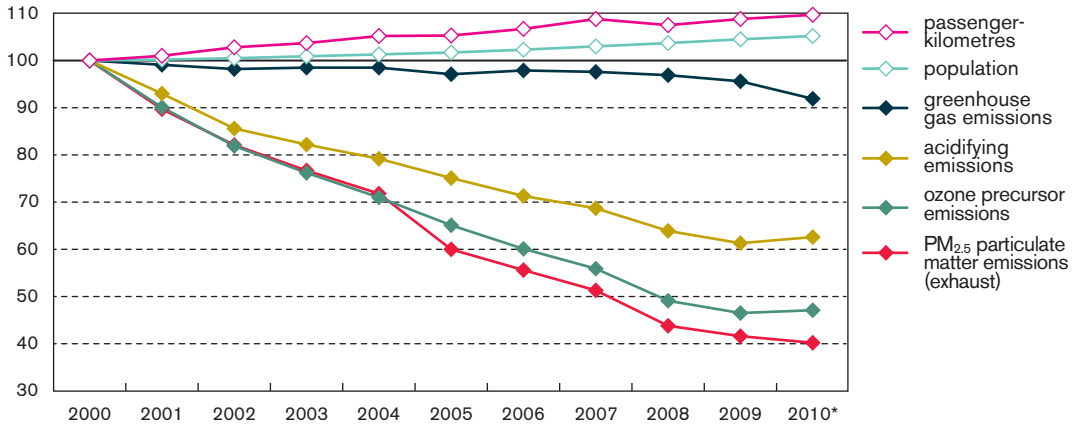
Eco-efficiency of passenger transport

PACT 2020 DPSIR



* provisional figures
emissions from road traffic for 2010 are not comparable with the 2000-2009 dataset due to model modifications
emissions from road traffic for 2011 assumed identical with those for 2010, emissions from transport for 2011 not shown on figure

Source: MIRA based on ADSEI, De Lijn, FOD MV, NMBS, VMM

Absolute decoupling of emissions and passenger transport

Since 2000, the number of passenger-kilometres (road and rail) has increased faster than the population. In 2008, passenger transport decreased by 1.2 % due to the financial-economic crisis, and then increased again.

In the last decade, there was an absolute decoupling of the emissions from passenger transport and the passenger-kilometres. The decrease in greenhouse gas emissions was due to the increasing use of energy-efficient vehicles and biofuels for road traffic. There were more energy-efficient vehicles on the market as a result of the compulsory standards that the EU imposes on car manufacturers for the CO_2 emissions from new cars. Federal tax incentives promoted the purchase of these vehicles. In 2010, the average CO_2 emissions from new cars in Flanders decreased from 147 g/km to 138 g/km. In early 2012, the tax incentives were abolished for budgetary reasons. The impact of this measure on the total CO_2 emissions will become clear later on. Renewable energy was responsible for 4.2 % of the total energy consumption of transport, passengers and freight together, in 2010. Biodiesel had the largest share of this and bio-ethanol was responsible for about one-tenth, green power remained marginal. In 2008, the share of renewable energy was only 1.2 %, while in 2009 this was 3 %. The emissions of ozone precursors, acidifying components and $PM_{2.5}$ from passenger transport continued to decrease due to the tightening of European emission standards for new vehicles and fuels. The lower number of passenger-kilometres in 2008 resulted in a larger decrease in emissions that year. For passenger transport, the emissions of ozone precursors and acidifying components were higher in 2010 than in 2009. The new calculation method in fact estimates the NO_x emissions from Euro 5 diesel vehicles to be higher than those of most of the other Euro classes, in line with actual driving conditions.

	2000	2005	2006	2007	2008	2009	2010*
population (million)	5.94	6.04	6.08	6.12	6.16	6.21	6.25
passenger-kilometres (billion)	66.81	70.36	71.26	72.67	71.82	72.68	73.28
greenhouse gas emissions (ktonnes CO_2-eq)	8 219	7 978	8 044	8 024	7 967	7 855	7 554
acidifying emissions (million Aeq)	1 031	774	735	708	659	632	645
ozone precursor emissions (tonnes TOFP)	87 208	56 763	52 451	48 786	42 831	40 557	41 033
exhaust particulate matter emissions ($PM_{2.5}$) (tonnes)	2 630	1 577	1 462	1 348	1 153	1 093	1 057

Eco-efficiency of freight transport

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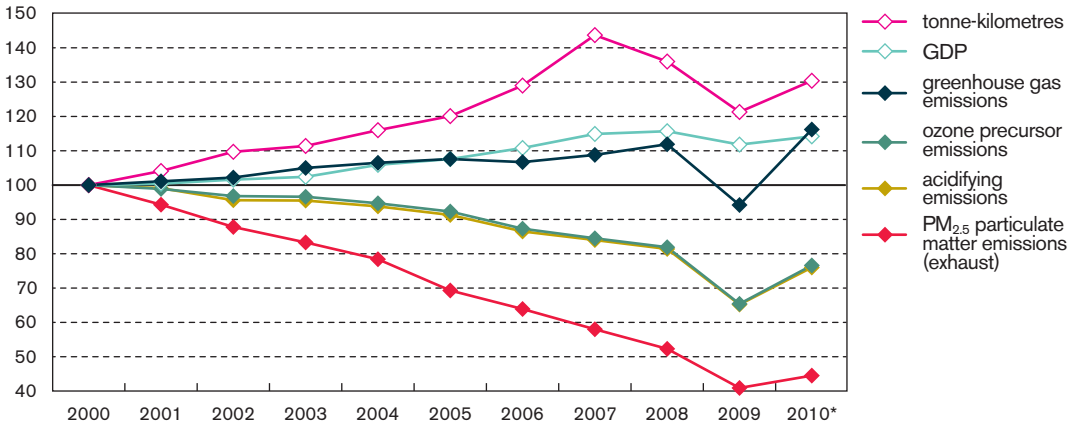

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Source: MIRA based on ADSEI, FOD MV, NMBS, NV De Scheepvaart, PBV, SVR, VMM, W&Z

Only a relative decoupling of greenhouse gas emissions and freight transport

During the last ten years, the number of tonne-kilometres of freight transport (road, rail and inland navigation) increased more than the gross domestic product (GDP). The financial-economic crisis caused a reduction in the transport activity and also in the global GDP. The crisis had more impact on freight transport than on passenger transport. In 2010, the market recovered, but only partly.

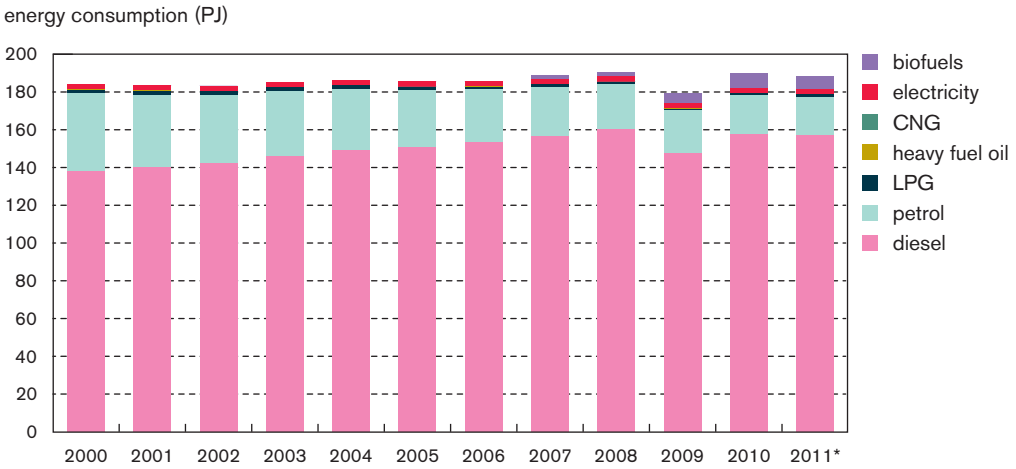
Although trucks are also becoming more energy-efficient, the greenhouse gas emissions from freight transport increased due to an increase in activity. The emissions, however, increased more slowly than the tonne-kilometres. There was a relative decoupling. In 2009, there was a decrease in emissions due to the crisis. In 2010, the greenhouse gas emissions from freight transport exceeded the 2009 level. Not only the recovery after the crisis but also modifications to the method explained the higher emissions. In 2011, the European Commission also imposed standards for the CO_2 emissions from light duty vehicles for the first time, on average 175 g/km by 2017. The proposed standard of 147 g/km by 2020 remains to be approved by the European Council and the European Parliament.

For freight transport too, the emissions of ozone precursors, acidifying components and $PM_{2.5}$ (exhaust) decreased due to tighter European emissions standards. There was an absolute decoupling from the tonne-kilometres. The sharp decrease in acidifying emissions and emissions of ozone precursors in 2009 was due not only to the crisis, but also to the introduction of Euro V engines in trucks. These engines emit fewer nitrogen oxides than their predecessors. In 2010, the emissions were higher than in 2009 as a result of a higher estimate for the number of kilometres. This was due to the recovery in activity but also to changes made to the method. In 2010, the share of freight transport (excluding aviation and inland maritime shipping) in the total emissions from transport was 44 % for greenhouse gases, 59 % for acidifying substances, 57 % for ozone precursors and 48 % for particulate matter emitted via exhaust.

	2000	2005	2006	2007	2008	2009	2010*
GDP (billion euros)	144,8	155,9	160,5	166,3	167,5	161,8	165,3
tonne-kilometres (billion)	34,91	41,93	45,03	50,17	47,49	42,33	45,52
greenhouse gas emissions (ktonnes CO_2-eq)	5 035	5 415	5 370	5 477	5 634	4 745	5 851
ozone precursor emissions (tonnes TOFP)	70 831	65 367	61 845	59 859	58 003	46 298	54 247
acidifying emissions (million Aeq)	1 218	1 112	1 053	1 023	991	793	925
exhaust particulate matter emissions ($PM_{2.5}$) (tonnes)	2 227	1 544	1 424	1 291	1 165	911	992

Energy consumption by transport

DPSIR



* provisional figures

Source: MIRA based on Flanders Energy Balance VITO

Share of biofuels no longer increased in 2011

In the period 2000-2008, the energy consumption by transport still increased slightly. The financial-economic crisis led to a dip for all modes in 2009. The recovery of the economy led to an increase in the energy consumption of shipping and road transport again in 2010. Road transport was also affected by methodological changes. Inland navigation also recorded an increase in 2011. According to a provisional estimate, the total energy consumption by transport in 2011 was 188.4 PJ, or 11.9 % of the total energy consumption in Flanders. More efficient loading and a decrease in the use of diesel trains had a positive effect on the energy consumption of rail. In 2011, 75 % of the energy consumption of rail was electricity and 25 % diesel. In 1990 their respective shares were still more or less equal. The energy consumption of inland navigation followed the change in the activity, but the energy-efficiency has increased in the last ten years by approximately 10 %. The energy consumption of inland maritime shipping increased from 2004, but also inland maritime shipping became more efficient due to improved fuel efficiency and an increase in scale.

In 2000, diesel produced three quarters of the energy used by transport. Petrol was the other main fuel. In 2010, the share of diesel had increased to 83 %, mainly due to the dieselisation of the vehicle fleet and more freight transport. Petrol decreased to 11 %. Electricity, used almost exclusively by rail, remained constant at approximately 1.5 %. LPG decreased from 1 % to 0.6 %. From 2007, road traffic also used biofuels. Their share increased and was approximately 4 % in 2010. Heavy fuel oil and CNG remained marginal. The shares remained virtually unchanged in 2011. Biofuels did not increase any further due to the lower production of these sources of energy in 2011.

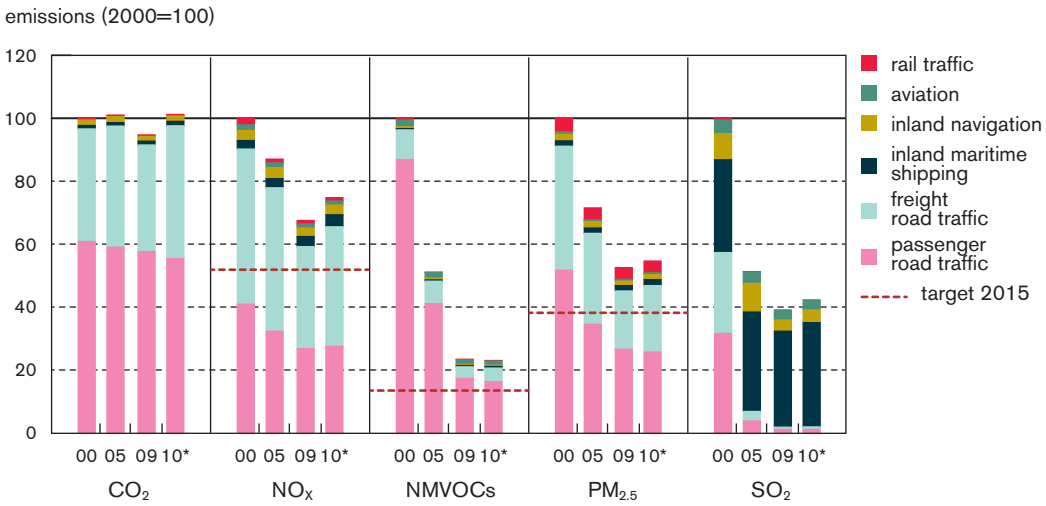
The use of efficient technologies and lighter vehicles can reduce the energy consumption. A modal shift to collective transport, rail and inland navigation can also contribute to this. Information and communication technology can help to reduce the transport flows.

energy consumption (PJ)	2000	2005	2006	2007	2008	2009	2010	2011*
road traffic	175.0	176.5	176.5	179.2	180.6	170.8	180.4	179.0
rail traffic	4.0	3.7	4.0	4.1	4.1	3.7	3.7	3.7
inland navigation	3.0	3.3	3.2	3.2	3.2	2.6	3.0	3.1
inland maritime shipping	1.9	2.0	2.0	2.3	2.4	2.1	2.6	2.6
domestic aviation	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total	*184.0*	*185.5*	*185.6*	*188.8*	*190.4*	*179.3*	*189.6*	*188.4*

* energy consumption by road traffic in 2011 only as a first estimate
energy consumption by road traffic in 2010 not comparable with the 2000-2009 series due to model modifications

Air pollutant emission by transport

DPSIR



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sectoral breakdown for assessment against MINA transport targets differs from that used for assessment against NEC targets

Source: VMM

Further reduction in traffic emissions needed

The CO_2 emissions from transport have slightly fluctuated in recent years. The improved efficiency of vehicles has had a positive impact, but total CO_2 emissions did not decrease due to the increase in number of kilometres. Road traffic remained by far the most important source. Under the European Energy & Climate Package, Belgium is required to reduce its greenhouse gas emissions by 15 % between 2005 and 2020 for the non-ETS sectors, including transport. The third Flemish Climate Policy Plan will include measures to reduce emissions from these sectors for the period 2012-2020.

Due to the tightening of the environmental standards for vehicles, the NO_x, NMVOC and $PM_{2.5}$ emissions from transport decreased in the period 2000-2009. For NO_x, the decrease was less than expected due to the dieselisation of the vehicle fleet and the increased freight transport. Non-exhaust particulate matter emissions increased due to the increasing traffic and in 2010 already accounted for 33 % of the $PM_{2.5}$ emissions. Also the non-exhaust fraction has a harmful effect on health. However, more research is needed to assess the full impact and to derive useful measures. Successive EU directives have limited the sulphur content of fuels and consequently SO_2 emissions. In 2010, the majority of emissions exceeded the 2009 level. This is to be attributed to increased activity but also to various model changes.

The targets of the MINA plan 4 (2011-2015) call for a further reduction in transport emissions for 2010-2015: 31 % for NO_x, 41 % for NMVOCs and 30 % for $PM_{2.5}$. In addition to tighter Euro standards, the Flemish Air Quality Plan for NO_2, approved in early 2012, will contribute to this. This plan is aimed at the greening of vehicle taxes and the logistics sector. As a first step, the Flemish Government reformed the traffic registration tax in 2012. The new tax is more advantageous for new petrol vehicles, which emit less NO_x, than for new diesel vehicles.

air pollutant emissions	2000	2005	2006	2007	2008	2009	2010*
CO_2 (ktonnes)	13 128	13 256	13 267	13 361	13 456	12 437	13 282
NO_x (tonnes)	100 752	87 770	83 669	82 024	78 704	68 012	75 287
NMVOCs (tonnes)	28 963	14 813	12 888	10 749	7 891	6 754	6 650
$PM_{2.5}$ (tonnes)	6 027	4 308	4 072	3 854	3 551	3 168	3 283
SO_2 (tonnes)	3 428	1 751	1 646	1 682	1 519	1 339	1 447

CO_2 emission from new passenger cars

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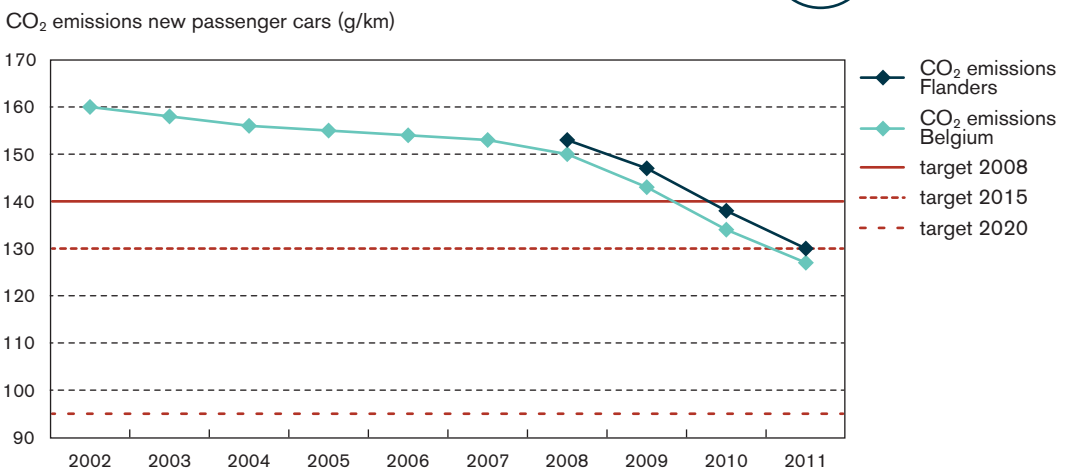

The Dutch driver and vehicle licensing agency (RDW) was used as source for the emissions data for the years 2008-2011, because it is considered to be the most reliable. As a result, the average CO_2 emissions for 2008 are 2 g higher than the figure included in the previous report. The differences for 2009 and 2010 are negligible.

Source: VITO based on DIV and RDW

Target 2015 already reached in Belgium and Flanders

In the period 2008-2011, the average CO_2 emissions from new cars in Belgium decreased more than before. More fuel-efficient vehicle models appeared on the market. Furthermore, in 2007 the federal tax allowance for vehicles with emissions of less than 115 g/km changed over to a direct discount on purchase. Especially the share of new private cars with CO_2 emissions of less than 105 g/km increased sharply from 3 % in 2008 to 39 % in 2011. Almost half of all new private cars benefitted from a federal discount in 2011. Furthermore, from 2008 onwards the deductibility of company cars became dependent on the CO_2 emissions. In 2010, company cars that emit less than 60 g CO_2/km received additional benefits. With 127 g/km, Belgium met the 2015 target already in 2011. Flanders, which on average has heavier cars, also reached the target, albeit just barely. The federal incentive for fuel-efficient vehicles encouraged the purchase of diesel vehicles because, on average, they emit less CO_2 than petrol cars. This did, however, lead to higher NO_x and particulate matter emissions. Further tax reforms taking into account all emitted pollutants therefore seem appropriate.

It remains to be seen whether the target for 2020 is feasible. In fact, since 2012 the federal incentives for fuel-efficient vehicles were abolished for budgetary reasons. A tax reduction of 30 % on the purchase price of electric passenger cars continued to apply in 2012. Since March 2012, the reformed Flemish traffic registration tax is valid. This tax is now also dependent on the CO_2 emissions. Electric and plug-in hybrid vehicles are exempt from traffic registration tax.

In Belgium, the average CO_2 emissions from new company cars still exceeded those from new private cars in 2011. The relative difference was approximately 10 g/km and has remained stable in recent years. Leased cars performed not much worse than private cars. Purchased company cars were especially less fuel-efficient.

CO_2 emissions new passenger cars Belgium (g/km)	2008	2009	2010	2011
leased cars	149	141	133	126
purchased company cars	163	156	147	142
all company cars	155	149	140	134
private cars	146	139	131	123

Ecoscore of new passenger cars

DPSIR

Source: Sergeant et al. (2012)

Diesel cars are the least environmentally friendly

The ecoscore is an indicator for the environmental performance of vehicles based on their noise nuisance and impact on climate change, ecosystems and health. The score takes into account not only the direct emissions that are released while driving but also the indirect emissions during the production and distribution of the fuel. The calculation method was recently modified using more realistic NO_x emission values. As a result, the ecoscore of the more recent and more fuel-efficient diesel vehicles in particular is lower than before.

The environmental performance of new cars is continually improving. EU regulations require car manufacturers to produce cars with increasingly lower CO_2 emissions. In addition, particulate matter and hydrocarbon emissions from diesel vehicles and nitrogen oxide emissions from petrol cars decreased following the introduction of the tighter Euro 5 standard in 2009. In 2011, the average ecoscore of the new Flemish car fleet was 61.6, i.e. an increase of five units with respect to 2008. The average ecoscore of the complete Flemish car fleet was 53.4 in 2011. It remains to be seen whether the target of the MINA plan 4 (2011-2015), a score of 61 determined on the basis of the previous method, is feasible by 2015.

Of the various vehicle technologies, the battery-electric vehicle has the highest ecoscore. Harmful pollutants are emitted only during the production of the fuel, not during the actual driving. Plug-in hybrid vehicles, which partly run on electricity, score well too. These two types of electric vehicles are followed by natural gas vehicles. None of these three types of vehicles is yet being purchased in significant numbers in Flanders, so their impact on the overall Flemish ecoscore is still limited in 2011. LPG vehicles score only slightly better than petrol cars. Diesel cars are the least environmentally friendly. This is mainly due to their higher NO_x emissions. They do, however, show the most marked improvement since 2008. On the one hand, this is due to the higher proportion of new diesel cars with a built-in particle filter. This filter reduces the emission of particulate matter. On the other hand, the average CO_2 emissions from new diesel cars decreased slightly more than those from new petrol cars. New private cars were, on average, more environmentally friendly than new company cars in 2011. Company cars more often run on diesel and are on average heavier and more powerful.

ecoscore new passenger cars	2008	2009	2010	2011
private cars	57.7	59.5	60.9	63.2
leased cars	56.1	57.2	58.8	59.9
purchased company cars	54.5	56.1	57.2	58.7