The Consumer Voice in Europe

Good for the environment and good for your pocket: Consumer benefits of CO_2 emissions targets for passenger vehicles

Long version

Contact: **Stefanie Heinzle – environment@beuc.eu**

Ref.: X/2012/047 - 06/07/2012

BUREAU EUROPÉEN DES UNIONS DE CONSOMMATEURS AISBL | DER EUROPÄISCHE VERBRAUCHERVERBAND
Rue d'Arlon 80, B-1040 Brussels • Tel. +32 (0)2 743 15 90 • Fax +32 (0)2 740 28 02 • consumers@beuc.eu • www.beuc.eu
EC register for interest representatives: identification number 9505781573-45

Summary

The European Commission is currently defining the modalities of implementing the CO_2 emissions target for passenger vehicles which is foreseen in Regulation (EC) No. 443/2009 for the year 2020.

We welcome the emission target of 95 g CO_2/km for the new passenger car fleet for the year 2020 as we expect this target to reduce CO_2 emissions of the transport sector, reduce the dependence on foreign oil imports, protect consumers from steady increases in fuel prices and prevent further air quality pollution.

In addition, the emission target of 95 g CO_2/km will reduce fuel costs and lead to fuel savings – two big concerns to EU consumers. Tighter CO_2 emissions targets for passenger vehicles will therefore not only benefit to reduce the impact on the environment, but will also help consumers achieve significant cost savings – an approach that will lead to a win-win situation for consumers and the environment.

Relative to the baseline of 130 g CO_2/km which manufacturers must achieve as an average CO_2 emission target by 2015, meeting the 95 g CO_2/km standard in 2020 would lead to significant fuel savings for consumers: The average European private motorist buying a new petrol car would benefit from fuel savings of approximately 344 Euros per year and the average European buyer of a new diesel vehicle would benefit from fuel savings of approximately 465 Euros per year. If fuel prices would increase as expected, the target of 95 g CO_2/km would lead to even more significant fuel savings per year. As additional manufacturing costs can amount to approximately 1,000 Euros, the payback period for the additional manufacturing costs is therefore assumed to be at the maximum of three years.

However, a typical European private motorist sells the car after a holding period of five years. Approximately a third of the higher costs for meeting the CO_2/km standard can still be passed on to the used car buyer and only two thirds of the higher initial purchase price needs to be paid by the new car owner. We therefore assume that at today´s fuel prices the payback period for the share of the potential higher purchase price that the typical new car buyer has to bear is below 1.9 years for the average buyer of a new gasoline driven car and below 1.4 years for the average buyer of a new diesel driven car. When a car is purchased at a time when fuel costs are higher, consumers would be able to recoup their investment even within a shorter period of time.

The average consumers would therefore benefit from this emission target as they would see a significant net saving over the average period of ownership of the vehicle. For consumers who sell their cars below the average holding period of 5 years, the payback period is still likely to be shorter than the buyers' holding period of the car as, although those buyers will see lower fuel savings in total, they will be able to pass on a higher amount of resale value to the second hand car buyer.

In this position paper BEUC provides first an overview of the importance of passenger cars in citizens' life and on the EU Commission's proposal on the EU average fleet targets set for 2020. We discuss and present the benefits to consumers of the proposed CO_2 emissions standard of 95 g CO_2/km.

Finally, we will present our policy demands which include:

- Achieving the average CO_2 emissions limit value of 95 g/km by 2020 solely by means of improvement in vehicle motor technology;
- Not introducing a phase-in period of the targets and not including super-credits;
- Setting a medium and long-term preliminary limit value today to be achieved by 2025 and 2030 respectively;
- Setting test cycles and test procedures to present real-world fuel consumption;
- Maintaining excess emissions premiums at a high level;
- Setting the parameters for determining the limit values to provide an incentive to cut down on weight;
- Reducing emissions by heavier cars proportionally more than by lighter cars.

1. Introduction

Across the entire life-cycle, from children to pensioners, mobility is an essential right to citizens and is vital to the quality of life of consumers and a prerequisite and a consequence of European and global integration.

Passenger cars accounted for 83.3% of inland passenger transport in 2008 as measured by the number of inland passenger-kilometres travelled. In 2009, there were 473 passenger cars for 1000 inhabitants in the EU-27 corresponding to a vehicle stock of 236.1 million passenger cars[1]. Between 1995 and 2007, the kilometres travelled by passenger cars increased by about 1.6% per year in the EU[2]. Cars as the principal mode of passenger transport clearly play a predominant role in European citizens' life and are expected to become even more important in the new EU member states[3].

Transport-related expenditures play an important part in private households' budgets. More specifically, private households in the EU have spent approximately 13.2% of their household budget on transport-related goods and services in 2011[4]. More than half of the transport related expenditure was dedicated to the operation of personal transport equipment such as for example purchasing fuel[5].

An increase in expenditure on operational costs over the last years, mainly caused by increases in fuel prices, can also be noted[6]. European transport is heavily dependent on oil for 96% of total energy consumption[7]. As oil is a limited resource, world oil production is set to pass a peak where the maximum rate of extraction is reached and will decline thereafter ("peak oil"). According to the International Energy Agency, oil prices will continue to significantly increase due to higher worldwide demand for oil. More specifically, the 2011 World Energy Outlook expects increases of nominal oil prices to over 210 dollars/barrel in 2035[8]. The rising cost of crude oil will naturally translate also to an increase in fuel prices for car drivers, following the trend of the past few years. More specifically, gasoline prices have increased from about 1 Euro to 1.6 Euros per litre between 2005 and 2012 and diesel prices have increased from about 93 cents to 1.5 Euros per litre between 2005 and 2012[9].

---

1 Eurostat (2012): http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdpc340.

2 For more information see Annex 1.

3 Between 2000 and 2008, the amount of passenger vehicles grew significantly among many of the new member states such as Lithuania, Latvia and Romania and the trend seems to continue (for more information see Annex 2).

4 For more information see Annex 3.

5 For more information see Annex 4.

6 See Annex 5 for more details with regards to the trends in share of household expenditure on transport.

7 EU Commission (2011): White Paper - Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM(2011) 144final, http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm.

8 2011 World Energy Outlook: http://www.iea.org/w/bookshop/add.aspx?id=428.

9 DG Energy (2010): http://ec.europa.eu/energy/publications/doc/2010_energy_transport_figures.pdf and DG Energy (2012): http://ec.europa.eu/energy/observatory/oil/bulletin_en.htm.

Finally, by the year 2020, the EU aims to reduce its greenhouse gas emissions by 20 per cent. The transport sector plays a fundamental role in helping achieving these goals as it is responsible for almost 29% of all CO_2 emissions[10]. However, the transport sector is not only one of the most energy-consuming sectors but it is also the fastest growing sector in terms of energy consumption[11]. In addition, the transport sector is the only one which has shown increasing CO_2 emissions between 1990 and 2005, while all other sectors including the power sector, industrial and residential sector have successfully reduced their share of CO_2 emissions[12]. As a consequence, the sector's emissions of CO_2 and other greenhouse gas emissions continue to increase, causing a tremendous pressure on the environment. In order to reduce CO_2 emissions of the transport sector and to reduce the dependence on foreign oil imports, it will therefore be necessary to fundamentally change our transport system in order to secure European citizens access to mobility. As has been pointed out in the White Paper on Transport, the "*challenge is to break the transport system's dependence on oil without sacrificing its efficiency and compromising mobility*."

2. Revision of Regulation No 443/2009 setting emissions standards for new passenger cars

Road transport is responsible for about 71% of transport-related CO_2 emissions, with passenger cars accounting for about 63% of these emissions. The EU agenda aiming to improve the sustainability of cars has in the last decade largely been influenced by the White Paper on Transport in 2001. Following the White Paper, important regulatory measures have been adopted including the obligation for car manufacturers to reduce CO_2 emissions from cars in a step wise approach[13]. This process has been re-enforced through the launching of a new White Paper on Transport in 2011, listing 40 initiatives. The White Paper sets a clear quantitative target of reducing CO_2 emissions from transport of 60% by 2050 compared to a 1990 baseline.

According to the EU Regulation No. 443/2009 on passenger cars, which has been formally adopted in 2009, manufacturers must achieve a CO_2 emission target of 130 g CO_2/km by 2015 as an average value for the fleet of new cars registered in the EU in one calendar year. Therefore, the emission limits are only applied to the average of all automobiles and not to individual car models. Each manufacturer is given an individual target which depends on the average mass of all its newly registered vehicles in the EU. This system therefore specifies higher values (i.e. more g of CO_2 per km) for manufacturers of heavier cars in contrast to manufacturers of lighter vehicles.

---

10 European Commission (2011): EU transport in figures – EU statistical pocketbook CO_2 emissions from transport – EU-27 by mode, http://ec.europa.eu/transport/publications/statistics/doc/2011/pocketbook2011.pdf.

11 European Environmental Agency (2011): Laying the foundations for greener transport. TERM 2011: transport indicators track progress towards environmental targets in Europe, http://www.eea.europa.eu/publications/foundations-for-greener-transport.

12 DG Clima (2011): A roadmap for moving to a competitive low carbon economy in 2050: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:EN:PDF

13 Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles (23 April 2009).

In 2011, the average CO_2 emissions from new passenger cars sold in the EU amounted to 135.7 g CO_2/km, 4.6 g CO_2/km lower than in the previous monitoring year (140.3 g CO2/km in 2010)[14]. It is rather certain that the introduction of the mandatory standards resulted in this sudden decrease of CO_2 emissions. Based on present trends the European Environment Agency (EEA) sees the industry as a whole on a good way to achieve the target of 130 g CO_2/km by 2015[15]. With current reduction rates, it seems that the 2015 target of 130 g/km might be met "even a couple of years ahead of time"[16].

Regulation (EC) No 443/2009 was formally adopted after a compromise agreement had been reached between the Council and the Parliament. The regulation sets a target for new cars of 120 g/km by 2012 as the overall objective but pursues an integrated approach for reaching the target: an objective of 130 g CO_2/km was set as an average for new passenger cars to be achieved through improvements in vehicle motor technology. To meet the CO_2 emission target of 120 g/km, a further reduction of 10 g CO_2/km could be delivered through other complementary measures including further technological improvements such as better tyres. In addition, the regulation was phased in over the period from 2012 to 2015. Manufacturers are obliged to meet their average CO_2 emissions targets for a certain percentage of their fleet in a staged approach:

- 65% by 2012
- 75% by 2013
- 80% by 2014 and
- 100% by 2015.

The EU Regulation No. 443/2009 on passenger cars also sets a target of 95 g CO_2/km for the new car fleet for the year 2020. However, up to date, this target is only provisional. A review is currently carried out by the European Commission in order to define the modalities of reaching this target. A legislative proposal confirming this target is expected for mid-July 2012 and will have to go through the ordinary legislative procedure in order to become binding.

3. Undervaluation of future fuel costs at the time of car purchase

With large increases in fuel costs, high fuel prices and car running costs are now a significant issue for European consumers.

Many surveys conducted in several member states indicate that the level of fuel consumption of a car is a highly relevant criterion in consumers' purchasing decisions. For instance, a UK study indicates that when consumers are asked 'what factors were important in the decision making process?' when purchasing their current car, results show that, in order of importance, 'fuel economy/running costs', 'size/practicality' and 'vehicle price' were the three factors considered most

---

[14] European Environment Agency (2012): Monitoring CO_2 emissions from new passenger cars in the EU: summary of data for 2011.

[15] European Environment Agency (2012): New cars sold in 2011 were 3.3% more fuel efficient than those sold in 2010: http://www.eea.europa.eu/highlights/new-cars-sold-in-2011

[16] International Council on Clean Transportation (ICCT): EU car manufacturers likely to meet 2015 CO_2 target early (http://www.theicct.org/blogs/staff/eu-car-manufacturers-likely-meet-2015-co2-target-early).

important[17]. Another study by the German Energy Agency (DENA) claims that fuel consumption is a main criterion for German car buyers[18].

In addition, several studies show that consumers are generally concerned about increases in fuel prices. For example, a 2011 survey by Which? in the UK found that fuel prices were the joint top concern for consumers (along with energy prices): 91% of respondents said they were fairly, very or extremely worried about fuel prices[19]. A study conducted by GfK with 2,000 consumers indicated that German consumers assessed their purchasing power as being compromised, "as an ever greater proportion of their income is spent on energy, particularly on petrol and diesel, and is therefore not available for other purchases".

CO_2 emissions from cars are directly related to the car´s fuel consumption – each 1% increase in fuel consumption results in a corresponding 1% increase in CO_2 emissions. With an average lifespan of a car in use in the EU being about 12 years[20], the level of CO_2 emissions of the vehicle chosen today therefore considerably impacts the amount of future operating costs that have to be paid over the lifetime of a car. Even though consumers more and more take the level of fuel consumption of a car into account, research still shows that consumers substantially undervalue future fuel costs arising during the total length of ownership at the time of car purchase[21] and often not take account of rising fuel costs. Research has shown that consumers only consider fuel savings of approximately a period of three years[22].

Such an undervaluation of fuel savings leads to a situation where consumers might take wrong purchase decisions as buying a cheaper but fuel inefficient vehicle might lead to higher total costs over the ownership period. Explanations for this market failure include difficulties of discerning the financial benefits of buying a fuel efficient car when the information is presented in physical units (e.g. litres/ 100 km or CO_2/km), difficulties in information overload in decision-making, uncertainty about future fuel prices or the holding period of the car or a lack of confidence in fuel consumption data indicated by the manufacturers.

---

17 LowCVP Car Buyer Survey (2010): Improved environmental information for consumers, Research conducted by Ecolane & Sustain on behalf of the Low Carbon Vehicle Partnership – June 2010. http://www.lowcvp.org.uk/assets/reports/LowCVP-Car-Buyer-Survey-2010-Final-Report-03-06-10-vFINAL.pdf).

18 German Energy Agency (2012): http://www.dena.de/presse-medien/pressemitteilungen/dena-umfrage-autohaendler-unterschaetzen-potenzial-des-pkw-labels.html.

19 Which? (2011): Survey of 2094 UK consumers in November 2011. Consumers were asked how worried they were, if at all, about a range of factors in the current economic climate.

20 According to Nemry et al. (2008), "the average lifespan of a car in Europe is between 12 and 15 years. In a wide range of studies, car lifetime is assumed to be 12 years. Obviously, the life span varies between countries and vehicle technologies." (Nemry, F., Leduc, G., Mongelli, I., Uihlein, A. (2008). Environmental Improvement of Passenger Cars (IMPRO-car). JRC Scientific and Technical Papers, p. 49: http://ec.europa.eu/environment/ipp/pdf/jrc_report.pdf).

21 As shown by different recently conducted studies, including Helfand and Wolverton 2009 (http://yosemite.epa.gov/EE/Epa/eed.nsf/44a8be610f6c5f0885256e46007b104e/51a36d18d3ef67b98525761c004dfa5e/$FILE/2009-04.pdf); Greene 2010 (http://trid.trb.org/view.aspx?id=920593); Alcott and Wozny, 2010 (ftp://wuecon195.wustl.edu/opt/ReDIF/RePEc/mee/wpaper/2010-003.pdf)

22 Potoglou and Kanaroglou (2007): Household demand and willingness to pay for clean vehicles, Transportation Research Part D 12, 264-274; Consumer Federation of America (2010) (http://consumerfed.org/pdfs/Consumer_Savings_Survey_Fact_Sheet 092710.pdf).

4. Additional manufacturing costs for meeting the CO_2/km standard

A study by the International Council on Clean Transportation (ICCT) for the European vehicle market, based on most recent data and assessment methodologies originally developed for the US Environmental Protection Agency (EPA) has estimated that from today's point of view the additional manufacturing costs for meeting the 95 g CO_2/km standard in 2020 relative to the baseline of 130 g CO_2 amounts to approximately **1000 Euros**[23]. However, cost curves differ across the different vehicle segments included in the simulation model by the ICCT, which constitute distinct product markets[24]. The additional manufacturer costs for achieving increasing levels of CO_2 reduction in the vehicle segments B and C, which represent approximately 61% of all cars sold on the European market, amount to approximately 900-1000 Euros. The additional manufacturer costs for achieving increasing levels of CO_2 reduction in the D-segment (11% market share in the EU) amount to approximately 1000 Euros for petrol-driven cars and 1500 Euros for diesel-driven cars[25]. It is important to note that the ICCT analysis does not assume any technological breakthroughs or improvements in manufacturing processes, both of which would likely result in lower costs than estimated above.

The European Commission has also commissioned a study on a cost assessment of the 95 g target. The report published several scenarios of how meeting the target would affect the manufacturing costs and describes three scenarios as the most realistic[26], laying in the range of about 765 to 1280 Euros for additional technology in order to reach the fuel efficiency target of 95g per kilometre in comparison to a 130 g CO_2/km baseline[27].

---

[23] ICCT (2012): http://www.theicct.org/sites/default/files/ICCT_Apr27_ICCT_PM.pdf. The study by the ICCT is based on existing technology studies that were performed in preparation for the United States 2017-2025 light duty vehicle regulation. This study makes use of extensive vehicle simulations and a so called tear-down cost assessment, both of which are very detailed and generally seen as best-practice example that closely follows the industry-internal approach of vehicle development. In the U.S., the project was carried out jointly by three major agencies (EPA, NTHSA, CARB) with a total budget for technical studies of around 15 million US$. The study by the ICCT adapts the existing data from the U.S. to the conditions of the European market in order to arrive at CO_2 reduction cost curves for different EU vehicle segments. For instance, the study considers additional driving cycles, vehicle segments and technologies commonly available in the EU, and adapts underlying assumptions. For the production cost assessment, it is assumed by the study that all parts are produced in Western Europe, taking German labour costs as the basis for all calculations.

[24] Cost curves were constructed specified separately for 6 different vehicle segments (small vehicles in the B-segment (28% market share in the EU), medium-sized vehicles in the C-segment (32% market share in the EU) and larger vehicles in the D-segment (11% market share in the EU) on petrol and diesel, respectively). No cost curves for cars belonging to the A-segment (11% market share in the EU), E-segment (3% market share in the EU) and small SUV segment (below 5% market share in the EU) are available.

[25] It is important to note that technology requirements and costs may be different for individual manufacturers. Figure in Annex 7 shows the cost curves calculated by the ICCT for the EU market for all vehicle segments.

[26] Support for the revision of Regulation (EC) No. 443/2009 on CO2 emissions from cars, presentation at stakeholder meeting, December 6, 2011: http://ec.europa.eu/clima/events/0048/sr1_final_report_en.pdf p. 11.

[27] It is important to note that the budget by the European Commission for this study amounted to only approximately 1 million Euro; the US study which served as the basis for the ICCT simulations in contrast, has worked with a total budget of around 15 million US$. In addition, the study commissioned by the European Commission collected data from automobile manufacturers, suppliers and trade association mainly through a detailed questionnaire and consultations which might lead to limited transparency and possibility of overestimation of additional manufacturing costs. The U.S. study in contrast made use of a tear-down cost analysis which closely follows the industry-internal approach of vehicle development and is seen as a ground-breaking method to assess costs.

In addition, many studies have shown that estimated costs of meeting emissions targets are often not passed on to consumers via higher vehicle prices. For instance, a report by the Netherlands Organisation for Applied Scientific Research (TNO) compiled in 2006 projected that the costs of reaching the goal of an average of 140 g/km would lead to an increase in retail prices of 1200 Euros per vehicle. However, on the market the opposite development took place: car prices declined by 2.5% in 2010, by 0.6% in 2009 and by 3.1% in 2008[28]. Obviously, the development of retail prices are influenced by many other factors, including the recent financial crises, competition from outside Europe and changing consumer demands. Nevertheless, there are good reasons to assume that price increases in the future might also be lower than the current estimations predict.

5. Financial benefits to consumers of more stringent CO_2 standards

With a big part of households' budget dedicated to the purchase of fuel, more ambitious CO_2 standards would lower the costs of driving significantly through a reduction in fuel expenditures and therefore be of high benefit to consumers:

- The target of 95 g CO_2/km would equal a 27% improvement on the 130 g CO_2/km standard which manufacturers will need to meet as an average value for the fleet of new cars registered in the European Union in 2015.
- This new target results in a reduction in fuel consumption of approximately 1.52 litres/100km for gasoline and 1.32 litres/100 km for diesel driven cars[29].

[28] In addition, a study by the Institute for Applied Environmental Economics showed that ex-ante estimates of unit costs for the future are often too high as no attention is given to "normal innovation" such as economies of scale or unforeseen developments resulting in cost benefits (http://ec.europa.eu/environment/enveco/ex_post/pdf/transport.pdf). Finally, the catalytic converter technology provides another example that the automotive industry has been significantly overestimating the costs for new technology in the past (http://awsassets.panda.org/downloads/crywolf0404b.pdf).

[29] For these calculations, we used the emission factors calculated for petrol and diesel supplied at public refuelling stations as indicated in the 2011 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting (http://archive.defra.gov.uk/environment/business/reporting/pdf/110707-guidelines-ghg-conversion-factors.pdf): 2.6480 for Diesel (100% mineral diesel) and 2.3018 for petrol (100% mineral petrol).

a. Benefits to new car buyers and payback period for the higher expected purchase costs

Assuming that the average new car buyer holds the vehicle over a period of 5 years[30] and drives approximately 14,000 kilometres with a gasoline driven car and approximately 24,000 kilometres with a diesel driven car[31], the average European private motorist driving a *new* car would benefit from significant fuel savings per year. The specific results are highly sensitive to the fuel price *at the time of the purchase of the car*[32]. Results are therefore presented for a variety of fuel prices (see below).

The private motorist buying a new petrol car at *today's fuel prices* would benefit from fuel savings of approximately **344 Euros** per year. The average European citizen buying a new diesel vehicle at *today's fuel prices* would even benefit from fuel savings of approximately **465 Euros** per year. If fuel prices would increase as expected, the target of 95 g CO_2/km would even lead to more significant savings per year as displayed in Table 1.

---

[30] A study by McKinsey (Cost and potentials of greenhouse gas abatement in Germany, 2007: http://ccsl.iccip.net/costsandpotentials.pdf) assumes that in Germany, the first driver sells his car after a period of 4.5 years. The European Motor Vehicle Parc (http://www.acea.be/images/uploads/files/20100427_EU_Motor_Vehicles_in_Use_2008.pdf) also publishes the average holding car holding period for several countries: France 4.9 years (2008), Netherlands 6 years (2003) and Spain 6 years (2003).

[31] The European Automobile Manufacturer´s association indicates that the average annual distance travelled by a car in the EU is about 14000 km/year (http://www.acea.be/news/news_detail/vehicles_in_use/). However, the average distances travelled by diesel-engined passenger cars and petrol driven cars significantly differ in most Member States. The European Motor Vehicle Parc 2008 has published data on average kilometres driven for gasoline and diesel for several member states. In addition, both the sustainable energy authority of Ireland (http://www.cso.ie/) and the German Federal Statistical Office (https://www.destatis.de/EN/Publications/STATmagazin/Environment/2010_01/2010_01Consumption.html) provide data on the average distance travelled for private cars by type of fuel. As an average, we assume an average annual distance travelled by a petrol fuelled car of 12000 km/year and for a diesel fuelled car of 20.000 km/year. However, according to the German model TREMOD, average distance travelled depends on the age of the vehicle. We assume that a car has an approximately 20% higher average distance travelled within the first five years of ownership.

[32] The fuel price at the time of purchase of a car defines the fuel savings of the first year. For the calculation of the fuel savings per year during the remaining part of the holding period of the car, we assumed a net discount rate of zero as we assume that fuel cost increases will compensate for discounting (e.g. Deutsch, 2007; Hutton and Wilkie, 1980) as shown by the following data:

- As a discounting factor we presume a relevant market rate of money corresponding to consumers' best lending rate (the interest rate consumers would have to pay if they financed the fuel efficient investment). According to the European Central Bank, interest rates on new euro-dominated loans to households for consumption range from 6.31% (over one and up to five years initial rate fixation) to 7.95% (over five years initial rate fixation) (https://stats.ecb.europa.eu/stats/download/mir_pr_t04/mir_pr_t04/mir_pr_t04.pdf)
- In contrast, petrol prices have increased from 1.010 Euro in 2005 to 1.61492 Euro in 2012 (as of 28 May 2012) which represents an annual average increase of 8.6% and diesel prices have increased from 0.926 Euro in 2005 to 1.47039 in 2012 (as of 28 May 2012), which represents an annual average increase of 8.4% (http://ec.europa.eu/energy/publications/doc/2010_energy_transport_figures.pdf and (http://ec.europa.eu/energy/observatory/oil/bulletin_en.htm)

Table 1: Savings from 95 g CO_2/km standard for a buyer of a new car

Petrol			Diesel		
Petrol price (€/litre) at the time of purchase	Consumer savings per year	Payback period (year)	Diesel price (€/litre) at the time of purchase	Consumer savings per year	Payback period (year)
€ 1.61492[33]	€ 344	1.9 years	€ 1.47039[34]	€ 466	1.4 years
€ 1.80	€ 383	1.7 years	€ 1.80	€ 570	1.1 years
€ 2.00	€ 425	1.5 years	€ 2.00	€ 634	1.0 years
€ 2.20	€ 468	1.4 years	€ 2.20	€ 699	0.9 years
€ 2.40	€ 511	1.3 years	€ 2.40	€ 760	0.9 years

After a holding period of 5 years, the average vehicle is commonly sold at around a third of its original value[35]. Therefore, it is expected that approximately two thirds (i.e. 667 €[36]) of the higher initial purchase price has to be paid by the new car owner. The remaining part of the higher costs (one third or 333€) for meeting the CO_2/km standard can thus be passed on to the used car buyer.

The payback period for the share that the new car buyer has to pay for the initial higher purchase price of a car purchased at *current fuel prices* for meeting the CO_2/km standard is assumed to be approximately **1.9 years** for buyers of gasoline driven cars and approximately **1.4 years** for buyers of diesel driven cars[37], with significant fuel savings over the remaining holding period. When the car is purchased at a time when fuel costs are higher, consumers would be able to recoup their investment even within a shorter period of time. This analysis shows that car buyers see a net saving from the new standards relatively quickly at every fuel price scenario and well before they typically sell the vehicle.

This analysis is based on the assumption that the consumer holds the car for 5 years. For consumers who sell their cars sooner[38], the payback period is still likely to be shorter than the buyers' holding period of the car. Although those owners will see lower fuel savings in total, they will be able to pass on a higher amount of resale value to the second hand buyer.

---

33 Weighted average price (EU-27) of petrol (Euro-super 95) as of 28 May 2012 (http://ec.europa.eu/energy/observatory/oil/doc/prices/bulletin_with_taxes/2012_05_28_with_taxes_1606.pdf).

34 Weighted average price (EU-27) of diesel (automotive gas oil) of 1.47039 Euro (as of 28 May 2012) (http://ec.europa.eu/energy/observatory/oil/doc/prices/bulletin_with_taxes/2012_05_28_with_taxes_1606.pdf).

35 According to Kelley Blue Book research in 2010, an average vehicle in the United States even retains 32.6% of its original value after five years of ownership. We assume similar values for the European market.

36 This figure represents two thirds of the estimated additional manufacturing costs of approximately 1000 Euro for meeting the 95 g CO_2/km standard in 2020 relative to the baseline of 130 g CO_2/km as measured by the study of the International Council on Clean Transportation. The remaining part can be passed on to the second hand car buyer.

37 It is important to note that these calculations are based on average fuel prices. Results naturally largely differ between member states. In addition, we did not take account of any rebound effect which states that people who purchase more efficient cars tend to drive more on average.

38 There are consumer segments who sell the vehicle well before the 5-year average ownership period. For instance, a 2012 car survey by Which?, based on the feedback of 47,716 mostly private owners found that 52% owned the car for less than 3 years, 25% owned their car for less than 2 years, and 16% for less than 1 year. Precise data of consumers' holding periods of other member states are not available.

The biggest loss of value comes in the first year of a car's life, when depreciation is at its steepest. Nevertheless, it is expected that at least 70% of the initial purchase price can be passed on to the second-hand buyer after one year. Therefore, at today´s fuel prices, the payback period for a buyer of a new car who sells his petrol-driven or diesel-driven car after one year is approximately 10 months or 8 months, respectively. This shows that even those car buyers who sell their car after a very short period of time will see a net saving within their holding period.

The analysis is based on the average for all segments of the additional manufacturing costs for meeting the 95 g CO_2/km target in 2020 relative to the baseline of 130 g CO_2/km. However, as we have outlined above, the additional manufacturing costs for larger diesel driven cars are considerably higher (approximately 1500 Euros). But, according to data of the German Tremod model[39] and the UK Committee on Climate Change[40], larger cars also drive significantly more kilometres per year than smaller cars. The higher distance travelled per year will therefore translate to higher annual fuel savings, which in turn will result in similar payback times as calculated above.

In addition, consumers would also save money from tax differentials in those Member States where taxes for fuel efficient cars are lower[41].

b. Benefits to used car buyers and payback period of the higher expected purchase costs

A big share of new passenger cars is not purchased by private motorists but by firms. More specifically, 42% of all new passenger cars sold in European Union are purchased by companies[42], who sell them mostly to private motorists. In many countries of the European Union the used car volumes exceed the sales of new cars[43].

Assuming an average annual distance of the used car buyer of approximately 10,000 kilometres for a gasoline driven car and approximately 16,000 kilometres for a diesel driven car, the *average* European private motorist driving a *used* car would benefit from significant fuel savings per year. Again, the specific results are highly sensitive to the fuel price *at the time of the purchase of the car*. Results are therefore presented for a variety of fuel prices.

---

39 Aktualisierung "Daten- und Rechenmodell: Energieverbrauch und Schadstoff-emissionen des motorisierten Verkehrs in Deutschland 1960-2030": http://www.ifeu.de/verkehrundumwelt/pdf/IFEU%282012%29_TREMOD_Endbericht_FKZ%20363%2001%20370_120301.pdf.

40 Committee on Climate Change (2009): Meeting Carbon Budgets – the need for a step change. Progress report to Parliament Committee on Climate Change. http://downloads.theccc.org.uk/docs/21667%20CCC%20Executive%20Summary%20AW%20v4.pdf

41 For instance, in the UK, car tax varies from £0 to £475 (590 Euros) depending on CO_2 emissions, with a car emitting 120g/km paying only £30 (37 Euros) but one emitting 121g paying £100 (124 Euros).

42 Gutiérrez Puigarnau, E. and Van Ommeren, J. (2008) *Welfare Effects of Distortionary Company Car Taxation.* TI 2007-060/3, Tinbergen Institute Discussion Paper.

43 See Annex 8.

The private motorist buying a used petrol car at *today's fuel prices* would benefit from fuel savings of approximately **245 Euros** per year. The average European citizen buying a new diesel vehicle at *today's fuel prices* would even benefit from fuel savings of approximately **311 Euros** per year[44]. If fuel prices would increase as expected, the target of 95 g CO_2/km would even lead to more significant savings per year as displayed in Table 2.

Table 2: Savings from 95 g CO_2/km standard for a buyer of a used car

Petrol			Diesel		
Petrol price (€/litre) at the time of purchase	Consumer savings per year	Payback period (year)	Diesel price (€/litre) at the time of purchase	Consumer savings per year	Payback period (year)
€ 1.61492[45]	€ 245	1.4 years	€ 1.47039[46]	€ 311	1.1 years
€ 1.80	€ 274	1.3 years	€ 1.80	€ 380	0.9 years
€ 2.00	€ 304	1.2 years	€ 2.00	€ 422	0.8 years
€ 2.20	€ 334	1.1 years	€ 2.20	€ 465	0.8 years
€ 2.40	€ 365	1.0 years	€ 2.40	€ 507	0.7 years

As described above, approximately one third of the higher costs for meeting the CO_2/km standard needs to be paid by the driver who buys a 5-year old second-hand vehicle. The payback period for the share that the used car buyer has to pay for the potential higher purchase price of a car purchased at *current fuel prices* of a maximum of 333 Euro[47] for meeting the CO2/km standard is assumed to be approximately **1.4 years** for buyers of used gasoline driven cars and approximately **1.1 years** for buyers of used diesel driven cars, with significant fuel savings over the remaining holding period. When the car is purchased at a time when fuel costs are higher, consumers would be able to recoup their investment within a shorter period of time. This analysis show that used car buyers also see a net saving from the new standards relatively quickly at every fuel price scenario, and well before they typically sell the vehicle.

To sum up, at today's fuel prices, the payback period for the share that the new car buyer has to pay for the potential higher purchase price is below 1.9 years for the average buyer of a new gasoline driven car and below 1.4 years for the average buyer of a new diesel driven car. The payback period for the share that the used car buyer has to pay for the potential higher purchase price is below 1.4 years for the average buyer of a used gasoline driven car and below 1.1 years for the average buyer of a used diesel driven car. Most consumers would therefore benefit from this emission target as they would see a net saving over the average period of ownership of the vehicle.

---

[44] The fuel price at the time of purchase of a car defines the fuel savings of the first year. For the calculation of the fuel savings per year during the remaining part of the holding period of the car, we assumed a net discount rate of zero as we assume that fuel cost increases will compensate for discounting.

[45] Weighted average price (EU-27) of petrol (Euro-super 95) as of 28 May 2012 (http://ec.europa.eu/energy/observatory/oil/doc/prices/bulletin_with_taxes/2012_05_28_with_taxes_1606.pdf).

[46] Weighted average price (EU-27) of diesel (automotive gas oil) of 1.47039 Euros (as of 28 May 2012) (http://ec.europa.eu/energy/observatory/oil/doc/prices/bulletin_with_taxes/2012_05_28_with_taxes_1606.pdf).

[47] This figure represents one third of the estimated additional manufacturing costs of approximately 1000 Euros for meeting the 95 g CO_2/km standard in 2020 relative to the baseline of 130 g CO_2 as measured by the study of the International Council on Clean Transportation.

6. Our key recommendations

- **Achieving the average CO_2 emissions limit value of 95 g CO_2/km by 2020 solely by technical improvements**

We support the goal of limiting emissions to no more than 95 g CO_2 per kilometre in 2020 as already proposed in EU Regulation 443/2009. We support achieving the average CO_2 emissions limit value of 95 g CO_2/km by 2020 solely by technical improvements. Allowing manufacturers to prove the achievement of the emissions target through additional measures such as training consumers on eco-driving would shift the responsibility from manufacturers to consumers to provide more sustainable cars and would thereby water down the ambition level of the savings. Such savings would also be much harder to measure and verify. Technological innovations and improvement of motor vehicle technology are key in maintaining manufacturers' competitiveness in the long term. In general, it is crucial that all kinds of improvements required are measurable, accountable and can be easily monitored.

- **Not introducing a phase-in period of the targets and not including super-credits**

It is fundamental that targets should not be phased in from 2020 onwards but that the average emissions of 95 g CO_2/km should be fully achieved for the entire new car fleet already by that target year. A phase-in period would only lead to a weakening of the target and delaying the benefits to consumers.

In addition, we do not support the further inclusion of super-credits[48], which would take the form of a multiplier where vehicles with emissions lower than a certain amount of CO_2/km would count as more than one vehicle in the manufacturer's fleet average. In reality, that could mean that an electric vehicle with zero emissions at the tailpipe[49] would be able to offset several cars with high emissions that are not meeting the targets. We believe that this could lead to a situation where some manufacturers would only achieve a very small amount of improvements in the CO_2 reductions for their conventionally fuelled vehicles. Therefore, such a system would undermine the monetary benefits for the average consumers as the possible savings as outlined above could not be achieved. Even though we support the provision of incentives to manufacturers in order to support them to develop radically new technologies which will be fundamental in the long term to further achieve CO_2 reductions, we believe that this should not be done through this specific regulation as this would undermine the overall CO_2 savings targets of this regulation. We believe that the EU has other instruments in place to foster research and to support to bridge new technologies into the market.

---

[48] In the current regulation, each new passenger cars with CO_2 emissions lower than 50 g/km will count as 3.5 cars in 2012 and 2013, 2.5 cars in 2014, 1.5 cars in 2015 and 1 car from 2016 onwards.

[49] At the moment, CO_2 standards do only account for tailpipe emissions in g CO_2/km. Therefore, indirect CO_2 emissions from electricity generation are not taken into account when measuring the cars' emissions.

- **Setting a medium and long-term preliminary limit value today to be achieved by 2025 and 2030 respectively**

In order to protect consumers from steady increases in fuel prices, and to reduce the dependence on foreign oil imports and protect consumers from air quality pollution, there is a clear need to set a medium-term and long-term objective limit values to be achieved by 2025 and 2030. We suggest setting those targets at the earliest stage possible as this will ensure manufacturers have sufficient lead-time. Sufficient lead time is necessary to ensure that technology developments come about in the most economical way: costs passed on to car buyers are likely to be higher if technology developments are rushed.

A recent research project financed by the European Commission under the Seventh Framework Programme (FP7)[50] has identified that a CO_2 emission target of 70-90 g CO_2/km by 2020 and a 50-60 g CO_2/km level by 2030 is both technically possible and economically feasible. Improvement options are either implementing all efficiency technologies which are available today in one model or by combining available efficiency technologies in conventional cars and introducing new technologies including battery and fuel cell electrical vehicles into the market. The latter will be necessary in order to reach the goal of the White Book on Transport of halving the use of conventionally fuelled cars in urban transport by 2030, to pave the way towards achieving the goal of phasing out conventionally fuelled cars from cities by 2050 and to achieve a 60% or 70% reduction in CO_2 emissions by 2050 with respect to 1990 or 2008 levels, respectively[51]. We consider the phasing out of conventionally fuelled cars from cities as particular important as this would lead to significant health benefits for consumers. Conventional fuel combustion produces gases and particles that have a significant impact on consumers' health. For instance, emissions from diesel burning engines significantly increase the risk of allergic and asthmatic reactions[52]. It was recently announced by the World Health Organisation that exhausts from diesel engines even can cause cancer[53].

In addition, emissions from conventionally fuelled vehicles are responsible for a high number of deaths and hospitalization from lung diseases. According to estimations by the World Health Organisation (WHO), current levels of air pollution in Europe are responsible for 40.000 – 130,000 premature deaths a year in urban adults[54]. An introduction of electrical vehicles on a large scale would be able to significantly lower the health risks caused by cars. Electrical vehicles do not emit any harmful particles from the tailpipe as the electricity used is usually generated further from population centres. In addition, phasing out conventionally fuelled vehicles from cities will also help reducing noise pollution from traffic, which is also considered to be significant driver of health problems.

---

50 GHG-TransPoRD - Reducing greenhouse-gas emissions of transport beyond 2020, project led by the Fraunhofer Institute Systems and Innovation Research: http://www.ghg-transpord.eu/ghg-transpord/index.php.

51 EU Commission (2011): White Paper - Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM(2011) 144final, http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm.

52 European Research Headlines: http://ec.europa.eu/research/headlines/news/article_04_05_18_en.html

53 http://www.reuters.com/article/2012/06/12/us-cancer-diesel-who-idUSBRE85B0ZN20120612.

54 World Health Organisation: http://www.euro.who.int/__data/assets/pdf_file/0003/87573/E72015.pdf

In order to provide incentives for manufacturers to invest into research and development of such new technologies, we therefore support setting ambitious levels of long-term CO_2 emission targets for new passenger cars for 2025 and 2030 already today. By adopting an ambitious strategy, the European Commission will provide an impetus for development of technology, thereby incentivising the industry to take the technological lead and thereby stay competitive at a global level. More precisely, we support establishing an indicative ambitious target of 60-70 g CO_2/km by 2025 and of 50-60 g CO_2/km by 2030, subject to evaluation of the cost implications for consumers and examining consumer acceptance.

- **Setting test cycles and test procedures to present real-world fuel-consumption**

Members of the European Consumer Organisations ANEC and BEUC have measured more realistic fuel consumption values of up to 47% higher than the figures indicated by the manufacturers[55]. A study by the International Council on Clean Transportation also found that the gap between type-approval and "real-world" fuel consumption/CO_2 values increased from about 8% in 2001 to 21% today. One explanation to this development refers to the fact that the New European Driving Cycle (NEDC) which is used to measure the CO_2 emissions by cars does not represent realistic consumer driving conditions, such as it does not include a motorway test. In addition, existing tolerances and loopholes in the determination of road load, vehicle weight, and laboratory test temperatures are commonly used. For instance, manufacturers can turn off power-sapping equipment such as air-conditioning when testing the vehicle.

This is a significant issue which causes harm to European consumers. Consumers are misled when they are making their purchase decision mainly on the information of currently available fuel consumption values. The full benefits of higher emission standards are not realised by consumers, i.e. the fuel consumption reductions achieved in laboratory conditions are not translated into monetary benefits for consumers. As a result, distrust towards the car industry increases as consumers feel that the fuel consumption indicated on the label does not correspond to actual fuel consumption of the car and their willingness to pay for the additional fuel efficiency might be reduced.

The test cycle and test procedure therefore needs a thorough overhaul. We support in principle the development of a better, harmonised testing standard. This is the objective of a World Light Duty test procedure in the framework of the United Nations Economic Commission for Europe (UNECE) which is intended to enable consumers to get a more realistic picture on fuel consumption which is badly needed. In order to support the introduction of the new test procedure, it is important that these new test procedures represent truly real world conditions and should not allow manufacturers any flexibility and loopholes in the test procedures.

Loopholes in testing should be closed as a matter of urgency. Therefore, we would like to stress that it will be fundamental that the process of developing a better, harmonised testing standard is completed as swiftly as possible. If this process is delayed, we urge the European Commission to take own actions ahead of time, if necessary and appropriate.

---

[55] Que Choisir magazine, February 2011: http://www.quechoisir.org/auto/achat-vente-location/enquete-consommation-des-voitures-les-constructeurs-minimisent), Test-Aankoop/Test-Achats magazine, July 2008: http://www.test-aankoop.be/Auto-en-vervoer/Auto-s-en-accessoires/Stadsauto-s-s530123.htm

- **Maintaining excess emissions premiums at vehicle high level**

The emission premiums, which are imposed in case the average specific emissions of CO_2 exceed the specific emission targets of the manufacturer or the pool of manufactures, must be sufficient to ensure compliance. The costs for failing to meet the target must be higher than the costs for developing the necessary technical improvements. Therefore, BEUC supports maintaining excess emissions premiums at €95/g CO_2/vehicle.

- **Setting the parameters for determining the limit values to provide an incentive to cut down on mass**

By making use of mass as the parameter for determining the limit values, less incentive is provided to manufacturers to invest in light-weighting which is seen as a very efficient technical option for reducing CO_2 emissions from passenger cars. Research has also shown that reduced mass has the biggest potential for fuel consumption reductions[56]. Using mass as the parameter might even have the unintended negative consequence that manufacturers increase the mass of the cars in order to improve compliance.

There are many technologies nowadays available[57] that can reduce vehicle mass by up to 30% without any compromise in vehicle size or function[58].

A report[59] showed that by making use of footprint as the parameter for determining the limit values, the necessary CO_2 reductions can be achieved in a more economical way.[60] Therefore, costs passed on to car buyers are likely to be lower than if mass is used as the parameter for determining the limit values. In addition, research has shown that size-based standards "may reduce vehicle and pedestrian crash fatalities compared to mass-based standards". A report by Dynamic Research Inc. (DRI) which served as a basis for US regulation concluded that mass reduction would be expected to decrease the overall number of fatalities. Other studies have also shown that reduced car mass reduces the total driver fatality risk[61]. This is mainly because in car crashes, higher mass of one car is more risky to the occupants of the other vehicle. The isolated effect of the size of a vehicle, on the other hand is shown to have no adverse effect on the occupants of the other vehicle. In addition, mass reduction will be an important measure for further CO_2 reductions beyond 2020.

We therefore suggest implementing a footprint-based system which encourages manufacturers to invest in mass reductions.

---

56 Assessment of technologies for improving light-duty vehicle fuel economy (2011, p. 116): http://www.nap.edu/openbook.php?record_id=12924&page=116

57 Including component-level lightweight material substitution (high-strength steel, aluminium, and composites) and using more comprehensive mass-optimized vehicle structural designs that integrate parts and employ more advanced lightweight bonding and forming techniques.

58 German, J. and N. Lutsey (2010). "Size or Mass?: The Technical Rationale for Selecting Size as an Attribute for Vehicle Efficiency Standards." International Council on Clean Transportation.

59 Institute for European Environmental Policy/ TNO (2008): Footprint as utility parameter. A technical assessment of the possibility of using footprint as the utility parameter for regulating passenger car CO2 emissions in the EU. http://www.transportenvironment.org/sites/default/files/media/2008_07_02_ieep_tno_ce_footprint_paper_summary.pdf.

60 In addition, the study commissioned by the European Commission also concludes that "if a separate cost curve would have been constructed for footprint, it would have resulted in lower cost of light weighting which is more effective for footprint. This result would therefore be a somewhat lower average cost for footprint" (http://ec.europa.eu/clima/events/0048/meeting_summary_en.pdf, p. 1).

61 Evans (2004): Chapter 4 Vehicle Mass and Size in Traffic Safety: http://www.scienceservingsociety.com/p/154.pdf.

- **Reducing emissions by heavier cars proportionally more than by lighter cars**

Each manufacturer is given a specific emissions target based on the average vehicle mass sold. Therefore, according to the current regulation, producers of heavier cars are allowed to manufacture vehicles with higher average CO_2 emissions than manufacturers of lighter vehicles. In addition, manufacturers are still allowed to produce cars with emissions above the limit value curve provided these are balanced by vehicles with emissions below the limit value curve. Data shows that heavier vehicle segments have by far the highest average CO_2 emissions. For instance, whereas in 2010 the average CO_2 emissions from new passenger cars sold in the EU amounted to 140.3 g CO_2/km, the average CO_2 emissions from cars belonging to the luxury and SUV/Off-road segment amounted to approximately 228 and 182 g CO_2/km, respectively[62].

The contribution of heavier vehicles in comparison to lighter ones is conditioned by the slope of the limit value curve. If the value curve is set at a flatter slope below 100%, the reduction targets do not rise so rapidly with increased weight but will still be higher for heavier vehicles than for lighter cars. The steeper the value curve, the less effort is needed from manufacturers of heavier cars to reduce CO_2 emissions. We support to set the limit value curve at a much lower level in order to require emissions from heavier cars to be reduced more than those from lighter cars.

We believe that setting the slope in such a way is justifiable from a social point of view. First of all, vehicle weight is highly correlated with vehicle size and segment. Therefore, in general lighter cars tend to be of smaller size and are therefore sold at a much lower price level than heavier cars. Although there are obviously exceptions to the weight/price relationship, households with lower income generally purchase less-expensive, lighter vehicles.

Tighter emission standards will imply anyway a higher relative increase on the purchase price of smaller, lighter cars than on the purchase price of larger and heavier cars[63]. The additional manufacturing costs for reaching the CO_2 reductions for larger, heavier vehicles only form a small part of the entire manufacturing costs. Therefore, the price increase on heavier cars is thus much smaller in relative terms. This is of particular importance as buyers of lighter cars form the largest proportion in the market. More than 70% of all new passenger cars sold in the EU-27 belong either to the lower medium, small or mini segment[64]. Almost 40% of all new registered cars belong even to the mini or small car segment whereas only about 10% of all new registered cars are considered as being part of the luxury or SUV/off-road segment[65]. By setting the value curve at a flat slope, the percentage price increase on lighter cars will therefore be slightly reduced which helps to limit the burden on low income consumers to some extent.

We therefore support to continue setting the slope of the limit value curve at 60% using 2009 baseline data. Unfortunately, the study commissioned by the European Commission did not assess slopes below 60%, but it appears that these would be even more socially equitable.

---

62 See Annex 9.

63 For instance, an increase of 900 Euro on the initial purchase price of 10.000 Euro implies a much higher relative price increase (+9%) than an increase of 1500 Euro on the initial purchase price of 30.000 Euro (+5%).

64 Example vehicles for the mini car segment are the Smart fortwo, Fiat Panda, Citroen C1. Example vehicles for the small car segment are the VW Polo, Mini Cooper, Fiat Punto. Example vehicles for the lower medium car segment are the VW Gold, Audi A3, Volvo C30, Alfa Romeo 147.

65 See Annex 10.

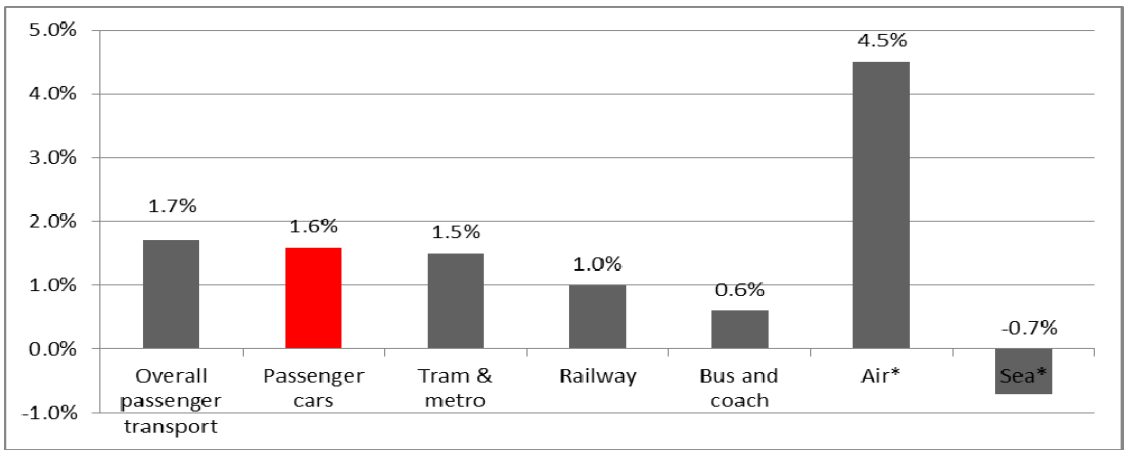
Finally, we also feel that setting the current slope of the limit value curve at 60% using 2009 baseline data is also of high benefit to drivers of heavy vehicles. Data from Germany[66] and the UK[67] has shown that cars which belong in the upper segments of the markets tend to drive further distances. Due to the higher kilometres travelled by those cars, the average driver of such a car would benefit from higher fuel savings which is expected to more than outweigh the possible increases in purchase price. This also helps to improve the cost effectiveness of the CO_2 reductions. Finally, in light of the fact that most cars in those upper segments are company owned cars[68], the private motorist will have to bear less of the higher costs of compliance of more heavy cars.

[66] Aktualisierung "Daten- und Rechenmodell: Energieverbrauch und Schadstoff-emissionen des motorisierten Verkehrs in Deutschland 1960-2030": http://www.ifeu.de/verkehrundumwelt/pdf/IFEU%282012%29_TREMOD_Endbericht_FKZ%20363%2001%20370_120301.pdf

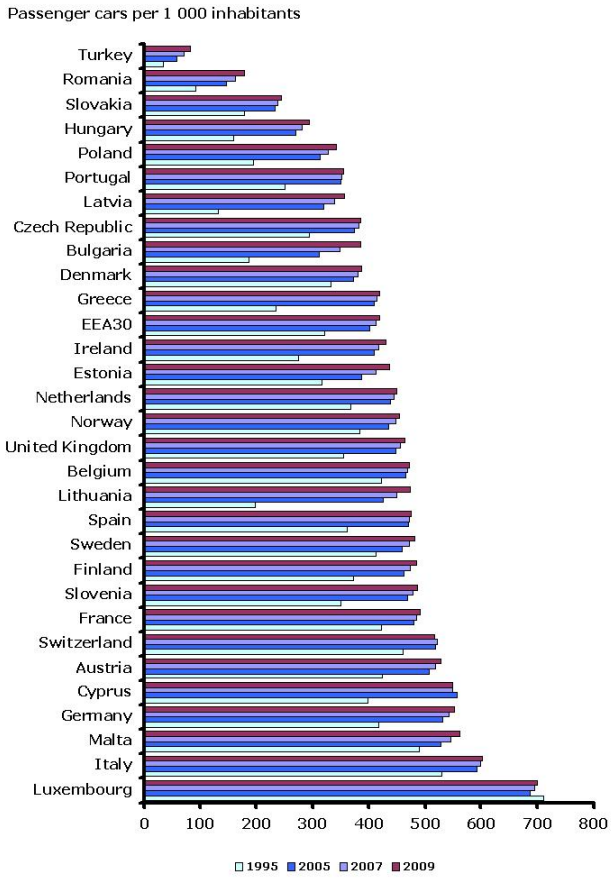
[67] Committee on Climate Change (2009): Meeting Carbon Budgets – the need for a step change. Progress report to Parliament Committee on Climate Change. http://downloads.theccc.org.uk/docs/21667%20CCC%20Executive%20Summary%20AW%20v4.pdf

[68] More than 60% of all medium, upper medium and large cars are company cars, see: http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_papers/taxation_paper_22_en.pdf

Annex 1: Increase in passenger travel kilometres in the EU27 from 1995 - 2007[69]

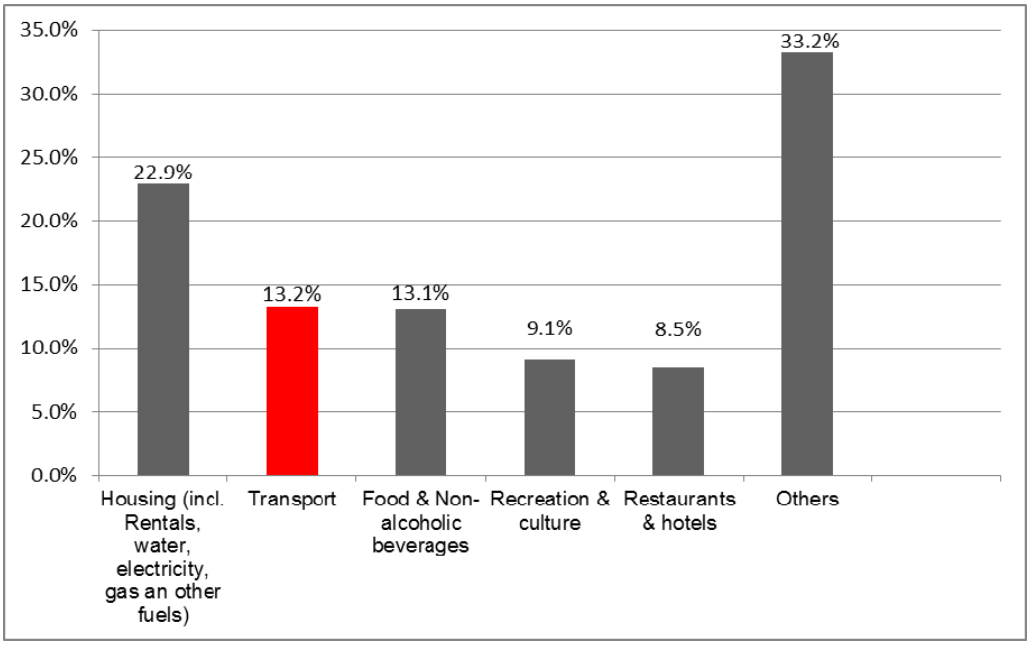


Annex 2: Development of number of passenger cars per 1000 inhabitants between 1995-2009

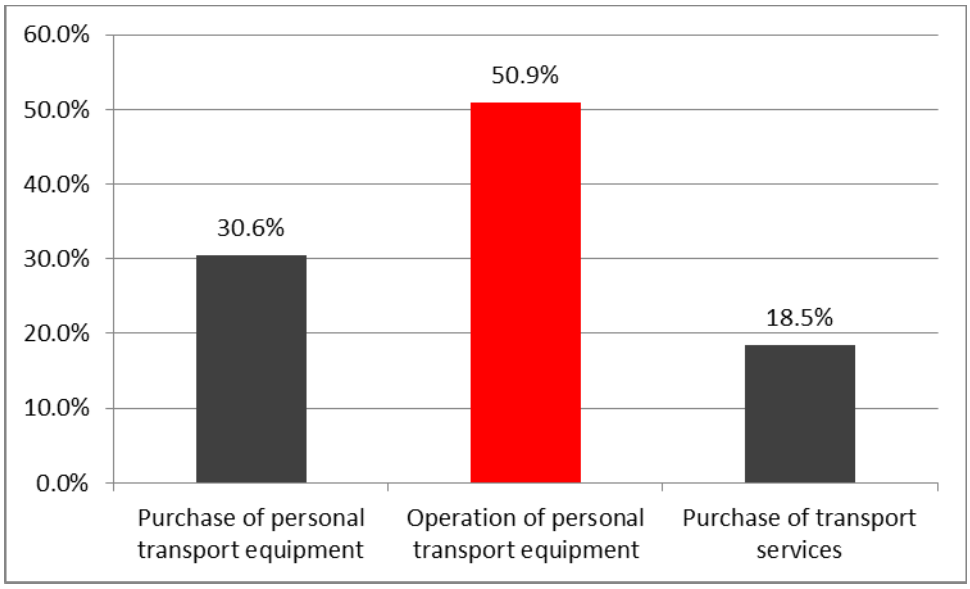


[69] DG for Energy and Transport (2009): EU Energy and Transport in Figures, Statistical Pocketbook 2009, European Commission, Brussels.

Annex 3: Share of total household expenditure[70]



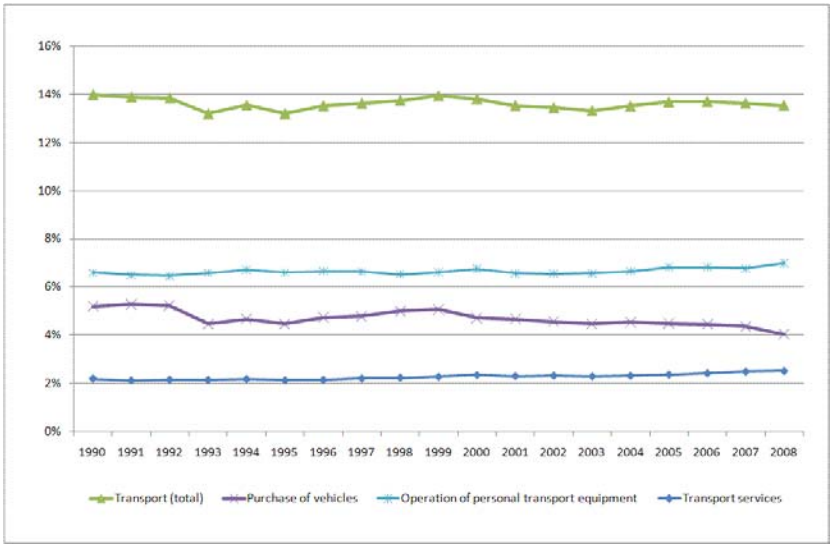
Annex 4: Share of total household expenditure on transport (Source: Eurostat, 2009)[71]



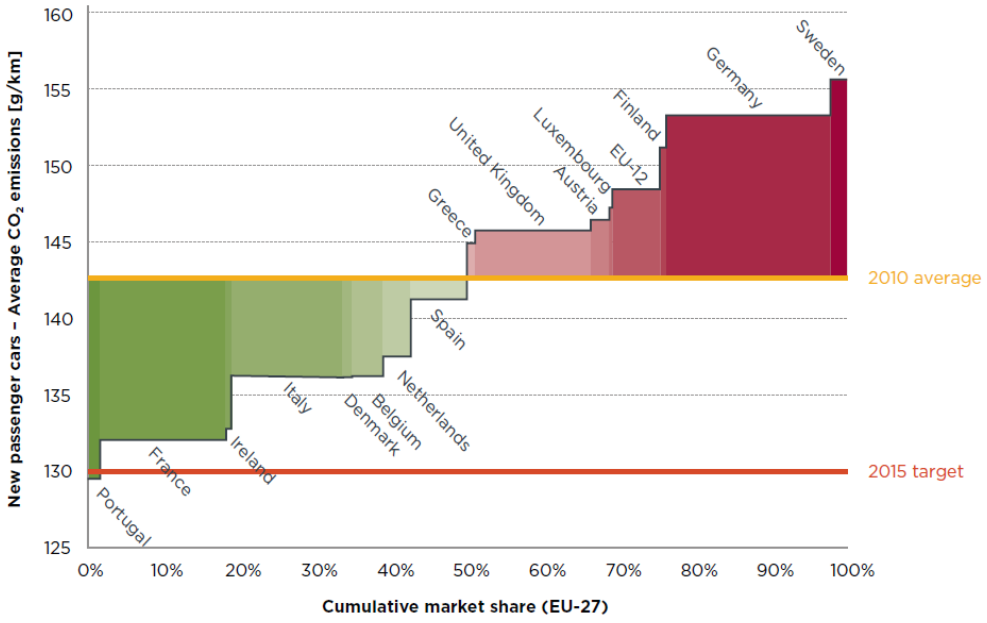
[70] Household expenditure for transport include expenditures for purchase of personal transport equipment, expenditures for the operation of personal transport equipment (e.g. maintenance costs and fuel) and the purchase of transport services (including bus, train, plane tickets) ; Eurostat (http://ec.europa.eu/transport/publications/statistics/doc/2011/pb_2011_21_general_web.xls)

[71] Eurostat (2011): Final consumption expenditure of households by consumption purpose. (http://ec.europa.eu/transport/publications/statistics/doc/2011/pb_2011_21_general_web.xls)

Annex 5: Trends in share of household expenditure on transport (percentage of total spending, EEA-32)[72]



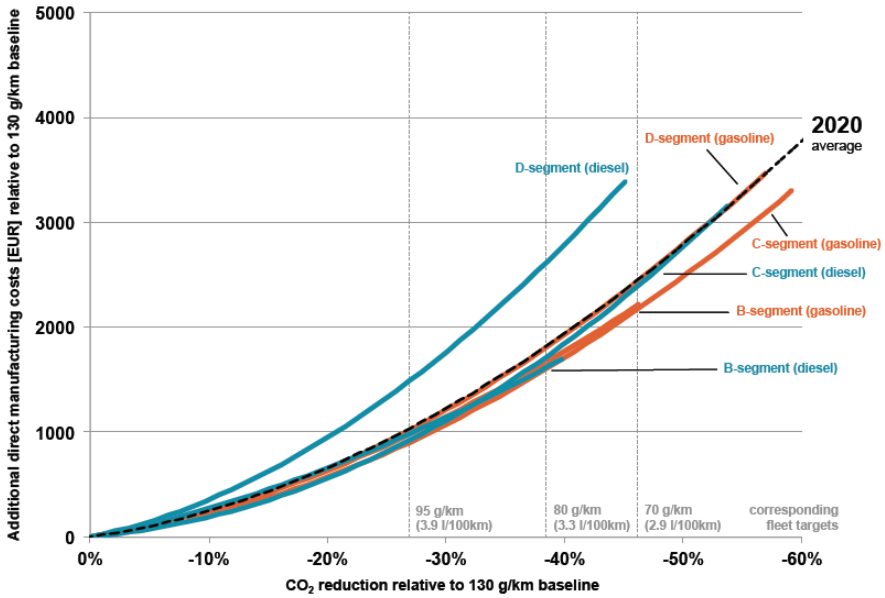
Annex 6: New passenger cars: CO2 emissions and market share by Member State (2010)[73]



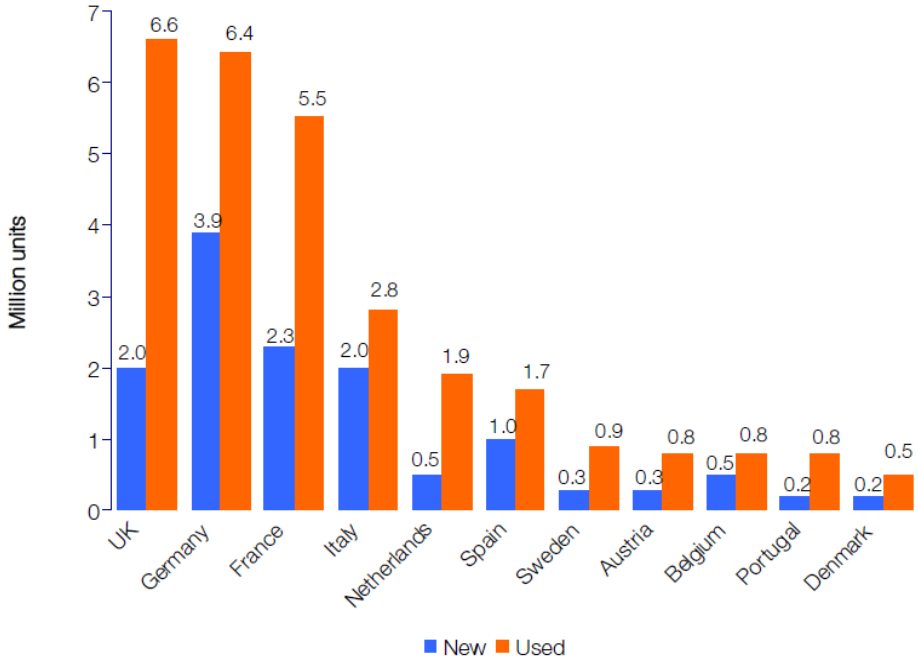
[72] European Environment Agency (2011): Trends in share of household expenditure on transport: http://www.eea.europa.eu/data-and-maps/indicators/expenditure-on-personal-mobility-2/assessment. As regards fuel and vehicle costs, to give the UK as an example, the UK Office of National Statistics Family Spending survey 2011 shows that in 2010, as an average across all households, that expenditure on petrol, diesel and motor oils and expenditure on vehicles accounted for 4.6% (roughly the same as spending on energy bills, and an increase on its share of 3.9% in 2005-06) and 4.1% of weekly household expenditure respectively. Further, between the survey and the first quarter of 2012, UK inflation for fuel costs has significantly exceeded the UK consumer price index.

[73] ICCT (2011): European Vehicle Market Statistics (http://www.theicct.org/sites/default/files/publications/Pocketbook_LowRes_withNotes-1.pdf).

Annex 7: Cost curves for the EU market – all vehicle segments[74]



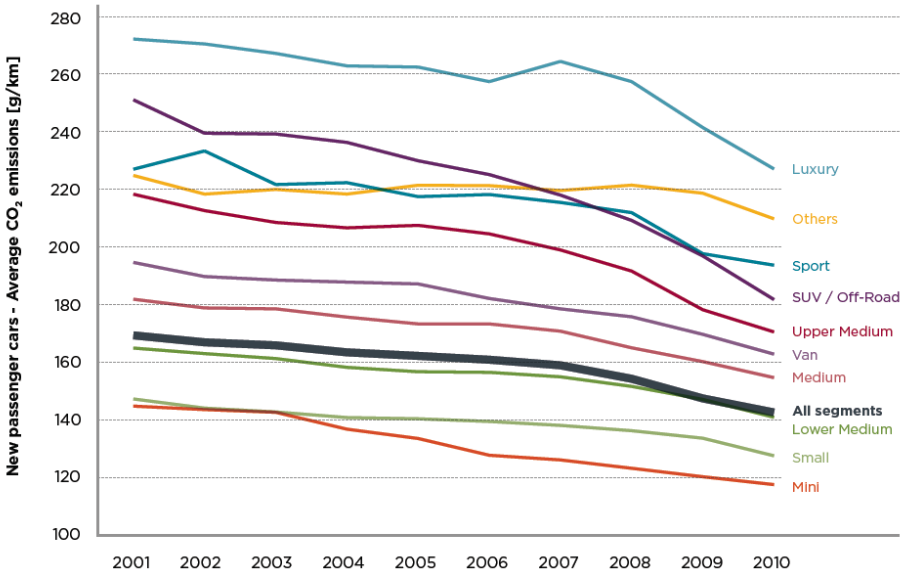
Annex 8: Principal European markets new and used car sales - 2010[75]



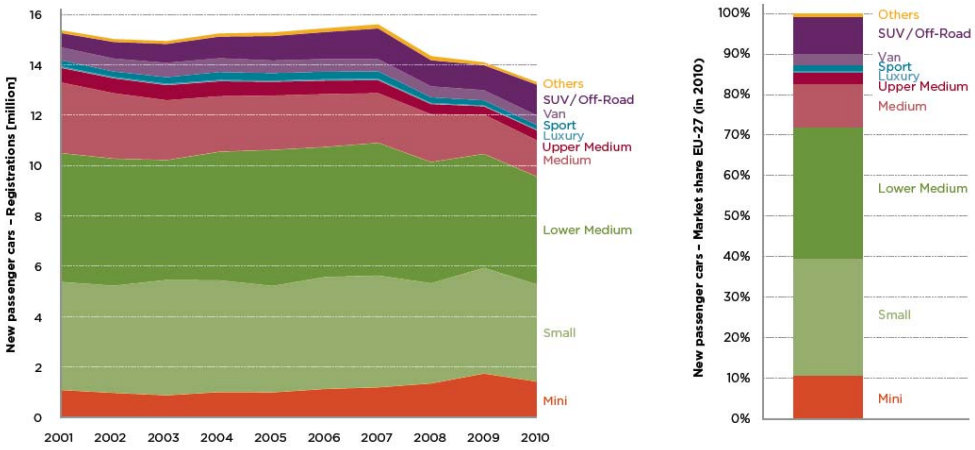
[74] ICCT (2012): EU vehicle technology study: Background and results of Phase I: http://www.theicct.org/sites/default/files/ICCT_Apr27_ICCT_JG.pdf.

[75] http://www.buckingham.ac.uk/wp-content/uploads/2010/11/pnc-European-Used-Car-Market-Report-2012.pdf.

Annex 9: CO_2 emissions by vehicle segment



Annex 10: New passenger cars: Registrations by vehicle segment[76]



[76] Campestrini, M. and Mock, P. (2011): European Vehicle Market Statistics: http://www.theicct.org/sites/default/files/publications/Pocketbook_LowRes_withNotes-1.pdf.