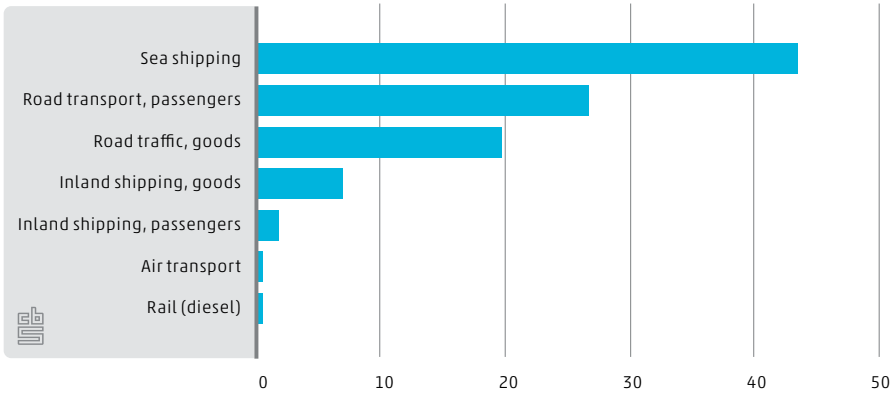


Source: CBS, 2016a.

Half of PM_{10} emissions by traffic and transport due to road traffic

Half of the particulate matter emissions by traffic and transport in the Netherlands is caused by road traffic. The share in the PM_{10} concentrations in the urban areas is large because that is where a major part of the emissions by road traffic take place. The PM_{10} emissions by sea shipping (40 percent) mainly take place on the North Sea, so it has a relatively low impact on the inhabited areas.

8.3.2 PM_{10} emissions by traffic, 2014

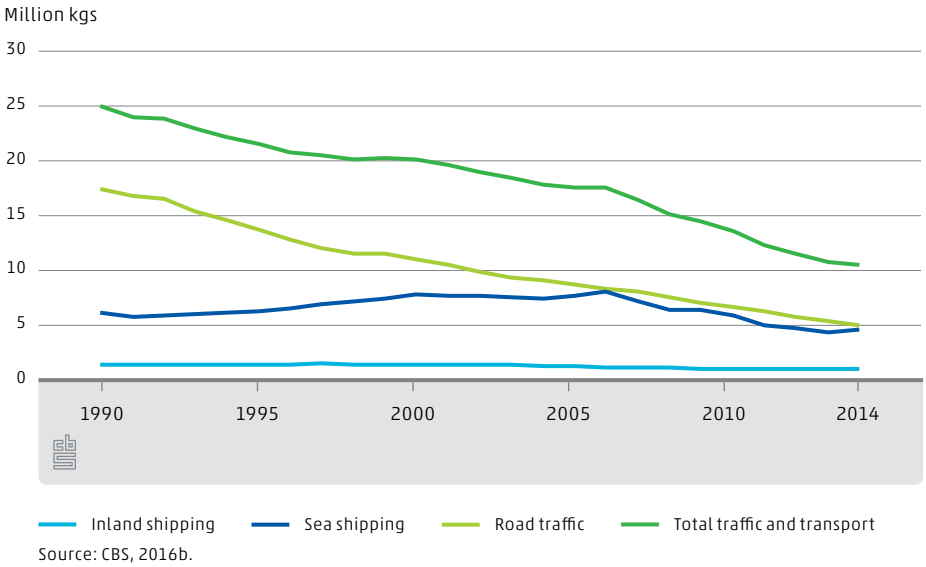


Source: CBS, 2016b.

PM_{10} emissions by traffic and transport reduced by 60 percent

PM_{10} emissions by traffic and transport decreased by 60 percent in 1990–2014, despite the increase in traffic. This is mostly due to the application of DPFs in diesel vehicles so as to meet European emission requirements. The PM_{10} emission levels of road traffic in 2014 were down to less than 30 percent of the 1990 levels.

8.3.3 PM_{10} emissions by traffic and transport in the Netherlands



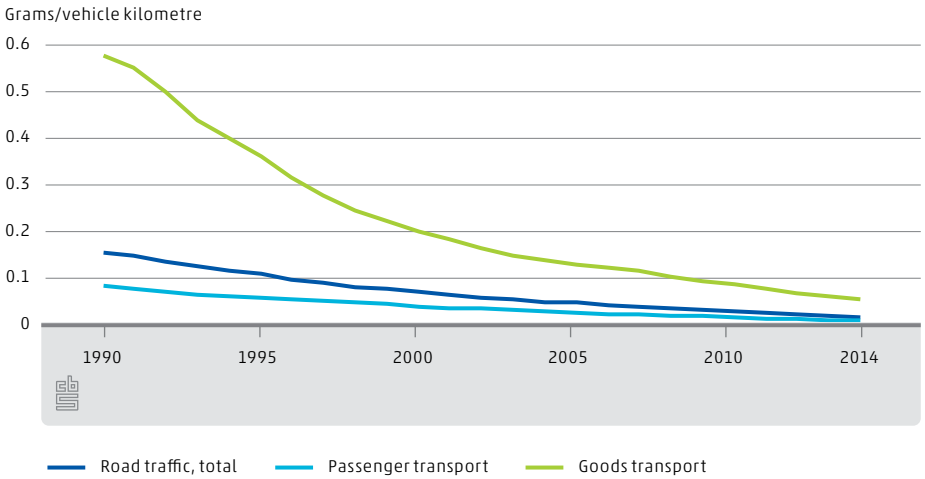
Source: CBS, 2016b.

PM_{10} emissions per vehicle kilometre decreased drastically

The application of DPFs on road vehicles with diesel engines has led to an 88 percent reduction in the average PM_{10} emission per vehicle-kilometre for 1990–2014. This reduction is completely due to cleaner exhaust gases. Emissions from the wear and tear on tires, brake linings and road surfaces have more or less stayed the same. Their share in the total PM_{10} emissions of road traffic has increased from 12 percent in 1990 to 51 percent in 2014.

20% of PM_{10} emissions by traffic and transport caused by road haulage

8.3.4 PM_{10} emissions per vehicle kilometre



Source: CBS, 2016b.

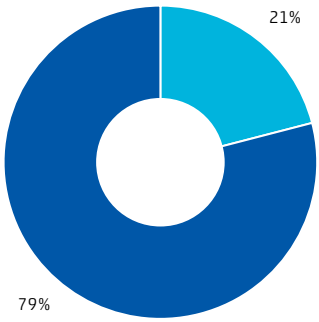
8.4 Carbon dioxide

Carbon dioxide (CO_2) is the most important greenhouse gas after water vapour. Greenhouse gases ensure that the warmth of the sun is retained. The average temperature on earth would be -18 degrees Celsius without greenhouse gases, whereas the actual average temperature is around 12 degrees.
Due to the continuously increasing use of fossil fuels since the industrial revolution, CO_2 concentrations in the atmosphere have increased by about 30 percent. Researchers expect the average temperature to increase, if fuel use does not change, which could lead to significant climate changes and natural disasters. Therefore policies to reduce CO_2 emissions by human activities have been implemented. Stimulating people to buy energy-efficient vehicles through tax incentives is one example in the Netherlands.
The figures on CO_2 emissions in this publication concern actual emissions within the Dutch territory as published on CBS Statline. Statistics Netherlands also publishes CO_2 emissions calculated according to the IPCC guidelines (CBS, 2016d) for international reports in the context of the Kyoto protocol. There is an explanation of the most important differences between the calculations of the IPCC and the actual emissions in this Statline table. The IPCC stands for Intergovernmental Panel on Climate Change. Its task is to scientifically guide the implementation of the Kyoto Protocol.

Share of traffic and transport in total CO_2 emissions in the Netherlands

About 20 percent of CO_2 emissions in the Netherlands are caused by the sector of traffic and transport. Nearly 80 percent of this can be attributed to road traffic.

8.4.1 CO_2 emissions in the Netherlands, 2014

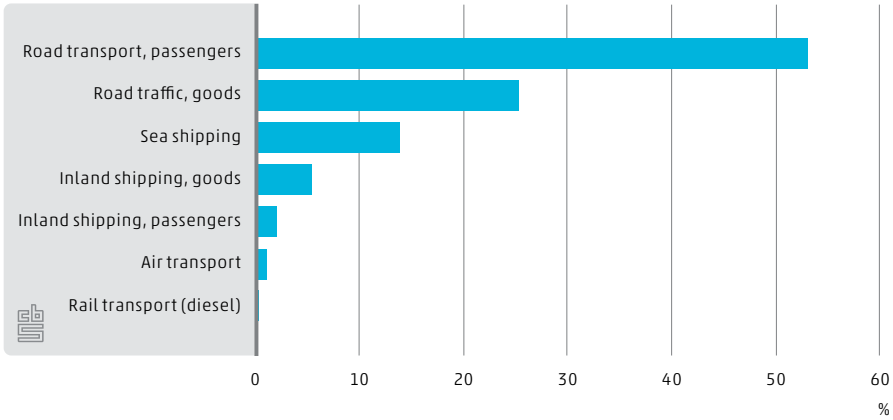


Traffic and transport
Other sources

Source: CBS, 2016a.

53% of CO_2 emissions by traffic and transport due to passenger road transport

8.4.2 CO_2 emissions by traffic, 2014

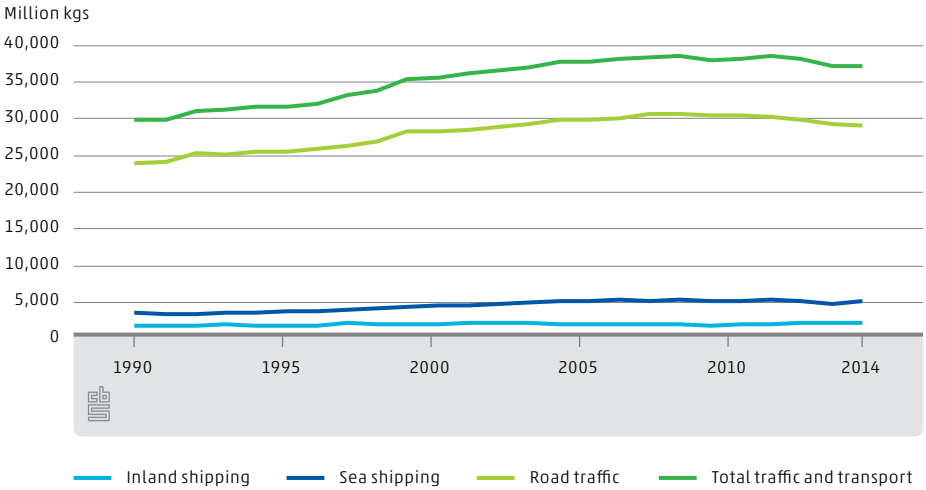


Source: CBS, 2016b.

Slightly lower CO_2 emissions by traffic and transport

The CO_2 emission of traffic and transport increased by more than a quarter in the period 1990–2004. In 2005–2011 yearly emissions remained fairly stable, but there was a slight decrease during 2011–2013. In 2014 the emissions stayed almost the same as in 2013.

8.4.3 CO_2 emissions by traffic and transport in the Netherlands

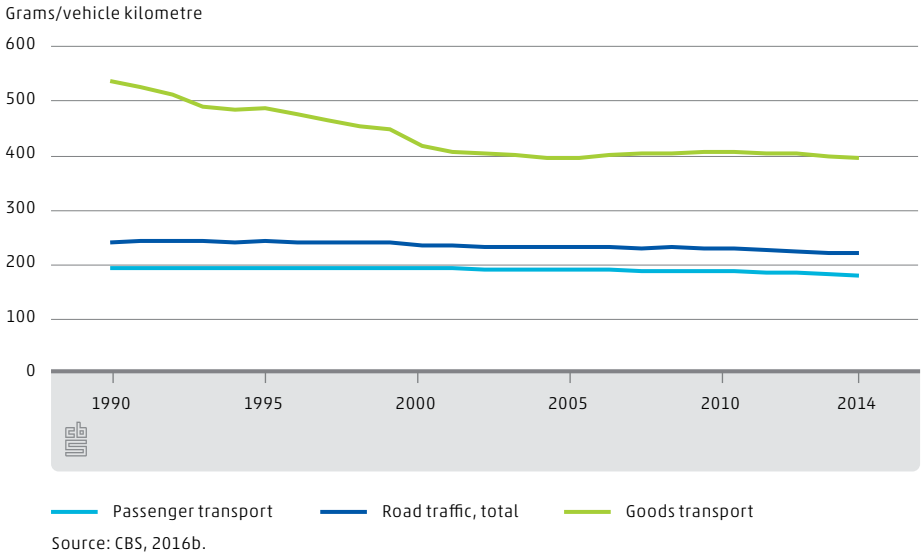


Source: CBS, 2016b.

Slight downward trend in CO_2 emission per vehicle kilometre since 2005

The CO_2 in exhaust gases originates from the combustion of carbon in motor fuels. Because of this, emissions are proportionate to fuel consumption. In the period 1990–2005 the average emission per vehicle kilometre was fairly constant. Although engines became more efficient thanks to technical improvements, this effect was counteracted by the increased weight of the vehicles. Since 2005 the fiscal policy to stimulate people to buy energy efficient vehicles has led to a decrease in the CO_2 emission per vehicle kilometre. The considerable drop in CO_2 per kilometre of goods vehicles is caused by the large increase of delivery vans in this vehicle category. Delivery vans use far less fuel than heavy duty vehicles.

8.4.4 CO_2 emissions per vehicle kilometre



Source: CBS, 2016b.

Sources

CBS (2016a). Statline: Emissions to air on Dutch territory; totals.
(figures for graphs 8.2.1, 8.3.1, and 8.4.1)

CBS (2016b). Statline: Emissions to air on Dutch territory; mobile sources.
(figures for graphs 8.2.2, 8.2.3, 8.3.2, 8.3.3, 8.4.2, and 8.4.3)

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(figures for graphs 8.2.4, 8.3.4, and 8.4.4)

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9. The economic significance of traffic and transport

490 thousand people employed in the transport sector

80 billion euros in turnover by the transport sector

37 thousand companies active in the transport sector

The transport sector has traditionally been of great economic importance as a source of employment and income. Exports and imports of goods come with a great deal of transport and logistic activity. Within the Netherlands the supply of materials and the distribution of products is vital for companies active in manufacturing, construction, trade, hotels and restaurants and services. Apart from goods transport, the transport of people is vital in keeping the country running. People need their own means of transport or public transport to arrive at their destinations, whether that is commuting, going on business trips or leisure.

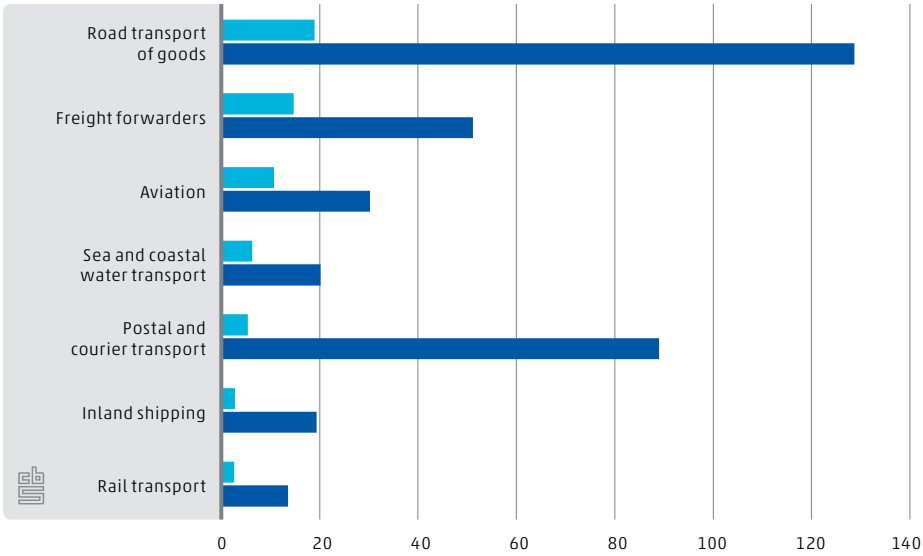
9.1 Introduction

In the Netherlands professional transporters provide transportation of people and goods. They have transport as their main activity and constitute the transport sector. There are private companies in other sectors that provide their own transport. For example, construction companies with their own fleet. There are also numerous companies which are engaged in activities related to transport, such as construction and maintenance of infrastructure, manufacturing, maintenance and repair of vehicles, and trafficking. These activities also provide a great deal of employment and economic activity.

9.2 The economic significance of the transport sector

The Dutch transport sector includes not only the professional physical transportation of people and goods, such as road transport, inland shipping, rail and air transport, but also the additional transport services. These are for example, airports, ports, storage, cargo handling, shipping and the postal and courier services. More than 37 thousand companies are active in the Dutch transport sector producing nearly 80 billion euros in sales and employing almost 490 thousand people. The Dutch transport sector represents around 4.5 percent of the gross domestic product.

9.2.1 Major transport sectors by turnover and persons employed, 2014



Source: CBS, 2016a.

4.5% of Dutch GDP
contributed by the transport sector

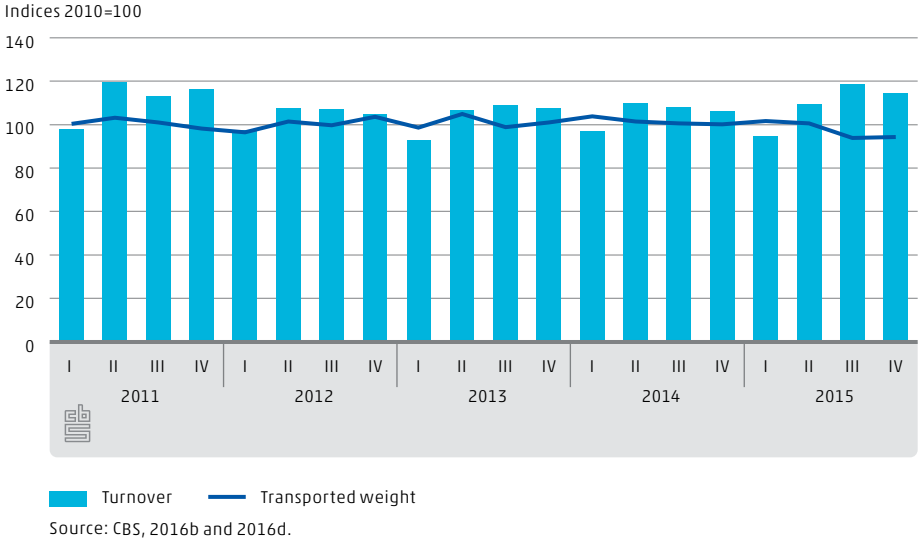
Road transport

Within the transport sector, road haulage is the largest sector in terms of persons employed, employing 130 thousand people who generate 19 billion euros in turnover. Transportation services are larger in terms of turnover, with 22 billion euros in sales and 77 thousand people in the workforce. Since 2011, the turnover in services has exceeded that of road transport, and the gap is widening.

Inland shipping

In the Netherlands, inland shipping is the most important modality after road haulage. This is partly due to the extensive waterways. The inland shippers have benefited from low water level in the rivers in the second half of 2015. Sales increased by almost 10 percent compared to the same period in 2014. Due to the low water level vessels could be less heavily loaded, so more cargo space was required and the skippers had a good negotiating position for transporting freight. They also got bonuses because of the low water levels. The downside was that less cargo could be transported. Compared to the last six months of 2014 the freight transported was down by 5.5 percent.

9.2.2 Turnover and transported weight in inland shipping



Source: CBS, 2016b and 2016d.

Removal companies

The Dutch removal companies form a small branch within the transport sector. In 2015 they generated an annual turnover of 477 million euros. The housing market collapsed during the economic downturn and so did the turnover of the removal companies. They hit rock bottom in 2013 when turnover was 27 percent lower than before the housing market collapsed. But since the economic recovery started, the housing market has picked up, which had a positive impact on the turnover of removal companies. From 2014 on, removal companies saw their turnover rise again and in 2015 the upward trend continued.

Although sales rose, the housing market in 2015 was still 2 percent below the level of 2008. This was not yet quite reflected in the turnover generated by removal companies, which was still about 20 percent below the 2008 level.

Public transport

Railway transport and aviation focus mainly on passenger transport. Railway transport derived nearly 90 percent of its total revenue from passenger transport in 2015. In aviation, this was about 87 percent. Freight transport has a small share in both markets. The railway companies employ about 13.5 thousand people generating 2.7 billion euros in turnover.

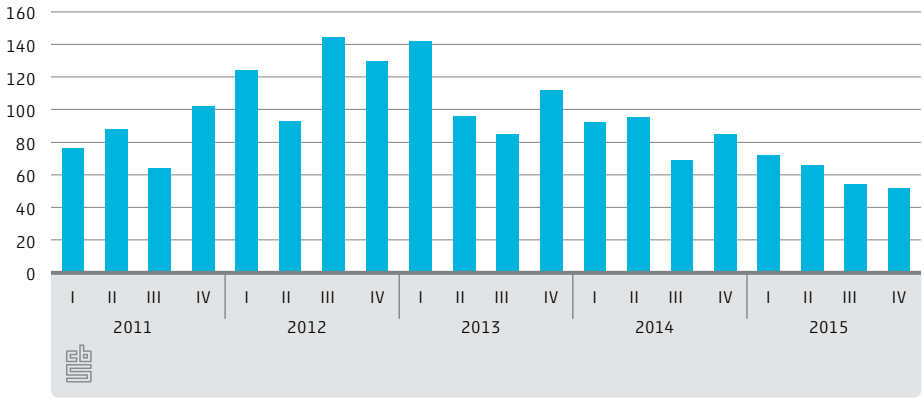
Taxi companies

Taxi companies not only focus on the street taxi services. They generate the most revenues from the contract transport, such as transporting disabled people and school children as well as medical transportation. Due to government budget cuts, the turnover of taxi companies is under pressure. Contract transport is based on tenders, awarding the contracts to the carrier with the best price/service ratio. The competition between the companies is fierce.
In the last six months of 2015 turnover increased after three years of declines.
The taxi branch employs about 43 thousand people and the turnover generated is some 1.6 billion euros.

Bankruptcies

A large number of transport companies went bankrupt in recent years, partly as a result of the economic crisis. In 2015, 244 transport companies had to close their doors, in 2012 there were 491.
In the fourth quarter of 2015, 52 bankruptcies were pronounced in the transport sector. This is a decrease of 33 percent compared to the same period of the previous year. The downward trend that began in mid-2013 continued.
In road haulage, the largest branch in the transport sector, there were 36 fewer bankruptcies in 2015 than in 2014.

9.2.3 Bankruptcies in the total transport sector



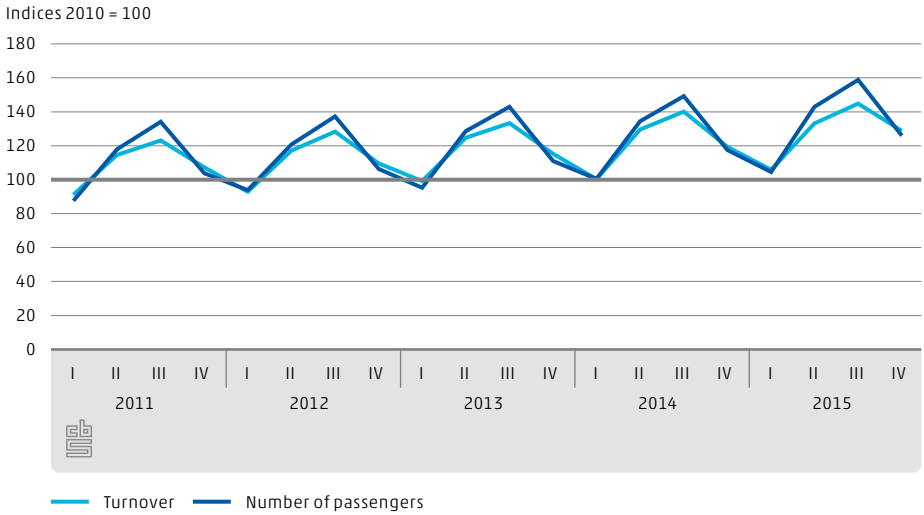
Source: CBS, 2016c.

9.3 Transport services

Airports

Dutch airports, of which Amsterdam Schiphol Airport is the largest, are important hubs in international passenger transport. In 2015 more than 65 million passengers travelled via the Dutch airports, 6 percent more than a year earlier. The growth in the number of passengers led to a turnover increase of nearly 4 percent.
Cargo handling plays a smaller role at the airports. Cargo weight decreased by 2 percent in 2015 to some 1.7 million tonnes.
Each third quarter sees relatively much activity at the airports. This is the holiday season, when many people travel to and from holiday destinations. Therefore the revenue is at its peak. Other sectors also benefit from travelling air passengers, such as railways and bus companies and of course the catering and retail companies at the airport.

9.3.1 Airports, turnover and transport of passengers



Source: CBS, 2016b en 2016e.

Sea ports

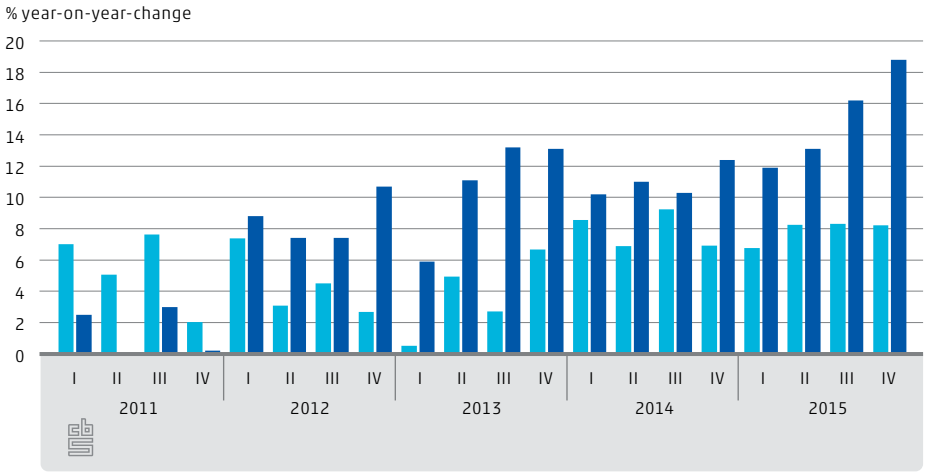
The Dutch sea ports, of which Rotterdam is the largest, are of great importance for the Dutch economy. Within Europe, Dutch sea ports handled the most freight. About half of the total freight imported or exported is handled in the seaports. Ports fall under 'Warehousing and support activities for transport' which besides warehousing includes support activities such as operating transport infrastructure (for example airports, harbours, tunnels, bridges, etc.), salvage and diving companies, sluices and pilot services, transport agencies and cargo handling. A total of about 5.5 thousand employees generate almost 1.5 billion euros in turnover.
The Dutch ports are visited by ships from all over the world and this also generates jobs in services and support: pilotage and towage, cargo handling, customs, maintenance and repairs, bunkering fuel, storage companies, and so on.

Couriers and online retail stores

The turnover of the courier companies has grown significantly in recent years. Mainly because consumers increasingly shop online. Couriers receive more orders because these purchases must be delivered. The past five years their turnover

has increased to more than 3 billion euros. Couriers employ almost 36 thousand people. The turnover of online shops has also soared in recent years.

9.3.2 Turnover webshops and couriers



Source: CBS, 2016b and 2016f.

Logistics services

The logistics services are very important in the transport sector. The physical transport of goods and passengers is what appeals most to the imagination: lorries, buses, ships and aircraft are very common in our daily life. There are service providers needed in order to make these kinds of transport possible. Freight forwarders ensure that goods are transported from A to B, and that the customers can choose from various modalities. Storage companies offer different types of storage, such as conditioned storage (refrigerated), tanks (liquids), warehouses and outside storage for bulk goods such as sand, gravel and ores. Cargo handling companies ensure that ships, trains and lorries are unloaded and loaded.
The Netherlands also has multimodal transhipment hubs, which are used to shift goods – often containers – to another modality.

Freight forwarders

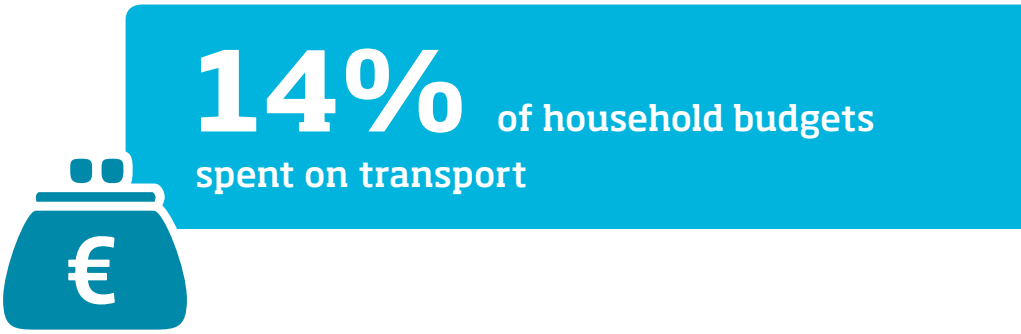
Freight forwarders form the link between the shippers (who send the goods) and transporters (for example a shipping company). Freight forwarders undertake activities to maintain the smooth flow of goods such as customs clearance, permits, payments, invoicing etcetera. The importance of these companies is also reflected in the level of turnover and employment. With 15 billion euros they have the second largest turnover in the transport sector, and they employ around 51 thousand people.

Other companies

The transport sector also includes companies that provide other activities, such as pilotage and diving and salvage companies and companies that accompany extra-long, extra wide or extra heavy transports. It also includes parking facility operators and storage companies for cars, caravans and vans. Furthermore air and railway traffic control (allocation, safety) are part of the transport sector.

9.4 Consumer expenditure on transport

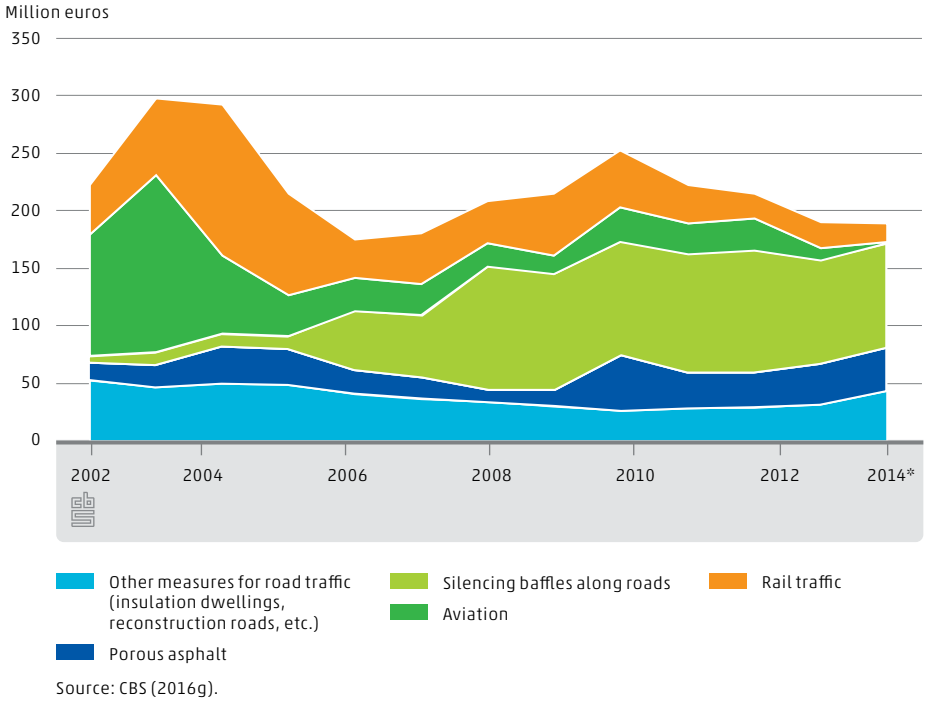
Households spend 14 percent of their budget on transport. This amounts to 40 billion euros, out of a total consumption of 284 billion euros. More than half of the 40 million euros goes to privately owned vehicles including fuel, insurance and tax. Over 6 billion euros a year is spent on new vehicles and over 5 billion euros on transport services provided by third parties, such as public transport by bus, tram, metro, train and flights.



9.5 Public expenditure on the reduction of noise nuisance

Road traffic, rail traffic and aviation are the major sources of noise nuisance in the Netherlands. The government contributes to the abatement of noise nuisance not only by legislation and regulations but also financially by subsidising measures at the source of the noise, in the transfer of noise (silencing baffles, noise barriers and porous asphalt) and at the receiving end of noise (insulating dwellings).
In 2014 total public expenditure for the reduction of noise nuisance by traffic amounted to about 180 million euros; 95 percent of this was spent on road traffic. The expenditure on the abatement of noise by traffic rose significantly in the last decade. More silencing baffles were built, especially near road broadenings and new road constructions. Between 2000 and 2005 the costs of construction and maintenance of silencing baffles soared. In 2014 half of the total public expenditures for the abatement of noise nuisance was spent on placing and maintaining the baffles.
About a quarter of the expenditure went to measures at the receiver end of noise (e.g. insulation of dwellings), 21 percent went to the construction and maintenance of porous asphalt (double layered) and about 5 percent to the reduction of noise by rail traffic and aviation.

9.5.1 Public expenditures for reduction of noise nuisance by traffic



Source: CBS (2016g).

The public expenditure for the abatement of noise nuisance by rail traffic and aviation fluctuates from year to year due to large infrastructural projects. For instance, in the period 2003–2005 the expenditure was high because of the construction of the Betuwe line and the high speed railway, and in the period up to 2005 because of insulating dwellings near Schiphol airport.

Sources

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(figures for 9.2.1, 9.2.2, 9.3.1 and 9.3.2)

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(figures for 9.2.3)

CBS (2016d). StatLine: Vervoerd gewicht binnenvaart
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(figures for 9.2.2)

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http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=37478HVV&D1=11&D2=0&D3=260,264,268,272,277,281,285,289&VW=T
(figures for 9.3.1)

CBS (2016f). StatLine: Kwartaalomzetten webwinkels
http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=81804NED&D1=3&D2=29&D3=156,160,164,168,173,177,181,185&VW=T
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(figures for 9.5.1)

10. Emissions of nitrogen oxides by diesel cars

Authors
John Klein (CBS)
Gerben Geilenkirchen (PBL)

5 times more NO_x emitted by diesel than by petrol cars

4 times more NO_x emitted by Euro-6 diesel cars than the type test limit

20,000,000 kg lower NO_x emissions in 2014 if diesels had complied with EU standards

If diesel cars and vans had complied with European type test standards under actual road conditions, the 2014 emissions of nitrogen oxides (NO_x) in the Netherlands would have been about 20 million kilograms less. The total road traffic emissions in 2014 amounted to over 80 million kilograms. Diesel cars tested to the most recent standard (EURO-6) emit on average 4 times as much nitrogen oxides in practice than according to the type test limit achieved under laboratory conditions.
Remarkably, heavy duty vehicles that have to comply to the most recent EU standard (EURO-VI) do stay below the limits and often emit less than delivery vans.
All diesel vehicles actually comply with the type test standards for particulates due to the use of particle filters.

10.1 Introduction

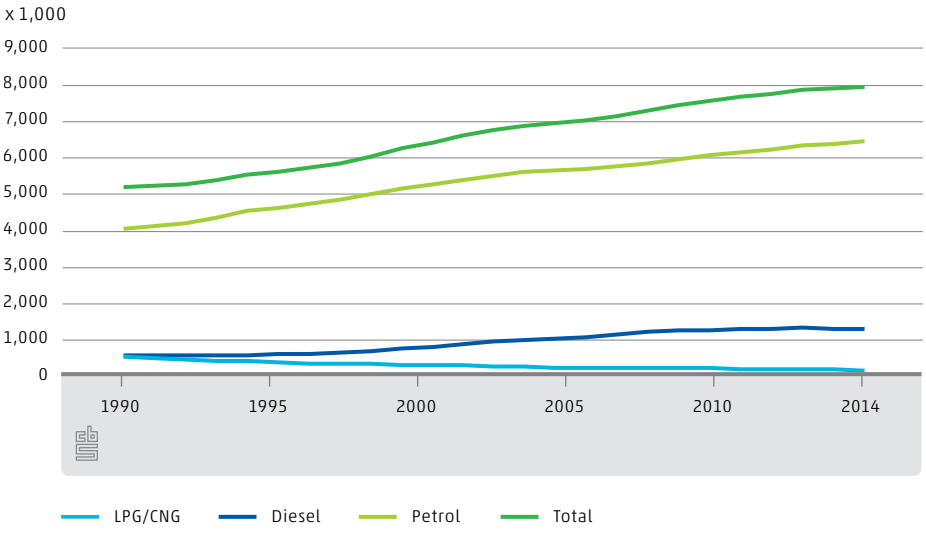
There has been much to do about the emissions of air pollutants by diesel cars. In September 2015 it was uncovered that Volkswagen had used illegal software in order to meet the American requirements for the emission of nitrogen oxides (Dieselgate). It later turned out that Volkswagens in Europe had also been fitted with this software.

This chapter deals with trends in diesel car emissions of nitrogen oxides (NO_x) and particulates (PM_{10}). We consider their share in total domestic emissions, the trends in 1990–2014 and the expectations up to 2030. The emissions of NO_x and PM_{10} by road traffic play a prominent role in air quality problems in Dutch cities.
The emission figures have been calculated on the basis of CBS fleet and traffic data and emission factors resulting from actual driving tests performed by the Netherlands Organization for Applied Scientific Research TNO. The emissions up to 2030 are based on prognostications from the Dutch National Energy Enquiries 2015 by the Netherlands Environmental Assessment Agency PBL (Geilenkirchen, G.P., et al., 2016).

10.2 Car numbers and car use way up since 1990

Dutch car numbers have soared in recent decades. In 1990 there were about 5 million cars in the Netherlands; in 2014 this had increased to 8 million. The share of diesel powered cars has risen from 11 percent in 1990 to 17 percent in 2014. The total number of kilometres driven yearly has increased from 81 to 103 billion. Diesel cars covered 31 percent of the kilometres driven in 2014, which is considerably higher than their share in total car numbers. The purchase of a diesel car is most attractive when people drive a great deal.

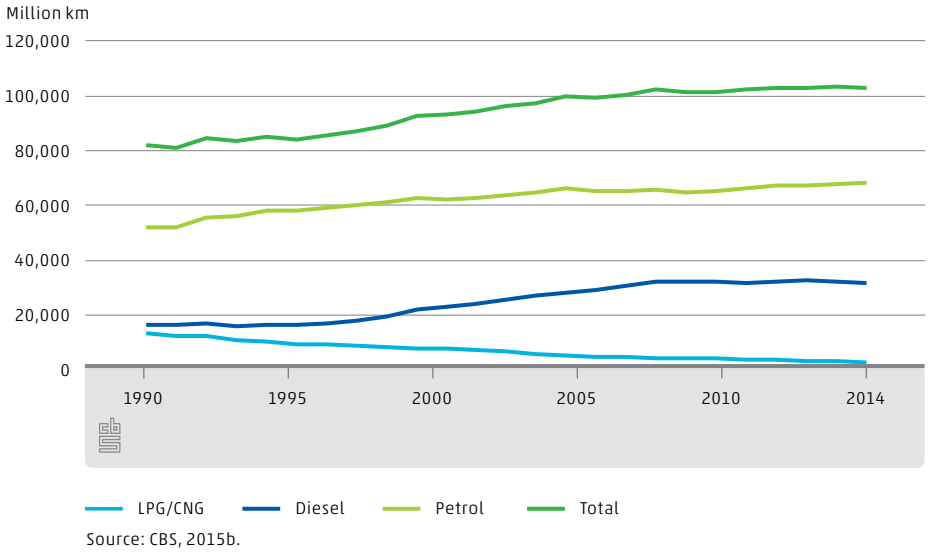
10.2.1 Cars in the Netherlands[1)]



Source: CBS, 2015a.

[1)] Concerns the average number of cars in a year.

10.2.2 Traffic performance of cars within the Netherlands

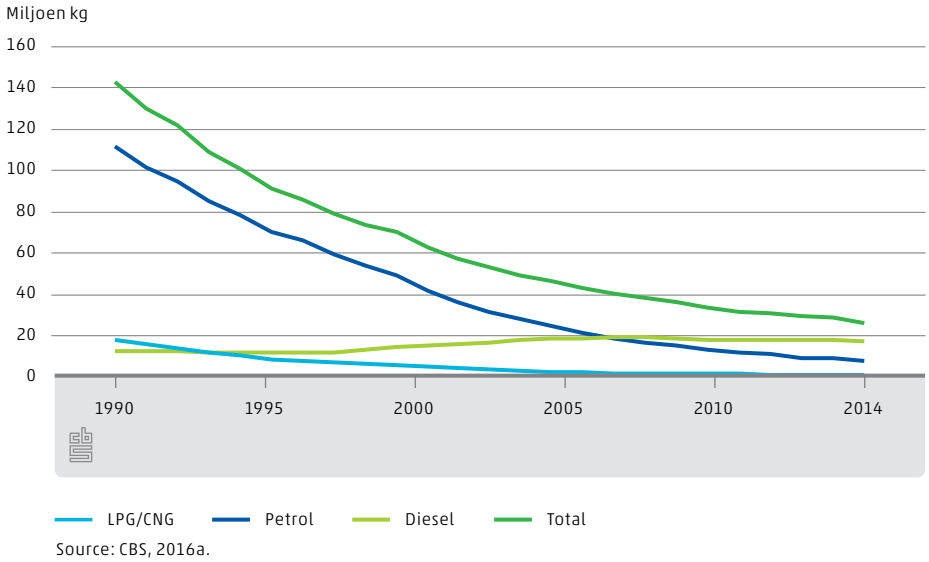


Source: CBS, 2015b.

10.3 Decrease in nitrogen oxide emissions by cars, except diesels

The NO_x emissions by cars in the Netherlands has nosedived from 143 million kilograms in 1990 to 27 million kilograms in 2014. This decrease mainly occurred with petrol cars. Due to the obligatory application of three-way catalytic converters, NO_x emissions of new petrol cars have been very low since the early nineties. As the share of cars equipped with a three-way catalytic converter increased, NO_x emissions decreased. The average NO_x emission per driven kilometre of the total number of Dutch petrol cars has decreased by 95 percent between 1990 and 2014. In spite of the large increase in car use, NO_x emissions by petrol cars decreased from 112 million kilograms in 1990 to just 8 million kilograms in 2014.

10.3.1 NO_x emissions by cars

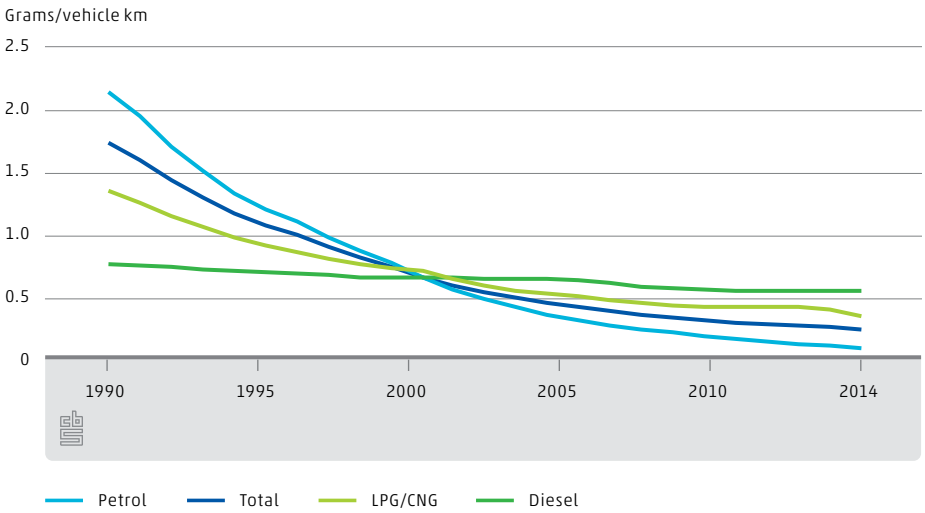


Source: CBS, 2016a.

In contrast, NO_x emissions by diesel cars were 38 percent higher in 2014 than in 1990. NO_x emissions amounted to 13 million kilograms In 1990 but came to 18 million kilograms in 2014. Although diesel cars have become slightly cleaner – NO_x emissions per kilometre driven fell by 28 percent between 1990 and 2014 – this has been amply compensated by the more than 92 percent increase in diesel car use. NO_x emissions of petrol cars are now substantially lower than those of diesel cars, even though petrol cars cover twice the total annual kilometres.

67% of the NO_x emissions by cars in 2014 from diesel cars

10.3.2 NO_x emissions by cars per vehicle kilometre

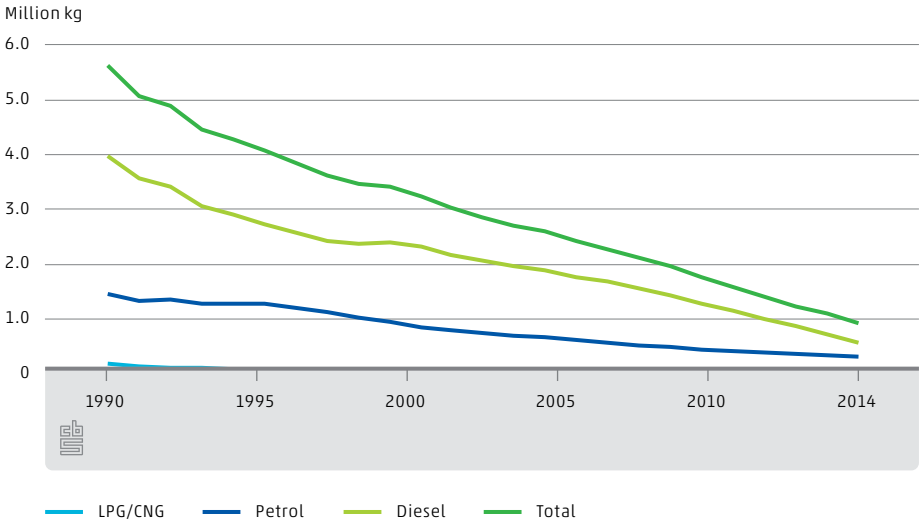


Source: CBS, 2016a.

10.4 Fast decrease in particulate emissions of diesel cars

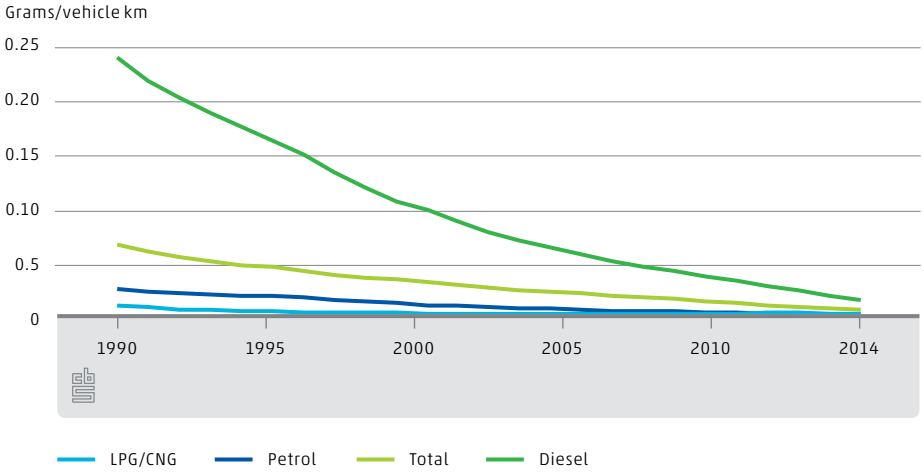
The exhaust emissions of particulates (PM_{10}) by diesel cars have decreased by 85 percent during 1990–2014. As diesel exhaust gas is the main source of road traffic particulates, the total emissions by cars have decreased by about 85 percent too. The cause of this huge drop is the application of particulate filters, leading to a 92 percent decrease in the average emission per vehicle kilometre of diesel cars. This development has also taken place with heavy duty vehicles.

10.4.1 Exhaust emission of particulates by cars



Source: CBS, 2016a.

10.4.2 Exhaust emission of particulates by cars per vehicle kilometre

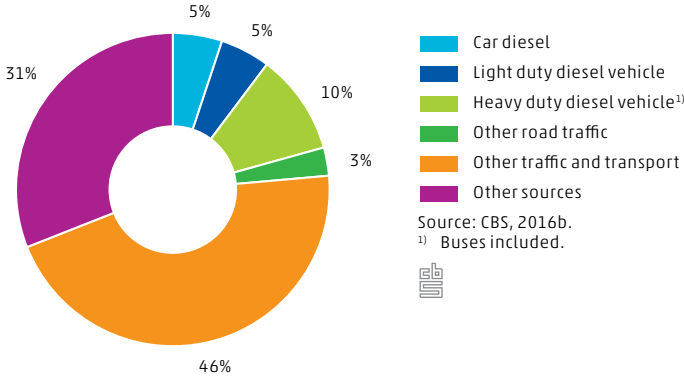


Source: CBS, 2016a.

10.5 Share of diesel cars in 2014 emissions

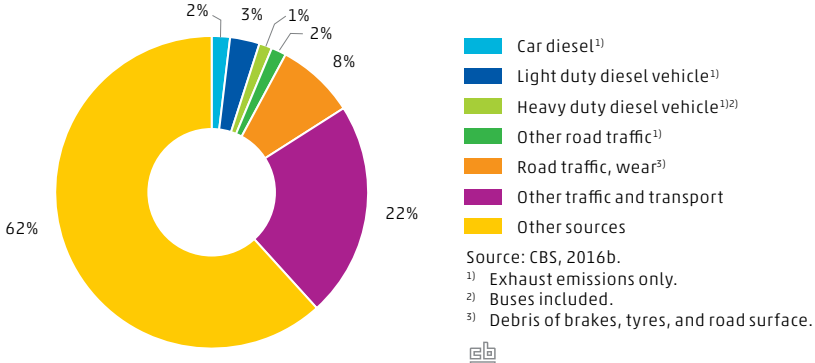
Exhaust gases of cars only account for a fraction of the total emissions of NO_x (8 percent) and PM_{10} (3 percent) on Dutch territory. Nevertheless the impact on air quality is substantial, because these emissions largely take place at the ground level and in urban areas. It is worth mentioning that diesel cars over 25 years old account for about 15 percent of the particulate emissions by diesels, whereas they only have a 1 percent share in the number of vehicle kilometres. This relatively high contribution was one of the reasons for the government to lift the exemption from road tax for cars of 25 years and older.

10.5.1 NO_x emissions within the Dutch territory, 2014



Source: CBS, 2016b.
1) Buses included.

10.5.2 Particulate emissions within the Dutch territory, 2014



Source: CBS, 2016b.
1) Exhaust emissions only.
2) Buses included.
3) Debris of brakes, tyres, and road surface.

10.6 The European standards for the emission of air polluting substances

To reduce air pollution by road traffic, European type test standards have been set up in the early seventies for the maximum emissions of several air polluting substances. New vehicles have to comply with these standard before being admitted to the European market. These standards were adopted by the member states and have become more stringent through the years. The European standards from the early nineties onwards are called EURO standards. Table 10.6.1 shows a summary of the NO_x standards for diesel cars from 2000 onwards (EURO-3 and higher).

10.6.1 EU directives for type testing of air pollution by diesel cars [1)]

	EU directive	Commencing date		Limiting value for
	number	new types	existing types	nitrogen oxides
				grams/vehicle kilometre
Eurostandard				
EURO-3	98/69/EG	1-1-2000	1-1-2001	0.50
EURO-4	98/69/EG	1-1-2005	1-1-2006	0.25
EURO-5	1999/96/EEG	1-9-2009	1-1-2011	0.18
EURO-6	715/2007	1-9-2014	1-9-2015	0.08

Source: EU-Lex.

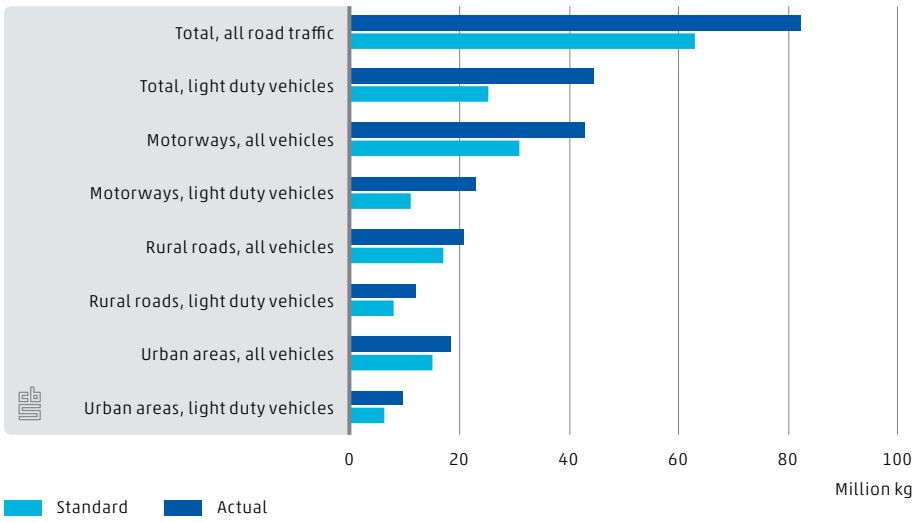
[1)] See: http://eur-lex.europa.eu/nl/index.htm.

The CBS emission figures have been calculated on the basis of on-the-road emissions measured by TNO. For this purpose miscellaneous trips, typical for the average situation on Dutch roads, have been carried out in cars equipped with mobile measurement apparatus. The limiting values according to the EURO standards are based on tests on a laboratory stand on which vehicles perform a standardised test cycle.

10.7 Type approval and NO_x emissions in on-the-road driving conditions

It was found that cars and vans, and in the past also lorries, equipped with a diesel engine generally emit far more NO_x on the road than was expected on the basis of the laboratory tests. It became obvious that the results of the type approval tests misrepresented the actual emissions. Currently the "New European Driving Cycle" (NEDC) is applied for the type approval of cars and vans. It turns out to be possible for vehicles to meet the standards during the test, while the NO_x emission levels in actual driving conditions are well over the limiting values of these standards.
The total emission of nitrogen oxides by road traffic in 2014 would have been about 63 million kg if all cars and vans had actually complied with the current type approval standards on the road. The NO_x emission based on TNO emission factors for real driving conditions amounted to 82 million kg.

10.7.1 NO_x emissions by road traffic, 2014



Source: CBS.

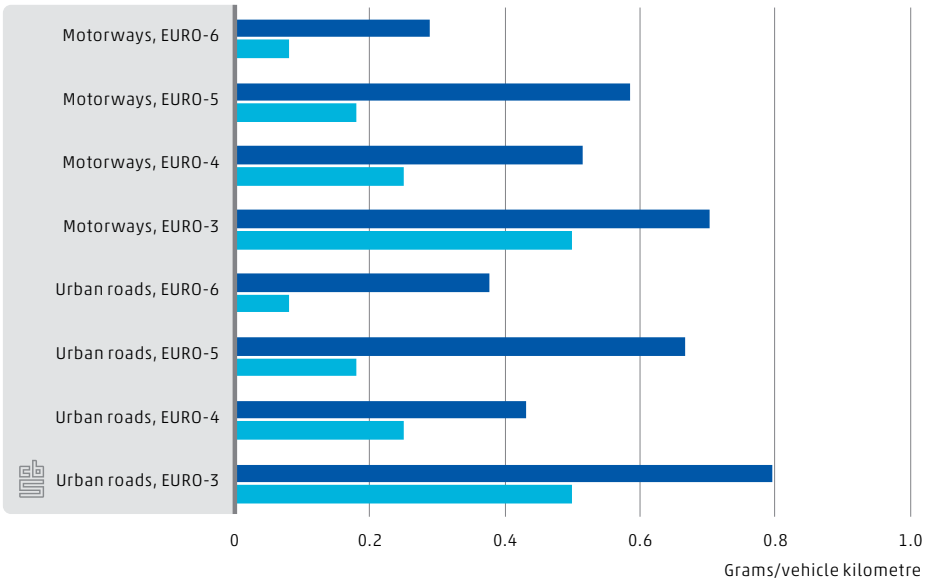
According to EU plans, NEDC will be replaced by a new worldwide standard in 2017: the Worldwide Harmonized Light Duty Vehicles Test Procedure (WLTP). The WLTP test is also run under laboratory conditions, but it is based on stringent test procedures which are expected to provide a better insight, particularly in fuel use and CO_2 emissions in practice (See Marotta et al., 2015). This new test

procedure probably won't lead to lower real driving emissions. Experience shows that test results are more influenced by cold start and laboratory temperatures than by the cycle itself. There is the possibility that, just like with the NEDC, the emission control of a car has been optimized for the narrow range of WKTP cycle (see Velders et al., 2013).

Further emission reductions are possible as a result of RDE legislation (RDE=Real Driving Emission). This will offer competent authorities the possibility to implement road emission tests, which could lead to lower emissions under all possible driving conditions.
The RDE requirements (for new vehicles) will be introduced in two stages. The first stage should come into force on September 2017 for new car models and on September 2019 for existing models. During this first phase, a conformity factor of 2.1 (110 percent) is allowed for exceeding the NO_x emission limit (80 mg/km) during the real driving tests. The purpose is to enable car manufacturers to adapt to the RDE standards gradually. This first conformity factor will be phased out in 2021 at the latest.
In a second phase, coming into force in January 2020 for new models and in January 2021 for existing models, it will still be possible to apply a conformity factor. This factor will be 1 at the most, including an uncertainty margin of 0.5. This means that the limiting value may be exceeded by a maximum of 50 percent in real driving conditions.

Figure 10.7.2 compares the NO_x limiting values from EURO-3 onwards with the real driving factors which are currently applied by CBS in the calculations of the Dutch emissions. TNO determined the real driving factors by means of the VERSIT+ emission model (see Klein et al., 2016). Until Euro-2 the average urban real driving NO_x emission exceeded the limit, whereas the motorway emission was below the limit. From EURO-3 onwards cars exceed both limits (see figure 10.7.2). Furthermore it is remarkable that EURO-5 values are above EURO-4 values; for motorways they even exceed the EURO-1 values.

10.7.2 NO_x emission limiting values and actual emission factors, diesel cars



Source: EU, TNO.

10.8 Disappointing NO_x emissions lead to poorer air quality

In order to improve air quality in the EU, there have been limits set within the European framework for maximum concentrations of various air polluting substances in ambient air, among which for nitrogen dioxide (NO_2) and for particulates (PM_{10}). The limits for PM_{10} and NO_2 came into effect in 2005 and 2010 respectively. The Netherlands was granted a postponement by the EU: until June 2011 to comply with the PM_{10} standards and until January 2015 for NO_2. To improve air quality in the Netherlands and to comply with the limiting values for NO_2 and PM_{10} on time, the National Cooperation Program for Air Quality (NSL) was set up in 2009. Here the national and local governments cooperate to improve air quality.

The NSL monitoring of 2015 (Zanten van, M.C. et al., 2015) shows that in 2014 the limit for NO_2 was exceeded at 298 locations along major roads. The limit for PM_{10} was exceeded at 66 locations in 2014. In spite of an expected drop in air pollution levels, the limits for both substances are expected to be exceeded at several points in 2020. An inquiry by the National Institute for Public Health and the Environment (RIVM), the Netherlands Environmental Assessment Agency (PBL) and TNO shows that if the NO_x emissions by cars and heavy duty vehicles had declined as intended by the EURO standards, NO_2 limits would hardly have been exceeded in 2015. The Dutch environmental activist group Milieudefensie has recently released a report on the results of their 2015 air quality measurement campaign in Dutch cities. This report also shows how the NO_2 limit was exceeded (Milieudefensie, 2016).

10.9 Fewer diesel cars due to Dutch fuel mix policy

The number of diesel cars in the Netherlands has more than doubled since 1990. In 2014, 17 percent of all cars were diesels. The share of new diesels in total Dutch car sales hovered around 25 percent in last five years. However, in many other European countries the share of diesels has increased considerably faster. In Germany almost 50 percent of all new cars are diesels, and in Belgium and France their market share even exceeds 60 percent. In contrast with these countries relatively many 'clean' petrol cars have been sold in the Netherlands.

The relatively low share of diesel cars in the Netherlands is caused by an intentional policy to reduce the sales of diesel cars. The Netherlands has long had a fuel mix policy for cars, which focuses on promoting the influx of cars with low emissions of NO_x and PM_{10}. As a compensation for the relatively low fuel tax on diesel fuel, a diesel car surcharge applies for purchase tax (bpm) and road tax (mrb). This makes buying diesel cars only attractive for people who drive a lot. Diesel cars are mostly sold to the business market. After several years many of these cars end up on the second-hand market and are bought by private individuals. Now, due to changes in the purchase tax regulations a growing number of relatively new diesel cars is exported. This is why diesel cars account for about 17 percent of the total number of cars, in spite of their 25 percent share

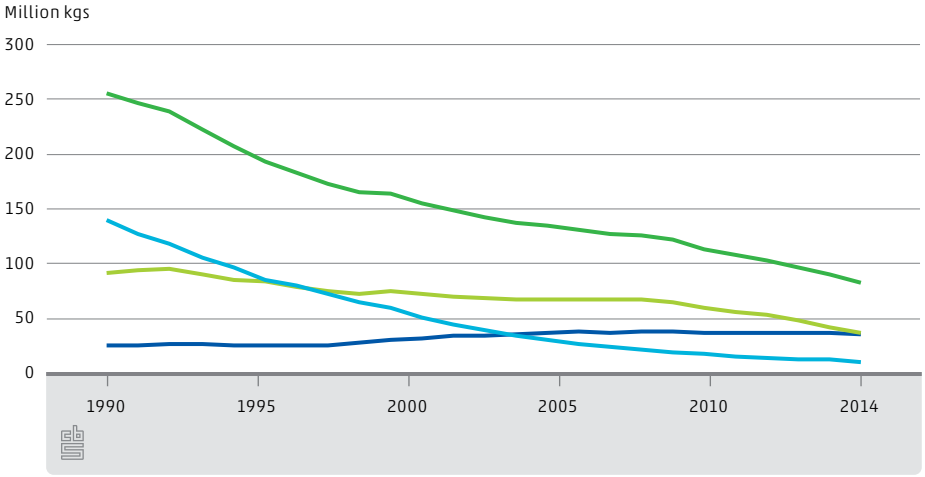
in new cars sales. Because diesel cars are used far more intensively, they account for approximately 31 percent of the total number of kilometres covered by cars on Dutch roads. In any case, without this fuel mix policy the NO_x emission of road traffic, and with this the NO_2 concentration levels along roads, would have been higher.

60% less NO_x by diesel cars from 2014 to 2030

10.10 Heavy duty vehicles are clean in real driving conditions

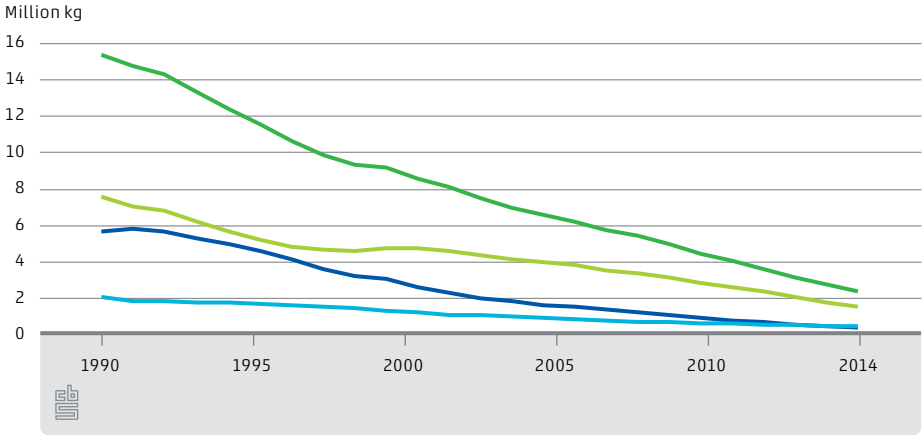
Besides EURO standards for light duty vehicles, the EU has also set standards for engines used in heavy duty vehicles like lorries, road tractors and buses. The decrease of NO_x emissions in this category has also lagged behind the type approval standards for years. However, RDE regulations have been introduced for this vehicle category, resulting in very low NO_x emissions by the latest generation of EURO-VI lorries and road tractors, not only on paper but also in practice. This became clear from the measurements by TNO and other research centres (see Kadijk et al., 2015). The NO_x emissions by lorries and road tractors are decreasing rapidly. Figure 10.10.1 shows that the NO_x emissions of heavy duty diesel vehicles have fallen by 46 percent between 2005 and 2014, whereas they only fell by 4 percent for diesel powered cars and vans.
As mentioned before in this chapter, all cars and also heavy duty vehicles comply with the limiting values for PM_{10}. During 2005–2014 the exhaust emissions of road traffic have decreased by over 60 percent. In comparison with 1990 the decrease even amounts to about 85 percent (see figure 10.10.2).

10.10.1 NO_x emissions by road traffic



Source: CBS, 2016a.
1) Cars and vans.
2) Buses included.

10.10.2 Exhaust emissions of particulates by road traffic

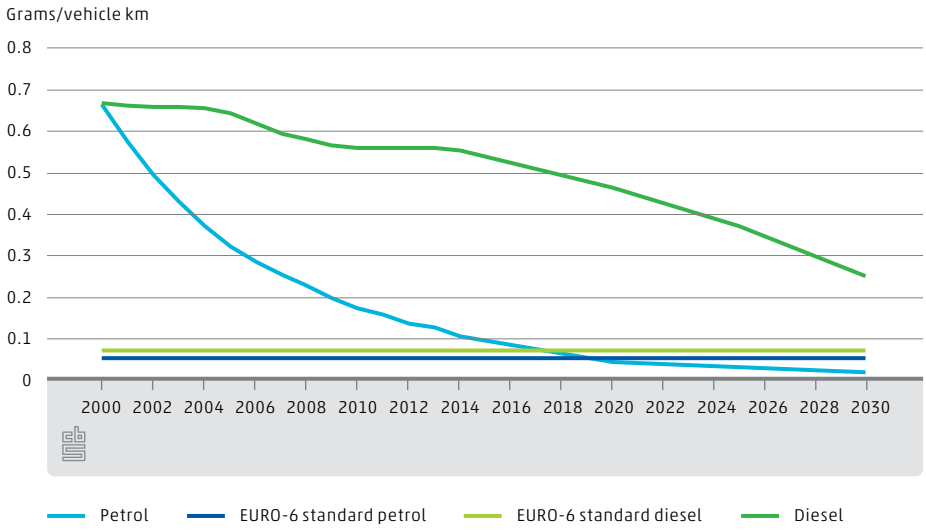


Source: CBS, 2016a.
1) Buses included.
2) Cars and vans.

10.11 Expectations for the future

The introduction of RDE regulations for cars and vans will lead to a rapid drop in the actual NO_x emissions of new diesel cars in the next few years. The average NO_x emission per vehicle kilometre of the Dutch diesel cars is expected to decrease from 560 milligrams per kilometre (mgs/km) in 2014 to 260 mgs/km in 2030, according to projections by PBL and TNO. The total NO_x emission by diesel cars will drop from 18 million kilograms in 2014 to 16 million kilograms in 2020 and 7 million kilograms in 2030. The total NO_x emission of car traffic within the Netherlands in 2030 is expected to amount to only 10 million kilograms so it will be over 93 percent lower than in 1990, when the EURO standards were introduced (Geilenkirchen, G.P., et al., 2016).

10.11.1 NO_x emissions per vehicle kilometre by cars, 2000-2030

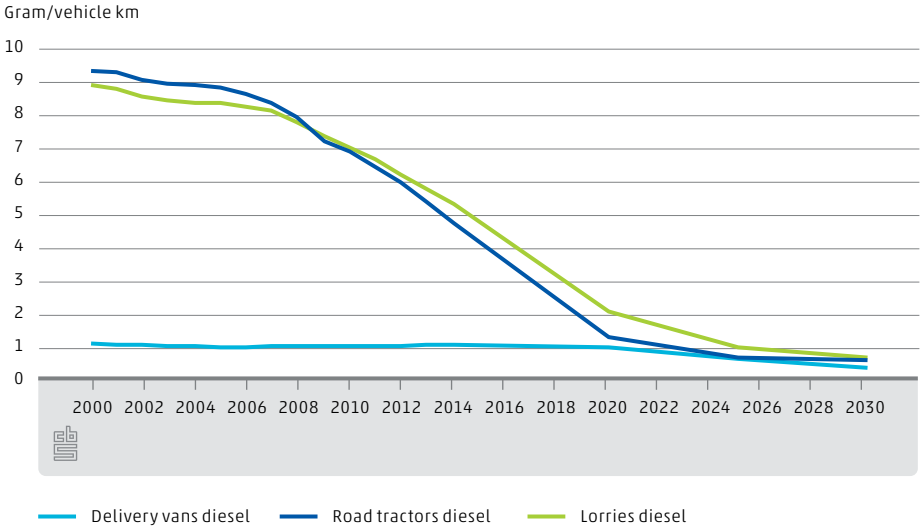


Sources: 2000–2014: CBS/Pollutant Release and Transfer Register, 2015–2030: PBL.

RDE regulations already apply for lorries, road tractors and buses. As shown by TNO measurements (Kadijk, G., et al., 2015), this has resulted in very low NO_x emissions per kilometre by modern EURO-VI trucks, also under real driving conditions. Because lorries and road tractors are replaced by new ones relatively fast, there will be a rapid decrease in the average NO_x emissions by these vehicle categories as more EURO-VI trucks come on Dutch roads. In 2020 the average road tractor

is expected to emit more or less the same amount of NO_x as an average delivery van (see figure 10.11.2), despite its much higher weight. After 2020 the average NO_x emission of delivery vans will also drop as a result of RDE regulations.

10.11.2 NO_x emissions per vehicle kilometre by road transport vehicles, 2000–2030

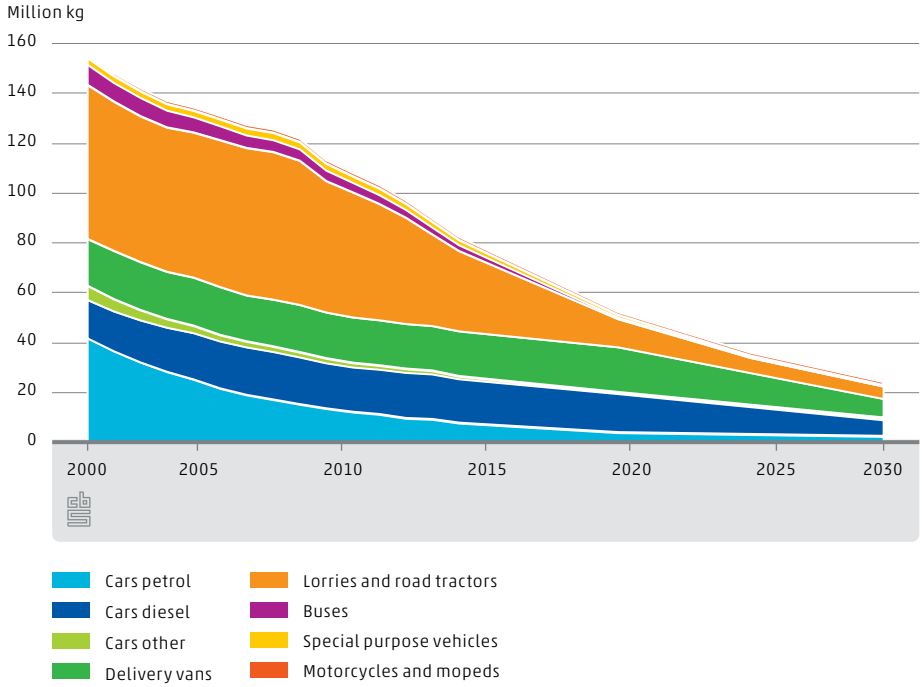


Sources: 2000–2014: CBS/Pollutant Release and Transfer Register, 2015–2030: PBL.

In 2030 the total road traffic NO_x emission in the Netherlands is expected to be around 24 million kilograms, down 90 percent on 1990.

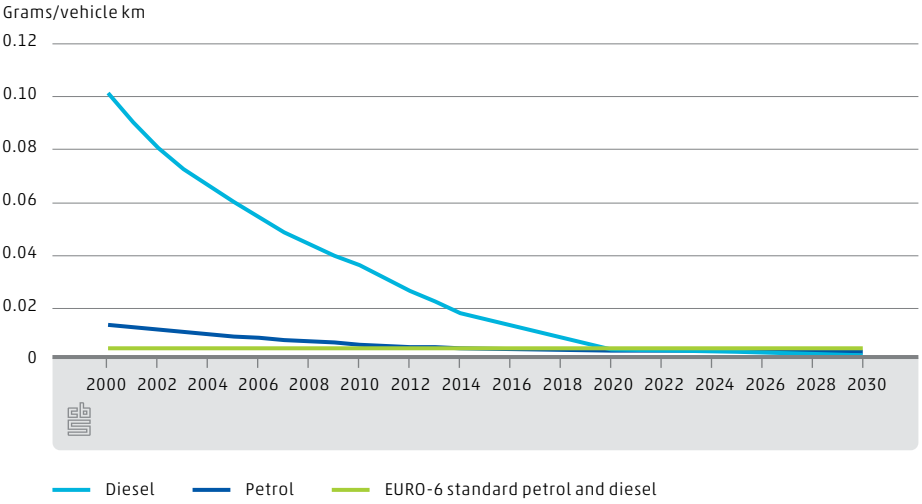
The PM_{10} exhaust emissions of diesel car traffic has been dropping very rapidly for quite a few years and will continue to do so until 2020. By then most diesel cars will be equipped with particle filters, resulting in very low PM_{10} exhaust emissions. In 2020 the total PM_{10} exhaust emission by car traffic will amount to around 0.5 million kilograms, which is 90 percent below the 1990 figure.

10.11.3 NO_x emissions by road traffic within the Netherlands, 2000–2030



Sources: 2000–2014: CBS/Pollutant Release and Transfer Register, 2015–2030: PBL.

10.11.4 Exhaust emission of particulates per vehicle kilometre by cars, 2000–2030



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11.

Holiday traffic

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15,500,000 holidays
by car in the Netherlands in 2014
6,900,000 holiday flights
abroad in 2014
900,000 holidays
by train within the Netherlands in 2014

Cars are the favourite means of holiday transport. Cars are the number one preference when Dutch people go on holiday within the country or abroad. However, people prefer to fly when they go on long-distance trips. Holidays with flights have increased by one third. Coaches and trains are also common means of transport for holiday destinations: coaches especially for holidays abroad and trains for domestic trips.

11.1 Introduction

In 2014, 12.5 million Dutch people went on holiday. And 70 percent went more than once. In total there were 35.1 million holidays. More than half, almost 17.2 million, had a domestic destination. The Netherlands was more popular for short holidays (three nights or less) than for longer holidays. Some 80 percent of the 17.9 million holidays abroad were long holidays.
In this chapter we zoom in on holiday traffic. Which means of transport do people prefer to use? Does it matter whether people stay close or travel far, if the stay is long or short? And how busy is the traffic in the holiday periods?

11.2 Dutch people on holiday

Most domestic trips by car

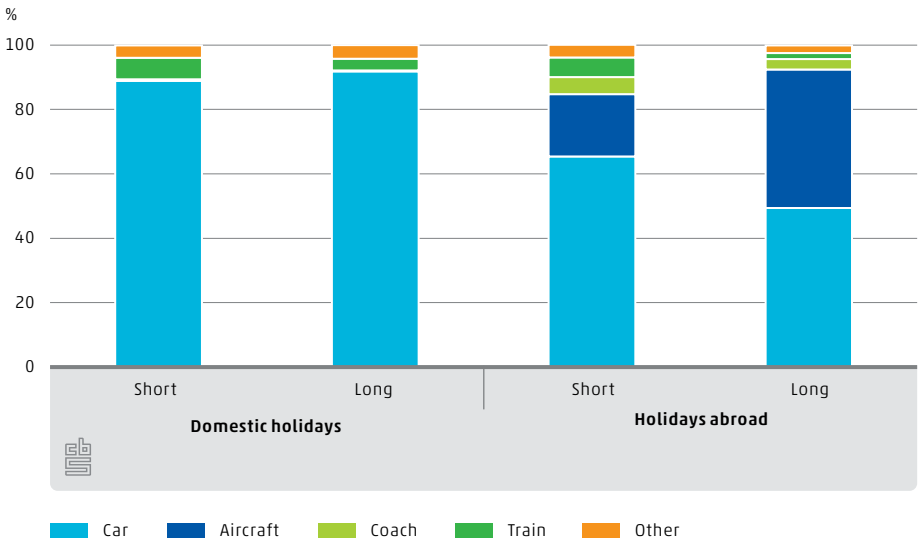
Cars are used in 9 out of 10 cases, for short as well as for longer holidays in the Netherlands. The train is the second preferred option for domestic trips. It is used more for short holidays than for longer ones. The water sports regions and the North Sea beach resorts are the most popular destinations.

49% of long holidays abroad by car in 2014

Holidays abroad often include air travel

For holidays abroad the car is favourite as well, with 53 percent of the total. For short holidays abroad the car is used more often (65 percent) than for long holidays (49 percent). Flights are the second preferred choice, followed by coach and train. People often fly when they go on long holidays abroad. Trains are favourite for shorter holidays, more so than coaches, but for longer holidays this is the other way around. Favourite destinations for short holidays abroad are neighbouring Belgium and Germany, for long holidays the favourites are Germany, France and Spain.

11.2.1 Holidays by destination and means of transport, 2014



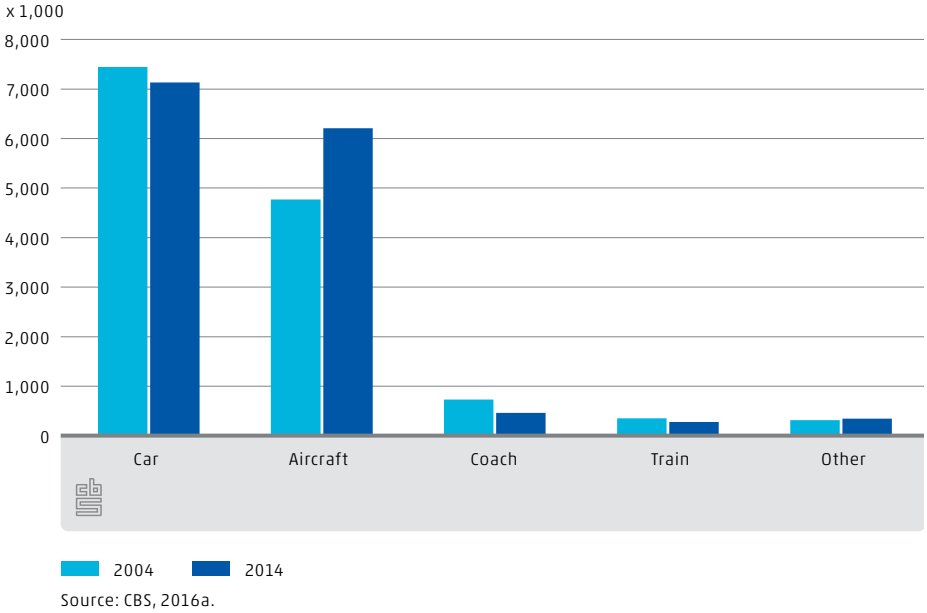
Source: CBS, 2016a.

11.3 Holiday traffic by road, rail and air

Importance of cars for long holidays abroad decreased

During the last decade the share of car holidays in the Netherlands has remained stable. However, for long holidays abroad cars lost ground to flights. Since 2004 the share of car holidays has decreased by 5 percent points to 49 percent, the share of holidays with flights increased by 8 percent points to 43 percent.
There were 7.1 million long holidays abroad in which people drove in 2014, 4 percent less than in 2004.

11.3.1 Long holidays abroad by means of transport



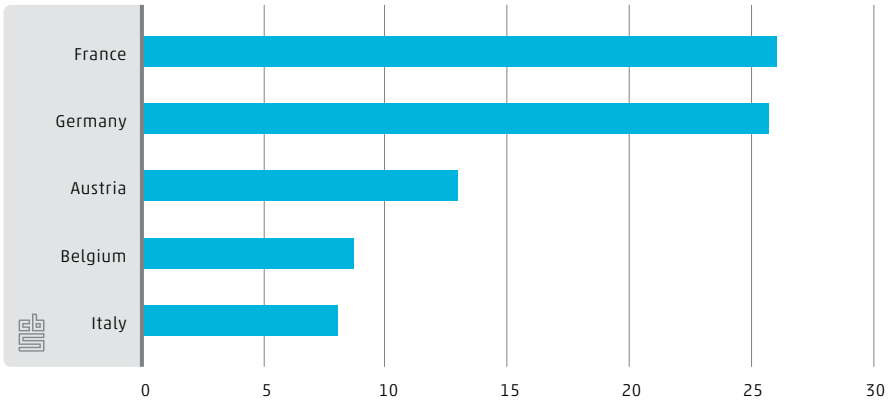
Source: CBS, 2016a.

Half of the long car holidays abroad to France and Germany

France was the favourite in more than a quarter of all long holidays by car, another quarter was destined for Germany. Austria, Belgium and Italy are also common destinations for long holidays.
Germany is by far the favourite destination for short holidays by car, followed by Belgium and France.

People usually take their long holidays in the Netherlands in North Sea beach resorts, water sports areas and the sand areas in Groningen, Friesland and Drenthe. For short holidays they usually go to water sports areas, the Veluwe and West- and Mid-Brabant.

11.3.2 Top-5 destinations of long car holidays abroad



Source: CBS, 2016b.

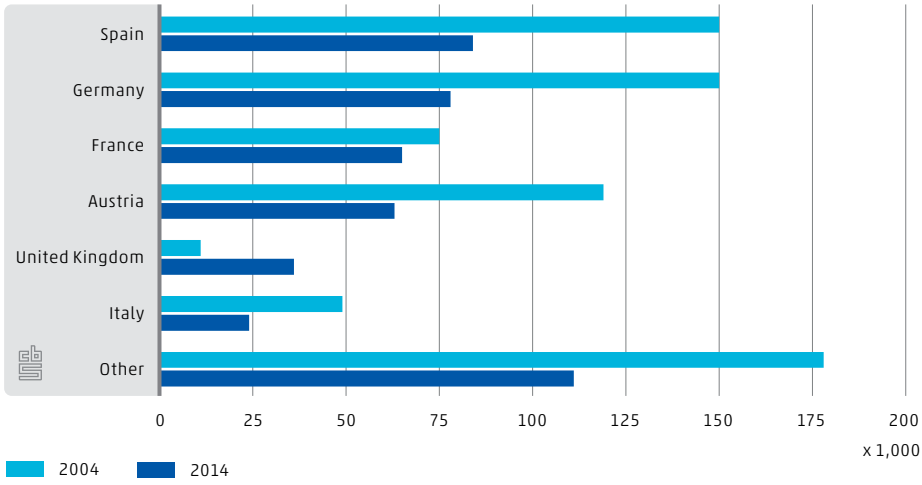
37% drop in long holidays by coach abroad between 2004 and 2014

Less often by coach to Germany, Austria and Italy

Coaches are primarily used for holidays abroad. People took coaches in 5 percent of all short holidays and 3 percent of all long holidays. Coaches now have a much lower share in holiday traffic. In 2004 people took 730 thousand long holidays by coach, in 2014 this had fallen to 460 thousand, a 37 percent decrease. The decline was especially sharp for destinations in Germany, Austria and Italy. The number of coach holidays to these countries halved between 2004 and 2013. Spain became also less popular; compared to 2004 the number of holidays by coach fell by 44 percent. Great-Britain is an exception: in 2014 there were three times as many holidays by coach as in 2004.

The fading popularity of coaches also shows in the distance driven by Dutch coaches abroad. In 2004 they travelled 109.3 million kilometres a year, in 2014 this was down to 83.6 million kilometres.

11.3.3 Long coach holidays abroad by destination

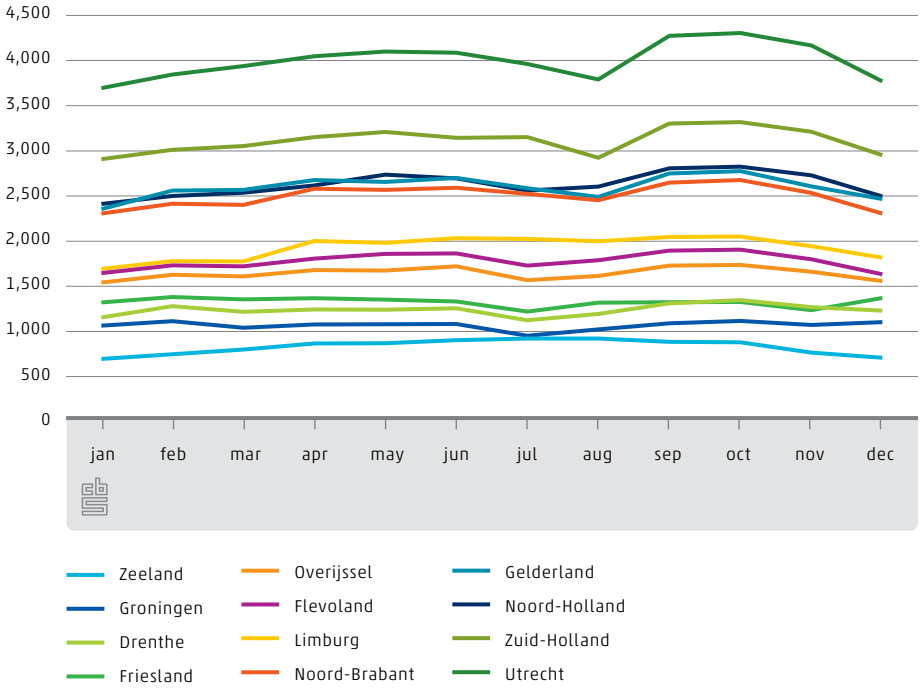


Source: CBS, 2016b.

Holiday traffic on main roads

In July and August traffic is much less dense since there is less commuter traffic. This effect varies between regions, partly because they have different school holiday periods.
In July 2014 traffic density was lowest on the main roads in Groningen, Friesland, Drenthe, Overijssel, Flevoland and Noord-Holland, because the school holiday period started in the North that year. That month 2.2 million people in the Northern region had their summer holidays.
The summer dip in the other provinces, with the exception of Zeeland, was in August, when 2.7 million people in the Mid region and 1.7 million people in the South had their summer holidays.

Motor vehicles per hour on main roads by province, 2014



Source: CBS 2016c, NDW: Verkeersintensiteiten op rijkswegen.

In Limburg the traffic density on the main roads is barely less in the summer than in any other season. Tourists visit the province, and traffic from other provinces travels through Limburg to holiday destinations further south. Zeeland is the only province without a summer dip: traffic density in July and August is even higher than in other months because of the many holiday visitors.

Domestic holidays often by train

For holidays in the Netherlands the train is the second favourite option after the car, with 5 percent of the total number of trips. This share is slightly higher than in 2004. People take the train more for short holidays (7 percent) than for long holidays (4 percent). The favoured destinations are the water sports regions for short holidays. The Wadden islands and the North Sea beach resorts are favourite for long holidays.
The train plays a modest role in holidays abroad, and this diminished even further. In 2004 Dutch people took the train 656 thousand times to go on short or long holidays, in 2014 this had decreased by 25 percent to 490 thousand. Germany is the major foreign destination.

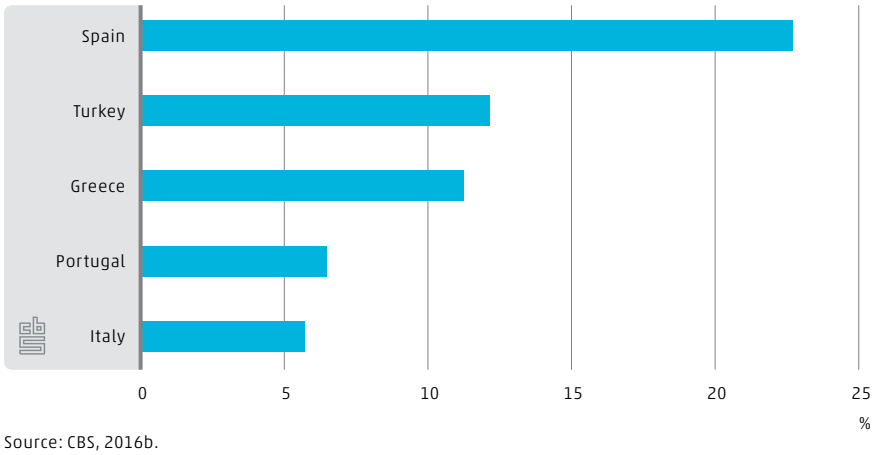
Number of holiday flights booming

Flying is becoming very popular for holidays abroad. Between 2004 and 2014 the air travel holidays increased by 32 percent from 5.2 million to almost 6.9 million. Nine of ten of these holidays were long holidays.
The increase in flying came at the expense of travelling by car, coach and train.
In 2004 Dutch people took the plane for 35 percent of their long holidays, in 2014 this had increased to 43 percent.
Because of the cheap flights by price fighters, flying has come in reach for an increasing group of people. The top-5 of destinations for holiday flights are: Spain, Turkey, Greece, Portugal and Italy. These countries are all in the top-10 of price fighter destinations (see figure 3.4.2).

Schiphol busiest in July and August

The increased popularity of flying can be seen at Schiphol airport. The busiest months were July and August in 2015, with 5.5 million incoming and outgoing passengers. The busiest day was 31 July when 208 thousand passengers flew to and from Schiphol. The quietest day was Christmas with 96 thousand passengers. Schiphol was used by 44 percent of all passengers travelling for holidays or city trips (see 3.4).

11.3.4 Top 5 long holiday flight destinations



Source: CBS, 2016b.

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12.

Injuries and burden of injury of serious road injuries

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20,700 serious road injuries in 2014

90% of burden of injury of serious road injuries due to permanent disabilities

22% of burden of injury of serious road injuries due to fractures in the knees and lower legs

In the Netherlands 20.7 thousand people were seriously injured in traffic in 2014, 4.2 thousand more than in 2000. More than half were injured in bicycle accidents without motor vehicles involved. Injuries of head, hip and lower leg are most common. Pedestrians and people on powered two-wheelers (PTW) face the highest injury burden, whereas the injury burden is lowest for bicyclists in accidents where no motor vehicles are involved. However, this type of bicycle accidents occurs so often that it produces the highest share in the total burden of injury. Of all injury types, injuries of the head and the lower legs cause the highest burden of injury.

12.1 Introduction

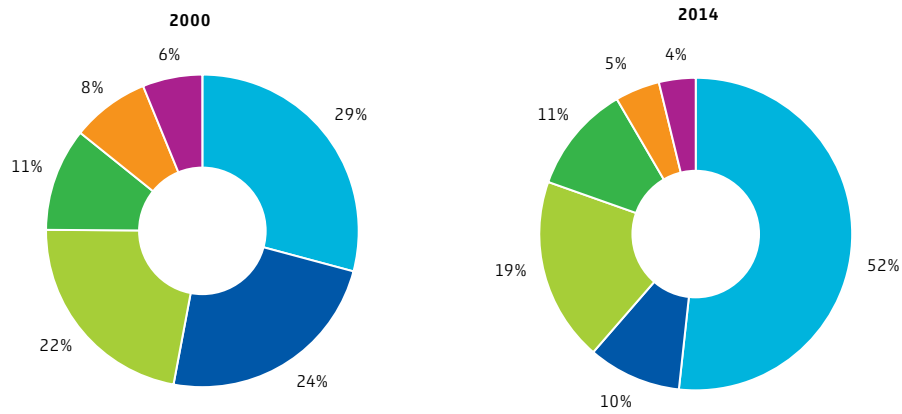
In this article we focus on injuries and injury burden of people seriously injured in traffic. As mentioned in Chapter 6, the number of serious road injuries has shown an increase in the last few years. Serious injuries lead to enormous costs: in 2009 over 5 billion euros, 42 percent of the total costs of traffic accidents. Costs per injured person may vary from case to case: some people fully recover within a few weeks, others suffer permanent disabilities.
SWOV investigated injuries and injury burdens at length in 2014. More details can be found in *Lasten van verkeersletsel ontleed* (Weijermars, Bos and Stipdonk, 2014) and in Weijermars et al. (2016). The information presented here is based on that research, partly supplemented with more recent data.

12.2 Serious injuries in traffic

Bicycle accidents without motor vehicles involved are the most important focus group

More than half of all seriously injured people are bicyclists in an accident without a motor vehicle involved. In such accidents people fall off their bikes, end up on the road side or collide with an obstacle. Between 2000 and 2014 the share of these accidents has increased considerably.

12.2.1 Serious road injuries, registered in hospital, by means of transport, 2000 and 2014



Source: DHD.

4.8 days in hospital after serious road injuries in 2011

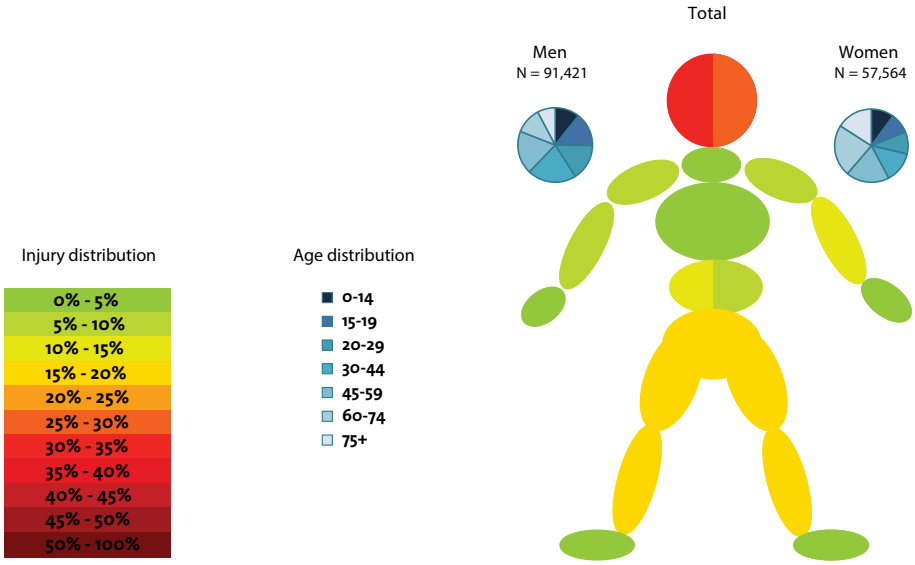
Head, hip and lower leg injuries most common

Injuries of seriously injured people differ for different kinds of accidents. To clarify the differences, we present injury figures.

Injury figures

Injury figures show the main diagnosis by part of the body.[1)] Back and chest are taken together, as are hip, pelvis and thigh. The parts of the body are coloured from green to dark red, depending on their share in the main diagnosis. The left side of the injury figure shows the injury shares for men, the right side for women. Basis for the injury figures are data registered in hospital from all people seriously injured in traffic during 2000–2009.

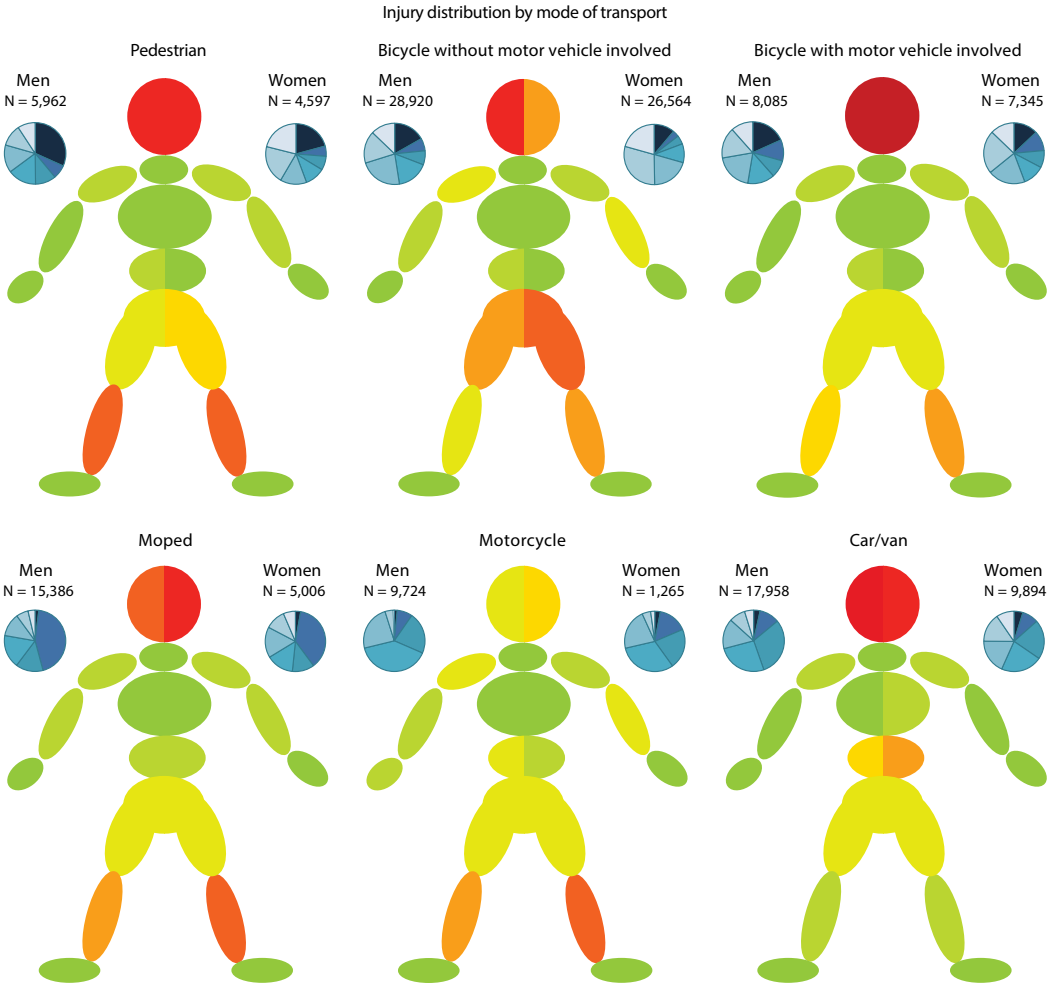
Injury figure: injury distribution (main diagnosis) of all serious road injuries, registered in hospital, with legend



The injury figure in the box shows that head injuries – mostly concussions – are the most common, followed by hip and lower leg injuries. Injury figures vary for different means of transport. Pedestrians and people on powered two-wheelers (PTW) relatively often suffer lower leg injuries. Moped drivers have relatively more head injuries than motor cyclists, probably due to the fact that helmets are not obligatory for light mopeds. Car passengers suffer relatively often abdominal injuries.

[1)] Based on an idea of Stefan Hoeglinger (KfV, Vienna).

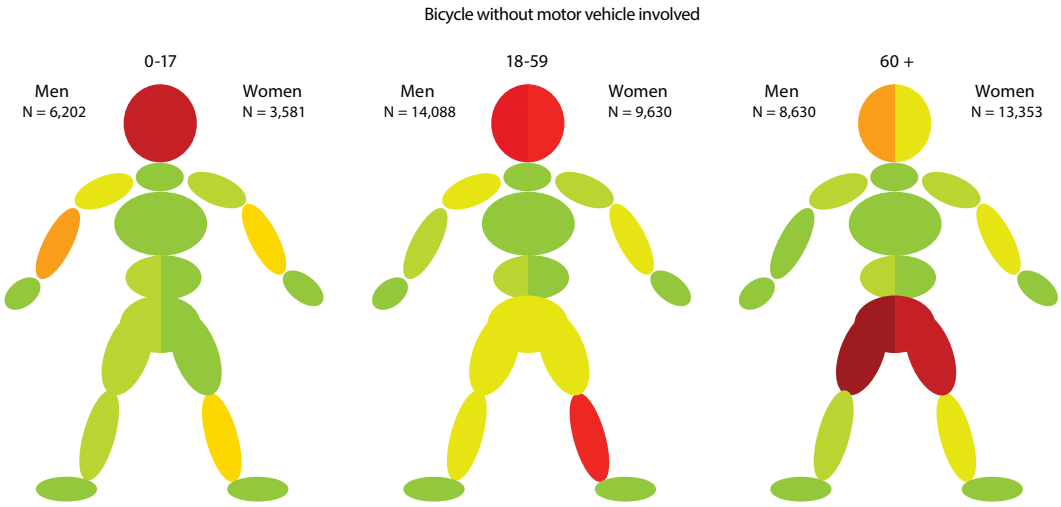
12.2.2 Injury distribution (main diagnosis) of all serious road injuries, by different modes of transport



For bicyclists it makes a difference whether or not motor vehicles are involved in the accident: without motor vehicles involved, the risk of hip and thigh injuries is higher than in accidents with motor vehicles involved, on the other hand the share of head injuries is higher than average in accidents where motor vehicles are involved.

Injury patterns vary considerably by age. Young people suffer relatively often injuries of head and lower legs, whereas people aged over 60 relatively often get injured at hip and thigh. This age difference is strongest in bicycle accidents without motor vehicles involved.

12.2.3 Injury distribution of seriously injured bicyclists, in accidents without motor vehicles, by age group



12.3 Consequences of serious injuries

Injured people report physical as well as mental problems in the long term

Seriously injured people can be left with physical and/or mental problems. There may also be social, financial and legal consequences. The results of the LIS-interviews by VeiligheidNL among patients during 1997/1998, 2000/2001 and 2007/2008 clarify the consequences of traffic (as well as other) injuries. Participants were interviewed about the consequences of their injuries for their work and daily lives at various times after the accident (2.5, 5 and 9 months after the accident, and in 2007/2008 after 24 months as well).
In the 2000/2001 LIS-interview, about 60 percent of the hospitalised respondents reported inconveniences after 9 months. Pain and problems with daily activities (school, work) were mentioned most. Almost 20 percent of the respondents reporting inconveniences after 9 months reported that their injuries influenced their moods as well. This shows that accidents may have psychological effects, as is found in literature. Several studies (Mayou en Bryant, 2003; Hours et al., 2013)

mention a prevalence[2] of 16 percent for posttraumatic stress disorder one year after a traffic accident.

Burden of injury as a quantitative indicator

To substantiate policy choices, quantitative indicators are needed that consider consequences of traffic injuries for people's lives and work. The burden of injury is such an indicator. The concept of burden of injury stems from health care; the definition is the number of healthy years of life lost in a population due to injuries. The burden of injury concept encompasses the lost years of traffic deaths (Years of Life Lost, YLL) and loss of quality of life of seriously injured (Years Lived with Disability, YLD). Here we only deal with the burden of injury of the seriously injured.

Method to determine burden of injury

We calculated the burden of injury of serious road injuries by a method developed in the European INTEGRIS project and described by Haagsma et al. (2012). Haagsma et al. provide information about the consequences for several types of injuries. They developed weighting factors and calculated the proportions of injury patients who suffer permanent disabilities. Weighting factors show the loss of life quality compared to full health: 0 meaning no loss, and 1 meaning complete loss. Combining these data with injury data and age of the injured person results in burden of injury per injured person. By summing the burden of injury for all casualties, we find the total burden of injury in YLD. Application of this method to people injured in traffic has some limitations (Weijermars et al., 2014), but the results give a good first impression of the burden of injury of different groups.

Bicyclists also main focus group for burden of injury

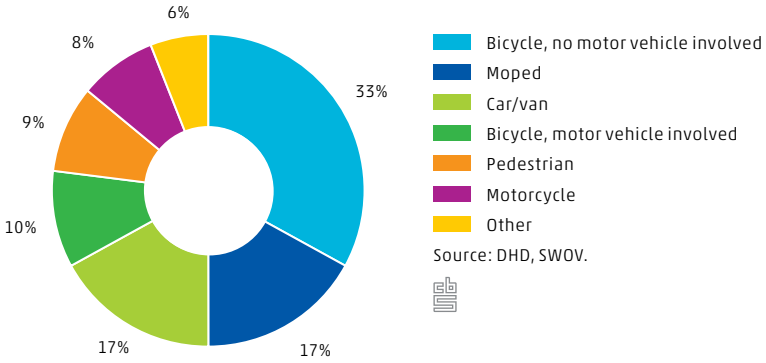
The burden of injury was slightly less than 2 YLD per seriously injured person in 2011. We estimate that all serious road injuries together represent over 40,000 YLD. About 90 percent of the burden of injury of the seriously injured is caused by permanent disabilities.

[2] Occurrence of a certain disorder at a specific moment in time.

20% of the serious road injuries suffer permanent disabilities

Pedestrians and people on powered two-wheelers (PTW) have the highest average burden of injury per casualty, whereas bicyclists injured in an accident without a motor vehicle involved have the lowest. However, because of the large number of bicycle accidents bicyclists have the biggest share in the total burden of injury. One third of the total burden of injury of all seriously injured registered in hospitals between 2000 and 2011 was due to bicycle accidents without any motor vehicle involved. For the same period, these accidents account for about 40 percent of all serious road injuries.

12.3.1 Distribution of the burden of injury of serious road injuries, registered in hospital, by transport mode, 2000/2009



Source: DHD, SWOV.

Head and lower leg injuries have the largest share in the total burden of injury

The burden of injury varies by type of injury as well. Injuries of the spinal cord result in the largest burden of injury per injury. However, the number of spinal cord injuries is relatively low. The total burden of injury (number of injuries combined with burden per injury) is highest for fractures of knees and lower legs (22 percent), followed by brain contusions and concussions (18 and 13 percent respectively).

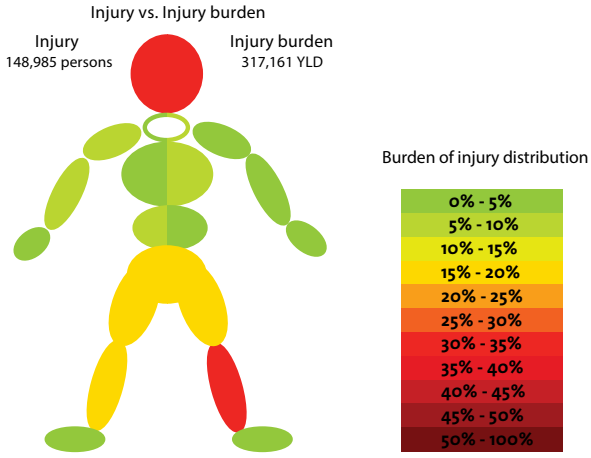
Burden of injury figures show the distribution of the burden of injury over the body. Comparison of burden of injury and injuries shows that the lower legs have a larger share in the burden of injury than in the injuries. One reason is that lower leg injuries cause relatively many permanent disabilities, another reason is that young people suffer lower leg injuries relatively often. Because their remaining life expectancy is long, their weight in the total injury burden is relatively high.

Head injuries occur relatively often and have a high share in the total burden of injury. The distribution of the burden of injury over parts of the body varies for different means of transport and age groups. More details are available in Dutch in the SWOV report '*Lasten van verkeersletsel ontleed*'.

Burden of injury figures

Burden of injury figures show the distribution of burden of injury over parts of the body (right side) and compare these with the distribution of injuries (left side). Neck injuries are combined with injuries of back and chest. In case of several injuries, the burden of injury is assigned to the body part that gives the most constraints, not necessarily the body part of the injury referring to the main diagnosis.
The presented burden of injury figure refers to all serious road injuries, registered in hospital, during the period 2000–2009.

12.3.2 Burden of injury figure: burden of injury (prioritised injury group) of all serious road injuries, registered in hospital, with legend



Minor injuries also relevant for burden of injury

Serious road injuries represent less than 10 percent of all people injured in traffic. Annually 300 to 400 thousand people are treated for road traffic injuries. Most are treated by their general practitioner. In 2011 around 90 thousand people treated in an emergency unit could leave after treatment (without being hospitalized).

In the months after the accident, people with minor injuries also suffer problems, although relatively less than the seriously injured. After 9 months, 37 percent of the respondents in the LIS interviews who were not hospitalised still reported complaints due to a traffic accident, against 60 percent of the hospitalised respondents. Because of their large numbers, less seriously injured people account for a considerable share of the total burden of injury; 32 percent of the burden of injury or road traffic injuries is attributable to victims treated in an emergency unit (Polinder et al., 2012).

12.4 Concluding remarks

A considerable part of the total costs of traffic accidents is caused by serious injuries, and the number of serious road injuries is increasing. So the growing focus of traffic safety policy on serious road injuries is to be welcomed. Not only the number of serious road injuries, but also the consequences of the injuries are relevant. As we showed, the consequences are considerable and vary among groups of casualties. The burden of injury may be used as a quantitative measure for consequences of injuries.

Focus groups

Pedestrians and people on PTW face a relatively high burden of injury; from the burden of injury approach they appear to be somewhat more important than if only the numbers of seriously injured are considered. However, bicyclists are the most important focus group, because of the large numbers of bicycle accidents. Head injuries (brain contusions and concussions) and lower leg injuries (knees and lower leg fractures) are the main injuries following the burden of injury approach. These injuries have a high share in the total burden of injury.

Follow-up research

SWOV is carrying out follow-up research, to estimate permanent constraints for different groups of seriously injured. Headed by the Erasmus Medical Centre and in cooperation with VeiligheidNL and RIVM the possibilities to improve calculation methods will be analysed. SWOV is also involved in the EU project SafetyCube (http://www.safetycube-project.eu/), studying the consequences of injuries and burden of injury in cooperation with European partners.

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