Europe’s Steps to Reduce CO$_2$ Emissions:
140 g/km, 120 g/km

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Focal points:

Trend/development of CO2 emissions from traffic and mileage show continuous increase.

The specification of a CO2 reduction target of 140 g CO2/km for passenger cars is a contribution to reducing this increase, with a move towards 120 g/km as a further milestone.

EU strategy is based on three pillars.

Commitment by automobile industry is the key one.

Current status and activities regarding a move towards a 120 g/km target are outlined.
Trend of mileage in Germany
- Road -

- gasoline LDV
- gasoline w/o cat.
- diesel LDV
- others: diesel/gasoline

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Around 60 million passenger cars, goods vehicles, buses and two-wheel motor vehicles are now registered in Germany alone.

Mileage totals around 650 billion km per year. By 2020, it will increase by a further 150 billion.

The aspect of environmental compatibility plays a crucial role. Energy consumption must be minimised to protect resources.

Today’s conventional drives, diesel and gasoline engines, have been through a long development process, achieving considerable success with regard to improving performance, comfort, consumption and emissions.

Stringent requirements for exhaust gas emissions so that a sufficiently good air quality can be safeguarded despite increasing traffic levels. However, in particular with regard to energy consumption the situation is unsatisfactory. There is a target conflict (exhaust gas optimisation is not equal to consumption optimisation!)

At present there is a clear trend in particular against the background of reducing fuel consumption in the whole of Europe: the share of gasoline engines in passenger cars is decreasing in favour of diesel engines!

In Germany, around 50% of newly registered passenger cars now have diesel engines. The mileage share of these diesel-powered vehicles will increase correspondingly in future.

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CO₂ emissions - means of transport

Jahr

Road

Air

Water

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Contribution of road traffic to traffic-related CO2 emissions remains dominant as before.

Special measures are needed here and have a particularly strong impact.

Reducing CO2 emissions from vehicles is essential.
European strategy on reducing CO$_2$ emissions from passenger cars

• Pillar I:
  Voluntary agreement of automobile industry to reduce fuel consumption and CO$_2$ emissions, including monitoring

• Pillar II:
  Fiscal instruments

• Pillar III:
  Consumer information

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The EU strategy on reducing CO2 emissions from passenger cars is based on three pillars:

1. Voluntary commitment: on 27 July 1998 the automobile industry committed itself vis-à-vis the Commission to reducing average CO2 emissions from newly registered passenger cars to 140 g CO2/km by 2008 (corresponds to approx. 6 l/100 km for gasoline and approx. 5.3 l/100 km for diesel). The Environment Council approved this commitment on 6 October 1998. Furthermore, a review for a move towards 120 g CO2/100 km by 2012 is provided for (corresponds to approx. 5.1 l/100 km for gasoline, approx. 4.6 l/100 km for diesel).

The Japanese (JAMA) and Korean (KAMA) automobile industries have committed themselves to reaching the goal of 140g CO2/km by 2009.

This pillar bears the main weight of the European Commission’s strategy.

2. The strategy also prescribes the possibility of using fiscal measures to have a steering effect. This is in agreement with linking the vehicle tax to CO2 as prescribed in the coalition agreement instead of the current engine capacity link.

3. The European directive on consumer information and fuel consumption is the third pillar.
ACEA’s commitment

- 1998: ACEA commits to achieve a target of 140 g CO$_2$/km by 2008
- Average CO$_2$ reduction of 25% compared to 1995
- Some members will introduce in the EU market, not later than 2000, models emitting 120 g CO$_2$/km or less
- For 2003 ACEA considers an estimated target of 165-170 g CO$_2$/km to be appropriate
- Review in 2003
In 1998, the ACEA committed itself to a target of 140 g/km by 2008.

In total this means a specific CO2 reduction of 25% based on emissions from vehicles with model year 1995: 186 g CO2/km.

In addition, a commitment was made that not later than 2000, vehicles with a maximum CO2 emission of 120 g/km would also be on the market.

These vehicles have barely introduced to the market to date.

A CO2 value of 165-170 g/km was aimed at as an interim target for 2003. The actual value was 163 g/km, so it is possible to say that the commitment has been adhered to up to now.

This commitment also provides for a review in the year 2003 for a move towards a 120 g/km target. Unfortunately the Commission is only working on this now.
Current status

• In 2003: average CO₂ emissions of new vehicles
  163 g/km for ACEA, 172 g/km for JAMA und
  179 g/km for KAMA.

• Compared to 1995, reduction of
  – 22 g/km or 11.9 % for ACEA
  – 24 g/km or 12.2 % for JAMA
  – 18 g/km or 9.1 % for KAMA
The Commission publishes an annual report on the development of CO2 emissions.

The most recently published report was from June 2005 (5th annual report). It deals with the development up to 2003.

It shows that the ACEA fleet average was 163 g CO2 /km. JAMA: 172 g/km; KAMA: 179 g/km. These vehicles have higher emissions, as in previous years.

The JAMA development contains the highest reduction quotas in comparison.

The reasons why there are differences between the manufacturers are for example the composition of the vehicles types on offer (from small cars to SUV) and the share of vehicles with diesel engines (Japan started with diesel later than the EU).
ACEA average CO$_2$ emissions of new passenger cars in EU-15

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Development as an average value of all vehicles (diesel and gasoline):

It shows, on the one hand, a continuous decline in CO2 emissions.

However, the decline as indicated by the straight line is scarcely sufficient to achieve the target of 120 g/km in 2010 (original target of the Commission).

According to this trend it will not be possible to achieve the goal of 140 g CO2/km in 2008 either without further measures.

This goal cannot be reached without intensified efforts.
Diesel - gasoline

CO₂ emission of new passenger cars in EU-15

2003 Indicative Target Range: 165 g/km to 170 g/km
2008 Target: 140 g/km
Development of CO2 emissions according to type of engine: diesel and gasoline

Success with diesel is clearly greater (-22 g/km as compared with -17 g/km for gasoline.) The specific emission from diesel-powered vehicles is considerably lower, which ultimately was used by the industry as a selling point for diesel. The potential for reducing consumption with diesel as compared with gasoline was decidedly greater in the past. This remains the case today.

However, the specific advantages of diesel are accompanied by the known disadvantages. The greater efficiency of diesel engines is today still countered by the better exhaust gas emissions of gasoline engines. However, for the environment it is not possible to set CO2 off against nitrogen oxide or particulate matter.

It is easier to comply with the CO2 reduction targets with diesel engines than with gasoline engines. However, the target of 140 g/km could not be reached even if the diesel share were to be increased to 100%. The level for 2003 would be around 154 g/km. Such a high diesel share would also not be desirable.

In short: the target can only be achieved through additional efforts.
ACEA’s fleet composition acc. to CO₂ categories (% share of total registrations) in 1995 and 2002

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Dividing vehicles into groups according to CO2 emissions shows a clear shift from vehicles with 160-250 g to vehicles with 120-180 g between 1995 and 2002.

The target is far from being reached:

In 2002 the group of vehicles with 140 g was barely $\frac{1}{4}$ of new cars, the share of vehicles up to 120 g/km was a mere 5%.

A slight increase in the group of vehicles with 301-350 g CO2/km can be seen. We must monitor this development closely.
Registration of new passenger cars in Germany

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The impacts in Germany regarding the share of passenger cars with diesel and with gasoline engines due to CO2 requirements show a clear trend. While the share of gasoline-powered cars is decreasing, the share of diesel-powered cars has increased considerably. The 50% point of intersection has almost been reached. The share of diesel-powered cars exceeded 50% several years ago in other EU Member States (Austria, Belgium). On 1 January 2006 almost every second new passenger car had been fitted with a diesel engine, the total share is currently around 22%. This is leading to air quality problems.

In comparison: in the USA, in 2002 less than one percent of passenger cars and light goods vehicles sold were diesel-powered. However, in the US too, automobile manufacturers are currently very active in promoting the fuel-efficient and clean diesel alternative, in particular on the booming market of large, high performance vehicles. Nevertheless, the outdated image of loud, sooty diesel engines still prevails in the USA. This is counterproductive with regard to CO2 emissions.
ECCP WG II approach
European climate change programme, working group II

- Vehicle technology
- Alternative fossil fuels
- Taxation
- Energy labelling
- Fuel efficient driving
- Air conditioning systems
- Vehicle and engine resistance factors, including tyres
- Public procurement
- Biofuels
- Inclusion of N₁ vehicles

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The road to 120 g CO2/km:

For the further development of CO2 reduction, the Commission has set up a working group in the framework of the ECCP to quantify possible measures.

As in the past, it can be assumed that the greatest impacts can be achieved through technical measures on vehicles. These measures include engine optimisation, i.e. increasing injection pressure even further for diesel engines or supercharging (e.g. turbo) and downsizing, i.e. small, highly supercharged engines or downsizing for vehicle weight reduction.

The use of biofuels, more CO2-oriented vehicle tax systems, improved consumer information and driver training regarding fuel efficiency can also have an impact on actual CO2 emissions from road traffic.

The use of reduced rolling resistance tyres or low-friction oils ultimately influence a vehicle’s CO2 emissions.

A study is being carried out on behalf of the Commission to review the potential available here and whether and how such reduction potential can be taken into consideration for the further development. TNO (N1), IEEP (Institute of European Environmental Policy) and LAT (Professor Samaras) are involved in this study.

In Germany’s opinion, transferring CO2 saving from driver training to driving behaviour in practice is scarcely possible. In contrast, it appears that the use of biofuels can be logically quantified and could be taken into consideration within the framework of further developing the voluntary agreement.
Biofuels
Coalition agreement

• “Fuels and raw materials derived from biomass can contribute significantly to the energy and resource supply and to climate protection.

We will therefore:
• further develop the fuel strategy with the objective of increasing the share of biofuels in the total fuel consumption to 5.75% by the year 2010;
• replace the exemption of biofuels from the mineral oil tax by the compulsory addition of biofuels to mineral oil…….”
The use of biogenic fuels is already of great significance with regard to CO2 reduction measures.

This is why our coalition agreement contains a commitment to increase the share of biofuels to 5.75% by 2020.

The current complete tax exemption for biofuels is to be replaced by a quota solution for biofuels on 1 January 2007.

The EU fuel standard permits admixture of up to 5% biodiesel by volume for diesel fuel and up to 5% bioethanol by volume for gasoline. Up to 15% ETBE by volume is permitted for gasoline.

Germany expects higher admixture grades of up to 10% by volume from biofuels to be permitted within the framework of the EU Commission’s planned review/amendment of the fuel standard. Such a quota would be feasible in Germany and could make a substantial contribution to CO2 reduction.

Second generation biofuels (synthetic fuels) will still have a significantly greater advantage. There are mainly two products:

• Biomass-To-Liquid (BTL) where solid biomass is converted into synthesis gas and later with Fischer-Tropsch into hydrocarbons; demonstration plants in operation in Germany and Sweden.

• Bioethanol from ligno-cellulosic processing (pilot plants established in Sweden, Spain and Denmark)
Alternative Specification of moderate ceilings

- China: applicable values from 2008 for all weight classes are on average one litre above the “mid range” passenger cars available in Germany today. A consumption limit value of 6.21/100 km applies to the lowest weight class (500 – 750 kg), i.e. above the average consumption agreed to by the ACEA for all new cars in 2008.

- California:
  - 2010 CO₂ limit value of 262 g/km (LDT2)
  - 2016 CO₂ limit value of 208 g/km (LDT2)
A direct comparison of regulations in different countries is not possible since the framework conditions are different. However, the examples of China and California show that the specification of ceilings is also an option for CO2 reduction, although both legal regulations are geared towards a comparatively moderate goal. For widely available large vehicles (LDT2: off-road vehicles, SUV and small vans) in California a CO2 limit of 262 g/km (gasoline 11.3 l/100 km) has been set. This will be reduced to 208 g by 2016. A limit value of 188 g/km applies for “normal” passenger cars for 2010 (corresponding roughly to the EU 1995 value). This limit is to be reduced to 139 g by 2014 and 128 g by 2016.

According to model analyses and plausible assumptions from the Pew Center on Global Climate Change, America and California have weaker regulations on CO2 emissions in the fleet average of new vehicles than Europe. In comparison with the ACEA voluntary obligation of 140 g/km CO2 from 2008, the CARB average fleet consumption limit for new vehicles is approx. 79% higher than in EU countries according to analyses by the Pew Center on Global Climate Change with around 250 g/km climate gas in 2009. In 2016, this limit will be greater than the ACEA 2008 value with an average 176 g/km.

The advantages of an ambitious ceiling would be that there are clear provisions to serve as orientation for engineers. This would in some cases spare the expensive development of vehicles that would never be able to comply with a climate goal.
Barriers

• Technical limits
• CO$_2$ reduction more difficult than with exhaust gas, CO$_2$ cannot be converted through the use of “catalysts”
• Trend when purchasing vehicle:
  – comfort
  – performance
  – safety
• Costs, e.g. for new drives (H$_2$ vehicle)
Due to physical compositions, weight, road resistance… reducing CO2 is more difficult than reducing exhaust gas emissions.

There are no catalytic converters to break down CO2.

Improving engine efficiency has its limits.

The demands placed on vehicles are growing.

Both engine performance and vehicle weight have continuously increased in recent years.

Unfortunately it has not been possible thus far to find a way of reversing this trend.

Really new CO2 reduction technologies (hydrogen cars) still appear to belong to the distant future. The related costs are a serious problem for the distribution of such vehicles.
Summary

- EU is striving for 140 g/km by 2008
- Move towards target of 120g/km currently under discussion
- Study currently being elaborated on behalf of ECCP WG II on estimating potential
- Use of biofuels in particular can contribute to reducing CO₂ emissions
- 120 g/km is an important milestone on the road to minimising energy consumption and CO₂ emissions from vehicles
Commission activity: Reducing CO2 emissions from light-duty vehicles:

- [http://europa.eu.int/comm/environment/CO2/co2 home.htm](http://europa.eu.int/comm/environment/CO2/co2 home.htm)

Fifth annual Communication on the effectiveness of the strategy


Spot climate protection