

The improvement of the automobile's efficiency within an energetic crisis scene

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Comisión de Expertos en Medio Ambiente y movilidad

THE CHALLENGES OF CARS IN A SUSTAINABLE MOBILITY

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1. Introduction

1.1. The political context

The context of mobility in Europe has changed considerably over the past years. With the help of the European single market and the freedom of movement mobility is getting more and more a key element of our lives.

At the same time, atmospheric air pollution, surging oil prices, CO₂ emissions and global warming as well as the scarcity of energy constitute unprecedented challenges and further incentives to work towards a form of mobility that is more energy-efficient and respectful of the environment.

The objective of the European Union policy is to ensure sustainable mobility. Amid forecasts of growth of the order of 50 % in the case of freight and 35 % in the case of passenger transport, Europe needs to rise successfully to that challenge¹.

The aim of the European Union is to disconnect mobility from its adverse effects.

1.2. The issues at stake

The issues of climate change and air quality are impacting on our everyday lives more and more. They are no longer simply subjects of high politics, but rather issues that impact on our mobility, how we drive and how much it costs us to get from A to B.

-- explain link between policy and daily mobility needs --

Policy needs to ensure that popular measures introduced in the name of these causes do not unnecessarily restrict mobility and really do have a beneficial impact on the environment. Economic, social and environmental impacts are assessed in an integrated and balanced way.

2. Atmospheric air pollution

2.1. Background

A clean air supply is essential to our own health and that of the environment. The quality of the air we breathe has become an important issue. Rising industrial and energy production as well as mobility all contribute to air pollution in our towns and cities which, in turn, can lead to serious health problems. For example, air pollution is increasingly being cited as the main cause of lung conditions such as asthma - twice as many people suffer from asthma today compared to 20 years ago.

As the result of EU legislation, much progress has been made in tackling air pollutants such as sulphur dioxide, lead, nitrogen oxides, carbon monoxide and

¹ Communication COM (2005) 24, Working together for growth and jobs – A new start for the Lisbon Strategy, 2005.

benzene. However, despite a reduction in some harmful emissions, air quality continues to cause problems. Summer smog – originating in potentially harmful ground-level ozone – regularly exceeds safe limits. Fine particulates also present a health risk which is of increasing concern. Clearly, more needs to be done at local, national, European and international level.

Air quality has been one of Europe's main political concerns since the late 1970's. Citizens' sensitivity to the bad quality of our air is steadily growing. But in fact, our air quality is improving thanks to the rapid progress made in motor and filter technologies. This is true for both industry and for motorised transport means. In the particular case of passenger cars, exhaust emissions have strongly decreased since the 1970's, due to the technological progress and in particular due to the ever more stringent exhaust emissions norms.

Decreases in exhaust emissions more than compensate for the increases experienced in motorised mobility, both in terms of the number of vehicles on the road and the kilometres driven. However an increasing awareness of the issue has left a sceptical general public convinced that we are experiencing a dramatic worsening of our air quality. There is some justification for concerns about worsening air quality but they must be qualified.

In spite of the significant improvements achieved, poor air quality is a real problem, particularly in highly densely populated and industrialised regions. And these problems do need to be addressed. But the right solutions must be found to these problems.

Europe's air quality policy aims at developing and implementing the appropriate instruments to improve air quality. The control of emissions from mobile sources, the improvement of fuel quality and the promotion and integration of environmental protection requirements into the transport sector are all part of these aims.

-- give an overview of the different strategies --

2.2. *European air quality directive*

The European Directive concerning air quality² prescribes that Member States should undertake assessments of air pollution levels. Where levels are high, Member States should prepare air quality plans to ensure compliance with the limit value. In addition, information on air quality should be disseminated to the general public.

The Clean Air for Europe (CAFE) programme was launched by the European Union in March 2001. CAFE aims to develop a long-term, strategic and integrated policy to protect against air pollution setting targets for health and environment, critical amounts of exhaust gases and developing exhaust reduction scenarios.

The following Commission's proposal for a CAFE Directive are to a) streamline provisions relating to ambient air quality, improve consistency and simplify reporting; b) established a legally binding "cap" for the annual average concentrations of particulate matter (PM) with a diameter of less than 2.5 micrometres by 2015

² Air Quality Framework Directive (1996) and related First Daughter Directive (1999).

replacing the limit values for PM₁₀. The current proposal, near final adoption, postpones, for three years, mandatory compliance to the air quality standards set in 1999.

The newly adopted directive, while setting European-wide minimum standards for air quality, leaves some flexibility to the Member States in implementing the Directive in order to allow a cost-efficient implementation.

2.3. Road vehicles euro norms

The pollutant emissions from road vehicles are regulated separately for light-duty vehicles (cars and light vans) and for heavy-duty vehicles (trucks and buses). For light-duty vehicles, the emission standard currently in force is Euro 4³. Following the CAFE programme and the resulting Thematic Strategy on air pollution, new Euro 5 and Euro 6 standards have already been agreed by Council and Parliament.

Euro 5 will enter into force in September 2009. The main effect of Euro 5 is to reduce the emission of particulate matter from diesel cars from 25mg/km to 5mg/km. Euro 6 is scheduled to enter into force in January 2014 and will mainly reduce the emissions of NO_x from diesel cars further, from 180mg/km to 80mg/km.

The legislation currently in force for heavy-duty vehicles is Directive 2005/55/EC (agreed in co-decision) and Directive 2005/78/EC (implementing provisions). This legislation defines the emission standard currently in force, Euro IV, as well as the next stage (Euro V) which will enter into force in October 2008. In addition, it defines a non-binding standard called Enhanced Environmentally-friendly Vehicle (EEV).

2.4. Enhanced Environmentally-friendly Vehicles

A proposed Directive on Enhanced Environmentally-friendly Vehicles (EEV) introduces environmental aspects into public procurement of vehicles and transport services. It covers vehicles procured by public authorities and by operators providing public transport services. When procuring vehicles, public authorities will use lifetime costs for CO₂ and pollutant emissions as well as for fuel consumption as award criteria. The application of these criteria will first be optional, then mandatory from 2012.

Public procurement represents a key and visible market. The Directive therefore is expected, over the long term, to boost the use of clean and energy efficient vehicles and to reduce their costs through economies of scale. This will also improve energy efficiency and the reduction of CO₂ and pollutant emissions from the whole vehicle fleet in Europe.

2.5. Low Emission Zones

The logic behind Low Emission Zones, or LEZs, is clear. These zones, where the access to vehicles is regulated according to their emissions, banned or charged, are intended to meet ever more stringent EU and national air quality standards. LEZs are seen as one of the most promising ways to comply to the limit values for certain

³ as defined by Directive 98/70/EC which is one of the Directives amending Directive 70/220/EEC.

traffic related pollutants such as fine particulate matter (PM₁₀) and nitrogen dioxide (NO₂)⁴.

Not surprisingly, the number of LEZs is growing and prominent newcomers include cities such as London (UK), Amsterdam, Rotterdam and Utrecht (Netherlands). Germany, though, has seen the greatest growth in the number of LEZs including major cities such as Berlin, Cologne, Dortmund, Hanover, Mannheim, and Stuttgart. Smaller German cities are following suit too. According to research by the FIA European Bureau, some 70 cities and towns in eight European countries have opted for LEZs. Six northern Italian provinces, including many prominent cities and towns, operate minimum environmental standards for all vehicles, including motorcycles, albeit for part of the day and only in winter.

-- explain how it works --

Important questions remain unanswered up to now.

A first question concerns the efficiency of these measures. These restrictions concern at the moment only limited areas in town and city centres. More detailed research still needs to be carried out, but preliminary results indicate little or no effect. Restrictions or traffic bans in larger areas like conurbations would strongly hamper public life and the economy and are therefore not realisable.

A second question relates to the freedom of mobility, in particular of those citizens coming from abroad. The implementation of these traffic restrictions, while answering to European legislation, differ significantly. As pointed out above each sticker is only valid in one country. Getting the sticker requires the involvement of an authority. This implies difficulties for foreign drivers of getting LEZ permits before entering a city abroad. Local traffic bans or restrictions can be a hurdle to foreign motorists crossing Europe. Moreover, motorists entering LEZs in different member states and putting all the necessary stickers would sooner or later suffer a reduced sight through their windscreen due to the multitude of stickers.

A further tool used to respond to more restrictive air quality legislation has been speed limitations. Examples are to be found in Austria, Belgium and Spain.

A study by the Spanish club RACC, on the basis of statistics gathered by German club ADAC, casts doubts on any automatic air quality improvements if maximum speed limits are reduced. RACC's study even indicates that average nitrogen oxide emissions are lower at 120 km/h than at 80 km/h⁵. This points to variable speed limits as being more effective in reducing congestion and traffic emissions. Since January 2008, Barcelona has imposed a speed limit of 80 km/h along highways entering the city. Justifying the measure, the government cites the need to meet European air quality standards.

It is difficult at this moment to predict the exact effect of these measures. A significant impact on air quality is however very unlikely. While such restrictive policies are often easy and quick to put into place and not very costly for municipalities, they do not

⁴ Council Directive 1999/30/EC made mandatory the limit values for PM₁₀ from 2005 and, from 2010, for NO₂.

⁵ RACC hosted a FIA workshop in Barcelona on road pricing and traffic restrictions in early February 2008.

bring in general the answers to the questions and are often very expensive to the society and the economy as a whole.

It is therefore doubtful whether the introduction of environmental zones, together with traffic restrictions or bans for vehicles belonging to certain emission categories to enter such zones, is the most cost-effective and legitimate measure to attain compliance with Community air quality legislation.

3. Climate change

3.1. Introduction

Public awareness on global warming has risen over the past few years. Being confronted with the present and expected future effects of global warming, the call for firm action to reduce the emission of CO₂ gets louder and louder.

Transport has a large share in the emission of CO₂. In Europe, passenger cars account for 12% of the CO₂ emission. To lessen the impact the European Union and its member states are developing policies to decrease the CO₂ emissions from cars. As global warming is a worldwide problem action has also to be taken on an international scale.

-- give an overview of the different strategies --

3.2. The Kyoto Protocol

Climate change is a long-term threat that calls for a long-term, global response. A significant milestone in international efforts to curb climate change under the 1992 UN Framework Convention on Climate Change (UNFCCC) has been the Kyoto Protocol, which entered into force in 2005.

The Kyoto Protocol legally obliges industrialised countries to meet targets with regard to their emissions of greenhouse gases during a first commitment period from 2008 to 2012. The Kyoto Protocol is, however vital, a first step only. The Kyoto Protocol requires its Parties to start considering commitments for a new commitment period at least seven years before the end of the first commitment period. Therefore, already in 2005, EU heads of state and government decided to discuss medium and longer-term emission reduction strategies including targets. This discussion is lead now.

Reasearch has shown that over the past century global average temperature has risen by about 0.6 °C and mean temperature in Europe has increased by more than 0.9 °C. Globally, the 10 warmest years on record all occurred after 1991.

Greenhouse gas emissions trap heat within the Earth's atmosphere by preventing thermal radiation from the Earth to escape to space.

A major anthropogenic source of greenhouse gases is the burning of fossil fuels (oil, natural gas and coal). This emits carbon dioxide (CO₂), which accounts for around 75% of global greenhouse gas emissions. Deforestation is also a major source of CO₂ emissions. Other greenhouse gas-generating activities include land-fill waste,

rice cultivation, cattle and fertilisation of agricultural soil, and the production and use of fluorinated industrial greenhouse gases.

3.3. CO₂ emissions from new passenger cars

The strategy proposed by the European Commission in 1995, and supported by the Council and European Parliament, has three pillars.

The first consists of voluntary commitments by the European, Japanese and Korean car industries to reduce CO₂ emissions from their new cars sold in the EU to an average of 140g/km by 2008 (for European manufacturers) or 2009 (for Japanese and Korean manufacturers).

The second pillar involves raising awareness among consumers. An EU directive[2] requires the display on each new car of a label showing its fuel consumption and CO₂ emissions, as well as publication of fuel efficiency information in other formats, including in printed advertisements.

The third pillar aims to promote fuel-efficient cars through fiscal measures. Several Member States have done this, and the Commission has proposed EU legislation[3] aimed at including a CO₂ element in national car taxes.

The strategy has brought only limited progress towards achieving the target of 120g CO₂/km by 2012. Between 1995 and 2004 average emissions from new cars sold in the EU-15 fell by 12.4%, from 186g CO₂/km to 163g CO₂/km. Over the same period new cars sold in the EU became significantly bigger and more powerful.

The EU is now considering setting a mandatory limit to average CO₂ emissions from new passenger cars to 120 g CO₂ per km by 2012⁶. Manufacturers' progress will be monitored each year by the Member States on the basis of new car registration data and a penalty scheme will be put in place. This data will be reported to the European Commission and published so enabling progress to be tracked. Achievement of this target will help Member States in the delivery of the reductions needed to respect of the Kyoto protocol.

3.4. ADAC CO₂ model

-- explain the role of consumer organisations --

The plans of the EU Commission to decline the average CO₂ Emission of new admitted cars until 2012 to 120 g/km will have relevant consequences for the automobile market in Europe. The German automobile club ADAC analysed whether the ambitious goals reachable and at which cost.

The model is based on the car registration dates in the EU 15 of the years 2001 and 2006. The analysis is based on the assumption that Euro 3 and Euro 4 vehicles build a homogenous fleet in 2001 and 2006 allowing trend analysis for the future about the

⁶ COM(2007) 856 final, Proposal for Regulation setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO₂ emissions from light-duty vehicles.

fleet CO₂ emissions in the single markets from the EU 15 and of single car manufacturers.

For the analysis ADAC sections the vehicle market in seven vehicle classes and according to diesel and petrol engines. The model enables to vary the share of diesel vehicles, the effects of the consumer demand and the technical development. The analysis contains the comparison between 2001 and 2006 and allows an estimation of trend scenarios, technology scenarios and consumer demand scenarios.

The ADAC CO₂ model offers an overall assessment of technology potentials, including development and production cycles by implementation rates. According to the model the current trend development can not reach the goal of 130 g/km until 2012, but miss it by 22 g/km or 17%. The 130 g/km as an average in 2012 can however be reached by a variety of technological and consumer demand measures (incl. ambitious development and production cycles). The necessary technologies are well known and developed for series application. The analysis also concludes that alternative fuels and propulsions are not necessary to reach an average CO₂ emission of 130 g/km until 2012.

3.5. CO₂ label

-- explain the ratio behind consumer information and CO₂ labelling --

The 1999 Directive relates to the availability of consumer information on fuel economy and CO₂ emissions in respect of the marketing of new passenger cars. The purpose is to ensure that information relating to the fuel economy and CO₂ emissions of new passenger cars offered for sale or lease in the Community is made available for consumers in order to enable consumers to make an informed choice.

The ADAC carried out a study to evaluate the effectiveness of the Directive's provisions in the Member States and the proposals of the Member States for improvements. In the following, an assessment of the Directive's effectiveness regarding informing and influencing consumers as well as regarding the reduction of the CO₂ emissions is carried out.

Energy labelling at the point of sale needs to be harmonised at a European level to be most effective.

3.6. Biofuels

Biofuels are part of the European strategy to meet the Kyoto emission targets. An EU directive aims to raise the market share of biofuels in road transport fuels to 5.75% by 2010.

Moreover, in order to reduce the fossil carbon content of transport fuels the Commission has proposed as part of the revision of the fuel quality directive to progressively reduce the carbon content of transport fuels from 2011 onwards. The CO₂ savings delivered by this measure up to 2012 will be counted towards the achievement of the 120g CO₂/km objective.

Biofuels are transport fuels produced from biomass feed-stocks (i.e. organic

material). The organic biomass material used can be wood, agricultural crops, forestry residues, agricultural residues or organic waste. Biomass includes non food-products for various purposes. The EU's production of biofuels amounted to 2.4 million tonnes in 2004, approximately 0.8% of EU petrol and diesel consumption. Bioethanol totalled 0.5 million tonnes and biodiesel 1.9 million tonnes. Brazil is the world's leading producer of bioethanol, followed by the United States. The European Union, with a production of almost 0.5 million tonnes, is estimated to have produced 10% of the world's bioethanol.

4. Increasing the efficiency of mobility

4.1. Fuel efficient driving

Fuel efficient driving is a no-regret measure that can be implemented rather easily, leads to solid results rather quickly and can contribute to fighting climate change. Fuel efficient driving is a smart, energy efficient and safe way of driving.

In many countries however eco-driving still gets little attention and only plays a marginal role in policy measures. The eco-driving concept and its benefits are not (well) known to the national audiences and policy makers are not (well) aware of the potential of eco-driving.

Long-term analysis however shows that the promotion of such driver information and education schemes increases overall fuel efficiency of passenger cars by five to ten percent, a non-negligible contribution to reducing greenhouse gasses. Many studies show that initiatives to improve fuel efficient driving must play a key role in efficient CO₂ abatement policies.

Fuel efficient driving should be part of novice driver training while advanced driver training should help to sustain the long-term effect.

4.2. Supportive technologies

The most promising technologies that contribute to more efficient transport are cooperative systems based on vehicle-to-infrastructure and vehicle-to-vehicle communication, and mobile – and internet-based – online services for travellers. Advanced vehicle safety technologies like ACC, ADAS, etc. have been the subject of numerous international research projects to prove their feasibility, quantify their safety potential and, more recently, also to explore their potential positive secondary impacts on the environment. This is guided by the principle that safety technologies help to avoid accidents, reduce congestion, save energy and therefore help to reduce emissions. Today the technology has already advanced in a way that some advanced vehicle safety technologies are offered as optional features for the safety conscious customer, or are fitted as standard in top-of-the-line models.

There is no dispute that a major area of potential gains is driving technique – a behavioural rather than strictly technical issue. Called “eco-driving”, shorthand for a number of techniques to reduce fuel consumption through influencing human behaviour, this appears to offer potential for a major contribution towards CO₂ reduction targets. The aim to change behaviour can be achieved through training,

awareness, real-time information, incentives & penalties, for example. However, in this report we look at those eco-driving measures that make use of information and communication technologies, including eco-journey support – on-line and mobile information services to the traveller with advice on environmental conditions and on multi-modal choices, provided before and during the journey; enhanced navigation using adapted algorithm for dynamic route guidance, e.g. with historic data, least-fuel routing etc.; cooperative eco-driving – providing the driver with support, feedback and guidance on a more fuel-efficient driving behaviour; online & real-time incentives – “bonus / save as you drive / green points”; and on-board and online coaching of “golden rules of eco-driving” for drivers

Fuel efficient driving support comprises checking tyre pressures as well as using fuel saving in-car devices like cruise control, tyre pressure monitoring systems and gear shift indicators. On-board diagnostics inform drivers about the performance of their vehicle and the consequences of driving habits and maintenance. In this respect gear-shift indicators are a valuable development. Such devices help motorists in realising the full potential of eco-driving.

4.3. Financial incentives

At present, once registration tax is paid on a polluting vehicle, this vehicle is free to remain in circulation and to pollute with no additional tax burden. Since registration taxes would, under the proposal, be replaced by annual circulation taxes collected on a yearly basis, it seems a good time to make adjustments to the bases of annual circulation taxes to make them more dependent on emissions so as to encourage car owners to replace their cars by less polluting ones.

The proposal only aims to restructure passenger car-related taxes, i.e. car registration taxes and annual circulation taxes, in those Member States that apply such taxes. Member States would remain free to decide on the steps to take so as to abolish registration tax before 2016; on the way in which to incorporate the 25%-50% CO₂ based element into the tax base of annual circulation taxes and registration taxes; and, potentially, on the introduction of tax elements related to other emissions into these tax bases. Value added tax (VAT) and fuel taxes are not covered by the proposal.

4.4. Individual versus public transport

Individual and collective transport offer different services and therefore fulfil different needs. They are not, as is often assumed, communicating vessels. Statistical evidence showing a large predominance of individual transport means in the context of urban mobility with almost nine motorised journeys out of ten made by car, compared to around one in ten by public transport in the EU, pinpoints to the fact that the individual transport is the area where most of the work needs to be done. The efforts need therefore to be focussed on enhancing the sustainability of individual transport. Public transport plays without any doubt a crucial supportive role in city centres. Its role can be enhanced if its service is further adapted to the needs of its users (comfort, flexibility, modal integration, etc.). A forced modal shift policy based on traffic restrictions and increased costs for individual transport will lead to a high loss of welfare without the expected benefits for mobility and quality of life.

5. Conclusion

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