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Transport performance and energy consumption in road transport 2007 – 2017

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Contents

Abbreviations, measures and symbols

DIW	=	German Institute for Economic Research (Berlin)	bn.	=	billion
			km	=	kilometre
EB	=	energy balance	PJ	=	petajoule (10^{15}joules)
EEA	=	Environmental-Economic Accounting	l	=	litre
			mill.	=	million
KBA	=	Federal Motor Transport Authority	t	=	tonne
			tkm	=	tonne-kilometre
LDV	=	light duty vehicle	veh.-km	=	vehicle-kilometre
NA	=	National Accounts	yr		year
			›	=	more than
			‹	=	less than
			X	=	cell blocked for logical reasons

Introduction

Environmental Economic Accounting (UGR) describes the interactions between the economy and nature and the environmental impact brought in connection with economic activities. Therefore it is important to have accurate knowledge about the main drivers of energy use, greenhouse gases and air pollutants.

The transport sector – and in particular motorised road transport – is on of the main drivers of energy consumption. A large number of economic units in the corporate sector, the public sector and private households take part in motorized road transport. In the EEA, road transport is one aspect of energy flow calculations and is analysed in detail because of its importance. According to the national energy balance, road transport accounted for 24.7 % of total final energy consumption in 2017 [1]. The energy balance provides data on road fuel consumption as a single aggregated position. However, the differentiated consideration of road transport by vehicle type and fuel type, as well as the allocation of mileage and fuel consumption to economic and private activities, is extremely important in determining the causes of environmental pollution, as well as in formulating measures to limit and reduce pressures.

In the National Accounts (NA) the resident concept is used in recording economic activities. Regarding transport this means that all relevant activities of domestic units, including activities outside the national territory, are included in the accounts. In contrast, transport activities of non-resident units are excluded. Due to the close relationship of (EEA) and NA, the resident concept is also used in the UGR road traffic calculations.

Up to the reporting year 2016, the basic data on mileage and consumption by residents was determined by the German Institute for Economic Research (DIW) based on driving performance surveys and data from the German Federal Motor Transport Authority (KBA). Starting with the reporting year 2017, the German Aerospace Center (DLR) took over this task. Due to methodological changes, data from 2017 can only be compared with previous years to a limited extend.

In contrast to the DIW and DLR data, the national energy balance is based on fuel sales quantities on domestic territory, regardless of who – residents or non-residents – carries out the refuelling (territorial or domestic concept).

For consistency reasons with the energy balance, fuel consumption accounts do not only include data according to the resident concept, but also provide so-called 'bridging items' which allow the transition to the domestic concept.

Detailed road transport results are published in the EEA publication “UGR-Tabellenband” (Part 5 “Transport and the environment”: mileages, energy consumption and air emissions). This report shows summarized results.

At first it provides an overview of energy consumption in road transport by vehicle type and fuel type for the period 2007 to 2017. In addition, results of energy consumption in 2017 are presented in a breakdown by group of vehicle keepers (cf. table 2). The next section provides an analysis of mileages changes.

This is followed by a more detailed analysis of the vehicle stock, mileage and fuel consumption by cars and trucks. Finally, transitions between the domestic and the resident concept are demonstrated using trucks as an example.

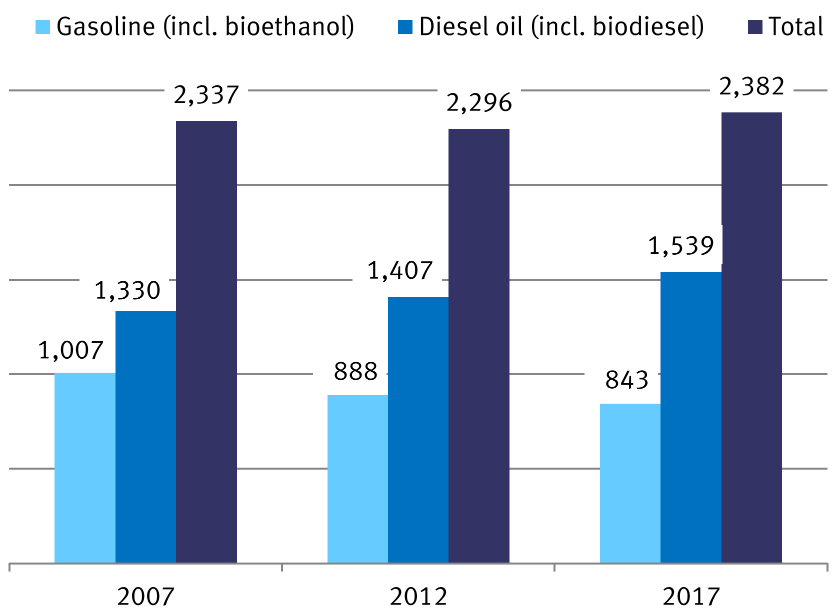
1 Final energy is that part of the original primary energy that is available to the consumer after deduction of line and conversion losses.

1 Energy consumption in road transport

In 2017 the final energy consumption in road transport, as defined in the energy balance (domestic fueling of diesel, petrol, biodiesel and bioethanol), amounted to 2,275 PJ. Compared to 2007 (2,142 PJ) this was an increase of 6.2 %. At the same time, final energy consumption in the transport sector as a whole increased to the same extend (+ 6.3 %). Total final energy consumption increased from 8,796 PJ to 9,208 PJ or by 4.7 % during this period.

In 2017 energy consumption by residential units in road transport (resident concept) amounted to 2,382 PJ, which was an increase of 1.9 % since 2007 (see table 1) – weaker than domestic fueling (domestic concept). According to the relevant definition of resident concept, residents' refueling abroad was taken into account in addition to the domestic refuelling of residents, but refueling of non-residents on the domestic territory was excluded. The increase in residents' energy consumption was slightly smaller than that of domestic refueling. A contributing factor might be that part of the refueling of residents abroad was relocated back to the domestic territory. The refueling of residents abroad had increased until 2010. After that, it dropped because of shrinking differences in fuel prices between Germany and its neighbouring countries. As a result, non-residents have also been refueling their vehicles in Germany more often.

Figure 1 **Energy consumption in road transport (resident concept) 2007 – 2017**
Petajoule (PJ)



Different trends can be observed for the various types of motor vehicles. Between 2007 and 2016, energy consumption by cars increased sligthly by 2.4 % according to the resident concept. By contrast, the consumption by motorcycles rose significantly by 13.7 %. An even greater increase in consumption of 20.6 % was recorded for light duty vehicles (LDV). An opposite trend was however observed for heavy duty vehicles. Their energy consumption declined markedly by 10.4 % (cf. table 1).

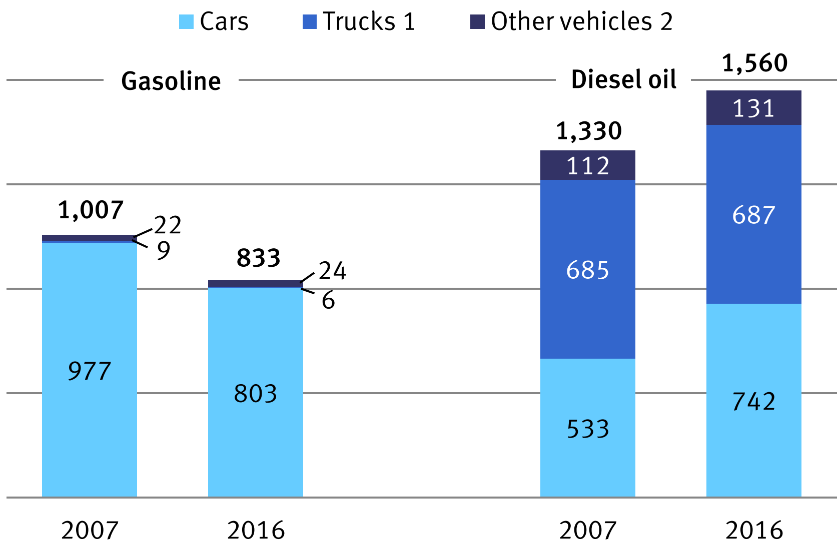
Table 1 **Energy consumption in road transport by vehicle type**

Vehicle typ	2007	2012	2016	2017 [1]	2016 zu 2007
	Petajoule				%
	Residents [2]				
Cars[3]	1,509.2	1,486.0	1,545.1	1,567.8	*2.4*
Gasoline engine	976.6	858.5	802.8	817.3	*– 17.8*
Diesel engine	532.7	627.5	742.4	750.5	*39.4*
Motorcycles	19.6	21.5	22.2	16.9	*13.7*
LDV [4]	229.8	247.0	277.2	261.8	*20.6*
Gasoline engine	9.0	6.8	6.5	8.0	*– 27.8*
Diesel engine	220.8	240.2	270.7	253.8	*22.6*
Heavy duty transportation	464.6	420.0	416.4	445.6	*– 10.4*
Trucks [5]	202.0	184.5	186.0	204.3	*– 8.0*
Truck-trailers	262.5	235.5	230.4	241.3	*– 12.2*
Buses	36.8	33.9	34.9	47.8	*– 5.2*
Other vehicles [6]	77.4	87.5	97.3	41.9	*25.7*
Gasoline engine	2.1	1.7	1.4	0.8	*– 30.7*
Diesel engine	75.4	85.8	95.9	41.1	*27.2*
Total residents	**2,337.4**	**2,295.9**	**2,393.2**	**2,381.9**	***2.4***
– Refueling of residents abroad	266.0	263.8	240.5	221,7r	*– 9.6*
+ Refueling of non-residents on the territory	56.2	51.6	55.6	106,9r	*– 1.1*
	On the territory				
= Road transport on the territory	**2,127.7**	**2,083.7**	**2,208.3**	**2.267,2r**	***3.8***
+ refueling of other motor fuels (gasoline, liquid gas, electricity, biomethane)	14.8	33.7	24.4	23.4	*65.1*
= Road transport on the territory (EB) [7]	**2,142.5**	**2,117.4**	**2,232.8**	**2,275.1**	***4.2***
Total transport (EB) [7,8]	**2,600.8**	**2,558.6**	**2,689.7**	**2,765.3**	***3.4***
Final energy consumption (EB) [7]	**8,796.1**	**8,918.5**	**9,071.2**	**9,207.8**	***3.1***
	% of final energy consumption				
Road transport on the territory (EB) [6]	***24.4***	***23.7***	***24.6***	***24.7***	X
Total transport (EB) [6,7]	***29.6***	***28.7***	***29.7***	***30.0***	X

Incl. bio-fuels, without gasoline, liquid gas, electricity, biomethane.
1 Preliminary.
2 Data for 2017 is not directly comparable with that of previous years.
3 Incl. ambulances and campers.
4 LDV = Light duty vehicles, until 2016 vecicles with a load capacity ‹ 3.5 t; 2017 vehicles with permitted total weight ‹ 3.5 t.
5 Until 2016 vecicles with a load capacity › 3.5 t; 2017 vehicles with permitted total weight › 3.5 t.
6 Tractors, Excavators, police and similar vehicles.
7 EB = Energiebilanz (energy balance), incl. gasoline, liquid gas, electricity, biomethane.
8 Road transport, inland water transport, railway transportation, aviation.
r Corrected value.

Looking at energy consumption by vehicles by engine type, gasoline (petrol) consumption and diesel oil consumption developed in opposite directions (cf. figure 2). While consumption of petrol (including bioethanol) dropped by almost 17.3 % from 1,007 PJ (2007) to 833 PJ (2016), consumption of diesel oil (including biodiesel) increased to the same extent from 1,330 PJ (2007) to 1,560 PJ (2016). In 2007 diesel consumption accounted 56.9 % of total fuel consumption, whereas the relevant share in 2016 was 65.2 %.

Figure 2 **Energy consumption in road transport by vehicle type 2007 and 2016**
Petajoule (PJ)



1 Gasoline: light duty vehicles; Diesel oil: Truck trailors, trucks and light duty vehicles.
2 Motorcycles, tractors, buses, other.

The strong decline in gasoline consumption can mainly be traced back to the smaller quantities consumed by cars (– 17.8 %). By contrast, diesel consumption by cars increased significantly (+ 39.4 %). With regard to all diesel vehicles, in 2007, trucks (heavy duty and light duty) accounted for markedly more than half of total diesel consumption (51.5 %), which was equal to an energy amount of 685 Petajoule. Consumption by cars was at 533 Petajoule (40 %). In 2016, however, cars consumed much more diesel oil (742 PJ, 47.6 %) than trucks (687 PJ, 44 %).

Table 2 provides an overview on energy consumption by vehicle keeper groups. It shows that households accounted for more than 85.1 % and industries for almost 14.9 % of energy consumption by cars in 2017. Regarding heavy duty transport (heavy duty trucks, trailer trucks), commercial transport accounted for 63.1 % of energy consumption and other vehicle keepers for the rest. Own-account transport of the manufacturing sector is included here, too.

Table 2 **Energy consumption by owner group and vehicle type 2017**

Owner group	Total	Cars	Trucks, truck-trailers	Light duty trucks	Other [1]
	Petajoule				
Agriculture, forestry and fishing	10.8	1.8	3.6	4.5	1.0
Mining and quarrying	3.8	0.6	2.3	0.7	0.2
Manufacturing	103.8	54.1	17.8	28.3	3.6
Electricity, gas and water supply and waste disposal	65.8	5.0	46.9	11.0	2.8
Construction	84.4	14.9	15.6	51.1	2.8
Wholesale and retail trade; repair of motor vehicles	133.1	33.1	54.6	38.8	6.6
Transport and storage	393.6	25.4	281.4	42.7	44.1
Hotels and restaurants	6.4	3.8	0.0	2.2	0.4
Information and communication	21.4	6.2	12.1	3.0	0.1
Financial intermediation. Real estate. renting and business activities	59.9	49.0	3.5	6.4	1.0
Public administration and defence; compulsory social security	36.3	10.0	0.3	9.2	16.9
Education	1.9	1.2	0.3	0.2	0.2
Health and social work	18.4	14.3	0.1	2.6	1.4
Other services	34.8	14.0	7.2	10.0	3.5
Industries	**974.6**	**233.4**	**445.6**	**210.8**	**84.8**
Private households	1,407.4	1,334.4	0.0	51.1	21.9
Industries and private households (residents concept) [2]	**2,381.9**	**1,567.8**	**445.6**	**261.8**	**106.6**
Balance of refueling [3]	– 170.2	– 98.5	– 54.9	– 16.8	0.0
Industries and private households (territorial concept)	**2,211.7**	**1,469.3**	**390.7**	**245.1**	**106.6**
	In % of total energy consumption				
Agriculture, forestry and fishing	*0.5*	*0.1*	*0.8*	*1.7*	*0.9*
Mining and quarrying	*0.2*	*0.0*	*0.5*	*0.3*	*0.2*
Manufacturing	*4.4*	*3.4*	*4.0*	*10.8*	*3.4*
Electricity, gas and water supply and waste disposal	*2.8*	*0.3*	*10.5*	*4.2*	*2.7*
Construction	*3.5*	*1.0*	*3.5*	*19.5*	*2.6*
Wholesale and retail trade; repair of motor vehicles	*5.6*	*2.1*	*12.2*	*14.8*	*6.2*
Transport and storage	*16.5*	*1.6*	*63.1*	*16.3*	*41.4*
Hotels and restaurants	*0.3*	*0.2*	*0.0*	*0.8*	*0.4*
Information and communication	*0.9*	*0.4*	*2.7*	*1.1*	*0.1*
Financial intermediation. Real estate. renting and business activities	*2.5*	*3.1*	*0.8*	*2.4*	*1.0*
Public administration and defence; compulsory social security	*1.5*	*0.6*	*0.1*	*3.5*	*15.8*
Education	*0.1*	*0.1*	*0.1*	*0.1*	*0.2*
Health and social work	*0.8*	*0.9*	*0.0*	*1.0*	*1.3*
Other services	*1.5*	*0.9*	*1.6*	*3.8*	*3.3*
Industries	***40.9***	***14.9***	***100***	***80.5***	***79.5***
Private households	*59.1*	*85.1*	*0.0*	*19.5*	*20.5*
Industries and private households (residents concept) [2]	***100***	***100***	***100***	***100***	***100***

Incl. bio-fuels. Preliminary results.
1 Tractors, excavators, police and similar vehicles.
2 Residents concept: incl. refueling of residents abroad, excluding refueling of non-residents on the territory.
3 Balance of refueling (bridging item): refueling of non-residents on the territory minus refueling of residents abroad.

2 Mileage in road transport

Total mileage in road transport – according to the resident concept – increased by 9.8 % between 2007 and 2016 (cf. table 3). Looking at the mileages by vehicle type shows different trends – similar to the development of energy consumption: The mileage of cars increased by 9.1 %, motorcycles rose by 14.4 % and light duty vehicles (LDV) even by 23.9 %. Looking at cars in a breakdown by engine type, mileage of diesel cars rose sharply by 41.5 %, whereas mileage of gasoline models decreased by 10 %. These changes can be attributed to a trend away from petrol to diesel vehicles (cf. chapter 3).

Table 3 **Mileage in road transport by vehicle type**

Vehicle type	2007	2010	2013	2016	2017 [1]	2016 zu 2007
	bn. km					%
Cars [2]	**583.6**	**587.1**	**601.1**	**636.9**	**632.4**	***9.1***
Gasoline engine	366.8	349.4	329.9	330.2	331.8	*– 10.0*
Diesel engine	216.8	237.7	271.1	306.7	300.6	*41.5*
Motorcycles	**15.4**	**16.3**	**17.0**	**17.6**	**13.7**	***14.4***
LDV [3]	**46.2**	**47.6**	**51.1**	**57.2**	**51.4**	***23.9***
Gasoline engine	2.2	1.9	1.8	1.8	2.2	*– 19.2*
Diesel engine	44.0	45.7	49.4	55.4	49.2	*26.0*
Heavy duty transportation	**31.5**	**29.3**	**29.0**	**30.2**	**38.4**	***– 3.9***
Trucks [4]	13.7	12.4	12.4	13.0	18.5	*– 4.7*
Truck-trailers	17.8	16.9	16.6	17.2	19.9	*– 3.3*
Buses	**3.4**	**3.3**	**3.2**	**3.4**	**4.5**	***– 0.5***
Other vehicles [5]	**8.0**	**8.5**	**9.3**	**10.0**	**4.5**	***25.3***
Gasoline engine	0.4	0.3	0.3	0.3	0.1	*– 25.1*
Diesel engine	7.7	8.2	9.0	9.8	4.4	*27.6*
Total residents [6]	**688.1**	**692.0**	**710.6**	**755.4**	**744.9**	***9.8***

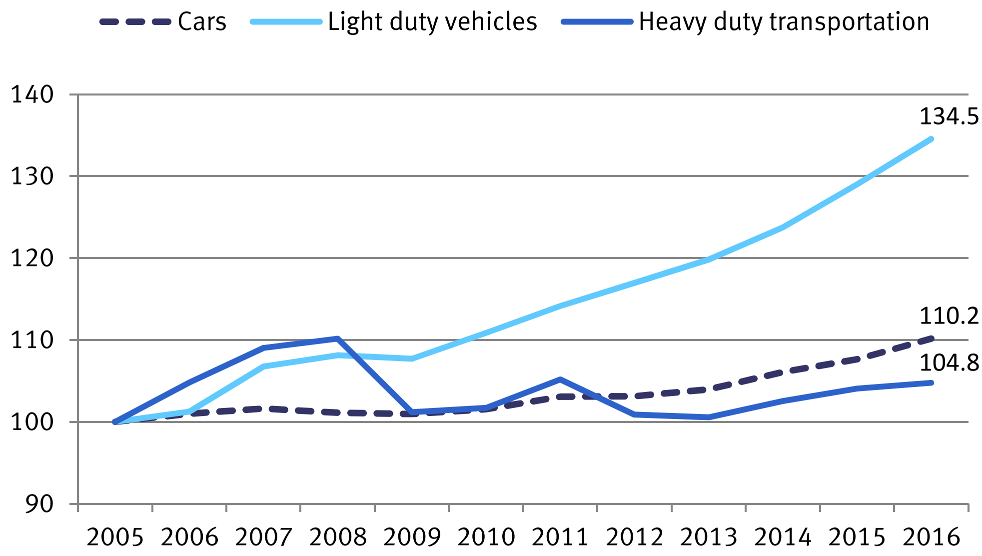
Including mileage with bio-fuels.
1 Preliminary. Data for 2017 is not directly comparable with that of previous years.
2 Incl. ambulances and campers.
3 LDV = Light duty vehicles, until 2016 vecicles with a load capacity ‹ 3.5 t; 2017 vehicles with permitted total weight ‹ 3.5 t.
4 Until 2016 vecicles with a load capacity › 3.5 t; 2017 vehicles with permitted total weight › 3.5 t.
5 Tractors, excavators, police and similar vehicles.
6 Incl. refueling of residents abroad, excluding refueling of non-residents on the territory.

Source: until 2016 German Institut for Economic Research (DIW), 2017 German Aerospace Center (DLR).

Mileage by heavy duty transport decreased by 3.9 %. The decrease is recorded for both truck-trailers (– 3.3 %) and trucks (– 4.7 %). The slightly diffent development may have been caused by shifting transports to trailer trucks whose transport volumes are larger and therefore less costly compared to other trucks.

Looking at the mileage of heavy duty transport over time shows considerable increases until 2008 (+10.2 % compared with 2005). The economic crisis in 2009 stopped this trend abruptly and led to a drop in mileage (2009 to 2008: – 8.2 %). The 2008 level (31.8 bn. km) was not reached again until 2016 (2016 to 2009: + 3.6 %). In contrast, a steady increase was recorded in road freight transport by light duty vehicles (LDV). Over the whole period (2005 – 2016), mileage increased by 34.5 % (only diesel vehicles).

Figure 3 **Mileage in road transport by selected vehicle types 2005 – 2016**
2005 = 100



3 Vehicle stock, mileage and fuel consumption by cars

Data on the vehicle stock is collected by the Federal Motor Transport Authority in Germany (Kraftfahrtbundesamt – KBA). In the period from 2007 to 2016, total car stock increased by 9.9 % (2017 compared to 2007: 10.7 %). Until 2016, the original KBA-data on vehicle stock on January 1st of the following year was used for the calculations of mileage and consumption by the DIW. In the course of taking over the calculations for the year 2017, the DLR used the annual mean values, calculated as average of the reporting year's initial value and that of the following year. As a result, the vehicle inventories in 2017 are only partially comparable with previous years.

The increasing number of cars was exclusively driven by the rapidly growing number of diesel cars. The latter rose by 50.2 % between 2007 and 2016, while the number of petrol cars fell by 3 % (cf. Table 4). Actually, vehicle keepers might mave responded to the jump in fuel prices by buying more fuel-efficient and therefore, in terms of fuel costs, cheaper diesel cars. In March 2012, the average price for one litre of petrol was 1.73 Euro – for diesel it was 1.52 Euro [2] (consumer price index 2000 – 2012: diesel oil prices: + 85.8 %, petrol prices: + 61.9 % [3]). However, the trend towards diesel vehicles has continued unabated despite the fact that fuel prices have been falling since 2013. The shift to diesel cars is closely associated with a trend towards larger and more powerful engines (SUVs). In 2016, the average fuel prices for gasoline were 21.1 % and for diesel 27.7 % below the 2012 level. 2017 fuel prices in Germany increased again.

However, recent numbers for new vehicle registration show a reversal of development: The "diesel scandal" led to significantly declining new registrations of diesel vehicles since 2016 (2018 vs. 2016: – 27.8 %). At the same time, more petrol cars were registered (+ 33 %) [4]. Considering registrations according to the vehicle size, there is also a trend away from the high-powered vehicles – in 2018, more than 12 % fewer

2 Source: https://de.wikipedia.org/wiki/Motorenbenzin.
3 Source: DESTATIS: Daten zur Energiepreisentwicklung – Lange Reihen; www.destatis.de/DE/Publikationen/Thematisch/Preise/Energiepreise/Energiepreisentwicklung.html.
4 Source: Kraftfahrtbundesamt (KBA): statistics of new registrations of passenger cars.

vehicles with a capacity of more than 2000 cm^3 were newly registered than in 2016. Whether these current developments will continue and to what extent they bring a noticeable change in total fuel consumption remains to be observed.

Total mileage of cars increased from 587.5 billion kilometres in 2007 to 636.9 billion kilometres in 2016 (+ 8.4 %). In that period, average fuel consumption by cars declined due to technical improvements. In 2007 the average fuel consumption by cars was 7.6 litres per 100 vehicle-km, while it amounted to 7.3 litres in 2016. This equals a decline of 4.8 %. Due to the technical improvements, total fuel consumption has been reduced in the years before 2008, despite growing annual mileage (2008 in comparison with 2005: – 3.3 %). This positive trend has not continued in recent years.

Between 2008 and 2016 fuel consumption rose by 5.5 % and reached the highest level since the year 2004. The steadily rising annual mileage and a vehicle fleet with significantly higher motorized vehicles have over compensated the savings due to technical progress.Fuel consumption changed similarly to vehicle stocks. While diesel consumption by cars increased by 40.4 % between 2007 and 2016, gasoline consumption decreased by 15.3 % (cf. table 4). The steeper decline in gasoline consumption compared to the decrease in vehicle stocks resulted from a decline in annual mileage (– 8.1 %) and the trend from petrol to diesel vehicles, especially among frequent drivers. Furthermore, the reduced petrol consumption was due to a decline in average fuel consumption (– 6.3 %).

Table 4 **Vehicle stock, mileage and fuel cosumption by cars**

	Unit	2007	2010	2013	2016	2017 [1]	2016 zu 2007
							%
		Total					
Vehicle stock	mill.	41.2	41.8	43.3	45.3	45.6	*9.9*
Mileage per year	1,000 km/yr	14.3	14.0	13.9	14.1	13.9	*– 1.4*
Total mileage	bn. km	587.5	587.1	601.1	636.9	632.4	*8.4*
Specific consumption	l/100 km	7.6	7.5	7.3	7.3	7.4	*– 4.8*
Total consumption	bn. l	44.7	43.9	44.2	46.2	46.9	*3.2*
		Gasoline engine					
Vehicle stock	mill.	31.1	30.5	30.1	30.2	30.4	*– 3.0*
Mileage per year	1,000 km/yr	11.9	11.4	11.0	10.9	10.9	*– 8.1*
Total mileage	bn. km	370.7	349.4	329.9	330.2	331.8	*– 10.9*
Specific consumption	l/100 km	8.2	7.9	7.8	7.7	7.8	*– 6.3*
Total consumption	bn. l	29.9	27.7	25.7	25.3	25.8	*– 15.3*
		Diesel engine					
Vehicle stock	mill.	10.0	11.3	13.2	15.1	15.2	*50.2*
Mileage per year	1,000 km/yr	21.6	21.1	20.5	20.3	19.8	*– 5.8*
Total mileage	bn. km	216.8	237.7	271.1	306.7	300.6	*41.5*
Specific consumption	l/100 km	6.9	6.8	6.8	6.8	7.0	*– 0.7*
Total consumption	bn. l	14.9	16.1	18.4	20.9	21.1	*40.4*
		Gasoline engine in % of total					
Vehicle stock	mill.	*75.6*	*73.1*	*96.5*	*66.7*	*66.7*	*– 11.8*
Total mileage	bn. km	*63.1*	*59.5*	*54.9*	*51.8*	*52.5*	*– 17.8*
Total consumption	bn. l	*66.8*	*63.2*	*58.3*	*54.8*	*55.0*	*– 17.9*

Residents concept. Including bio-fuel consumption.
1 Data for 2017 is not directly comparable with that of previous years.

Source: until 2016 German Institut for Economic Research (DIW), 2017 German Aerospace Center (DLR).

4 Vehicle stock, mileage and fuel consumption by road freight transport

Vehicles of road freight transport are subdevided into light duty vehicles (LDV) and heavy duty transport, which in turn consists of trucks and truck-trailers. The weight limit between light and heavy trucks was changed by the DLR for the 2017 reporting year from 3.5 tons netload to 3.5 tons total weight. Therefore the stocks of heavy trucks increased significantly and are no longer comparable to previous years. Aquivalent to cars, the stock of trucks was changed also to the annual mean values.

Between 2007 and 2016, the stock of heavy duty vehicles increased by 2.1 % (cf. table 5). The comparatively slowly increase in vehicle stocks was largely attributable to the decrease between 2008 and 2009 because of the economic crisis. Between 2008 and 2009, vehicle stocks went down by 8.7 %. From 2009 onwards, however, numbers increased (2009 – 2016: + 11.7 %) and the level of 2008 was reached again. If we consider heavy duty trucks separately from trailer trucks, the number of trailer trucks increased much more (+ 18 %) than heavy duty trucks (+ 7.9 %).

The stock of LDV has been increasing for many years now. Between 2007 and 2016, the number of LDV increased by 31.6 %. Looking at heavy and light duty transport as a whole, stocks grew by 25.5 %.

Total mileage in heavy duty transport has fallen by 3.9 % over the same period, in contrast to stocks, due to lower capacity utilization of each vehicle.The vehicle utilisation rate increased continuously until the crisis year of 2009. Between 2009 and 2016, the annual mileage per vehicle dropped sharply (– 7.3 %). These trends are even more profound in transport performance (tons-kilometres). In the years before the economic crisis, transport performance increased markedly (2005 – 2008: + 10.1 %). In the crisis year 2008/2009, however, there was a collapse of almost 10 %. In the following years, there was a slight recovery in transport performance, but the level of the years 2007/08 was no longer achieved. In 2012 there was a further decline and the transport performance in 2016 of 315.8 bn. tkm was barely higher than in 2005 (2005 – 2016: + 1.8 %).

In heavy duty transport, specific fuel consumption per 100 vehicle-kilometres declined by 17.2 % between 2007 and 2016. In the same period, the specific consumption per 100 tons-kilometres dropped by 13.5 %. These significant decreases in the specific consumption may be attributed to technical improvements on the hand, but possibly also to the use of smaller trucks (adapted to the needs) and at the same time higher transport loads (vehicles are fully loaded and make fewer empty runs) of the individual vehicle. Consistent with lower specific consumption and decreasing mileage, absolute fuel consumption by heavy duty transport dropped by a significant 20.5 % in the same period.

Table 5 Vehicle stock, transport performance and fuel consumption by road freight transport

	Unit	2007	2010	2013	2016	2017	2016 zu 2007
							%
		Total [1]					
Vehicle stock	1,000	2,356.5	2,459.6	2,660.3	2,958.6	3,017.5	*25.5*
Mileage per year	1,000 km/yr.	32.0	30.5	29.5	29.0	29.0	*– 9.6*
Total mileage	bn. km	75.4	75.0	78.4	85.7	87.6	*13.5*
Specific consumption .	l/100 km	25.3	24.7	21.9	20.9	22.4	*– 17.5*
Total consumption . . .	bn. l	19.1	18.5	17.2	17.9	19.6	*– 6.3*
		Heavy duty transport [1,2]					
Vehicle stock	1,000	484.7	450.9	466.5	495.1	706.9	*2.1*
Mileage per year	1,000 km/yr.	64.9	65.1	62.2	61.1	54.4	*– 5.9*
Total mileage	bn. km	31.5	29.3	29.0	30.2	38.4	*– 3.9*
Specific consumption .	l/100 km	41.2	41.3	35.4	34.1	32.6	*– 17.3*
Total consumption . . .	bn. l	13.0	12.1	10.3	10.3	12.5	*– 20.5*
		Transport performance of heavy duty transport [3]					
er year	1,000 tkm/yr.	708.6	694.3	655.5	637.8	X	*– 10.0*
otal	bn. tkm	343.4	313.1	305.8	315.8	313.1	*– 8.1*
Specific consumption .	l/100 tkm	3.8	3.9	3.4	3.3	X	*– 13.5*
		LDV [1,4]					
Vehicle stock	1,000	1,871.9	2,008.7	2,193.8	2,463.6	2,310.6	31.6
Mileage per year	1,000 FZ-km/yr.	23.5	22.7	22.5	22.5	21.3	– 4.3
Total mileage	bn. km	44.0	45.7	49.4	55.4	49.2	26.0
Specific consumption .	l/100km	14.0	14.0	14.0	13.7	14.5	– 2.0
Total consumption . . .	bn. l	6.2	6.4	6.9	7.6	7.1	23.5

Residents concept. Including bio-fuel consumption.
1 Data for 2017 is not directly comparable with that of previous years.
2 Trucks: until 2016 vecicles with a load capacity › 3.5 t; 2017 vehicles with permitted total weight › 3.5 t. › 3.5 t net load, truck-trailers.
3 Trucks with a load capacity › 3.5 t, truck-trailers.
4 Light duty vehicles: until 2016 vecicles with a load capacity ‹ 3.5 t; 2017 vehicles with permitted total weight ‹ 3.5 t. › 3.5 t net load; only diesel engines.

Sources: until 2016 German Institut for Economic Research (DIW), 2017 German Aerospace Center (DLR); Kraftfahrtbundesamt (KBA).

A comparison of the heavy duty transport performance of residents with that on domestic territory reveals the following (cf. table 6): the transport performance of residents decreased noticeable (– 8.8 %) from 2007 to 2017. In the same period, the transport performance of non-residents on German territory increased drastically by 30 %. This means that domestic transport was provided increasingly by foreign companies. The share of foreign transports on German roads has increased from 33.9 % in 2007 to over 40 % in 2017. By contrast, the transport services provided by domestic transport companies abroad have fallen very porfoundly since 2007 (– 48.7 %). In the same period, total transport performance on German roads increased by 8.1 %.

Table 6 **Transport performance in heavy duty transport – residents and on domestic territory**

	2007	2010	2013	2016	2017	2017 zu 2007
	Mrd. tkm					%
Residents [1]	343.4	313.1	305.8	315.8	313.1	– 8.8
Residents abroad [2]	43.1	31.2	25.1	23.3	22.1	– 48.7
Non-residents on domestic territory [3]	153.8	158.7	163.0	187.0	200.0	30.0
On domestic territory	454.1	440.6	443.7	479.4	491.0	8.1

1 Source: Kraftfahrtbundesamt (KBA); trucks with a load capacity › 3.5 t, truck-trailers.
2 Own calculations.
3 Source: Bundesministerium für Verkehr: Verkehr in Zahlen 2018/2019.