

Working Group
Under the
Joint Expert Group on Transport and Environment

Reduction of Energy Use in Transport

Final Report

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JEG working group on reducing energy use in transport

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The Joint Expert Group on Transport and Environment is hereby presenting to the Commission its 2005 report with suggestions on the reductions of energy use in transport as an input to the discussions on the Green Paper on energy efficiency presented by the European Commission in June 2005. This document should not be considered either as an official statement of the position of the European Commission or of the expert's Member States. The drafting of this report has been provided by a Working Group of the Joint Expert Group.

I Introduction

Mobility - a natural part of human life - brings people together and is the means for uniting business and communities in Europe and for connecting Europe to the world. In this respect mobility is a driver for economic prosperity and quality of life.

Due to, inter alia, the progress in technology, the availability of fuels at relatively low costs and the general increase in wealth mobility takes place, overwhelmingly and increasingly, in form of motorised transport which, consequently, has been becoming a major driver for energy demand, pollution and environmental nuisances like noise, entailing high social and environmental costs.

Moreover, the establishment of the European Union has created a freely functioning market for labour, capital, and goods and services which, in general, sets a frame for an increase in mobility demand. In so far the key policy objectives of the EU are in itself a major mobility driver.

In order to overcome the conflict between the environmental burden caused by motorised transport and the policy objectives of sustainable development the EU defined in the 2001 White Paper on transport as a policy goal to decouple transport growth from economic growth. In implementing this policy the EU is faced with the challenge of dealing with an increased pressure from growth in the transport sector, partly also driven by the recent enlargement of the EU, while securing sustainability. At the same time EU polices aim at meeting the economic and competitiveness objectives set out in the Lisbon Agenda as well as the objective to integrate environmental aspects into other EU policy areas, as endorsed by the Cardiff European Council.

Having in mind these framework conditions, the Joint Expert Group on Transport and Environment (JEGTE) identified at its Meeting of 21 April 2005 as a priority topic for its 2005 work programme the energy efficiency and energy use management in transport. In assisting the Joint Expert Group on Transport and Environment in its work on this topic a Working Group was established and asked in the terms of reference to address the following issues:

- *Identification of potential measures for reducing energy use and potential energy savings;*
- *Assessment of achieved savings from measures implemented;*
- *Identification of areas where there is synergy between reducing energy use and other policy areas such as safety, health and the environment;*
- *Identification of examples of best practice;*
- *Identification of appropriate EU level action and appropriate authorities to take responsibility for measures;*
- *Assessment of the transport part of the Green Paper on energy efficiency in the context of the above process;*
- *Development of recommendations for desirable action at Community level.*

The work of the Working Group should consider factors influencing energy use in transport over the whole chain including transport demand, modal choice, logistics, vehicle efficiency

and vehicle use. Assessment of measures to reduce energy use in surface transport¹ should cover their technical potential, economic and environmental implications and policy implementation issues.

It was agreed that the work of the group should build on existing knowledge and that it is important to identify what could be done at EU level, good and bad practices and barriers to the introduction of measures. For each measure the group should aim to identify its potential, the time frame, political acceptability and synergy with other policies.

The boundary conditions relevant for the work of the Working Group are very well known. The growth of energy use and the associated emissions of CO₂ from the transport sector are of concern for environmental and security of supply reasons. The key statistics paint an alarming picture of the transport sector in the EU. Just to repeat the most striking ones:

- 1 About 1/3 of the final energy consumption in EU 25 is caused by transport², and road transport is by far the dominating sector, consuming nearly 90 % of the energy used for transport purposes.**

		Final Energy Consumption 2002 (Mtoe)								
	All sectors	Industry	Households, Commerce, etc.	Households	Services	Transport	Road	Railways	Air	Inland navigation
EU 25	1080	307	435	274	106	338	281	9	43	5
EU 15	957	269	375	237	106	313	259	7	42	5

Table I -1: Final 2002 energy consumption in EU 25 and EU 15 by sector in Mtoe

- 2 Since many years the final energy consumption by transport is growing and forecasts do not show a break in this trend³**

		Final energy consumption by transport (Mtoe)								
Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	
EU 25	295	305	311	323	332	334	336	338	344	

Table I-2: Final energy consumption in EU 25 by mode of transport in Mtoe

¹ Due to this restriction in the mandate, air transport is not explicitly covered in this report.

² See: http://europa.eu.int/comm/dgs/energy_transport/figures/trends_2030/index_en.htm; more specifically:

http://europa.eu.int/comm/dgs/energy_transport/figures/scenarios/index_en.htm and

http://europa.eu.int/comm/dgs/energy_transport/figures/pocketbook/2004_en.htm and

http://epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136228,0_45572945&_dad=portal&_schema=PORTAL and

http://epp.eurostat.cec.eu.int/portal/page?_pageid=0,1136239,0_45571450&_dad=portal&_schema=PORTAL

³ See for example: European Commission: “European Energy and Transport Scenarios on Key Drivers”, September 2004.

3 The growth is mainly caused by an increase in transport volumes which overcompensates the small energy efficiency improvements which have been made over time for the individual means of transport

Year	Annual Growth Rates in EU 25 (% change per year)	
	1995- 2002	2001- 2002
Passenger transport pkm (4 modes) ⁽¹⁾	1,7	1,7
Freight transport tkm (4 modes) ⁽²⁾	2,4	0,9

(1) : passenger cars, buses & coaches, tram+metro, railways ; (2) : road, rail, inland waterways, pipelines

Table I-3: Annual growth rates of passenger and freight transport in percent⁴

4 The goal of the EU, to decouple GDP growth from transport growth makes no progress for freight transport, and only very limited progress for passenger transport.

Year	Volume of freight transport index								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
EU 25	100.0	99.2	101.2	101.6	100.9	100.8	99.8	100.6	99.7

Table I-4: Index of inland freight transport volume relative to GDP; measured in tonne-km / GDP (in constant 1995 Euro), 1995=100

Year	Volume of passenger transport index								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
EU 25	:	:	100.0	:	:	:	:	:	:
EU 15	100.6	101.1	100.0	100.0	99.0	98.4	97.7	96.1	96.4

Table I-5: Index of inland passenger transport volume relative to GDP, measured in passenger-km / GDP (in constant 1995 Euro), 1995=100

5 For both, passenger and freight transport road is the overwhelmingly preferred mode of transport which continuously increased its share in passenger transport as well as in freight transport.

Modal split in %									
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Road	67,8	68,3	68,2	69,3	70,5	70,4	71,3	72,0	
Rail	19,8	19,4	19,6	18,5	17,5	17,7	16,8	16,4	
Inland Waterways	6,6	6,3	6,4	6,4	6,2	6,2	6,1	6,0	
Pipelines	5,8	6,0	5,7	5,9	5,7	5,6	5,8	5,6	

Table I-6: Modal split for Freight Transport in EU 25

⁴ Please note that the increase in air transport, which is not covered by the statistics shown, is even higher. In fact air transport is the fastest growing sub-sector in the EU.

Modal split in %	1995	1996	1997	1998	1999	2000	2001	2002
	Passenger Cars	81,7	81,7	81,9	82,1	82,2	82,2	82,3
Bus & Coach	10,2	10,1	10	9,9	9,8	9,7	9,6	9,5
Railway	7	7	7	6,9	6,9	7	7	6,8
Tram & Metro	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1

Table I-7: Modal split for Passenger Transport in EU 25

6 Transport is nearly exclusively fuelled by oil. Gas, electricity and alternative fuel do not play a major role in the energy balance yet. This makes transport in the EU vulnerable to changes in the oil market. As global energy demand is expected to grow in the next decades, the EU is faced with rising public concerns over energy dependence from outside regions and environmental issues.

Transport (2002)		
	Mtoe	% of total final demand
Oil	331.5	97,8
Gas	0.4	0,1
Electricity (incl.14% from RES)	6.0	1,8
Renewables	1.0	0,3
Total	338.9	100

Table I-8: Final energy consumption of transport in EU 25 in 2002

This view is supported by the assessment made by the EEA in its TERM 2004⁵ report as well as by other publications⁶. Moreover, forecast show that the situation will change very much in future even if the “business as usual” measures would be taken.

Mtoe	2005	2010	2015	2020	2025	2030
Total	1140	1209	1263	1318	1356	1394
Transport	365	387	404	427	440	449
Public road transport	7,1	7,1	7,1	7,0	6,7	6,4
Private cars and Motorcycles	169,4	169,0	164,3	68,6	166,8	161,6
Trucks	125,1	143,8	161,1	74,5	186,8	195,5
Rail transport	8,7	8,0	7,1	6,6	6,3	6,2
Aviation	48,5	53,0	57,4	63,3	65,7	71,2
Inland Waterways	5,8	6,3	6,7	7,1	7,4	7,8

Table I-9: Forecast of energy demand in transport in EU 25 (PRIMES baseline scenario)⁷

⁵ see: <http://org.eea.eu.int/documents/>

⁶ see for example:

<http://www.mnp.nl/en/publications/2005/EffectivenessOfTheEUWhitePaperEuropeanTransportPolicyFor2010.html>

In the light of these facts the Council laid down in its 1999 strategy on the integration of environment into transport policy three urgent action areas which relate to energy use in the transport sector:

1. the growth of CO₂ emissions from transport, in particular road transport and aviation;
2. the expected growth of transport and, in particular, private and commercial road transport, notably as a consequence of the enlargement;
3. modal split among transport modes and its evolution.

The Commission reacted to this development by identifying transport as a priority field of action and has undertaken a number of initiatives to address the issue. Since transport is at the same time a major source of a number of environmental impacts and is, in particular as far as road transport is concerned, far from being safe, as visible in the number of accidents and casualties, it is subject of policies in many areas. In recent years, the Commission published a number of key papers addressing the issue from one or the other angle.

Policy key papers in this respect are⁸:

- 1997 White Paper “Energy for the future - renewable sources of energy”
- 1998 White Paper "Fair Payment for Infrastructure Use: A phased approach to a common transport infrastructure charging framework in the EU"
- 2000 ECCP I initiative⁹
- 2001 White Paper on the European Transport Policy
- 2001 Communication "A sustainable Europe for a better World: a European Union strategy for sustainable development"
- 2002 Green Paper "Towards a European strategy for the security of energy supply" and its 2005 final report
- 2002 Sixth Environment Action Programme of the European Community¹⁰
- 2005 Green Paper on Energy Efficiency

Although looking at one and the same problem from different angles does not always lead to a coherent policy, many of the measures mentioned in the paper which, although often designed for other reasons, have a potential to reduce energy in transport and have positive repercussions on other environmental and social issues. Moreover, the overall messages and signals given in these papers are identical:

- Transport is - as a rule - not a value as such but serves a purpose. The less energy consuming and the less polluting transport is the better - this is also from an economic, competitive and geopolitical point of view the preferred solution, and
- Energy use, the environmental impact (greenhouse gas emissions, emissions of pollutants like SO₂, NO_x, particles, VOC as well as noise) and the social impact of transport (accidents) must be reduced.

⁷ http://europa.eu.int/comm/dgs/energy_transport/figures/scenarios/index_en.htm

⁸ see: http://europa.eu.int/comm/dgs/energy_transport/index_en.html and http://europa.eu.int/comm/dgs/environment/index_en.htm

⁹ http://europa.eu.int/comm/environment/docum/0088_en.htm

¹⁰ <http://europa.eu.int/comm/environment/newprg/index.htm>

Similar messages are also part of the work done and ongoing on transport, environment and health in OECD, ECMT and UN-ECE and WHO. Since most studies on emissions control, sustainable transport and on CO₂ emissions are closely related to energy saving in transport, part of the work presented here is inspired by the reports and resolutions of the said international organisations.

However, as mentioned in the beginning, this policy is being developed within a general political environment which aims at increasing prosperity and wealth, and within which policies and measures are designed and implemented which create additional transport demand. Therefore, while the overall objectives are clear, their realisation is a permanent task. It is therefore essential to consider transport policy as a never-ending optimisation task which aims at satisfying justified mobility needs at lowest costs and lowest environmental burden. However, since the “optimisation” has to take into account complex economic, social and environmental aspects there are no simple “engineered” solutions available: the solutions must be of political nature.

Of major interest in this respect are the links between the reduction of energy in transport and the EU’s Climate Change Policy, as well as the links to the “Clean Air For Europe” (CAFE)¹¹ initiative and to the compliance with the EU’s air quality limit values¹². In fact, a policy aiming at energy reduction in transport has large overlapping parts to the Climate Change Policy since, apart from a few policy fields (e.g. alternative fuels which are - due to their not very attractive WTW energy balance - currently not considered as an option to reduce energy consumption in transport, but which are considered as a promising option for GHG reduction), both policies go into the same direction. In this respect it would be short-sighted to focus in the transport sector solely on the substitution of fossil fuels by alternative fuels: to meet the general energy reduction objective the consumption of alternative fuels to incorporated into the considerations just as conventional fuels. That means a successful policy on energy reduction in transport (including fuels like alternative fuels, of course) would make a significant contribution to GHG emission reduction since transport is one of the key sectors with increasing GHG emissions (see Figure I-1).

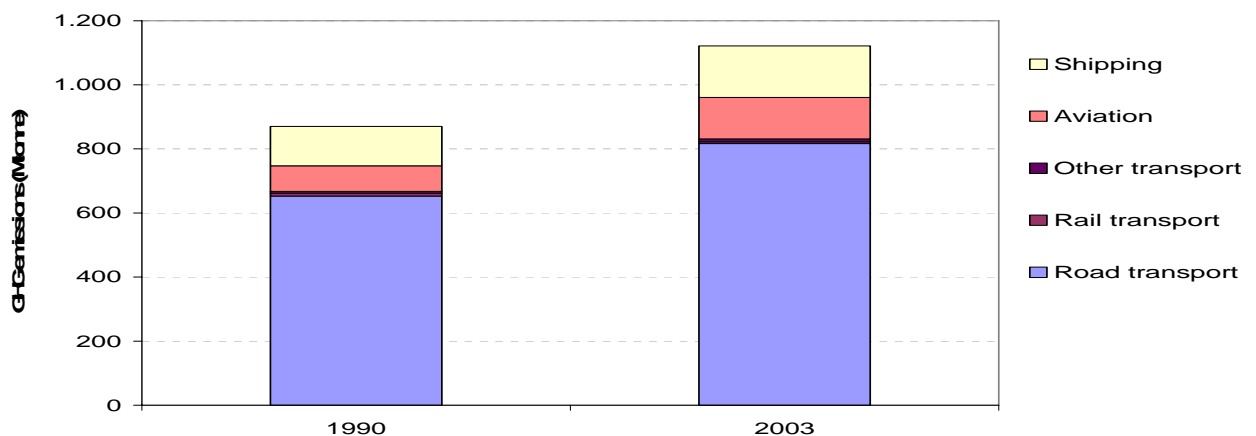


Figure I-1: Greenhouse gas emissions from transport in the 32 EEA member states.

¹¹ <http://europa.eu.int/comm/environment/air/cafe/index.htm>

¹² <http://europa.eu.int/comm/environment/air/ambient.htm>

This is also highlighted in EEA’s 2005 TERM report which states: “...the increase in greenhouse gas emissions from transport threatens European progress towards the Kyoto targets. Therefore, additional policy initiatives and instruments are needed.”

The links to CAFE and to the air quality limit values are also quite obvious: Transport emissions contribute significantly to the emissions of acidifying substances, ozone precursors and particulates. Although these emissions show decreasing trends, further reductions for all substances will be required from all sectors in order to achieve the various environmental targets set for 2010. Moreover, the additional reductions discussed in the CAFE Communication will require further measures which include transport. In addition, road transport is the largest contributor to NO_x emissions in Europe and the second largest for PM₁₀. The data analysed from a large number of monitoring stations in major urban agglomerations indicate that transport contributes significantly to the ambient air concentrations measured at these stations. In a number of EU cities both, the NO_x and the PM₁₀ concentrations are high, and in some cases above the limits. In the past, mainly technology has been effective in reducing transport emissions of the pollutants which fall under the CAFE. However, a lot of the technological progress was compensated by increasing transport volumes. This should be changed in future. That means, although the basket of measures known to reduce the emissions still contains a large number of technical options, the non-technical measures considered to reduce energy consumption in transport should become an integrated part of the clean air policy since many of them reduce the CAFE substances as well. Only such a double approach can avoid that technological progress is eaten-up again by the increase in transport volumes.

To work towards such an optimum with regard to energy consumption requires a systematic approach. The key factors which trigger the energy consumption and which are therefore crucial for the objective to reduce energy are simple to identify on the basis of the following equation:

<p>Energy consumption =</p> $\Sigma ((\text{consumption}/(\text{distance}) * \text{capacity use factor} * \text{distance}/\text{trip} * \text{trips} * \text{trip execution pattern})$
--

To be summed up for all means of transport.

Therefore the measures potentially able to reduce the energy consumption due to transport are:

- (1) To reduce by technical means the specific consumption of the individual means of transport (increase of unit efficiency)
- (2) To use the mean of transport with the highest unit efficiency (modal shift)
- (3) To increase the efficient use of transport capacity (increase load factor or occupancy rate per trip km)
- (4) To reduce the distance per trips
- (5) To reduce the number of trips
- (6) To use the most efficient driving style (e.g. driving behaviour)

These measures are addressed in the chapters of this report: transport demand and control issues (= reduce the distance per trips + reduce the number of trips) in chapters III, the

increase of the technical unit efficiency (= increase of unit efficiency) in chapter IV, modal shift (= use the mean of transport with the highest unit efficiency) in chapter V, and vehicle usage issues (trip pattern + increase efficient use of transport capacity) in see chapter VI of this report. The brief analysis given in these chapters is supported by more detailed information given in the Appendix in form of “documentation sheets”. These sheets describe briefly individual measures considered by the Working Group.

This report aims at contributing to the discussion by making concrete proposals aiming – in application of the principle of subsidiarity – at measures to be taken at EU level. In addition, the Green Paper on Energy Efficiency is a prominent point of reference for the work of this group. This report provides first reactions to these proposals and gives preliminary answers to the questions raised in this Communication¹³.

In the light of the little time available and the limited resources, the report cannot provide any sort of final assessment of the measures mentioned or proposed. It should be considered as the result of a brainstorming process designed to fuel the discussions in the Joint Expert Group on Transport and Environment (JEGTE) and in the relevant European and national institutions.

Moreover, it should be mentioned that this report is being drafted at a point of time at which the Commission is launching or preparing new initiatives related to the energy consumption in transport, e.g. the launching of the 2nd European Climate Change Programme (ECCP II), new initiatives on alternative fuels, reflections on the competitiveness of the automobile industry (CARS 21), preparations for the post-Kyoto negotiations etc. Due to the great dynamic of these processes it is not possible to integrate them into this report. However, whenever possible and appropriate references to these activities are given.

¹³See: http://europa.eu.int/comm/energy/efficiency/index_en.htm

II Review of Existing EU Activity

II.1. Overview of EU action influencing energy use in transport

As mentioned in the chapter “Introduction” a large range of EU policy actions impact directly or indirectly on energy use in the transport sector. A study¹⁴ has been performed for the European Commission assessing the relationships between a number of areas of policy and demand for transport. This assessed the following policy areas to provide an initial estimate of the degree to which policies lead to additional transport demand. The areas assessed were:

1. Agriculture
2. Competition
3. Environment
4. Internal market
5. Regional Policies
6. Taxation

The study concludes that more work is needed in the specific areas to clearly identify the impacts. And as important, a further stage of work would be required: To assess the transport energy impacts of policies initiated in the sectors mentioned above.

Compared to that there is a much more limited number of EU activities that have the goal of reducing energy use in the transport sector. However, it should be recalled that energy is not specifically referred to in the Treaty. It is therefore not surprising that there is no explicit document on EU transport energy¹⁵. Even the 2001 Transport White Paper does not specifically address the problem of increasing energy use in transport or contain any analysis of the effects of transport policies on energy use in the sector. Neither is there a discussion on managing energy use, although alternative transport fuels are discussed.

Nevertheless, major efforts have been made in all transport modes at EU level to improve operational efficiency, and in doing so to contribute indirectly to the reduction of energy use in the transport sector. The area where this was first achieved was road transport. Moreover, a single market in aviation was achieved in 1997 but still there remain plenty of obstacles

¹⁴ Initial survey of European policy and legislation with a view to decoupling transport from economic growth in the EU and the accession countries

¹⁵ Nevertheless there have been references to the subject in recent policy documents. The main references are detailed below:

ECCP I

One of the ECCP Working Groups looked specifically at transport. It identified a range of areas and measures where action could be taken to reduce energy consumption in transport.

Green Paper on Energy Security

The Green Paper on security of energy supply discusses the scale of energy demand in the transport sector. This discusses a number of responses such as energy taxes, vehicle technology, substitute fuels and shifting transport away from road. In relation to the latter it discusses encouraging rail and waterborne transport, tightened enforcement for road, non-road infrastructure investment, discouraging car use in towns and full charging of external costs.

Green Paper on Energy Efficiency

The Green Paper on Energy Efficiency discusses some options for reducing energy use in transport.

through air traffic control. In addition in the rail sector there remains a substantial amount still to be done to achieve a single market.

Moreover, the Commission has been suggesting for some time that charges for the use of transport infrastructure should also reflect the external costs arising from that use. Had such a policy been implemented it could have had a counterbalancing effect to the reduction of the other constraints on transport demand.

II.2. Policy impacts on transport energy

It is useful to make a distinction between three types of policy:

- policies that aim to influence energy use in transport.
- policies that have links to and impact on transport energy use.
- transport policies that have an impact on energy use.

It is not possible within this report to identify the scale of energy impact of all of these different actions. The following sections attempt to outline in a qualitative way the broad policy elements and their energy impacts.

II.2.1. EU policy actions to reduce energy use in transport

Most prominent in this respect is the CO₂&cars strategy which is based on four pillars:

CO₂ and cars voluntary agreements

Negotiated commitments to reduce CO₂ emissions from passenger cars and improve fuel economy have been concluded with the European (ACEA), Japanese (JAMA) and Korean (KAMA) automobile industries. All three commitments contain the same quantified CO₂ emission objective for the average of new passenger cars sold in the EU of 140gCO₂/km (to be achieved by 2008 by ACEA and 2009 by the others). This means the fleet of new cars put on the market in 2008/2009 will consume on average 5.8 l petrol or 5.25 l diesel per 100 km. The CO₂ targets have to be achieved 'mainly' by technological developments and associated market changes. The Commission endorsed the Commitments by publishing corresponding Recommendations.

Directive on car labelling (99/94)

The Directive aims to ensure that information on the fuel economy of new passenger cars offered for sale or lease is made available to consumers to enable them to make an informed choice. The following information must be provided:

- A fuel economy label displayed at the point of sale for all new cars;
- A poster (or display) showing official fuel consumption and CO₂ emission data of all new cars displayed or sold or leased through the point of sale;
- A guide on fuel economy and CO₂ emissions;
- Promotional literature must contain official fuel consumption and CO₂ emission data for the car model to which it refers.

To improve the effectiveness of the Directive, a study has been carried out based on reports provided by Member States and the Commission is reviewing the options proposed in the report, in consultation with stakeholders concerned.

Proposal for a Directive on car taxation

In July 2005 the Commission presented a proposal for a Directive¹⁶ that would require Member States to re-structure their passenger car taxation systems. The proposal would restructure the tax base of both registration taxes and annual circulation taxes so as to include elements directly related to carbon dioxide emissions of passenger cars. The proposal aims only to establish an EU structure for passenger car taxes. It would not harmonise tax rates or oblige Member States to introduce new taxes.

To the degree that the proposal led to increased incentives to purchase more fuel efficient vehicles and that this did not lead to a rebound effect of greater distance travelled it would be likely to lead to a reduction in transport energy use.

Research

A lot of EU research activity has addressed all aspects of measures to reduce energy use in transport. Links to many projects dealing with urban mobility such as encouraging non-motorised transport, mobility management, spatial planning, low energy vehicles can be found through http://europa.eu.int/comm/energy_transport/en/cut_en.html.

The EU finances extensive research in the field of aviation one of whose main goals has been to reduce energy consumption in future aircraft. One of the headline objectives of the aeronautics research programme is to reduce CO₂ emissions (and fuel consumption) by 50% per passenger-kilometre in the long-term through improved engine efficiency as well as improved efficiency of aircraft operation.

A lot of automotive research has also had as its goal measures to directly or indirectly reduce energy consumption. For example one of the main objectives of the land transport and marine technologies part of The Competitive and Sustainable Growth Programme under FP5 was “Improved fuel efficiency and reduced emissions - cutting CO₂ emissions and developing and validating zero-emission vehicles”.

II.2.2. Other EU policies with impacts on transport energy use

The fact that so many activities generate transport has led to calls for a decoupling of economic growth from transport. Without such a break, transport infrastructures will need to expand proportionately to avoid serious congestion and the consequent demand for resources to construct the infrastructure and vehicles and to power them will expand proportionately. It is doubtful whether such a scenario is attractive for reasons of land take, noise and intrusion even before considering the energy required for such continued transport expansion.

According to the EEA¹⁷, as shown in the graphs below there has in recent years been some decoupling of economic and transport growth for passenger transport but not for freight transport.

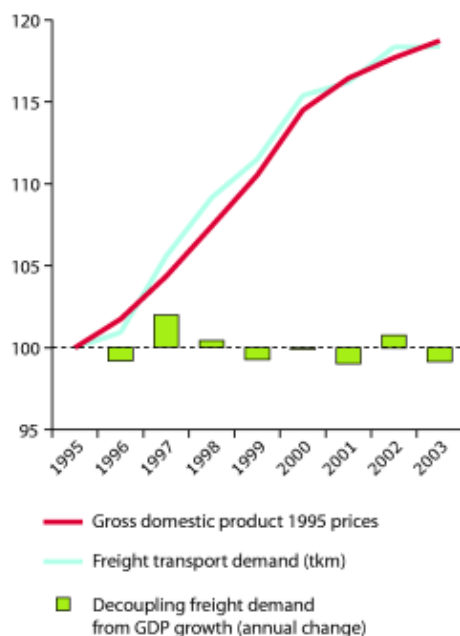
¹⁶ COM/2005/261/FINAL

¹⁷ EEA, Term 2004

Breaking the link between economic growth and transport growth can be interpreted as a means of energy reduction in transport since it essentially breaks down into either more efficient or less transportation.

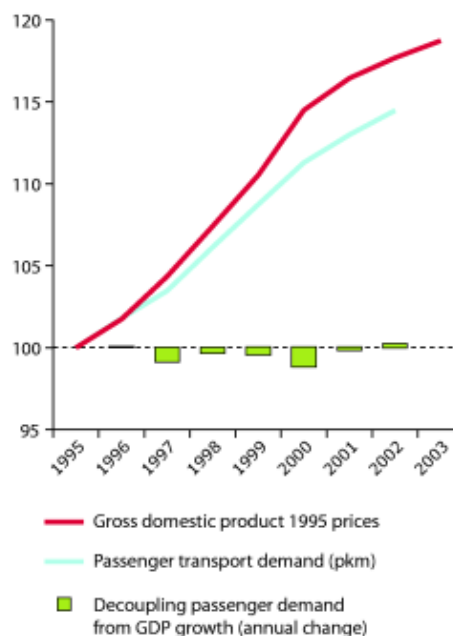
Trend in freight transport demand and GDP, index 1995=100

Index: EU-25 in 1995 = 100



Trend in passenger transport demand and GDP, index 1995=100

Index: EU-25 in 1995 = 100



Source: http://themes.eea.eu.int/Sectors_and_activities/transport/indicators

Figure II-1: Trends in freight and passenger transport compared to the trend of Growth Domestic Product National in EU 25

To address such general objectives often requires taking general national approaches and strategies. For this reason the Commission forwarded a proposal for a Directive which contains general energy reduction targets:

Proposal for a Directive on Energy Efficiency and Energy Services

In December 2005 agreement was reached on a Directive on the promotion of end-use efficiency and energy services to enhance the cost-effective and efficient end-use of energy in Member States including the transport sector. This aims to provide the necessary targets, mechanisms, incentives and institutional, financial and legal frameworks to remove existing market barriers and imperfections for the efficient end use of energy.

The Directive sets out mandatory targets for annual energy savings at Member States’ level and for the share of energy efficient public procurement for the period 2006-2012. For the same period, strong incentives are given by the Directive for Member States’ to ensure that suppliers of energy offer a certain level of energy services.

II.2.3. EU activities in the transport field and their impact on transport energy use

The following section describes EU transport activities, mostly from the White Paper and gives a brief assessment of their likely impacts on transport energy.

II.2.3.1. Cross-modal activities

Infrastructure Charging

The ECCP I identified infrastructure charging as the second most important manner to reduce energy use in the transport sector, able to contribute a third of the anticipated savings. The White Paper discusses the importance of putting in place appropriate charges for the use of infrastructure in all transport modes so as to ensure that users are faced with the cost of their transport decisions to society. In this it reiterates a series of papers from the Commission in this area. One subject of discussion concerns the coverage of external costs by the users, which are otherwise borne solely by society, for example from noise, pollution, barrier effects, impact on landscape. To date there is only EU legislation regulating infrastructure charges for road haulage and rail and this legislation is limited in the degree to which the full costs of transport are levied on users. Other modes have no legislation in place.

Since the cost of transport use is mostly identified as a major driver of transport decisions and demand, the lack of charging for external costs and in many cases for any charges at the point of using infrastructure would lead to excess demand and therefore excess energy use.

Marco Polo

The main goal of the MARCO POLO Programme is to improve the environmental performance of the whole transport system (and reduce road congestion) by shifting freight from 'road only' transport to short sea, rail and inland waterway transport. The programme has three types of activities: modal shift actions, catalyst actions and common learning actions. It does not have reducing energy use as a specific objective.

Because the average energy consumption of non-road modes of transport is lower, it is likely that the types of actions foreseen would lead to a reduction in energy use. Offsetting this will be factors such as the increased mass transported from loading units and intermodal vehicles (e.g. carriage of lorries on rolling roads or short sea shipping) and potentially increased journey distances. It would be necessary to assess projects individually to determine the impact on energy use.

TEN-T

The trans-European transport network (TEN-T) mainly comprises infrastructures (roads, railways, waterways, ports, airports, navigation aids, and intermodal freight terminals). In a limited number of cases, specific services necessary for the operation of these infrastructures are also included.

The objectives of the TEN-T are to ensure the mobility of persons and goods through high-quality infrastructure, interoperable in all its components, for all modes of transport covering the whole territory of the Community and optimising use of existing capacities. In addition it should allow for its extension to the CEEC, Mediterranean and EFTA States.

The priority TEN-T measures concern: completion of the connections needed to facilitate transport; optimisation of the efficiency of existing infrastructure; achievement of interoperability of network components; integration of the environmental dimension in the network.

The policy aims to reduce barriers to transport on the main European transport axes. There are likely to be a range of effects from this on energy use. More fluid journey conditions could be expected to lead to reduced energy use, shifts of traffic between modes might lead to increases or decreases in energy use, longer distance journeys are likely to become more attractive leading to increased energy use. It seems likely that the overall balance will be a reduction in the overall cost of transport and therefore an increase in demand and an increase in energy use.

Local passenger transport

Regulation 1191/69, as amended by 1893/91, regulates Public Service Obligations in local public passenger transport. The Commission has proposed to update this Regulation and discussions are ongoing within the EU institutions. Ensuring that local public transport is efficient and competitive improves the likelihood that it will be chosen by individuals for the journeys they must make. To the degree that this public transport is more energy efficient than the alternative the policy would lead to a reduced energy use since it is unlikely that its use would lead to an overall increase in mobility.

Sustainable Development – transport

European Heads of State adopted the current EU Sustainable Development Strategy in June 2001 based on a Commission Communication of May 2001. A Sustainable Development perspective tends to highlight the fact that many current policies often do not pay enough attention to long term issues, or the inter-linkages between different policy areas (such as between energy and environment).

The Transport White Paper called for the development of medium and long-term environmental objectives for a sustainable transport system. The Commission planned to submit a communication in 2002 to spell out these objectives but this has not been done. Instead a monitoring tool has been put in place through the TERM mechanism (transport and environment reporting mechanism).

II.2.3.2. Road

Congestion is increasing even on the major roads and road transport alone accounts for 84 % of CO₂ emissions attributable to transport.

Putting vehicles on the market

The putting of vehicles on to the market is a single market concern and subject to EU regulation. This provides the rationale for the intervention through the voluntary agreement on CO₂ and cars to limit CO₂ emissions and to a large extent also the subsequent energy use of those vehicles, see II.2.1. Annual monitoring reports are published by the Commission¹⁸. The agreement is currently being reviewed and a working group of the European Climate Change Programme is considering an integrated approach to reduce CO₂ emissions from light-duty vehicles.

Road haulage

¹⁸ http://europa.eu.int/comm/environment/co2/co2_home.htm

Road haulage is targeted in the Transport White Paper, because 2010 forecasts point to a 50% increase in freight transport. Despite their capacity to carry goods all over the European Union with unequalled flexibility and at an acceptable price, some small haulage companies are finding it difficult to stay profitable. To address this and to harmonise competition, the Commission stated its desire to:

- improve quality in the road transport sector,
- harmonise fuel taxation for commercial users, particularly in road transport;
- harmonise national weekend lorry bans;
- develop vocational training;
- promote uniform road transport legislation¹⁹;
- harmonise penalties and the conditions for immobilising vehicles;
- increase the number of checks;
- encourage exchanges of information

To the degree that these actions would lead to a more tightly regulated haulage profession they might be expected to lead to an increase in costs, although they could also lead to greater deployment of tools that enable more efficient fleet management and transport operations. The harmonisation of fuel taxation if it led to an increase in the average level of taxation could lead to increased costs and therefore reduced demand and reduced energy use.

Car transport

The majority of activities relating to the regulation of car use have been considered for subsidiarity reasons to fall within the domain of the Member States. This includes for example, speed limits, which are determined at national level.

Bio fuels

There have been a number of activities relating to Bio fuels. These are not discussed here because although they lead to reduced fossil energy use, their goal is not to reduce overall energy use in transport.

II.2.3.3. Rail

Rail transport has been considered to be an attractive means of transport for both freight and passengers because of its lower impacts. However, the sector had not evolved in comparison with its main competitors and therefore the Commission identified that there was a need for it to be revitalised at EU level. A series of packages of measures have sought to establish the conditions for a more competitive dynamic and customer responsive sector.

The Transport White Paper points to the lack of infrastructure suitable for modern services, the lack of interoperability between networks and systems, the constant search for innovative technologies and, finally, the shaky reliability of the service, which is failing to meet customers' expectations. However, the success of new high-speed rail services has resulted in a significant increase in long-distance passenger transport.

¹⁹ For instance the proposal for a regulation of the European Parliament and of the Council on the harmonisation of certain social legislation relating to road transport [COM (2001) 573 final].

The first railway package was adopted in 2001 and included measures to separate railways from the state, the separation of railway activities between the network and train operators and the regulation of licensing of train operators.

The second railway package was adopted in 2004. It comprised five new legal texts and sought to improve railway safety²⁰; bolster interoperability measures in order to operate trans-frontier services and cut costs on the high-speed network²¹; set up a European Railway Agency responsible for safety and interoperability²²; extend and speed up opening of the rail freight market through opening national freight markets²³; to join the Intergovernmental Organisation for International Carriage by Rail (OTIF).

The third railway package sets out proposals to harmonise train driver licensing, guarantee passenger rights in international railway transport, liberalise international passenger services within the EU by 2010, and secure quality in rail freight transport.

A large number of the measures undertaken in the rail sector have aimed to improve customer focus and organisational efficiency. Measures to improve interoperability and in particular introduction of advanced forms of ERTMS could lead to increased railway capacity. Many of the measures proposed should result in lower cost rail services which should make them more competitive with regard to alternatives. These factors should lead to greater demand for rail use; however it is likely that only some proportion of this demand will transfer from other modes such as road while the remainder will be generated.

Traditional railway operations had lower energy use than comparable road transport. The situation is less clear with regard to high speed services where energy consumption is higher. Transfer of traffic from road and aviation to rail is likely to lead to energy saving although this is not always the case. Increases in transport demand will lead to increased energy use.

II.2.3.4. Waterway

Transport by sea and transport by inland waterway are an alternative to transport by land with underused capacity. Better use could be made of inland waterways, but there are a number of infrastructure problems, such as bottlenecks, inappropriate gauges, bridge heights, operation of locks, and lack of transshipment equipment.

²⁰ Directive 2004/49/EC of the European Parliament and of the Council of 29 April 2004 on safety on the Communities railways and amending Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification [Official Journal L 164 of 30.4.2004].
(See also: Directive 2004/51/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 91/440/EEC on the development of the Communities railways [Official Journal L 164 of 30.4.2004].)

²¹ Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system [Official Journal L 164 of 30.4.2004].

²² Regulation (EC) No 881/2004 of the European Parliament and of the Council of 29 April 2004 establishing a European railway agency (Agency Regulation) [Official Journal L 164 of 30.4.2004].

²³ Communication from the Commission to the Council and the European Parliament: "Towards an integrated European railway area" [COM (2002) 18 final - Not published in the Official Journal].
Recommendation for a Council Decision authorising the Commission to negotiate the conditions for Community accession to the Convention concerning International Carriage by Rail (COTIF) [COM (2002) 24 final - Not published in the Official Journal].

As transport by sea and transport by inland waterway are a key part of intermodality, they allow a way round bottlenecks between France and Spain in the Pyrenees or between Italy and the rest of Europe in the Alps, as well as between France and the United Kingdom and, looking ahead, between Germany and Poland.

The Commission has proposed a new legislative framework for ports which is designed to lay down new, clearer rules on pilotage, cargo-handling, stevedoring. Furthermore, the new framework will simplify the rules governing operation of ports themselves and bring together all the links in the logistics chain (consignors, ship owners, carriers, etc.) in a one-stop shop.

For inland waterways, the Commission's objectives are:

- remove bottlenecks;
- standardise technical specifications²⁴
- promote transport by sea and inland waterway²⁵
- develop motorways of the sea
- tougher maritime safety²⁶ rules
- European maritime traffic management system.
- directive on the tonnage-based taxation system
- harmonisation of technical requirements for inland waterway vessels,
- harmonisation of boat masters' certificates

It is clear that the majority of the measures proposed will help to remove inefficiencies and barriers to the use of these transport modes. These should lead to lower operating costs making these modes more competitive. To the degree to which water transport offers lower energy use, this could result in a reduction in overall energy use²⁷. Offsetting this would be the effect of the overall reduction in freight transport costs on overall transport demand.

II.2.3.5. Air transport²⁸

In October 2001 the European Commission proposed a package of measures on air traffic management with a view to establishing a Single European Sky by the end of 2004. The objective was to end the fragmentation of EU airspace and create an efficient and safe airspace without frontiers.

To eliminate frontiers, the Commission proposed in the Regulation on the organisation and management of airspace to set up a unique flight information region by merging all the

²⁴ e.g. regulation (EC) No 789/2004 of the European Parliament and of the Council of 21 April 2004 on the transfer of cargo and passenger ships between registers within the Community

²⁵ e.g. directive 2002/6/EC on reporting formalities for ships arriving in and/or departing from ports of the Member States of the Community

²⁶ e.g. the Council Directive 98/18/EC of 17 March 1998 on safety rules and standards for passenger ships, or the "regulation (EC) No 417/2002 of the European Parliament and of the Council of 18 February 2002 on the accelerated phasing-in of double hull or equivalent design requirements for single hull oil tankers" including all its amendments.

²⁷ However, as regards the environmental performances, short sea shipping and inland water vessels need to recover their former relative advantage on trucks by improving fuel quality and engine technology/emissions control, since road trucks have applied various modern control technologies and low sulphur fuels, which are not yet introduced into sea and inland water going vessels and engines (especially relative to NOx and PM10 abatement).

²⁸ Please note: In accordance with the mandate this report does not cover air transport in any detail

national regions into a single portion of airspace within which air traffic services will be provided according to the same rules and procedures.

Subsequently, the Commission has proposed a further series of measures to implement the Single European Sky²⁹ that address:

- the creation of the single sky,
- more efficient use of airport capacity,
- definition of a new regulatory framework.
- striking a balance between growth in air transport and the environment
- over-fragmentation of EU air traffic management systems.
- reduction of noise and pollution caused by aircraft.
- intermodality with rail to make the two modes complementary, particularly when the alternative of a high-speed train connection exists;

The Commission has recently discussed measures to reduce the climate change impact of aviation in a Communication and now within the ECCP a working group is assessing how aviation could be incorporated in the EU emission trading regime.

Air transport has been growing at around 6 % per year and its CO₂ emissions and energy use have been growing by 4.4 % per year. The measures underway to create the Single European Sky will reduce inefficiencies in the management of air traffic and thereby facilitate further cost reductions and demand growth. In contrast inclusion of aviation in the EU ETS will lead to a slight increase in cost for aviation but is not predicted to have any significant impact on demand.

II.3. Council strategy on the integration of environment into transport policy and its actions to reduce use in transport

In 1999 the Council in its strategy on the integration of environment into transport policy underlined the need for progress in a large number of fields:

Avoidance of the negative effects of traffic growth through:

- Charging for transport infrastructure use signals environmental costs to users.
- land use and transport planning to reduce travel need and promote less harmful transport.
- focus telematics applications to support environmental objectives.
- The use of telecommunications as an alternative to travel.

29

- Regulation (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky
- Communication from the Commission to the Council and the European Parliament on the creation of the single European sky [COM (2001) 564 final - Not published in the Official Journal].
- Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky [Official Journal L 96 of 31.03.2004].
- Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network [Official Journal L 96 of 31.03.2004].
- Communication from the Commission to the Council and the European Parliament: "Action programme on the creation of the single European sky" [COM (2001) 123 final - Published in Official Journal C362E of 18.12.2001].
- Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky [Official Journal L 96 of 31.03.2004].

Promotion of environmentally less harmful modes through:

- Promote public transport through the common transport policy.
- Use of buses and High Speed Trains for intermediate and long-distance travel.
- Rail in large urban areas reduces car commuting growth.
- Traffic management and parking restraint policy.
- Standardisation and harmonisation of intermodal transport units.
- develop international rail freight for environment benefit.
- support non-motorised mobility.

Research and technological development:

- Environmental standards for vehicles, engines and fuels should be continuously improved.
- economic instruments to favour clean and fuel-efficient vehicles and fuels.
- behavioural aspects of transport choices defining policies to achieve modal shift.

Awareness raising:

- Development of awareness of how to reduce transport's environmental impact.

Many of these measures were also subject of the discussions in the Working Group and for many of them a preliminary assessment has been performed.

In its first review of this integration strategy the Council Resolution from Helsinki (April 2001) recognises the need for packages of measures and policy instruments aiming at an accelerated and broad market introduction of clean, quieter and energy efficient technology and renewable fuels, a revival of public transport, a fair and efficient pricing regime including environmental costs, an efficient use of the entire transport system including an increased use of environmentally less harmful means of transport and a consequent adaptation of the transport infrastructure.

The Gothenburg European Council (June 2001) concluded that action is needed to significantly decouple transport growth from GDP. In its second review of the 1999 strategy the Council (Transport) in December 2002 recalled this conclusion of the Gothenburg Summit and considered that there is particular need for further action on greenhouse gases.

Experience, however, shows that there are specific obstacles at EU level with regard to the political acceptance and practical implementation of measures that could aim to reduce transport energy use. The most obvious general obstacles are:

- The countries located at the edges of the European Union have longer distances to the markets which increase the transport costs and influence their competitiveness. They have strong interests that products of firms located in their area can be transported throughout Europe at low costs while the countries located in the centre of the Union aim at minimizing the environmental burden associated with their role as transfer region.

- The interest of “monopolies” to keep certain transport sectors under their control, partly also driven by old-fashioned organisational and social structures once established under state-ownership.
- The general interest of companies and businesses to keep transport costs low. This can conflict with the interest of governments to reduce costs for society.

In addition, there are also a number of other obstacles, e.g. associated with the effectiveness of individual measures, the appropriate level of action etc., which make it difficult to agree on specific steps.

Thus, while there is a general political will to address the issue of energy reduction in transport and to integrate this issue into other policy fields there are major obstacles associated with individual policies and measures which are difficult to overcome.

Unfortunately, there seems to be no systematic analysis of the obstacles which hampered the adoption and implementation of policies and measures designed to reduce directly or indirectly the energy consumption in the transport sector.

One way to overcome the problem might be to carry out a comprehensive integrated assessment of technical and non-technical measures which results into programmes and proposals addressing more or less all means and modes of transport. This would allow all sides to see their own contribution as a part of a bigger master plan. Another option is the adoption of national benchmarks combined with the obligation to draft national programmes. The exchange of information on these programmes and the identification of concrete common interest, plans and measures would to better identify the areas of action appropriate for the EU level, see documentation sheet (1) and (2). Finally one should consider whether the application of the “enhanced co-operation” clauses of the Treaty provide options for regional measures which could bypass identified obstacles, see documentation sheet (3).

II.4. Assessment of EU progress in measures that could reduce transport energy use

The EEA reports in TERM that decoupling of transport and economic growth, has not been achieved for freight transport but for passenger transport there are some indications of a moderate decoupling, see also Figure II-1. In the new Member States economic growth has outpaced transport growth (passenger and freight). EEA suggests that new Member States previously had more transport intensive economies focussed on industrial and agricultural production but are now in transition towards more service orientated economies. This appears as decoupling. TERM indicates that throughout the EU the share of aviation and road transport continue to grow, while the shares of rail, bus and inland shipping are gradually decreasing.

TERM reports slow progress in restructuring charges towards better internalisation of external costs. Important developments are the introduction of urban charging systems and distance related charging schemes on motorways. Charge differentiation concentrates mainly on air pollution in the road sector and noise in the aviation sector. Very few measures have yet been taken to internalise costs of CO₂ emission, rail and road noise and congestion.

Progress regarding taxation of aviation fuel and reduction of greenhouse gas emissions from aviation is slow. The large gap on the perspective of the climate problem between Europe and other countries, not much has been achieved in the last nine years. The Netherlands have introduced a kerosene-tax on domestic flights.

Low carbon vehicles and fuels have become a foreseeable reality. A significant number of promising technologies and fuels are ready for market introduction. The conditions (policy, social, economic) needed to develop markets for these vehicles and fuels have become increasingly important. This includes raising consumer awareness and changing consumer behaviour. Attempts (at various levels) have been made to shift consumer attitudes by developing information policies (e.g. CO₂/energy efficiency labelling), developing fiscal incentives and/or subsidies, green purchasing policy, and promoting eco-driving. Several Member State initiatives have been taken to promote the use of low carbon technologies by e.g. tax incentives or introducing these technologies in public transport and other public sector fleets.

The key measures and initiatives mentioned in this chapter and/or adopted in recent years at EU level can be compared with the policy options listed in the chapter “Introduction” in order to identify their direct (=X) or indirect (= (X)) impact on the listed:³⁰

	Increase of unit efficiency	Use the mean of transport with the highest unit efficiency	Increase efficient use of transport capacity	Reduce the distance per trips	Reduce the number of trips	Use most efficient driving style
Charges on infrastructure (Euro vignette Directive)		X	X			
Directives related to the rail package		X	X			
Alternative fuels Directive	(X)*					
CO ₂ &cars Strategy	X					(X)
Fuel tax Directive	(X)	(X)	(X)	(X)	(X)	(X)
MARCO POLO Programme			X			
Sea motorways & inland waterways programme		X	(X)			
GALILEO Programme			X	(X)	(X)	
TEN-T		(X)		(X)	(X)	(X)
Awareness Raising	(X)	(X)	(X)	(X)	(X)	(X)
Promoting the use of public transport (e.g. Reg. 1191/69)	(X)	X	X	(X)		
Single European Sky			X			X
EU environmental technologies action plan (Etap)	(X)					
Energy Efficiency proposal	(X)	(X)	(X)	(X)	(X)	(X)

* In the past more related to security of supply and GHG emission reduction than to energy reduction

³⁰ In addition the Commission launched a large number of related activities and programmes, e.g. such as Intelligent Energy Europe, Urban Transport Best practice, or research activities. Not all of these activities are mentioned in this report.

Table II-4: Energy related impact of policies and measures taken at EU level in recent years

Obviously only very few measures have direct impact on energy consumption in the transport sector, supporting the view that a targeted energy reduction policy has not been developed so far at EU level.

There is, however, another aspect which needs to be mentioned: The capacity available for the evaluation and assessment of policies and measures. While there is no doubt that the Commission improved its capacity in recent years, e.g. by improving and developing further programmes and simulation models like PRIMES, SCENES, ARTEMIS, SUMMA, TREMOVE etc. It is also true that the available analytical capacity is still insufficient to carry out comprehensive and consolidated predictions of the repercussions of the policies and measures considered. There is an urgent need to improve the available tools in order to allow in-depth assessments of the complex policy packages to be considered in future. The lack of analytical capacity makes it also difficult to assess the success of policies and measures in place. For example, while the TERM work of the EEA is a very helpful source of information, e.g. for the identification of trends, it is not able to provide detailed assessments on the underlying trend-drivers.

Thus, in summary, what is needed are

- a) indicators which are able to identify the key trends
- b) models and methodologies able to explain the trends and predict the success of policies and measures planned
- c) reliable data and information which fit to the indicators and to methods and models,

Currently the points b) and c) are only partly covered in a satisfying form.

III Drivers of Transport Demand and Demand Control

III.1. Transport Demand

The main drivers of transport demand are:

- Economic boundary conditions
- Opportunity
- Capacity
- Time
- Convenience
- Acceptability

These drivers act in quite specific ways on passenger transport and freight transport.

III.1.1. Passenger transportation.

III.1.1.1. Economic boundary conditions

In general, the economic boundary conditions determine the “private lifestyle” and the increase in income has become a main driver for passenger transport demand. The notion of lifestyle involves many choices: i.a. type of housing, area of settlement, work places, leisure and holidays. All those aspects have a direct influence on the need of transportation. Demand for single houses and gardens in cheaper rural areas drives up demand for transport, and especially individual transport. Holidays in remote places have a direct influence on air transportation demand.

Higher income allows travelling more. This applies also to elderly people who, in the past, were considered as quite immobile (although the aging population in EU 25 in total might lead to somewhat less transport demand since elderly people are less mobile than the working fraction of the population). Higher income also allows selecting the more convenient and the faster mode of transport. This leads often to decisions on favour of the less environmentally friendly mode, e.g. private car instead of public transport, airplane instead of train etc.

This trend is supported by other economic factors. Many studies consider the influence of price on transport demand. For example, in France, fuel prices / road transport demand elasticities of -0.3 on highways and -0.16 on national roads are frequently considered. Fuel price but also vehicle prices (to be linked with offer), fiscal benefits, the price of other modes of transportation influence transport demand and modal choice. For many years, transport prices have been decreasing compared to productivity and income and, in relative terms, individual transport is nowadays often cheaper than in the past, e.g. in Germany, on average, the 2004 costs/km to drive a car are by about 0.12 EUROCENTS lower than 1950.

The higher wealth also contributes to the available capacities, e.g. increasing incomes make cars (whether business or private cars) affordable for more people, and to the land planning, e.g. living at distant places and commuting over long distances to work is often cheaper than living in or near city centres.

Another typical example is air transport. For a few years now, aviation transportation prices have dropped to very low levels, making air travel affordable to ever more people. This results in increasing the offer of remote places of holidays or even week ends.

There is also another aspect which requires consideration: Technical efficiency improvements may also lower transport costs and lead potentially to an increased transport. This does not mean that one should stop technical developments leading to higher energy efficiencies, on the opposite (see chapter IV). However, transport demand considerations (and demand control measures) should be part of an integrated approach to increase energy efficiency in the transport sector even if this approach concentrates on technical measures. And not only there: Any measure that reduces inefficiencies in transport, whether it is through removing border obstacles, improving technical interoperability or reducing costs may lead to an increase in demand for that service. All other factors remaining equal, this increasing transport will result in increased transport energy use. Thus, a comprehensive integrated impact assessment of relevant planned measures is an inevitable prerequisite for a successful energy reduction policy.

III.1.1.2. Acceptability or some aspects of the psychological motives for transport demand and mode choice

In the today's society "to be mobile" is considered as normal or even "en vogue", and this applies for all levels of society. In fact, to spend vacations far away from home belongs to the normal living standard of many EU citizens and is not questioned at all. And in some classes of society there seems to be a tendency towards „omnipresence“: the wish to be present wherever one believes that something "special" is happening. This applies to private as well as to business trips: To be omnipresent is a status symbol; travelling goes in our days far beyond the factual needs of being present at different places.

In addition, car transportation is very often the preferred mode of transport. No doubt: Individual transportation has often great advantages in terms of autonomy, reachable territory and convenience. But car ownership and car use are linked to a strong psychological aspect as well, e.g. as a symbol of social identity. Thus car ownership and use go far beyond the factual needs. For example: German studies show that only about 20 – 25 % of the population depends on car transportation. The others could satisfy their transport needs without using individual transport by car. In reality, however, car ownership is about twice as high.

No doubt, passenger transport is also driven by psychological motives, as these examples show. Fortunately, there seems also to be also another trend: the "intelligent mobilist": In Germany about 12 % of the population belongs into this class. People who make very rational mobility choices, taking into account all available means of transport. Many of them do have a car, for example, but do use it only when it is considered as the best option taking into account the key drivers listed in the introduction to this chapter.

III.1.1.3. Practical motives: capacity, convenience and opportunity

Among the practical motives for travelling (and selecting a certain mode of transportation) and apart from costs, convenience and opportunity plays a determining role.

Capacity, on the other hand, as a rule, is not so much an issue anymore, and the distances travelled are getting larger since - assuming a more or less stable time budget – the required capacities are available and the means of transport are getting faster. In fact, technology and available infrastructure allows travelling to places within very short travelling times which

were considered as hardly reachable in the past. And this tendency is unbroken as signalled by the high investments into transport technology and infrastructure. US studies estimate that up to 15 – 20 % of the increase in transport volumes is caused by the provision of additional infrastructure. Thus, the increase of travelling opportunities and capacities is an important driver for transport.

This applies also to cities and their suburbs where an increasing road network and parking availability determines individual transport: more distant places for shopping and leisure are now coming within reach. Since cars offer an opportunity of going whenever somebody wants to wherever somebody wants, once the capacity to use cars is granted, opportunity for car use exists by itself. Thus, the tendency towards increasing road transportations results to a certain extent from the increase of the fleet and of the length of roads.

On the other side of offer is the availability but also the quality (= convenience) of public transportation: There is concern with regard to capacity and convenience of public transportation which competes with individual transportation opportunities. It is very well known that public transport has to meet certain standards in this respect in order to provide a realistic alternative to individual transport. The lack of attractive alternatives to individual motorised transport stimulates first car ownership and then car use.

III.1.2. Urban sprawl and specialisation of area: chicken or egg?

Many areas across Europe have experienced a development of *urban sprawl* where the cities have increased in size. Close suburbs and city centres become less attractive, especially for families with children because housing and living in rural areas are much cheaper. In parallel, there is a trend to specialisation of area functions, especially shopping areas which are now concentrated in low density but cheap places.

Consequently people have to travel longer to reach the same services. Since the basic mobility needs remain constant in most cases (people travel from their homes to work, to school, to services and leisure activities. The location of production centres, terminals and retail stores determine also some of the freight transport demand) the pkm (and tkm) increase. Statistics support this view: Whereas the frequency of passenger travel remains constant, distances increase, especially in sub-urban areas.

Public authorities react to this new demand by enlarging the infrastructure so that motorised vehicle access is nearly always easier and car ownership grows. This results in more motorised transport with all the negative impact on energy consumption and pollution.

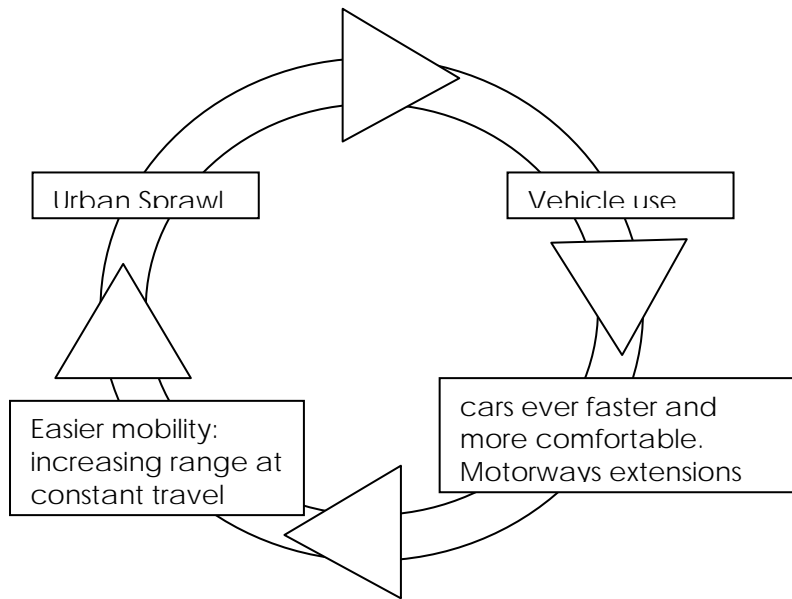


Figure III-1: Urban sprawl

But this development is not a “natural” law; it is also driven or at least supported by local, regional or national land- and city planning and other policies, e.g. fiscal incentives for house building and deductions for transport, which in many ways make it attractive to move into rural areas. And it is possible to counteract this development by re-vitalising the existing cities and urban areas.

III.1.3. Conclusions

The current trend shows first and very weak signs of decoupling although the Pkm per capita increase. This gives hope that the trend which has been considered as given can be influenced.

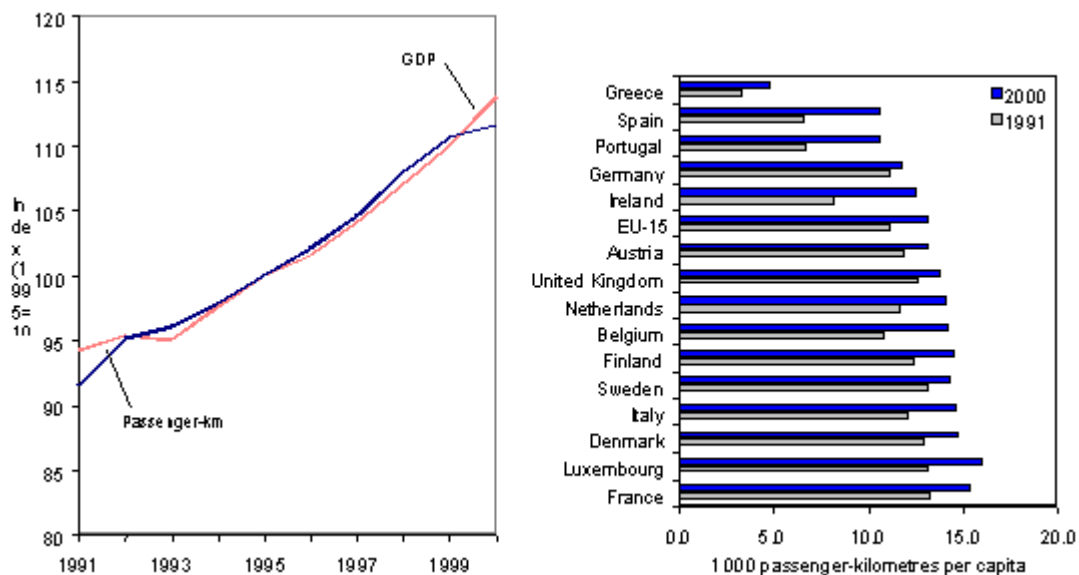


Figure III-2: Passenger transport demand and GDP. Source: EEA and Eurostat ³¹

In fact, government policies do have an impact on passenger transport demand. Policies which aim at influencing the transport demand, should take into account the sensitivity of the key drivers which are systematically, and somewhat simplified, shown in the following table, linked to the key parameters listed in chapter I.

	Increase of unit efficiency	Use of the mean of transport with the highest unit efficiency	Increase efficient use of transport capacity	Reduce the distance per trip	Reduce the number of trips	Use most efficient driving style
Economic boundary conditions	X	X	X	X	X	X
Opportunity	O	O	O	X	O	-
Capacity	O	-	X	X	O	-
Time	-	-	O	X	X	X
Convenience	O	O	X	O	O	-
Acceptability	X	X	O	O	-	O

Table III-1: Key drivers of passenger transport demand and their importance for energy reduction measures (X = important, O = less important, - = not important)

Obviously, the economic boundary conditions seem to have the greatest impact on passenger transport demand. Moreover, it is difficult to influence the unit efficiencies via transport demand measures, but it seems to be possible to influence the transport capacities and the trip length. The trip numbers are known to be, as a rule, less sensible, since the people tend to look for alternatives modes of transport rather than to cancel the trip.

III.1.4. Goods transportation

III.1.4.1. Economic boundary conditions

The main difference between passenger transport and the freight transport volume is the fact that freight transport is significantly less sensitive to costs. As a rule of thumb the logistic costs for an average EU case are in the range of 10% of product costs for manufacturers and of 20 % for traders. Out of this about 30 – 50 % are transport costs, thus about 3 - 5 % or 6 - 10 %, respectively, and out of this there is just a fraction which accounts for energy costs. This explains, among other things, the unbroken up-wards trend of freight transport volumes. This, of course, does not mean that industry and trade do not aim at minimising transport costs. They have to in order to be competitive. Certainly, aspects affecting the incremental costs of one or the other transport option, e.g. which are subject to logistics optimisation, may influence the transport volume as well. But they seem to be of secondary order since costs have a much lower impact on transport volumes than in the passenger transport sector. In the

freight sector transport opportunity, capacity and time are the key factors. Another aspect of the economic boundary conditions is the logistic provider. For these firms the costs of transport matter, since it is an important competitiveness aspect, and thus these firms are among the first to protest against changes in the price matrix.

III.1.4.2. Macroeconomic triggers and market failures.

“Globalisation” is a well known driver of freight transport demand. Globalisation has two main aspects: to produce where it is cheapest and to sell where it is most profitable. All follows the pressures of competition and profit maximisation. In between is transport so that globalisation became the origin of massive freight transport demand. To remain successful in this environment, production and trading firms have cut costs by broadening the sourcing of raw materials and intermediate products in increasingly interdependent regional and global markets. Key is here the costs of labour which differs by order of magnitudes between different regions of the world, but also within the EU. (To give an example: a German knitting firm produces since many years “original“ traditional English knitware for the UK market within largely automated production processes. In 1990 the production sites was Germany with labour costs of about 1500 Euro/person*month and 500 km distance form the point of delivery. Since 1990 the next stations of production/labour costs/distance to point of delivery were: East Germany/800/1100/Romania/200/2000 and Moldavia/80/2500. The firm is currently preparing its move to Far East...). This results in division of labour and a new organisation of production and distribution and in summary increase drastically the transport demand.

This globalisation is, however, based on a misconception, since transport externalities are not fully incorporated. This stimulates globalisation, as the non-integration of externalities make it more profitable to broaden the sourcing. Since the costs for the environment are not accounted for, they fall into the general public households, that means under the responsibility of the governments in form of social or environmental costs, or into the responsibility of the health care system, wherever privatised, or - if not accounted for now - they will, at least partly, have to be paid by future generations. But, as mentioned above, the costs for transport, even with full internalisation of external costs, are quite low and they are in many cases by far outweighed by the differences in labour costs.

III.1.4.3. Just in time and flux trends.

The profound geographical and structural shift in production infrastructure leads to a decrease of unit volumes or product volumes per trip on the one hand and increases of distances on the other, resulting overall in increasing tkm volumes. Goods are now produced in specialised firms for economic reasons: firms are more powerful, fewer in number and they deliver in wider areas than before. In general, the overall costs decrease and the transportation costs are covered by the increase in productivity. This trend has been fostered by the continuous decrease of transportation costs. That is in particular true for high added value products (in €/t) whose production efficiency is sharply increasing. As a consequence, there are fewer industrial sites even at an international scale (such as for printed circuit board, airplanes and cars).

Even if, at a local scale, this results in an increase of traffic, at a larger scale competitiveness encouraged the professionals to rationalise their transportation. The transport costs - although, as mentioned, in many cases not a key aspects for the transport volume as such – are an important optimisation parameter which competes with the costs for stocking and which is taken into account when deciding about the mode of transport. Optimisation measures include

a decrease in stocks at production sites, a centralisation of stocks for distribution in the trade businesses and an overall optimisation of the logistics the individual processes, taking into aspects costs, time (= inter alia, flexibility) and acceptability/convenience (= inter alia, security of supply).

Decrease of stocks at all the steps of production and distribution results in a decrease of the size of shipments and an increase of their number but also in a much higher degree of urgency for each of them. The development of fast delivery services (such as UPS) is a corollary of this phenomenon, or the demands of big production firms to raise the weight of lorries to 60 tons capacity, or the tendency towards (expensive) "express deliveries" which highlight as well the limited effect of costs (and which have a negative repercussion on load factors).

Nevertheless, production and distribution businesses have to secure supply in a flexible way which sets certain limits to the decrease in stocks. The solution is to optimise the stock location, taking into account the costs of land and transport. Whether these solution result in more transport volume depends on the individual case.

However, one consequence is that road transportation, with its capacity to adapt offer to demand and its home delivery capacity, is in many cases preferred to rail and fluvial transportation (cf. modal shift part).

III.1.4.4. Sensibility to economic growth: decoupling?

As already mentioned statistically there is a strong link between economic growth and transport demand, and there are no signs of decoupling.

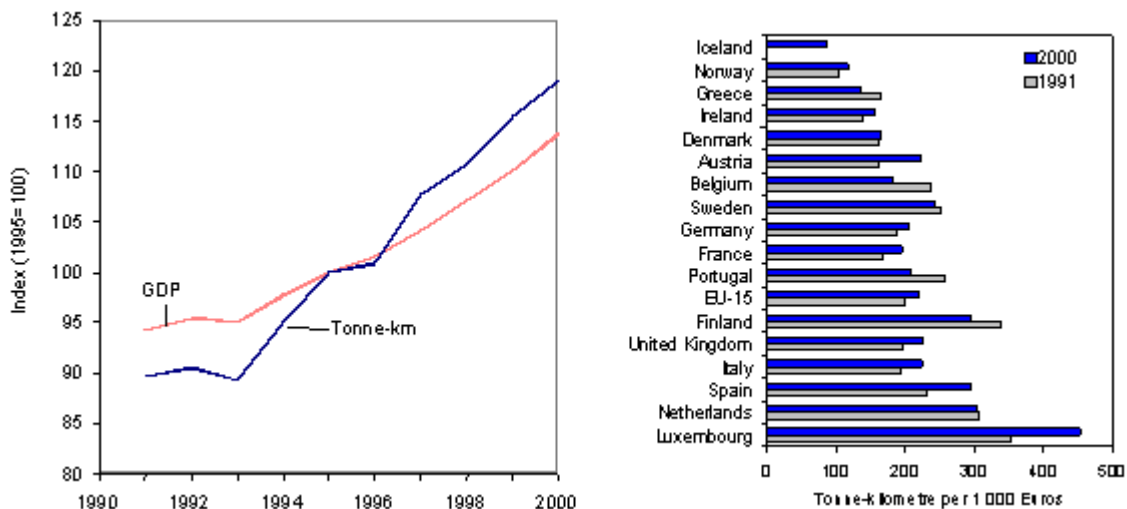


Figure III-3: Freight transport demand and GDP. Source: EEA and Eurostat ³²

The transportation of goods is linked to economic growth for several reasons such as the augmentation of the volumes produced, and the specialisation/differentiation of activities, products and labour costs, which makes it necessary to transport goods over longer distances in more complex product cycles. As the economy grows and production, sales and income rise, it is generally correct to assume that demand for transport would increase. For example,

³² <http://themes.eea.eu.int/>

under the boundary conditions given in the example above, the profits of (successful) enterprises increase drastically, freight transport increases significantly as well and GDP somewhat more or less, depending on national circumstances. Obviously, under these conditions it is very difficult indeed to decouple the increase of GDP and (freight)transport in a positive sense. For some EU Member States it might be just the opposite: GDP will decrease while (freight)transport will increase. The REDEFINE European project showed that in almost all European Member States, road freight activity is expected to grow faster than production, providing evidence that Europe is far from decoupling.

Nevertheless, decoupling is possible. For example, there are signals that Japan and United States have achieved a certain degree of decoupling. One of the main reasons lies in the type of goods produced: high value goods are often light and small and easy to transport. Thus, GDP increases drastically without adding too much to the transport balance. But this more an issue for the economic development of society in total than of transport policy, and an isolated transport policy has only limited possibilities to influence this process.

III.1.5. Conclusions

Government policies have less impact on freight transport demand than on passenger transport demand. Nevertheless, policies which aim at influencing the freight transport demand, should take into account the sensitivity of the key drivers which are systematically, and somewhat simplified, shown in the following table, linked to the key parameters listed in chapter I.

	Increase of unit efficiency	Use of the mean of transport with the highest unit efficiency	Increase efficient use of transport capacity	Reduce distance the per trip	Reduce the number of trips	Use most efficient driving style
Economic boundary conditions	-	-	X	O	O	-
Opportunity	-	-	X	X	X	-
Capacity	-	-	X	X	X	-
Time	-	-	X	X	X	-
Convenience	-	-	-	O	O	-
Acceptability	-	-	-	O	O	-

Table III-2: Key drivers of passenger transport demand and their importance for energy reduction measures (X = important, O = less important, - = not important)

Obviously, opportunity, capacity and time seem to have the greatest impact on freight transport demand.

III.2. Demand Control

Demand control is, in theory, an effective tool to reduce energy consumption in the transport sector. However, it is a very sensitive topic, and for many reasons it is difficult to design and implement appropriate policies in practice, e.g.:

1. As a rule the measures are not popular since they attack often something which is considered as granted by significant parts of the population and by businesses: cheap motorised transport.
2. Linked to point 1. is the general assumption that limiting transport demand has per se negative repercussions on the economic and regional development. Thus, while measures which potentially increase transport often do not require further justification those limiting transport are scrutinised in depth.
3. The measures have to be designed in such a way that they fit effectively into the complex mobility policy. This requires knowing the drivers of transport demand very well, as well as the possible repercussions of the measures envisaged. However, only too often the data base is limited and does not allow making serious predictions.
4. Strong pressure groups defend their “business” and make it difficult to obtain sufficient support for measures identified as efficient and feasible.

The policy approach has to take this into account. This means that packages of measures have to be designed in order ensure that all players make a contribution and that the complexity of the problems is adequately addressed. The analysis given above suggests that three types of policies are necessary: general policies, and policies tailored for the passenger and freight transport, respectively.

As a general remark it should be mentioned that some of the measures have also an impact on modal shift. In fact, many of them need this link since why a fraction of society/businesses may react to the proposed measures by reducing demand another fraction will search for alternative options. In many cases these must be provided in one or the other form in order to achieve the necessary level of acceptance. Thus, some of the measures are mentioned twice in this report, here and in chapter V.

III.3. General policies

General transport policies aim at establishing a systematic and coordinated strategic planning as well as at the setting of the general economic boundary conditions, including those which strengthen the polluter-pay-principle and which establish a level-playing field for transportation costs.

Possible measures³³ of these types are:

³³ Please note: The measures mentioned are discussed in greater detail in the documentation sheets

- National policy goals for energy consumption in the transport sector (documentation sheet (1)) or EU wide energy efficiency targets for individual modes or means of transport (documentation sheet (2))
- The use of the "enhanced cooperation" mechanism which would allow to design tailored policies for sub groups of EU Member States (documentation sheet (3))
- Establishment of a European Mobility Agency (documentation sheet (4), see also chapter on modal shift)
- Re-shaping of the fuel taxes for motorised transport (documentation sheet (5))
- Consequent application of the Extended Impact Assessment by the Commission (documentation sheet (7))
- Internalisation of external costs (documentation sheet (10))
- Improvement of the boundary conditions for TEN-T-projects (documentation sheet (13), see also chapter on modal shift)
- EU minimum standards for road signing and traveller information and support for the application of IT-systems based on "GALILEO" (documentation sheet (17))
- Public information campaigns (documentation sheet (34)) and information exchange programmes (e.g. THE PEP clearing house, documentation sheet (37))
- Mobility Management Centres (documentation sheet (38))

Although these general measures help controlling transport demand only very few have a direct and immediate impact on energy consumption. However, if implemented these measures would set a frame which would allow much better than today to develop and implement a consistent and successful EU transport policy. It should be mentioned that some of these measures, e.g. public information campaigns could be targeted to passenger and freight transport. Thus, they will not be mentioned again in the following chapters.

III.4. Passenger transport policies

The analysis of passenger transport demand showed the great sensitivity to price signals. Moreover, an active and progressive urban planning is one important and long term structural measure to stop urban sprawl, to control travel demand and certain demand patterns. Such measures can reduce demand as such or can influence the transport capacities and the trip lengths. Appropriate measures designed to match this analysis are:

- Energy tax escalator (documentation sheet (6))
- Reduction of urban sprawl (see also chapter on modal shift, documentation sheet (8))

- Integrated transport and land use planning for regional development (documentation sheet (20))
- Enabling EU-wide city tolls or access restriction zones (see also chapter on modal shift, documentation sheet (14))

III.5. Freight transport policies

The analysis of the freight demand showed that transport optimisation, addressing opportunity, capacity and time seems to be one most promising approach. In addition measures which support regional production/consumption networks as a counter balance to the trend of “globalisation” can reduce transport demand. Measures like:

- Mobility management for commercial enterprises (documentation sheet (9))
- Support for regional marketing strategies (documentation sheet (30))

serve these purposes. However, since mobility management results on most of the cases in modal shifts rather than in less tkm, most of the measures are described in the chapter on modal shift.

IV Vehicle Technology, Fuels and Lubricants

IV.1. Introduction

The development of new vehicle technologies and fuels will have a significant role in delivering energy savings by 2020 (e.g. meeting a 20 % target) from surface transport, and as advanced technologies start to gain prominence, they will make a key contribution to a more sustainable, energy efficient transport system beyond this time frame.

However, there is a great deal of uncertainty regarding the vehicles and fuels that will be used as part of a long-term, energy efficient transport system. Many envisage that hydrogen economy is the long-term solution to reducing vehicle emissions and tackling security of supply issues, but this is by far a forgone conclusion. Advanced bio fuels and hybrids utilising new plug-in technology might be other potential alternatives that could contribute. In the context of this uncertainty, the EU and Member States should not dictate the technologies that the motor and oil industries develop as part of an energy efficient transport system. This leaves the important technological decisions to the experts within industry and ensures that Government does not create a distorted market that incentivises technologies with dubious environmental credentials.

However, EU- and government policies can use various measures to give a clear message to industry about the importance of developing more energy efficient road transport in the short, middle and long term. Tools such as taxation systems, grant schemes, market-based instruments and emissions trading can be used to set a framework which encourages industry to develop the most energy efficient road transport, without dictating what technologies this should involve.

The global nature of the motor and oil industries means that there is potentially a considerable benefit if the EU could co-ordinate such a framework across Europe. A consistent message across Europe regarding the development of the best vehicle technologies and fuels would instil confidence in industry to invest in developing the new fuels and vehicles that will be required to deliver an enduring energy efficient transport system.

IV.2. Increase of technical unit efficiency: railways, coaches and buses

Apart from transferring road and air kilometres to the railways, technical improvements to rail vehicles also help to reduce energy consumption and CO₂ emissions. Clearly, considerable efforts will be required in long-distance passenger transport; an increase in occupancy rate could, of course, make a significant contribution as well.

Energy and CO₂ reductions can be achieved by means of vehicle engineering (e.g. lightweight design) and increasing operational efficiency. Operational measures include energy-saving driving behaviour, recovery or flywheel storage of braking energy (as seen, for example, in the diesel-electric prototype LIREX, with savings of up to 25 %), as well as a separation of fast and slow trains. In the light of the long life times of railway stock one could wonder whether subsidy programmes for scrapping of old locomotives and wagons are an option, see documentation sheet (21).

Technical measures on urban bus fleets, including reducing vehicle weight, using tyres with lower rolling resistance, low-viscosity oils, low-consumption design of the drive line and hybridising can lead to cuts in consumption. The total potential for cutting energy consumption and CO₂ emissions is at least between 20 and 25 %, and could be up to 40 – 50 % of all measures are effectively used. Here as well scrapping programmes and public procurement could be of help, see documentation sheets (19) and (29).

Of course, such programmes have always to be based on stringent and demanding performance criteria to be met by the replacement vehicles (see documentation sheet (27)). It should be mentioned that in both cases there is great potential to improve at the same time the performance with regard to other emissions and to noise, and in doing so to improve the competitive position of railways and coaches (e.g. used in public transport).

IV.3. Increase of technical unit efficiency: passenger cars

The currently most relevant instruments at EU level are the voluntary Commitments which the European Commission concluded with representative organisations of the car industry (ACEA, JAMA and KAMA). These voluntary Commitments aim to reduce average CO₂ emissions from new passenger cars to 140 grams CO₂ per kilometre in 2008 (ACEA) and 2009 respectively (JAMA and KAMA). A further reduction to 120 grams per kilometre in 2012 would help the EU to achieve the Kyoto targets, as the reduction path would be continued after 2008. This could be part of an integrated approach related to cars, fuels and car usage.

As a follow-up to the voluntary agreements with the car industry, several alternative measures can be taken, e.g.:

1. A second series of voluntary Commitments with the car industry after 2008-09, possibly with a goal of 120 grams per kilometre in 2012³⁴.
2. In the event of insufficient progress using new voluntary Commitments, legislation could be considered, i.e. a CO₂-standard.
3. It would be possible to introduce legislation with a flexible trade mechanism between manufacturers. One possible approach would be that a manufacturer marketing a car in the EU with CO₂ emissions exceeding the standard by x units can compensate for this by marketing another car with CO₂ emissions of x units below the standard, or buying an emissions surplus from another manufacturer. Manufacturers receive a surcharge on their production costs if they exceed the standards and a discount if they stay below the standard. However, it depends on the system itself whether similar targets as under option 2 can be reached. Apart from this reductions with flexible trade mechanisms might be more cost effective than other options (see documentation sheet (18)).

When discussing these options one should keep in mind the different sensitivities to influencing parameters of private car owners and businesses and the importance of costs for these different target groups, as explained in chapter III. Moreover, one should take into account the experiences gained with the voluntary Commitments which are currently in place and which do not show anymore the progress required to meet the targets. In the light of these experiences it seems to be most appropriate to consider in the long-term emission limit values for passenger cars (class M1) since it is the only way to guarantee that a pre-defined progress is made, see documentation sheet (22). Moreover, such a measure is in line with approaches taken elsewhere in the world, e.g. Japan and China, and could therefore, in the long run, contribute to a worldwide approximation of energy- or CO₂-performance characteristics. If this option is not considered as appropriate it is absolutely necessary to accompany future voluntary Commitments with legislation which comes into force as soon as certain benchmarks are not met. Without such a “back-up” the progress remains quite unpredictable. Moreover, it is in this case necessary to improve the fuel efficiency labelling, see documentation sheet (40).

³⁴ Please note, the Community target as defined by Council and EP is 120 g/km in 2010

In any case, energy and CO₂ reduction measures should be extended to light duty vehicles (N1 vehicles), which cause about 20 % of CO₂ emissions from road transport, (and may be in the long run also to heavy duty vehicles), with effect from 2007 to 2010 when a method to measure LDV's fuel consumption will be available. Here as well mandatory emission limit values seem to be in the long run the most promising option, e.g. expressed as a function of the pay load, see documentation sheet (22). In case of a voluntary approach the statements made with regard to passenger cars should be applied as well.

Another measure to reduce energy consumption and CO₂ emissions from vans, which also positively influence other emissions and road safety, could be to introduce mandatory speed limiters or other driver assistance systems at EU level, see documentation sheet (32).

Another technical aspect related to passenger cars and vans is the negative impact of climate control systems on fuel consumption and CO₂ emissions. These emissions are not accounted for in the present voluntary Commitments. The continued rise of the market share of cars equipped with air-conditioning systems calls for their inclusion in the post-2008 agreements, see documentation sheet (39).

IV.4. Increase of technical unit efficiency: motorcycles

The fleet of motorcycles is rather big and is going to increase further. That means the efficiency of motorcycles is low, and in addition the air pollution due to them is relatively high.³⁵ Moreover, the current power and performance levels are unacceptable.

The current average fleet fuel consumption of motorcycles and scooters in the EU is about 4.1 l/100 km (equivalent to about 98 g CO₂/km).

Although the energy efficiency of motorcycles needs to be improved significantly, there is some hope that Euro 3 motorcycles with catalytic converter run with leaner air fuel ratios and thus have lower fuel consumption. Based on a statistical analysis of the correlation between power to mass ratio (PMR) and fuel consumption of European motorcycles, the following measures are recommended:

- Well-tuned carburettors or - better - direct injection for exact fuel dosing.
- Only 1-cylinder engines for an exactly harmonised air fuel ratio.
- Use of 4-stroke engines, because of the scavenging losses by 2-stroke engines.
- Automatic transmission for reasonable gear changing to avoid increased fuel consumption (and noise) in consequence of strong acceleration.
- Not more than 650 cm³ cylinder capacity.

With the EURO 3 standard the common driving cycle will be introduced. This makes it possible for the first time to compare the CO₂ emissions of all European EURO 3 motorcycles in an objective manner. This comparison should be a part of a motorcycle environmental ranking list for analysis and evaluation of the environmental characteristics of motorcycles.

Furthermore it is necessary to introduce CO₂ limits for motorcycles graduated according to motorcycle classes (e.g.: mopeds, 50-169cm³, 170-269cm³, 280cm³ and above). This requires validated empirical data on fuel consumption of European motorcycles. Every motorcycle class has to get its own average CO₂ fleet limit in a specific time frame. Such CO₂ limits are the suitable way to break the motorcycle trend towards more power, speed and acceleration,

³⁵ With the introduction of the new emission standard EURO 3 which will be launched on 1 January 2006, all new motorcycles need a catalytic converter.

since motorcycle manufacturers would respond with power and speed downsizing. See also documentation sheet (23).

IV.5. Increase of technical unit efficiency: CO₂-based vehicle taxes for cars and light duty vehicles

Vehicle taxation differentiated according to exhaust emission levels has proved useful in the past for promoting low-emission vehicles and made a decisive contribution to accelerating the development and use of more environmentally sound vehicles. Now that requirements concerning pollutant emissions for newly registered vehicles have been tightened up significantly throughout Europe, it would be possible to use vehicle tax to promote sales of low-fuel cars. To do this, tax levels should be set according to the CO₂ emissions and progressively graded, i.e. the lower the specific fuel consumption and CO₂ emissions of a vehicle, the lower the amount of vehicle tax the owner has to pay. This measure has an impact both on people's decisions when purchasing cars and on faster replacement of old vehicles. A study carried out for the EU Environment Commission shows that had a vehicle tax graded to reflect CO₂ emissions been introduced in Germany in 2000, it would have produced a reduction of 6 % in 2008. That indicates that the pollutant emission categories currently used for the tax should be retained and the cubic capacity of the engine, which is actually not a concrete yardstick for consumption, should be replaced by CO₂ emissions per kilometre.

The potential of this measure for cars and light commercial vehicles is in the order of 6 % within 8 years. The possibilities of a CO₂-based vehicle tax reducing the fuel consumption of heavy-duty vehicles are much more limited, since the necessity of keeping operating costs as low as possible means that consumption values for these vehicles have already been optimised far more than is the case for cars and light commercial vehicles. For that reason this measure has not been applied to heavy-duty vehicles. The currently valid vehicle tax is fixed until 2006, so that the introduction of a CO₂-based element would be possible from 2007. The costs of this measure are very low in relation to the reduction in emissions that can be achieved, since, if it is organised in a revenue-neutral way, only the assessment basis for the vehicle tax would change. See also documentation sheet (24).

IV.6. Increase of technical unit efficiency: usage of low friction lubricants for engines

The most important function of low-viscosity oil in an engine is to reduce internal friction, in other words its lubricating function. The influence of friction on the overall energy conversion within the engine is particularly important. Modern engine oils have to be able to perform both at high temperatures (full load) and very low temperatures (cold-weather starts). The property that characterises a lubricant is its viscosity (flow property).

Engine oils are classified by their viscosity. There are a number of different systems of classification. The most common is the SAE system (Society of Automotive Engineers). This grades engine oils by their viscosity during a cold-weather start-up and at high engine temperatures. Oils in the SAE grades 0W30 and 5W30 guarantee the best lubrication function due to their viscosity; they are classified as low-viscosity oils. They consist of synthetic base oils and additives. Conventional engine oils (15W40, 10W40) are not able to achieve viscosity levels of that kind because of the blending properties of their mineral base oils.

In 2001, low-viscosity oils of grades 0W30 and 5W30 accounted for only 10% of the mix of engine oils sold in Germany. Since the term "low-viscosity oil" is not clearly defined, oils of different qualities are currently being marketed as low-viscosity oil. For example, 10W40 engine oils are sold as low-viscosity oils, although the flow properties of these oils are by no means ideal.

Defining a quality standard (e.g. using the EU "ECO LABEL") could facilitate the

widespread use of low-viscosity oils. Legislation defining a uniform quality standard could then be introduced in all Member States of the European Community.

The technical energy saving potential is 2-5 %, see documentation sheet (25).

IV.7. Increase of technical unit efficiency: efficient tyres

Vehicle tyres that have reduced rolling resistance generate less noise and contribute to lower fuel consumption. Rolling resistance occurs as a result of the tyre being deformed under load. The extent of the power loss depends on the weight of the vehicle and the friction between the road and the tyre.

One of the aims of tyre development over recent years has been to optimise rolling resistance, i.e. to retain important properties of the tyre, such as grip on wet surfaces and braking performance, while at the same time lowering the rolling resistance. The use of new compounds in treads have made it possible to develop fuel-saving, low-noise tyres, known as low rolling resistance tyres. In 1997, eco-label RAL-UZ 89 (“Blue Angel”) was introduced for low-noise, fuel-saving tyres [RAL-UZ89].

The German tyre market already has a wide range of tyres with low rolling resistance. Studies by the Federal Environmental Agency have shown that low rolling resistance tyres can be purchased from various suppliers in all sizes tested (summer and winter tyres) and in virtually all categories of tyre. It must be said that tyre manufacturers tend to use their own individual system of labelling, so that low rolling resistance tyres are not always called that, but are sold under the name of “Economy,” “Energy,” “Fuel-saver” or similar terms. The German eco-label (“Blue Angel”) is used by manufacturers to a very low extent. A price comparison of low rolling resistance tyres with conventional tyres showed that there is little or no price difference. A limit value for the rolling resistance coefficient of tyres could facilitate the blanket use of low rolling resistance tyres. Standard EU-wide labelling of rolling resistance and noise values on the sidewall of the tyre could support prompt implementation.

The technical energy saving potential is 2-9 %. However, current trends towards ever wider and larger tyres offset such gains largely. These trends should be stopped. On the other hand, tyre pressure as such is a problem in so far as about half of all tyres for cars and vans are under pressured by up to -20/-30 %, which wastes fuel at a rate of 2-4 %, increases accident risks and shortens tyre lifespan. Apart from systems and programs [mostly run under eco-driving] to enhance tyre pressure awareness and control practise, it is urgent to agree with the car and tyre industry to tackle this problem themselves, be it for safety reasons only. From NL research by TNO it can be concluded that current standard manufacturer’s guidelines for tyre pressures are too low and do not include current pressure losses or lack of driver’s attention. Standard pressure values can be raised by 0.2 bar/10 % without loss of driveability features [only some loss of comfort on rough pavements], which will prevent most vehicles from running too low pressure values after longer periods of non-checking or at high speeds and high loads [which need high pressure rating]. Energy saving effect is estimated at 2-4 %, without any costs. See also documentation sheet (26).

IV.8. Increase RTD support

Schemes that provide funding for the development and demonstration of prototype low emission vehicles and grants to encourage the purchase of the lowest carbon vehicles can provide a considerable incentive to manufacturers to produce more energy efficient vehicle technology. Member States should be encouraged to introduce grant programmes that adopt a technology neutral approach - that would incentivise the cleanest cars regardless of the technology or fuel type.

The EU could help the demonstration of new technologies by encouraging joint work between Member States. An integrated approach to the demonstration of the latest vehicle technology allows different stakeholders to share the risks involved in trialling new technology that may not work and would reduce costs by ensuring that there is no duplication of demonstration work across the Community. Centralised funding for demonstration projects from the European Commission which allocates funding on the basis of anticipated improved performance would mean that the Community targeted investment into projects with the greatest potential for energy efficiency improvements.

The EU could encourage Member States to introduce grant programmes by setting a clear framework for the level of grants available for different vehicle performance. A framework which varied the level of grants available across the Community depending on the carbon emissions performance of vehicles would have two key advantages:

- Gives the Industry a clear, consistent message across Europe, which makes it easier to plan the development of new vehicle technologies across many Member States.
- Would help avoid issues of State Aid, making it easier for Member States to introduce Grant programmes.

See also documentation sheet (28).

IV.9. Increase of technical unit efficiency: Public procurement and EEV standards

Public procurement can drive markets by securing forward commitments from public sector purchasers to allow the “scaling-up” to commercial viability of innovative, environmental products. Criteria for technology should allow for innovation and development which is best achieved by setting performance targets, rather than incentivising existing technology. Using performance standards allows work to be updated and kept current, as well as reinforcing the principle of giving industry a clear, long-term indication of the market for low carbon vehicles.

The European Commission studied the possible energy and carbon reductions from setting public procurement targets for low carbon vehicles. The results have not been published yet. It would be helpful to learn whether such a policy is worthwhile. Analysis is also required on how such a target would affect the competitiveness of Government fleet procurers, as Government fleets are run as a business within a specified budget and vehicles purchased need to be fit for purpose, affordable and reliable.

The implementation of public procurement programmes requires defining energy efficiency goals to be met by these vehicles. There has been a lot of work undertaken by the Commission to define “Environmentally Enhanced Vehicles” (EEV) but up to now without any visible outcome. For an energy efficiency targeted public procurement programme this could be facilitated by concentrating the efforts just on energy efficiency and define EEV in relation to the performance of the existing fleets of new vehicles, e.g. as percentages below the average current levels. The targets, once defined could then be reviewed time by time in order to follow the progress in technology. See also documentation sheets (27) and (29).

IV.10. Alternative Fuels Framework

Currently alternative fuels like CNG, LPG or bio fuels do not provide higher energy efficiencies and so therefore not contribute to lower energy consumption. Nevertheless, some of these alternative fuels can and will play a major role in future in order to reduce CO₂ emissions and increase security of supply. However, policies designed to work towards an increased use of alternative fuels for the transport sector should carefully consider the overall

energy balance. The central priority should be to focus on environmental gains, with the emphasis being on quantified benefits that are based on the life-cycle carbon performance of the fuel. For fuels which meet the expectations, providing as much certainty as is possible on excise duty differentials, helps provide the necessary stability, confidence and market conditions for investors. A framework for the duty levels on fuels, depending on their well-to-wheel carbon performance will ensure that policies continue to reflect the environmental benefits that alternative fuels can deliver and to establish a clear rationale for decisions on EU wide support.

The levels of support should reflect the full environmental impact of the fuel and the policy must be economically sustainable including the aspect of the abatement costs of greenhouse gases. The EU should not support an industry whose long-term survival is dependent on excessive levels of subsidy unjustified by environmental benefit.

The EU should set fuel duty differentials on a well-to-wheel carbon basis. The most efficient fuels should attract preferential tax duties, guaranteed for a 3-5 year rolling period, to give the oil industry long-term certainty required for initial investment, see documentation sheet (5).

V Modal Shift

V.1. Potential

Contrary to the aim of the Common Transport Policy the shares of aviation and road transport continue to grow, while the shares of rail, bus, and inland shipping are gradually decreasing (see Tables I-6 and I-7). Nonetheless, to shift transport demand to more efficient transport modes is a promising option for reducing energy use in transport, and should not be dropped.

The share of car use in the total of all city trips varies among different cities indicating high potentials for modal shift in urban transport (see Figure 5-1).

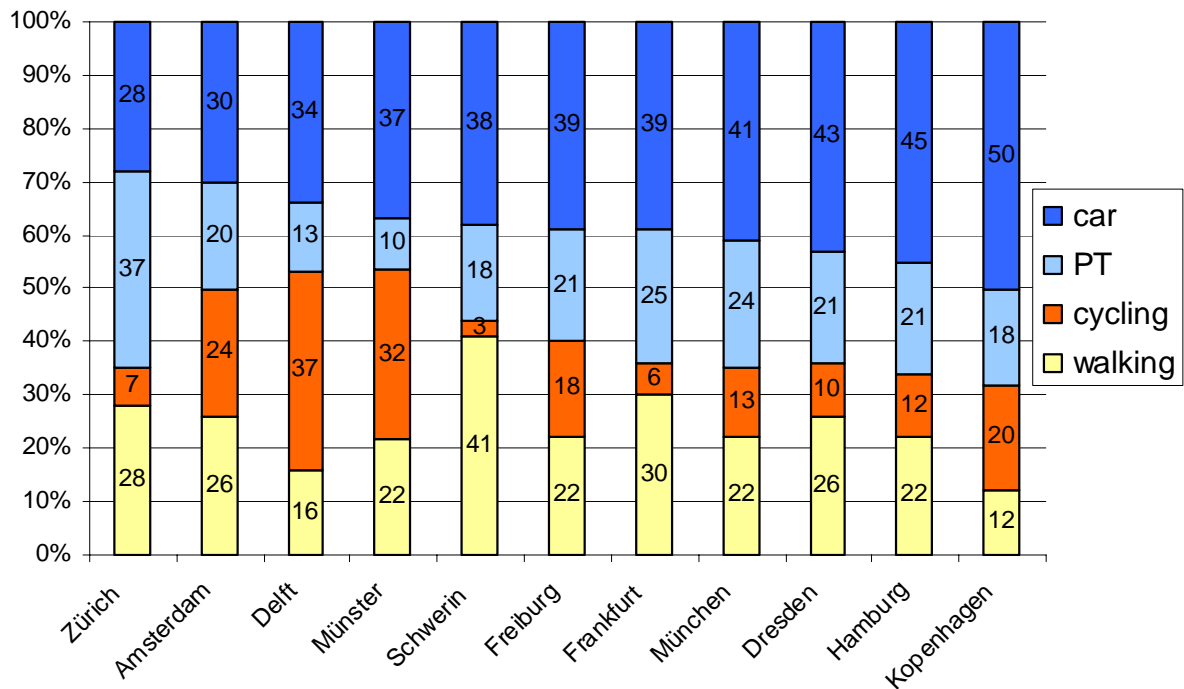


Figure V-1: Modal Split in European cities: trips

The share of road freight in the EU Member States varies from 100% in Malta to 22% in Latvia. The share of rail freight is nearly 70% in Estonia and 2% in Greece (see Fig. 5-2 for some more examples. Note that the data exclude maritime shipping, = 40% of tkm in EU-15).

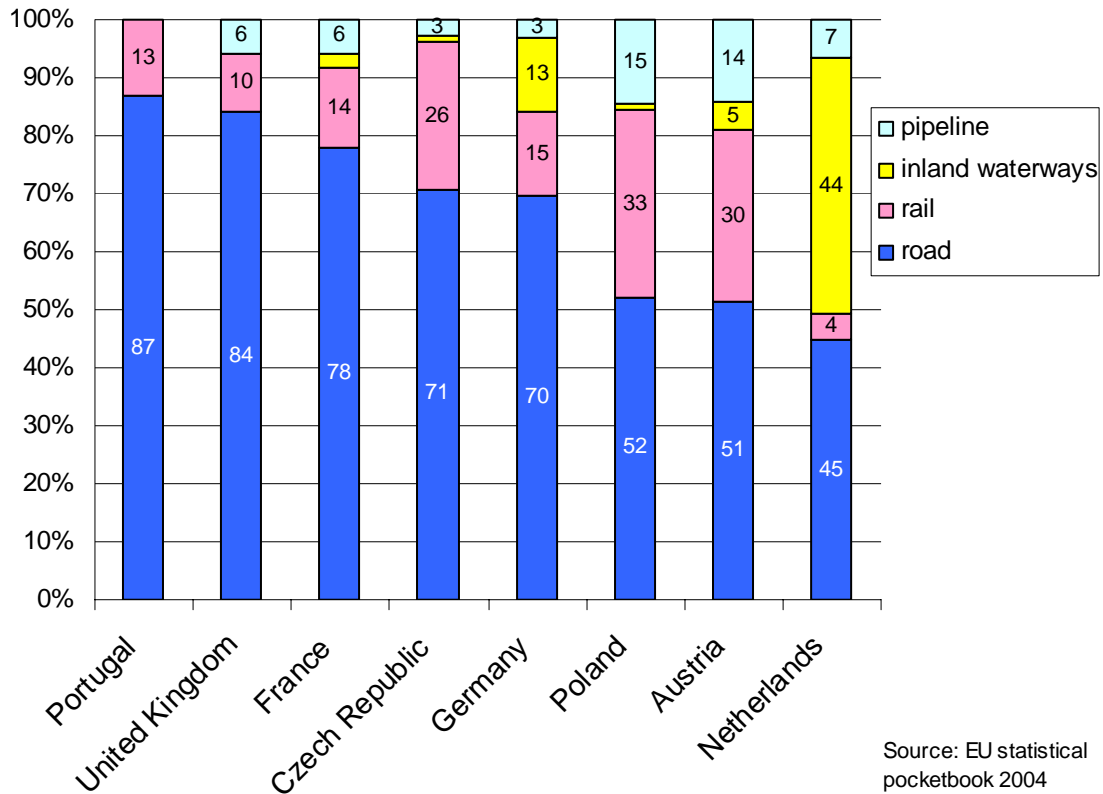


Figure V-2: Modal Split in Freight Transport: tonne-km

V.1.1. Energy efficiency per transport unit and mode

In the average energy efficiency of public transport (PT), rail freight and waterway transport is considerably higher than energy efficiency of cars and trucks. This also holds for the future (see Fig. V-6). When we look into individual transport incidents, however, advantages depend on vehicles used, load factors, detours due to infrastructure routing, and in the case of freight transport also the sorts of goods transported and the distances covered by pre- and onward-carriage.

According to average figures of passenger transport in urban areas of Germany, energy efficiency of buses and light rail is about twice the efficiency of the car. For long distance trips energy efficiency of rail is more than 30% (and can be up to 80 %) higher compared to cars (see Fig. V-3).

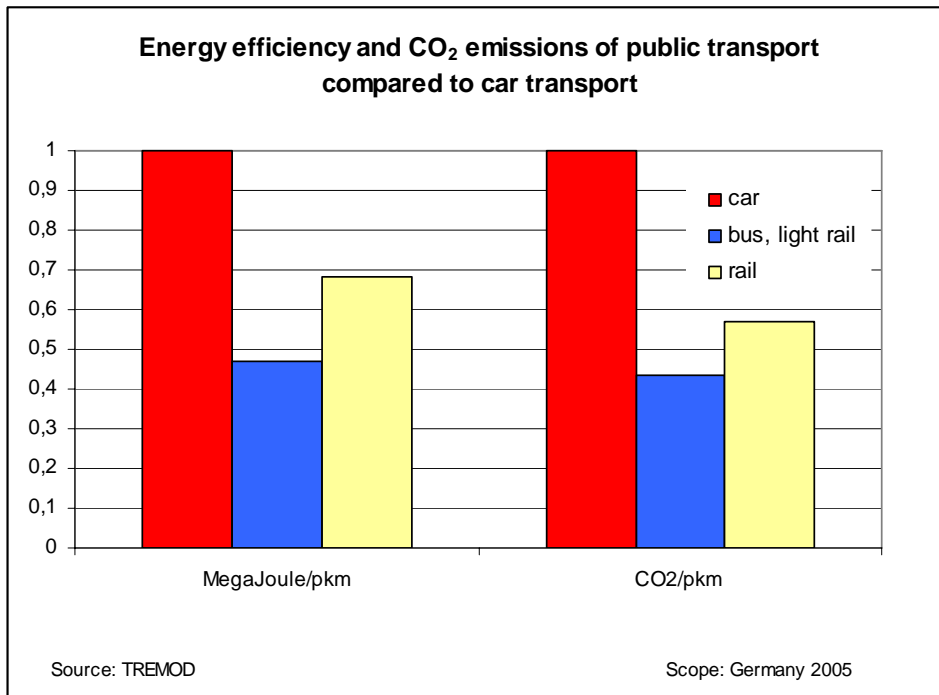


Figure V-3: Energy efficiency per transport unit and mode with passenger transport

Whether PT and rail are unit efficient very much depends on vehicle loads. The more people are travelling per vehicle the less energy is used per person/km. With commuter travel car occupancy is low (1,2 on average) while vehicle loads of PT are high (70 %), resulting in advantages of 1:5 or 1:6 of PT over cars (see Fig. V-4). For its Euro city train ‘Transalpin’ from Vienna to Innsbruck the Austrian railway company calculated an energy efficiency rate of 1:9 compared to the car. On the other hand with leisure travel in the late evening, vehicle utilisation of PT is very low (6% on average), and in this case the advantage is on the part of car transport. The same often holds in rural areas.

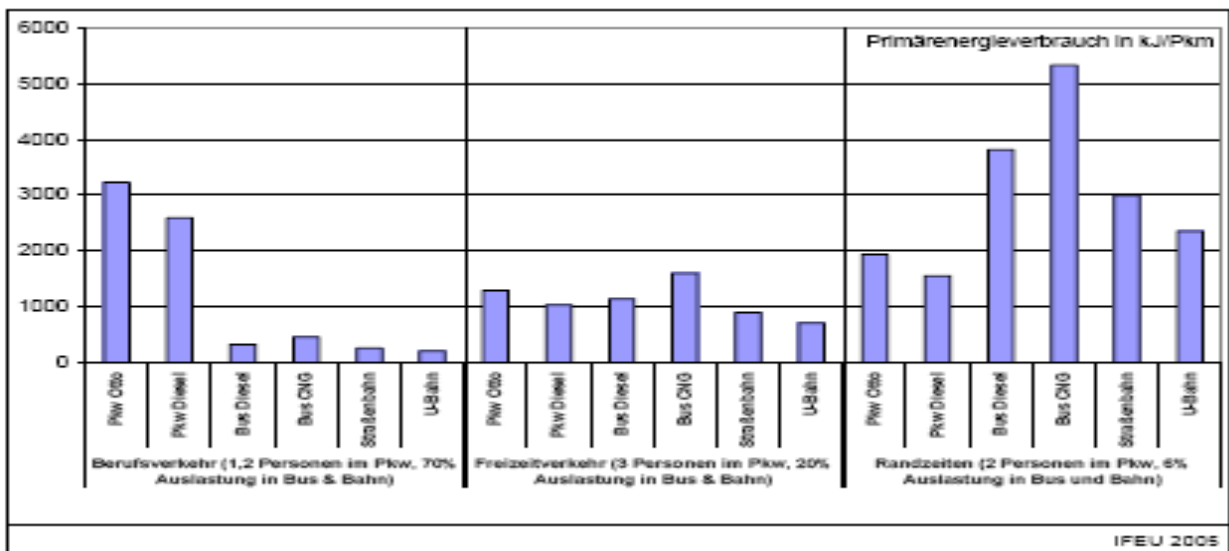


Figure V-4: Energy efficiency of cars and public transport modes in different situations: commuter travel, leisure travel and late evening travel

With freight transport, efficiency gains on the average are larger, rail and ships consuming only one third of primary energy compared to trucks in large volume transport (see Fig. V-5 for German average data). If we look at CO₂ emissions the advantage of rail is growing with the proportion of renewable energy used in power production.

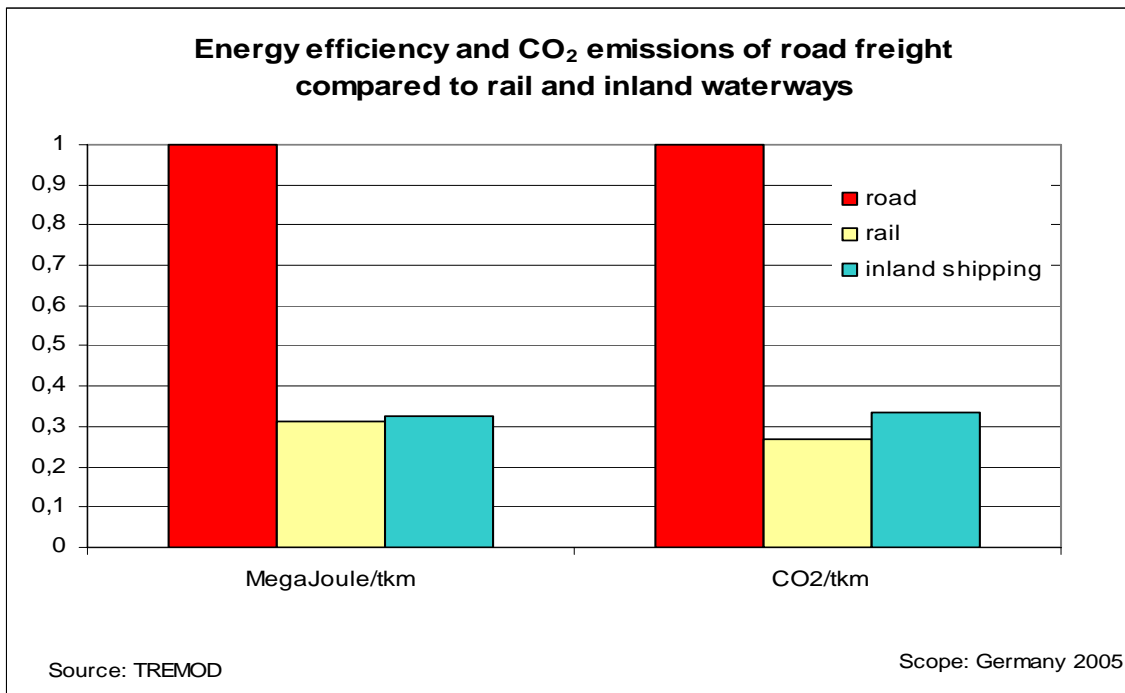


Figure V-5: Energy efficiency per transport unit and mode with Freight Transport

The advantages of rail over road vary for different sorts of goods. According to new data from Germany they are highest for bulk goods and lowest for container transport, light cargo lying in between (see Fig. V-6, IFEU 2005).

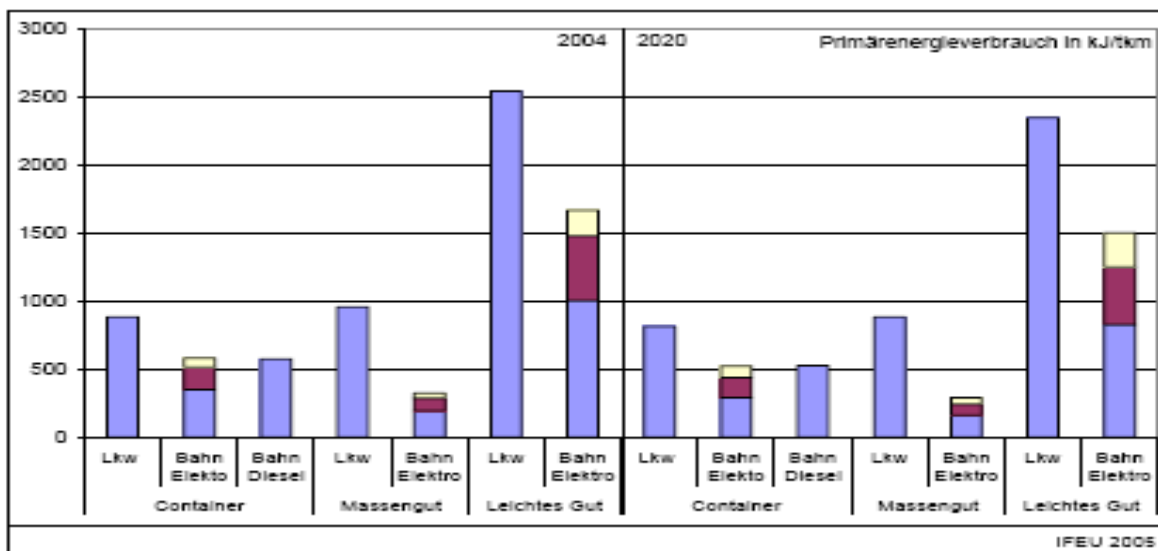


Figure V-6: Energy efficiency of road and rail freight transport by different sorts of goods

According to a study from the Netherlands the efficiency of inland vessels very much depends on vehicle size. Transporting long distance bulk freight, small vessels (<250 tonnes) consume

twice as much energy compared to trucks, whereas comparing trucks to inland vessels >3000 tonnes, the advantage of vessels is 1:3 (CE 2003).

Furthermore differences between modes depend on the specific transport situation. As shown in Fig. V-7 rail transport in some cases may be even less energy efficient than road transport. Several European railway and logistic companies have decided to create an internet tool to compare the emissions and energy consumption of different transport modes for individual routes and volumes of freight, named EcoTransIT (Ecological Transport Information Tool): <http://www.ecotransit.org/base/index.en.phtml>.

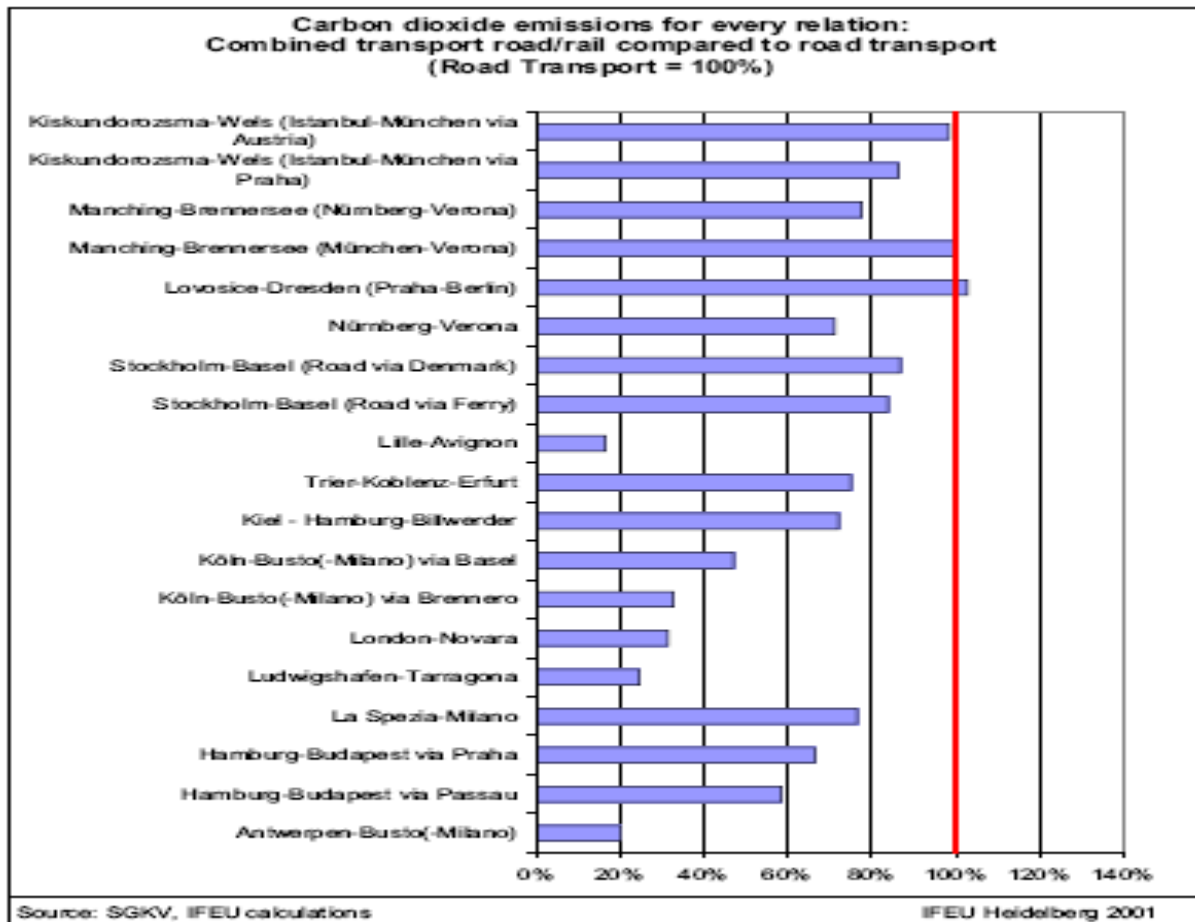


Figure V-7: CO₂ emissions of road/rail compared to road freight transport – specific relations

What do these figures mean to modal shift policies?

For any individual trip, to shift from private car use to PT (or non-motorised means) is favourable for environment and energy conservation reasons. In car use, raising the load factor proves beneficial as well. If we think about expanding PT networks and service, new supply has to be carefully designed in order to find users in sufficient numbers. While generally it is not reasonable to keep alive PT service if it is not used, in many cases nevertheless it may be useful to supply PT on lines or at times when utilisation is low, because offering door to door service may enhance the profitability of the whole network or system. As is the case with road infrastructure investments, investing in PT supply may fuel growth of transport demand. Therefore push and pull measures are needed in order to trigger

modal shift and prevent an increase of the total transport volume. Because PT often is rivalling walking and cycling measures to increase walking and cycling on the one hand and to improve public transport on the other hand have to be dovetailed carefully.

With freight transport it is more difficult to draw conclusions. Rail and waterway freight transport clearly outperform road freight transport in an average perspective. Nevertheless investments in rail infrastructure have to be tailored carefully to transport situations where modal shift in fact will yield energy efficiency gains. In order not to provoke growth of transport demand, restrictions for road transport should attend improvements of rail infrastructure. Furthermore the volumes of bulk freight transport are decreasing, efficiency gains of rail and waterways being most pronounced in this sector. Volumes of container transport are rising, while in this sector differences of energy efficiency are definitely less pronounced, and in many cases road freight is more energy efficient than rail or inland shipping. Therefore, while some experts see strong environmental arguments in favour of modal shift, the modal shift goal is challenged by others.

V.1.2. Cycling and walking

Half of all car trips in EU 15 are less than 6 km, which is half an hour cycling distance at the most, and 10 % are less than 1 km, an ideal walking distance (TERM 2001). This is particularly damaging for the environment since cold-start short trips by car increase fuel consumption and emissions by a factor 2 (summer) to 3 (winter). Walking and cycling are the most energy efficient transport modes. In Germany shifting 30 % of car trips less than 6 km to cycling would bring down CO₂ emission of road transport by 4 %. Compared to motorised transport modes moderate investments in cycling infrastructure and service would produce high mobility gains. Cities with low levels of cycling infrastructure could start with dedicating sections from parking lanes and sidewalks (provided these are broad enough not to pester pedestrians) to cycle lanes, supporting safety and speed for cyclists vs. car use.

V.1.3. Public Transport

For every per cent shift of transport in German towns from cars to PT modes (pkm) CO₂ emissions would drop by 240,000 tonnes. A 5 % shift would reduce CO₂ emissions by 2 million tonnes, provided PT capacity can absorb extra demand without expanding vehicle mileage. If PT would transport twice its current volume, CO₂ emissions would drop by 4 million tonnes even though vehicle PT mileage would have to rise. These are 2 % of German road transport bound CO₂ emissions.

V.1.4. Rail freight and inland waterways

Compared to road freight transport rail and inland shipping are by far more energy efficient modes, spending just about one fourth of the energy. On the average 70 to 80 kg CO₂ can be saved per 1000 tkm shifted to rail or shipping. Compared to heavy duty trucks of 34 to 40 tonnes the energy advantage of rail and waterways is less pronounced. Nevertheless shifting goods transported by one of these trucks travelling a distance of 1000 kilometres to rail or inland waterways will save 50 to 60 tonnes CO₂. Between 1995 and 2002 the volume of road freight transport in EU-15 increased by 22 %. If this increase would have been shifted to rail and inland shipping instead, 15 to 20 million tonnes CO₂ could have been saved.

V.1.5. Synergies

Modal shift to walking and cycling lowers noise in urban areas and reduces air pollution, all the more as walking and cycling would substitute short car trips, reducing high polluting cold

starts. It saves urban space and contributes to create liveable neighbourhoods, which in turn might provide incentives for inhabitants to stay in residential city areas instead of migrating to the suburbs. Walking and cycling in addition, accomplished as a daily exercise, improves public health and can contribute to reduce health costs.

While tight emission control regimes exist for road transport vehicles, emission limits for diesel powered trains and vessels have been introduced only lately. As a consequence NO_x and PM₁₀ emissions per tonne-kilometre by diesel trains and vessels are higher than emissions by trucks at the time being, and will be even higher in several years when more demanding emission limit values for HDV will come into force. However, it can be expected that the emissions limit values for trains and vessels will be tightened in future as well so that, in the long run, the emission performance of these means of transport might outplay road vehicles again. As rail and ship engines last very long, retrofit programmes will be necessary.

V.2. Costs

V.2.1. User costs

For transport users modal shift may pay off. Expenses for walking and cycling are low compared to any other mode. Concerning travel time, up to 7 kilometres distance bicycles are outrunning public transport, and up to 3 kilometres even cars. In addition, integrating walking and cycling into everyday mobility will bring about considerable health profits. Expenses for PT are half or less the expenses for cars, if all costs are considered including car purchase and maintenance. On the other hand travel time losses must be taken into account. Dutch data show for example that 87 % of all car trips made in 1999 had a travel time which was more than 1.5 times faster than if these trips were being made by PT (JEGTE topical report, Feb. 2005). Time spent in a train however can be used for other purposes than just driving, as relaxing, reading or working for example. This may be the reason why in the study mentioned travellers indicated that they considered PT an acceptable alternative if the travel time would be maximum 1.5 longer compared to car travel time.

User costs of road freight transport are generally rather low compared to rail. This still holds for travel time as well. The average speed of international rail freight services has fallen below 18 km/h. Railway transport is less reliable than road haulage as regards delivery times, which are far less predictable in the case of rail. On some international routes, delivery times have even doubled or trebled in recent years. This is due mainly to very long stopping times en route, because other trains (passenger services especially) have priority, and because procedures at borders are complicated (train crews and locomotives have to be changed because of differences in signalling systems from one country to another, etc.). Formalities are longer and more complicated at all stages of the procedure, whilst it takes barely a few hours to set up a contract with a road haulage operator. The value of goods is rising, and the higher the value of goods the more money is bound during transport. Thus short transport times are getting more important.

There are examples, however, how to save costs by modal shift, as demonstrated by the German mail-order company Otto-Versand. For its long distance hauls the company is using ocean shipping rather than air cargo. Transporting goods from Asian manufacturers by shipping the company is saving 90 % of transport costs compared to aviation. In this case the company is using shipping time as storage time, saving the additional costs of warehouses.

V.2.2. Social costs

Governments are spending huge amounts of money for transportation. It is a widespread prejudice, due to lack of transparency, that most of the money is assigned to PT. A study

funded by the European Commission now found that German local governments on balance are spending 100 to 150 € per inhabitant from their local authority budget on local car transport. The Austrian city of Graz is spending 170 € per inhabitant on car traffic, but only 84 € / inhabitant for PT.³⁶

The conclusion is that funding modal shift is not so much a question of spending more money but to optimize budget allocation corresponding to environmental, social and economic targets.

In addition, modal shift can substantially lower external costs of transport. A study by IWW/INFRAS estimated the average external costs of car traffic in EU 17 (EU member states plus Norway and Switzerland) to be 76 €/1000 pkm. For buses the amount is less than half this much, and external costs of rail traffic add up to only 30% of car costs. There are no external costs for non-motorised transport modes (see Fig. V-8).

According to the same study external costs of rail freight add to 25 % of the costs of road freight with heavy duty vehicles while the costs of air cargo are almost factor four (see Fig. V-9)³⁷. See documentation sheet (10).

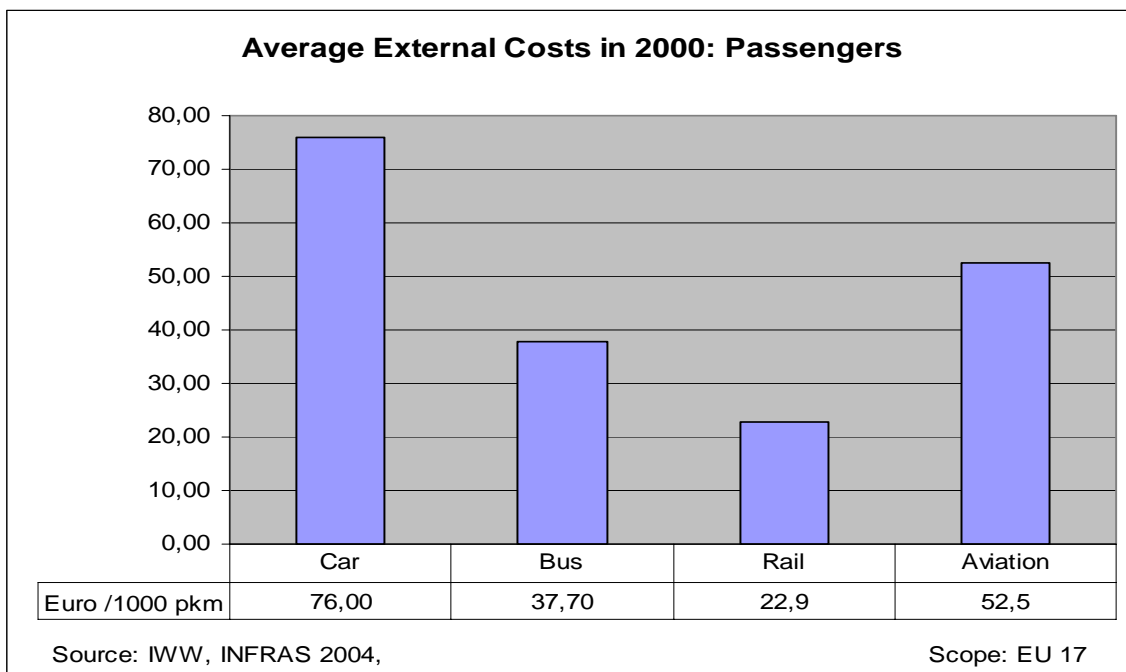


Figure V-8: External Costs of Passenger Transport by Transport Mode

³⁶http://www.increase-public-transport.net/fileadmin/user_upload/Procurement/SIPTRAM/Hidden_subsidies_final.pdf

³⁷ The study by IWW/INFRAS is one of the most comprehensive and respectable. Deriving average costs the authors analysed a broad range of studies. Their assessment of climate change costs may be discussed nevertheless being rather high compared to prices in current emission trading.

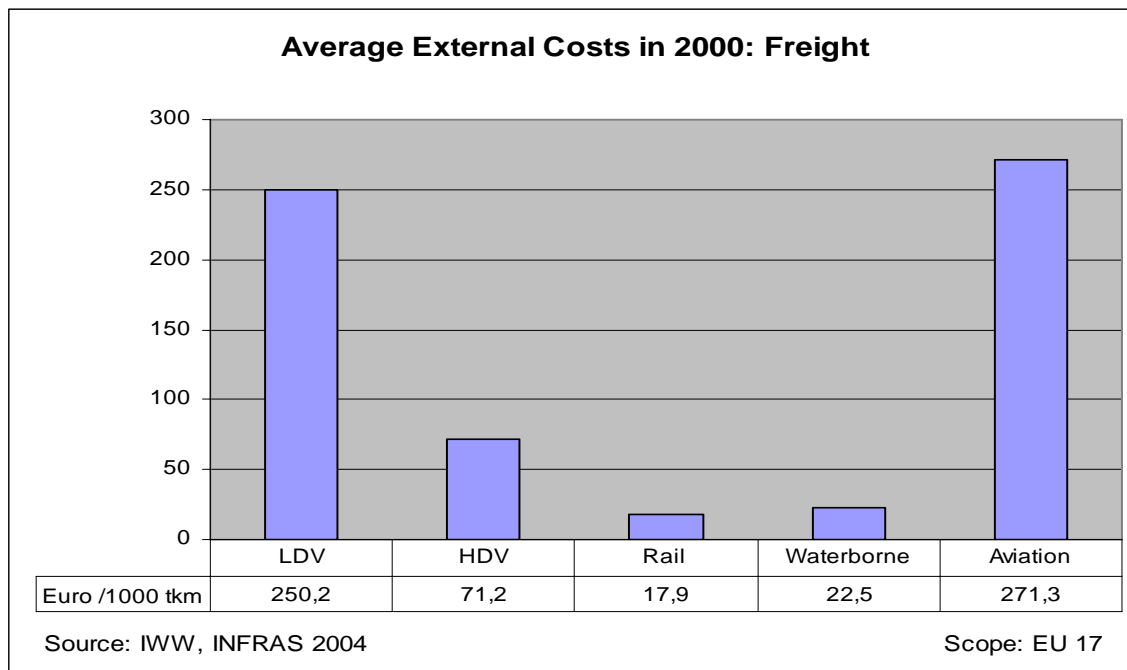


Figure V-9: External Costs of Freight Transport by Transport Mode

Security of supply

The grid-bound railway system is much more flexible in terms of energy supply than any other transport mode, using oil, coal, natural gas, waterpower etc. In addition, it is much more efficient and less costly to use renewable energy sources in power plants than in vehicles. In the long run an efficiency increase of power generation by up to 70 % is within reach, the share of renewable sources may amount up to 50 % (<http://www.umweltbundesamt.org/fpdf-1/2498.pdf>).

V.3. Measures

V.3.1. Fair pricing

All transport modes should pay their costs, including social costs. As shown above, the external costs of car traffic, road freight and aviation are substantially higher than those of the other modes of transport. On EU level, the modification of the Eurovignette directive at issue (Directive 199/62/EC) could have been a chance to deal with the problem. Unfortunately, despite the call for fair pricing and including external costs into transport pricing in the White Paper on European Transport Policy, the proposal discussed now does not allow for including all social costs into the calculation. In contrast to EU countries, in 2001 Switzerland started its stepwise road charging system on heavy duty vehicles, which will fully cover external costs when reaching its highest level in 2008. In Germany for example, according to ROTHENGATTER, DOLL (2001) a toll system according to the system in Switzerland could bring about a 12 % drop in vehicle kilometres of road freight transport, and a 60 % increase in the volume of rail freight, provided that capacities and good service are supplied for rail freight transport.

V.3.2. Support environmentally friendlier modes of transport

In 2003 the EU launched its MARCO POLO programme (2003-2006) providing 15 million EUR by the Community budget. The objective of the programme transferring 12 billion

tonnes/km annually off road freight to short-sea shipping, rail and inland waterways. This objective will be clearly met and with 1 EUR of subsidy spent, there are 15 EUR of external costs saved (http://europa.eu.int/comm/transport/marcopolo/index_en.htm). Compared to 1,376 billion tonnes/km of road freight transported in EU-15 in 2002 and expected 2,126 billion tonnes/km in 2013 the effect is nevertheless far too low. With MARCO POLO II then the Commission is responding to the needs and proposing an overall budgetary envelope of 740 million EUR for the period 2007 – 2013, extending the scope of the programme to Motorways of the Sea and Traffic Avoidance actions. The aim is to shift more than 140 billion tonne-kilometres of freight off the road. The question is whether this is enough or whether the funds available to the EU should not be earmarked in order to increase the financial support, see documentation sheet (16).

V.3.3. Revitalising the railways

Since in 1996 the Commission published its White Paper with a strategy for revitalising the Community's railways, a lot of activities have been started. The Directives [96/48/EC](#) and [2001/16/EC](#) on the interoperability of the trans-European high-speed and conventional rail system respectively have been put into force. The European Commission and the rail industry signed a memorandum of understanding on the deployment of the European Rail Traffic Management System (ERTMS), which will link the national rail systems together. The indicative timeframe for the installation of the system is 10 to 12 years.

Nevertheless, presenting its third railway package in 2004 the Commission stated that the process of opening up the European rail freight market is still too slow. In 2003, compared with 2002, the volume of goods transported by rail in the European Union fell by 1 %. Only 8 % of goods are carried by rail today, compared with 21 % in 1970. In the USA rail carries even 40 % of freight traffic. Over the last ten years, the volume of goods transported in the EU increased by 30 % (38 % for road) while rail transport stagnated (3 %). This aversion to rail transport is due above all to reliability and quality problems. While the rules for road transport are similar throughout the EU Member States, the regulations for rail transport are differing from state to state. There exist different gauge widths, different systems for the supply of electrical current, differences in maximum axle loads for wagons and locomotives, major differences in the organisation of the rail traffic management systems, differences in requirements for staff and so on. The differences in the rail systems account for significant delays at border crossings and therefore extra costs, which has made this mode of transport less competitive than transport by road for example. In addition, the decrease of private sidings for rail transport has given road transport a competitive advantage over rail.

On the other hand rail transport can be successful as can be seen for example by many private rail freight or passenger rail lines, showing there would be a real potential if only the present shortcomings could be overcome.

Having all this in mind, it seems urgent to speed up the process of integration of the European railway system and to allow for more competition on the existing track system. Enhanced competitions could, for example, improve door-to-door services by rail.

Last but not least railway companies have to amplify their ambitions to meet customers' needs. However, the EU-Commission recently withdrew a proposal for a directive concerning compensation rules for freight rail customers. Instead, the Commission is now in favour to improve the quality of rail transport by bilateral agreements between railway and customer. This effort may not be enough since a better customer orientation is crucial for the revitalisation of the railways.

Another, often neglected point is the insufficient consideration of railway transportation in training and education for transportation related jobs. Normally, the procurement of road

transport related matters are far overrepresented in vocational training. The EU could alter this situation by encouraging curricula, which do not ignore railway transportation issues.

See also documentation sheets (12) and (41).

V.3.4. Controlled Competition and high environment standards for Public Transport

In order to come up to larger scale modal shifts to public transport the introduction of controlled competition in EU countries is essential. The aim is to achieve a high standard of public service, while making better value of the money passengers and public authorities spend on PT. The financing of public transport should be organised in such a way that incentives for the highest possible transport volumes, customer satisfaction and cost efficiency are given. It is therefore important to update the existing Community legal framework, and put into force the REGULATION ON ACTION BY MEMBER STATES CONCERNING PUBLIC SERVICE REQUIREMENTS IN PASSENGER TRANSPORT BY RAIL AND ROAD proposed by the Commission in 2005 (KOM(2005) 319 final), which is to substitute the Regulation (EEC) No 1191/69 as amended by Regulation (EEC) No 1893/91. The Regulation will promote the provision of efficient and attractive public transport and will enable Member States to develop specific national regulatory systems.

Environmental performance of public transport has fallen behind compared to car transport. The Commitment of the automotive industry to further reduce CO₂-emission and fuel consumption of new cars will degrade the advantage of PT in energy efficiency if not efforts were made to reduce energy consumption of buses and trains. Therefore authorities should take environmental factors into account, when assessing the adequacy of public passenger service networks, defining selection and award criteria, and awarding public service contracts, in particular rational energy use and local, national and international standards and norms, especially those concerning the emission of air pollutants, noise and greenhouse gases.

See also documentation sheets (11) and (12).

V.3.5. Corporate Mobility Management

Corporate Mobility Management is to encourage companies to develop economically, environmentally and socially efficient strategies for the mobility of passengers and freight. Mobility management attempts to meet the specific requirements of groups of transport users, and to influence modal choice. It has been defined as “software” as it does not involve the realisation of new infrastructures but concerns persuasion, incentive and sometimes even restriction aspects. The aim of mobility management is to raise awareness of traffic problems in order to change everyday behaviour. The most promising transport sector for mobility management is commuter trips. This type of mobility, although representing only 20 to 40 % of overall mobility, has the advantage of being easily predictable and therefore easy to manage.

Strategies of mobility management are based on the intelligent use of different methods of transport (inter-modality) comprising:

- improving access to city or metropolitan areas by improving the efficiency of sustainable modes, such as public transport, pedestrian access and a combination of both;
- reducing the need for individuals to get around using private vehicles;
- encouraging individuals, companies and institutions to satisfy their mobility requirements by use of the public transport available;

- improving the integration of transport modes and the connections between the existing networks by developing specific information and communication systems;
- increasing the economic efficiency of each single mode of transport.

Mobility management is based on the techniques used for introducing new goods onto the market, and identifies measures to be adopted and interventions to be carried out according to the requirements of the mobility market. Any new transport service must involve phases of communication, information and marketing which advertise it, must be conceived to meet the needs of the target groups and must provide for evaluation of the effectiveness of the service.

Available tools

Private as well as governmental employers in Italy are bound to draft Home to Work Mobility Plans (HWMP). This document must be part of a reference planning framework, which is dictated by strategic planning tools already existing in Italy.

OPERATIONAL			INTERVENTION	STRATEGIC
ACCESSIBILITY	INCENTIVES	MOBILITY DEMAND		
Interventions on Public transport	Economic benefits	Flexible hours		Marketing and communications
Interventions on corporate transport	Acquisition of PT season tickets	Shift work		
Car sharing	Expenditure contributions for collective car use	Four day week		
Car pooling	Priority parking	Teleworking		
Guaranteed Ride Home programme	Availability of company vehicles	Telematic areas		
Bicycles and electric scooters use	Additional days off			
Stopping area policies	More flexibility			

Source: “Mobility Management” - Milan Provincial Council

Figure V-10: Home to Work Mobility Plan: possible interventions

Home to Work Mobility Plans comprise for example:

- Interventions in favour of public transport
Public transport is the first alternative which mobility managers could propose to company employees, but only after having carried out a careful analysis of the critical aspects which characterise it and identifying solutions to improve accessibility.
- Promotion of car pooling
- Guaranteed ride home programmes
The aspect which often discourages workers from using collective transport is the lack of a guarantee of an immediate service in the case in which there is a necessity to return home due to an emergency.
- Promoting the use of bicycles, see for example documentation sheet (15)
- Interventions within the company in order to influence mobility demand

The mobility of employees is characterised by the fact that it is concentrated in the same time periods during the day and has common destinations, which contributes to most of the congestion problems typical of peak times, with serious consequences for air quality and the environment in which transport networks operate.

In attempting to shift parts of corporate mobility from private transport to public transport, mobility managers must bear in mind all the subjective aspects, concerning cultural groups, who see collective urban transport as a poor and non-prestigious form of mobility. Such prejudice can be countered through the use of suitable communication campaigns: a convincing and suitable marketing policy could be a useful tool in influencing employees' choices towards sustainable means of transport, see also documentation sheet (9).

V.3.6. Transport Infrastructure

TEN-T comprises 75 200 km roads and 78 000 km railways, 9 500 km of inland waterways as well as ports and airports. The investment in the TEN-T roads from 1996 to 2001 has amounted to € 49.7 billion. Investments in the TEN-T rail network totalled € 84.1 billion during 1996-2001³⁸. So, taking into account that rail infrastructure needs investments around 3 times higher than road infrastructure, the TEN-T rail is only covered by two third of the costs in relation to the road network. The Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions come in their report on the implementation of the TEN-T for the period 1998-2001 to the conclusion that, if the current rhythm of investment were to be maintained, the target established in the TEN-guidelines for 2010 could be achieved in general terms for the road network but a significant portion of the rail network (up to 50 % of the length of the planned links) will not be in accordance with the requirements of the guidelines especially in the new member countries³⁹.

	Length	Estimated costs	Investments 1996-2001
TEN road	75 000 km	120 billion €	49.7 billion €
TEN rail	78 000 km	324 billion €	84.1 billion €

Source: Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions

The disproportion in the finalisation of the TEN-T between the modes will contribute to a consolidation of the high share of road transport in the old member states and to a shift from rail to road in the new member states, which still have a high share of rail. Once oriented to road transport a shift back to rail at a later date would require enormous efforts, if ever possible. The chance is given now to stop further modal shift, to maintain the exemplary modal split of most of the new Member States and to install it as a model for the old Member States.

In order to tackle the problem it is necessary to identify the obstacles why rail projects are not

³⁸ Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions: TEN-T Implementation Report 1998-2001. Brussels 2004

³⁹ PLANCO Consulting GmbH et.al. TEN - INVEST – final report. Essen, Germany 2003

considered in a balanced way. Among others these are:

- long delays in implementation of cross border projects because of different technical standards, multilateral coordination needs and unequal project development between Member States
- higher coordination and preparation needs for rail projects, so Member States start with the easier realisable road projects
- higher investment costs per length of the link
- stronger demands by the co-financing IFI's for rail projects related to cost benefit aspects
- road orientation as part of the new lifestyle and values in the Member States.

The new TEN-guidelines refer to some of the problems such as the consideration of environmental aspects (especially environmental impact assessments for border crossing projects). But major doubts remain whether these changes in the guidelines alone will lead to a substantially more environmental friendly implementation of the TEN-T. Many problems have to be solved also at other levels and have to address different stakeholders like EU structural fund, IFI's, Member States, regional administrations etc.

Furthermore the problem of induced traffic has to be concerned. Experience indicates that the expansion of transport infrastructure has been accounting for a good part of transport growth. According to SACTRA⁴⁰, analysing the problem of induced traffic in Great Britain, travel time and travel demand are closely related ($\epsilon = -0,5$ to -1). While most of the evidence concerning induced traffic refers to road infrastructure, investing in railway infrastructure may not only lead to a shift towards the railways, but to a growth in transport volumes as well. To avoid these side effects rail infrastructure plans should not be added to road infrastructure plans but as far as possible substitute it. In order to deal with this there is a need to improve planning procedures, to integrate road and rail planning, and to bring it into line with the policy goals.

See also documentation sheet (13).

V.3.7. Establish an European Mobility Agency (EMA)

The issues raised in this chapter highlight the complexity of the task to re-organise transport in such a way that it is more fuel efficient, but also safer and less harmful for the environment. This raises the question whether all necessary institutional steps have been taken in order to address this task in an appropriate manner.

Currently, the transport policy of the EU is supported by three transport-related agencies:

- European Maritime Safety Agency (EMSA)
- European Aviation Safety Agency (EASA)
- European Railway Agency (ERA)

⁴⁰ SACTRA (1994): The Standing Advisory Committee on Trunk Road Assessment, Department of Transport: Trunk Roads and the Generation of Traffic. London

However, the tasks of these agencies are not always directly related to the reduction of energy in transport sector it covers, e.g. the EMSA contributes to the enhancement of the overall maritime safety system in the Community in order to reduce the risk of maritime accidents, marine pollution from ships and the loss of human lives at sea, the EASA assists the Community in establishing and maintaining a high, uniform level of civil aviation safety, promotes the regulatory and certification processes etc. and the ERA concentrates on the liberalisation of the rail market and its technical harmonisation of the rail market. The missions of EASA and ERA certainly contribute to environmental protection and potentially an improvement of the energy efficiency in the transport sector.

In addition, very recently the Commission nominated six prominent figures as European coordinators and the setting up of an Executive Agency for the TEN-T⁴¹.

The Green Paper raises the question of the institution necessary to implement specific parts of the EU transport policy as well, and indeed, one could wonder whether there is not a need for an institution specialist in mobility questions: the European Mobility Agency. The mission of this Agency could be to support the implementation the agreed EU policy on transport, in particular

- To study measures and develop methodologies related to the internalisation of external costs of all modes of transport,
- To guide the planning and assessment of TEN-projects,
- To collect data and information on energy efficient transport and to make it available to the public,
- The monitoring of its success of the EU transport policy,
- To support the Extended Impact Assessment work of the Commission,
- To prepare and organise EU-wide public information campaigns.

It is proposed to consider whether such an Agency could not be an important step in support of an efficient EU transport policy. See also documentation sheet (4).

⁴¹ See:

<http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/05/977&format=HTML&aged=0&language=EN&guiLanguage=en>

VI Driver behaviour and traffic flow

VI.1. Introduction

As explained in the chapter “Introduction” total energy consumption (and pollution) of transport are determined along a causal effect structure which includes the most efficient driving style. In this chapter the driver behaviour is addressed in more detail, since this issue has hardly been addressed in EU energy or transport policies so far.

Improving driver behaviour, improving traffic flow and reducing vehicle speeds has a high potential for saving energy and reducing real fuel consumption/pollution per vehicle and of the fleet as a whole, as for example demonstrated during the first oil shock periods as well as the 1956 Suez crisis etc. Today’s “crisis” is of a totally different character and more structural but without the perception of a crisis among the public at large. Only during the first Gulf War driver behaviour responded spontaneously to rumours of shortage and high prices by a temporary drop in real NL highway speeds.

VI.2. Analysis

As a rule driver behaviour and average use patterns of modern cars are far less energy efficient than the potential of cars according to their performance in current test cycles. Driver behaviour is at the heart of this shortfall, which must be addressed more vigorously: It is essential to adjust real driver behaviour to the technical fuel saving potential of modern engines and vehicles.

Improving driver behaviour involves a range of actions and factors that have a direct influence on driver behaviour and, most of all, on:

1. traffic speed and traffic flow;
2. engine speed and engine load.

With regard to 1.: Given current driver behaviour and speed patterns there is a large potential for improvement towards an optimal pattern and practise. From road tests one may learn that individual fuel consumption differences due to driver behaviour factors may be over 50 %, in practise the average fleet-wide reduction potential must be set at maximally 10 % in the medium term [new oil shock effects not included]. The same may be true for air pollution reductions due to improving driver behaviour, though individual pollution levels may differ by full magnitude [aggressive versus defensive driving].

With regard to 2.: From earlier integrated cost-benefit-assessments [ref. PbIVVS] and from recent evaluations of (NL) speed limits [ref. TNO] it can be concluded that optimal (highway) speeds [with least negative effects to society at large, and reasonable travel times for car drivers] can be set at about 80 km/hr for HDV and at 80 – 100 km/hr for cars. In the end all speed and traffic factors trigger engine speed and engine loads, which determine both fuel consumption and emissions at vehicle level, at a given engine and exhaust gas abatement technology and a vehicle use pattern as demanded by the driver for travelling at any preferred speed.

From current road speed statistics and real driver behaviour as perceived in real traffic conditions it may be estimated that about 20 % of all car drivers operate their vehicles within optimal boundaries as described above. About 10 % have a “sporty” or “aggressive” driving

style with high engine loads and high vehicle and engine speeds, affecting not only fuel consumption and (regulated) emissions disproportionately but also accident risk. The great majority of car drivers operate their vehicles in a safe way but at too high engine speeds at all times [not using high gears where feasible] and at too high vehicle speeds and dynamics in most free flow traffic conditions.

Most HDV drivers operate their vehicles within the optimal RPM ranges [as prescribed by manufacturers and indicated in RPM meters and gauges] but at too high vehicle speeds and dynamics. As a rule HDV speed and flow patterns prove to be more consistent and homogenous and closer to optimal than car speed and flow patterns. HDV driver practise may provide examples for measures directed at improving LDV driver behaviour.

Supplementary to driver-related behaviour ‘behind the wheel’ there is still much potential for fuel saving by improving traffic flow and traffic management [which can and must provide optimal conditions for a homogeneous traffic flow at high-gear speeds – avoiding stop & go-patterns].

VI.3. Measures

VI.3.1. Ecodriving

Many countries have implemented programmes for improving driver behaviour and saving energy. The no.1 priority at Member State level is absorbing ecodriving in driving school curricula, training and examining as the normal driving technique [as is already the case in some countries and for HDV]. A role for the EU could be to harmonise these standards. Member states should provide for free advanced training facilities for all driving school trainers as a first step towards changing practise behind the learner wheel. If ecodriving should start anywhere, it is here, since habit formation is beginning here, backed by the driving school authority. See also documentation sheet (33).

Member States should seek support for developing and implementing ecodriving programs from all relevant organisations and intermediary interest groups from consumers, the car business, haulers and transporters, driver training, fleet owners, fuel industry etc. and stimulate commitment from those bodies. Only through dedicated and positive communication, networking and actions it can be achieved that ecodriving is perceived as positive and profitable and not as top-down government trick towards tax payers. Governments cannot and should not do the job alone, as is shown in many good practice practices so far. Such a measure could also include other modes of transport, e.g. rail. See also documentation sheets (31) and (41).

As a supplement to the no.1 priority at EU level is to introduce in a very short term a new regulation or voluntary agreement with the car industry with an obligation to install [as standard equipment] in *all* new vehicles a low-cost in-car device, the board computer which provides for constant driver feedback on actual fuel consumption. Basic standards for lay-out and presentation performance can be defined to guarantee maximal effectiveness, [preferably displaying the actual consumption figures with priority] so as to achieve high levels of driver awareness of the relation between engine load, RPM/gearshift and fuel consumption. Supplementary measures can be agreed such as standard equipping of all diesel and high mileage cars with cruise control, extending RPM-gauges with a green ‘eco-band’ at low [1200 – 2500] RPM-levels, installing gearshift indicators or more sophisticated forms of driver feedback such as the Modern Drive Device [which included CO₂ emissions per vehicle and instant gearshift feedback]. See also documentation sheet (32).

Moreover, mass media communication is an important and effective tool for enhancing driver awareness, capacity and self-learning-by-doing. Much can be learned from recent and highly esteemed TV campaigning in NL, though every country and car culture should seek for its own funny formula. The EU ECODRIVEN project can develop supporting mechanisms for Member States communicating actions and better set-up of TV campaigning. Many support actions can be developed in the area of leaflets, stickers, hand-outs etc. at any places where car driver meet and visit, such as filling stations and garages. Garage owner interest bodies should be at the forefront in distributing the “know-how” of ecodriving. Seasonal modifications can bring about season-specific driver behaviour improvements, such as preventing cold idling after winter cold starts [*“clean windows first, then start”*], or summer seasonal instructions for most efficient use of air conditioning. See also documentation sheet (34).

VI.3.2. Traffic management, traffic flow, travel information and road signing

Current traffic management is far from optimal in as far as traffic flows regularly are slowed down and halted due to unbalanced traffic light timing and configurations or by non-management of preference conditions. Traffic rules must be reviewed from an energy saving point of view, as well as road lay-out and signalling. In many Dutch cities, for instance, any cyclist can immediately halt a stream of trucks by simply pushing a button and getting priority, whatever the energy losses involved. These examples show that simple and cheap measures can improve traffic flow at any moment and structurally reduce fuel spilling. The “*green wave*” traffic flow measure should be implemented much broader than today, explicitly choosing to prioritise main stream and HDV traffic over side stream single vehicles [which must wait longer]. Traffic and car entry restrictions can well cooperate with flow improvement since low priority and non-essential car users frequently are the final blow to free flowing traffic volumes. As a rule priorities should be more balanced towards saving fuel and reducing emissions than towards guaranteeing equal entrance. On the other hand, improving traffic flow must be part of an integrated package of push and pull measures to prevent traffic volumes to further increase when travel times have decreased.

About 8 % of total VMT [ref. RWS/AVV] is lost due to drivers who lost-the-way or travelled over the wrong [longer] routing than optimal. Many car drivers take the road to unknown places without preparation and without any maps, town plans or information aboard, thus easily getting lost, spilling fuel and causing dangerous [nervous, seeking] driving, especially in the dark and in built-up areas. High tech-prone experts bet that GPS systems will do the job next years, which may be true for the longer term but not for most travellers. But the problem today and for the medium term is lack of any up-to-standards real [non-virtual] information systems at the road-side and in-car. So, in-car and at street level information systems [ranging from city maps, street name plates to house numbers that must be clearly visible in the dark] are simple, low cost but essential steps needed to be set to help drivers and travellers not getting lost and spilling fuel and VMT. GPS systems are to be preferred but should always be accompanied by in-car maps and using maps as part of driver training.

In summary, better traffic flow management and road signing and traveller information could reduce total fuel consumption with about 5 % easily, see also documentation sheet (36).

VI.3.3. Speed limits

Since thousands of EU citizens die every year due to ill-enforced or too high speed limits and since current practice in Member-States [30 % –80 % of all vehicles in excess of existing

speed limits] is counterproductive/violating EU policies and obligations [such as road safety, 4C and Kyoto protocol] the Community should step aside from subsidiary reasoning and seek to take initiative towards reducing too high speed limits and defining maximum allowable vehicle speeds from an energy and environmental point of view. As a start 130 km/h [any speed limit above that level is unsafe and unsustainable] seems achievable but 120 km/h should be set as best practice close-to-optimal limit for non-urban motorways and 100/80 km/h for urban motorways.

Member-States should, as a start, link speed limits to environmental and energy policies and set integrated policy goals as to reducing levels of violation and decreasing real speed levels of various classes of vehicles [including HDV!].

Existing speed limits should be much better enforced, thus saving many lives, as shown on French highways recently. This includes more and better equipped personnel and fully automated radar and control camera systems, preferably through section control systems, automated and swift administrative/judiciary processing of fines and penalties [ref. NL model], and more effective penalty levels, sophisticated control and communication tactics which suppose a high perceived chance of getting speed-controlled anywhere.

Controlling speed retarders of trucks and addressing the frequent tampering of such devices and of tachographs is a priority and should be part of implementation of EU Speed retarder directives, as is a better enforcement of social/working hours regulations by HDV drivers and employers. These directives should apply to LDV vans too – for safety, energy and environmental reasons – which should be equipped with [interactive] retarders set at max. 120 km/h.

Better cooperation between road safety and environment and energy experts, officials and institutions should be stimulated, and consumer/driver associations involved and influenced in order to communicate the interests involved and reasoning behind these measures. See also documentation sheet (35).

VI.4. Policy goal setting

Within a 10% reduction target the introduction and implementation of ecodriving as the normal and sustainable driving style should be a priority, including a broad range of supportive actions. The 10% - ambition level mentioned above should act as policy goal for the Community and Member-States as well: reducing average fuel consumption with 10% within 10 years [ceteris paribus] by improving driver behaviour and reducing traffic speeds and dynamics, thus narrowing the gap [“shortfall”] between EU vehicle test figures and everyday practise. Ecodriving and highway speed limits should as a start be part of Community and national energy and environmental/CO₂ policy goal setting, as is the case in some countries [NL], so to create a framework on which programs and measures can be developed and implemented including planning impacts and budgets.

As to cost-effectiveness the NL ecodriving program as monitored over a 5 year period has established very good return on [govt.] money records of <10 euro/ton CO₂. At individual level ecodriving is paying-off anyway in reduced f.c./ insurance/ maintenance and accident costs/tire wear/comfort. See also documentation sheet (2).

VII Summary

In its studies and investigations on the reduction of energy use in transport the Working Group assessed, as far as possible within the given short time span, the current situation and identified a number potential measures. It assessed the achievable savings and identified areas where there is synergy between reducing energy use and other policy areas such as safety, health and the environment. Moreover, it identified examples of best practice.

The general key conclusions which can be drawn from the work are:

- i. Energy is not specifically referred to in the Treaty. It is therefore not surprising that there is no coherent strategy or at least an explicit official EU document on the reduction of energy in the transport sector. A limited number of EU activities have the goal of reducing energy use in the transport sector. Specific proposals made by the Commission are, as a rule, based on the environment clauses of the Treaty. Since energy reduction in the transport sector is closely related to CO₂ reduction, the greenhouse gas emission reduction policies are currently the most appropriate vehicle for proposing measures designed to reduce energy in the transport sector.
- ii. However, even the GHG policy is not based so far on a coherent transport strategy. In particular there is a lack of an integrated assessment combining technical and non-technical measures. Instead, up to now, the major emphasis of EU transport policy has been on removing inefficiencies in transport system and on improving the unit efficiency of selected means of transport. While these policies and measures impact in one way or another on energy consumption due to transport, the overall impact remains unclear due to the lack of an integrated and overall cost-efficient strategy.
- iii. In contrast to that a large range of EU policy actions, e.g. in the sectors agriculture, competition, environment, internal market, regional policies and taxation, have the potential to impact directly or indirectly on energy use in the transport sector. Many policies implemented on their own are likely to remove barriers and reduce costs and thus lead to increased transport demand and consequently increased energy use. However, as a rule the transport related energy impact of measures taken in these sectors is not assessed.
- iv. The Working Group identified a large number of technical and non-technical measures potentially able to reduce energy consumption in the transport sector:
 - a. Demand control measures, have an impressive potential for energy reductions. However, since most of the measures identified result in higher costs and raise fears with regard to market distortion, economic development and the free flow of people and goods they need to be carefully designed and implemented. Thus, demand control is a sensitive policy and requires strong political will and courage.
 - b. There is substantial scope for further improving the unit efficiency of all modes of transport. The policies should address all modes and vehicle types and not just focus on certain types of vehicles.
 - c. Modal shift is still one of the most promising ways to reduce energy consumption in the transport sector. Although the environmental performance characteristics of the different modes of transport change with time, e.g. due to

legislative requirements on emissions, new fuels etc, there is still a general valid order with regard to the preferable modes which is for passenger transport: walking – biking - public transport (train, bus) – car; and for freight transport: train – waterway – road. However, this general scheme might not apply in all individual cases, and it does not take sufficiently into account the advantages and disadvantages of the different modes of transport. Thus, two types of measures are necessary:

- Measures which provide an appropriate framework for different modes of transport in order to guarantee fair competition between the modes, and
- Tailored measures which improve the synergies between the different modes of transport, or which improve the energy efficiency of particular transport chains, taking into account the advantages of the individual modes in relation to the transport and delivery requirements.

d. There is a great potential to reduce energy consumption by eco-driving and traffic management measures.

In summary, there is no lack of ideas and proposals. Overall the energy reduction potential is large, and for many of these measures the cost-efficiency seems to be high.

- v. Within this work it became very clear that packages of measures are necessary in order to tackle this complex issue. While the overall the objective of the measures proposed is straight forward: they should push or pull towards a direction which is characterized by:
- An increase of the unit efficiency,
 - A move towards the use of the mean of transport with the highest unit efficiency,
 - An increase of the efficient use of transport capacity,
 - A reduction of the distance per trips,
 - A reduction of the number of trips, and
 - The use of the most efficient driving style.

it was not possible to assess the overall effectiveness of these packages within the time given and the resources available.

- vi. In order to design sound packages of measures it is often necessary to decide in favour of one or the other measures since there are several options which may lead to the same result. Therefore the list of measures finally adopted by the Working Group, see Appendix, tries as much as possible to avoid duplications aiming at the same impact, e.g. to propose limit values and voluntary agreements for one and the same purpose.
- vii. In summary, the identified measures impact as follows on the individual modes or means of transport:

Measure	All means of transport:	Road vehicles: Two wheelers	Road vehicles: Two wheelers	Road vehicles: Passenger cars	Road vehicles: Light Commercial vehicles	Road vehicles: Heavy Duty Vehicles	Railways:	Inland waterways and maritime:	Air: not considered in any detail	Non-motorised transport:
National targets	X									
Benchmarks for modes		X					X	X	X	
Enhanced cooperation	X									
European Mobility Agency	X									
Re-shaping of fuel taxes	X									
Energy tax escalator			X	X						
Extended Impact Assessment	X									
Reduction of urban sprawl		X								
EMAS Mobility management	X									
Internalisation of external costs	X									
Competition in PT		X				X				
Liberalisation of railway market							X			
TEN-projects		X					X	X		
City tolls		X								
Bicycle infrastructure										X
MARCO POLO measures						X	X	X	X	
GALILEO measures	X									
CO ₂ emission trading		X			X	X		X		
Renewal of bus fleets						X				
Land use planning								X		
Renewal of railways							X			
Emission limit values for cars				X						
Emission limit values for TW			X							
CO ₂ tax for LDV					X					
Low friction lubricants	X									
Efficient tyres		X	X	X	X	X				
EEV standards		X								
R&D support		X								
Public procurement		X								
Regional marketing	X									
Ecodriving programmes			X	X	X					
Driver assistance		X								
Driving schools			X	X	X					
Public information	X									
Speed limits		X								
Traffic flow management		X								
Exchange of information	X									
Mobility Management Centres	X									
Mobile air conditioning		X								
Vehicle efficiency labelling			X	X						
Ecodriving training					X	X	X	X	X	

It should be noted that some of the measures identified could be subject to Communications of the Commission for 2006.

- viii. The packages of measures have, of course, to be analysed with regard to their push and pull impact on individual means of transport as well as on modes in total, their costs and their social impact. For this purpose detailed extended impact assessments have to be carried out with the help of complex transport models etc. The Working Group identified a lack of consistent analytical tools (methods and models) which would allow to carry out such complex tasks. Although a number of tools are available, they are currently not developed to a point which could be considered as satisfactory.
- ix. Although the Working Group had no sophisticated analytical tools available it thought it would be helpful to give at least an indication of the order of magnitude of changes necessary to achieve certain overall policy goals. Based on the PRIMES “business as usual” scenario given in Table I-9 one can broadly estimate, applying simple expert guesses, the size of the measures necessary in order to bring the 2030 total energy demand back to 2005 level. For this purpose a “10 % scenario” was developed. The key figures are:
- a. Reduction of total volume by 10 % (passenger car volume and total freight volume by 5 %, respectively)
 - b. Shift of 10 of passenger transport by car to public transport,
 - c. Shift of 10 % of passenger transport by car to rail
 - d. Shift of 10 % of air transport to rail
 - e. Shift of 10 % of truck transport to rail and (very minor) inland waterways.

In addition, the increase of unit efficiencies (technical efficiency times load/occupancy rate) as given in the business as usual scenario of PRIMES, e.g. by 30 % for cars, 15 % for trucks, 45 % for rail, 40% for aircrafts, 20 % for public transport and 5 % for inland waterways, are kept unchanged.

The Working Group believes that the measures listed in this report, if combined in an appropriate way, could deliver the “10 % scenario” reductions as well as the unit efficiency improvements.

- x. Taking a more qualitative view: A few examples should indicate how transport would look in the EU if these measures were implemented:
- Passenger transport: In general, the costs of motorised transport but also the unit efficiency (mainly driven by costs but also by mandatory requirements) would increase, keeping the overall burden within limits.
 - In the cities, we would see an increased use of non-motorised means of transport and public transport. The motorised transport would be slowed down, and people would drive more economically. In some parts of the cities there would be no motorised transport (in particular times) at all.
 - There would be little change in rural areas, but the cost of transport would go up.
 - For long distance travelling, the train would become more attractive, on costs of cars and airplanes.

- Freight transport: On average the costs of freight transport would increase, but quite differently for the individual modes of transport. The unit efficiency of all means of transport (mainly driven by costs and economic incentives) would increase as well.
- In cities less HDV would be allowed to enter the city and more efficient LCV would be used. Delivery times would be restricted in some areas.
- In rural areas no big changes would happen.
- In long distance freight transport we would see more cargo being transported by rail and ships (inland and maritime), and an improved network for intermodal shifting.
- Maybe the future will not look identical in all Member States, since the use of enhanced co-operation might lead to differences in the national policies, in particular as far as the taxation policy is concerned. However, overall, the transport policy of the EU and its implementation would be better co-ordinated due to the proposed establishment of the European Mobility Agency.

xi. The Working Group discussed also possible reasons why measures and policies identified in the past by various international groups and institutions have been not been implemented. It concluded that the most general obstacles are:

- The countries located at the edges of the Union have longer distances to the markets which increase the transport costs and influence their competitiveness. They have strong interests that products of firms located in their area can be transported throughout Europe at low costs while the countries located in the centre of the Union aim at minimizing the environmental burden associated with their role as transfer region.
- The interest of “monopolies” to keep certain transport sectors under their control, partly also driven by old-fashioned organisational and social structures once established under state-ownership.
- The general interest of companies and businesses to keep transport costs low. This can conflict with the interest of governments to reduce costs for society.

In addition, there are also a number of other obstacles, e.g. associated with the effectiveness of individual measures, the appropriate level of action etc., which make it difficult to agree on specific steps.

Thus, while there is a general political will to address the issue of energy reduction in transport and to integrate this issue into other policy fields there are major obstacles associated with individual policies and measures which are difficult to overcome.

One way to overcome the problem is a comprehensive integrated assessment of technical and non-technical measures which results into programmes and proposals addressing more or less all means and modes of transport. This would allow all sides to see their own contribution as a part of a bigger master plan.

xii. The Working Group is aware of the fact that the findings presented in this report are not final. They are the result of a brainstorming process and should rather be considered as a contribution to the discussion than as a final proposal. Nevertheless

the Working Group invites the JEGTE to take note of these findings and to consider ways and means on how to make best use of them.

VIII Recommendations

In the light of the findings presented in this report and in compliance with the mandate, the Working Group delivers to the JEGTE the following recommendations for desirable action at Community level:

- i. Although energy is not specifically referred to in the Treaty, the **Commission should aim at developing a specific and coherent strategy for the reduction of energy in the transport sector.** In the light of the large overlappings this could also be done as a part of the EU's greenhouse gas emission reduction policies.
- ii. **The Commission should aim at improving the available and developing additional tools** designed to take into account environmental, economic and social issues for a better integrated assessment of policies, combining technical and non-technical measures. In this respect the Commission should also consider institutional measures which would allow concentrating the work in a more efficient way, e.g. it should be considered, whether the transport policy of the EU and its implementation could be better co-ordinated by the proposed establishment of the European Mobility Agency.
- iii. **The Commission should apply the Extended Impact Assessment systematically to all policy areas**, e.g. also in the sectors agriculture, competition, environment, internal market, regional policies and taxation, in order to identify the potential of policies planned for these areas to impact directly or indirectly on energy use in the transport sector.
- iv. **The Commission should encourage the Member States to define environment and energy goals and make these goals guide their infrastructure decisions** in order to give energy efficient transport modes an extra weight, if alternatives are to be discussed.
- v. **There is a large potential to reduce energy consumption in the transport sector** by taking technical and non-technical measures: This includes all areas covered by this report: general framework setting measures, demand control, unit efficiency, modal shift and ecodriving. In order to be effective, it is necessary to design sound packages of measures and to ensure that these packages are balanced for the target groups, and the individual modes or means of transport. While it was not possible for the Working Group within the limited time and capacity given to agree on recommendations for appropriate packages, the Working Group strongly believes that measures identified and listed in the report provide a sound starting point for more in-depth analysis.
- vi. The **packages of measures have to be analysed with regard to their push and pull impact** on individual means of transport as well as on modes in total, their costs and their social impact. For this purpose detailed extended impact assessments have to be carried out with the help of complex transport models, etc. Nevertheless, the Working Group believes that the **general direction of the packages** should be such that it leads to:

- **Passenger transport:**
 - In general, the **costs of motorised transport but also the unit efficiency (mainly driven by costs, but also by mandatory requirements) should increase**, keeping the overall burden in balance within limits, in order to reduce volume and push for a modal shift.
 - In the cities: **increased use of non-motorised means of transport and public transport**. The motorised transport would be slowed down, and people would drive more economically. In some parts of the cities there would be no motorised transport (in particular times) at all.
 - For long distance travelling, the **attractiveness of railways should be increased**, on costs of cars and airplanes.

- **Freight transport:**
 - On average the **costs of freight transport should increase** – but quite differently for the individual modes of transport – in order to influence the volume and to readjust the balance between the modes. The unit efficiency of all means of transport (mainly driven by costs and economic incentives) should be increased as well.
 - In cities **less and only “clean” HDV should be allowed to enter the city and more efficient LCV should be used**. Delivery times should be restricted in some areas.
 - In long distance freight transport **more cargo should be transported by rail and ships (inland and maritime)**, and an improved network for intermodal shifting should be set-up (cargo centres).

- vii. **The Commission should aim at overcoming the identified existing general and specific obstacles**. The Working Group believes that development of a comprehensive and coherent strategy, based on an integrated assessment of technical and non-technical measures, which results into programmes and proposals addressing more or less all means and modes of transport would help breaking resistance since it would allow all sides to see their own contribution as a part of a bigger master plan.

- viii. **The Commission should consider making proposals appropriate for the application of enhanced co-operation**. Although this might lead to differences in the regional transport policies, in particular as far as the taxation policy is concerned, it might allow improving the transport energy balance of the EU in total.

- ix. **The Commission should enhance a discussion on good practice and support dissemination on energy saving strategies**, e.g. strategies on transport demand management, encouraging Member States to develop coordinated plans on low transport settlement structures or energy saving logistic technology for transport companies.

IX APPENDIX 1 – Documentation sheets

Appendix 1 contains documentation sheets of policies and measures considered by the Working Group.

Some of the measures were already subject of JEGTE meetings. For example, the JEGTE discussed recently the progress made with regard to the 2001 White Paper of the Commission and listed informally a number of measures to be considered in future. The overview shown below indicates these measures⁴²:

Number	Short description of measure
A	Aim at integrated cross-sectoral approach
B	Revision of state aid guidelines
C	Setting of sector specific goals
D	MARCO POLO funds for modal shift
E	Support for non-motorized modes of transport
F	Internalisation of external costs
G	Harmonisation of urban pricing schemes
H	Harmonised system for identification of vehicles
I	Extension of emission trading to transport
J*	Ecodriving, in-car instrumentation; alternative fuels
K*	Public transport; public procurement; low emission zones

- Measures mentioned but not discussed

The Commission's 2006 work programme contains a number of Communications which might address one or the other of the policies and measures listed in the overview.

Title	Short description
2006/TREN/003	Communication on the implementation of a dedicated European rail freight network <i>(Communication sur le développement d'un réseau dédié au transport de fret ferroviaire)</i>
2006/TREN/029	Communication on urban transport <i>(Communication sur une politique européenne pour les transports urbains)</i>
2006/TREN/010	Communication on transport logistics solutions for promoting intermodality in Europe
2006/ENV/013	Communication to the Council and the EP: Results of the review of the Community Strategy to reduce CO ₂ Emissions from Cars
2006/TREN/032	Action Plan on Energy Efficiency
2006/FISH/001	Green Paper on future EU Maritime Policy
2006/ENV/017	Revision of Directive 2001/81/EC on national emission ceilings (NEC) for certain atmospheric pollutants

⁴² See: Dutch Ministry of Transport. "Input for Review by EU's Joint Expert Group on Transport and Environment", August 2005

Overview of measures considered by the Working Group

Recommendations for desirable action at Community level		
Number of measure	Proposed action or measure (number/title)	Short description
1	National energy consumption targets for the transport sector* ^C	Indicative national energy consumption goals/benchmarks for the transport sector for the target year 2020, accompanied with national Action Plans, should be set. The Action Plans should also be taken into account by the Commission for developing further the EU transport policy. Member States should report in 5 years intervals on the progress made. These reports should, inter alia, be used by the Commission for adjusting, or revising, the EU transport policy.
2	EU wide energy efficiency benchmarks/targets for individual modes or means of transport* ^C	Indicative EU-wide energy efficiency benchmarks/targets for individual modes or means of transport, e.g. energy consumption/tkm for road, rail and inland water ways, or energy consumption/passenger*km for cars, light duty vehicles, buses, diesel trains, etc. for the target year 2020, accompanied with EU Action Plans, should be set. These Action Plans should also be reviewed in 5 years intervals.
3	Use of the "enhanced cooperation" mechanism*	Enhanced cooperation should be used by EU Member States, an appropriate proposal for the approximation of taxation policies, e.g. vehicle and fuel taxes, and the development of sub-regional policies, e.g. national targets and sub-targets should be forwarded by the Commission.
4	Establishment of a European Mobility Agency	The mission of this Agency could be to support the implementation of the agreed EU policy on transport, in particular <ul style="list-style-type: none"> ○ To study measures and develop methodologies related to the internalisation of external costs of all modes of transport, ○ To guide the planning and assessment of TEN-projects, ○ To collect data and information on energy efficient transport and to make it available to the public, ○ The monitoring of its success of the EU transport policy, ○ To support the Extended Impact Assessment work of the Commission, ○ To prepare and organise EU-wide public information campaigns.
5	Re-shaping of the fuel taxes for motorised transport	Minimum tax rates based on energy content of the fuel, taking into account a (simplified=lump factors) WTW energy balance, should be set for commercial and non-commercial purposes for all transport fuels (including those for which such rates are already set), For enhanced effectiveness and co-operation the minimum tax should be raised. Adjustments for specific policies (e.g. specific

		modes of transport (public transport), CO ₂ reduction, introduction of special fuel types and qualities) should be made, whenever appropriate.
6	Energy tax escalator	Introduction of a long-term scheduled EU energy tax escalator for non-commercial fuels, starting with an annual escalator of (just to give an order of magnitude, the level of the escalator needs to be adjusted to the price of the fuel) about 1 € cents / MJ.
7	Consequent application of the Extended Impact Assessment ^A	EU policies “all transport related policies” (e.g. fiscal, trade, agricultural and regional policies etc.) may have unwanted effects on additional transport demand. A transport assessment scheme to specifically include energy use in the assessment as well as the transport demand implications of other policies should be developed and systematically applied by the Commission in the standard ExIA for all Commission proposals (transport assessment)
8	Reduction of urban sprawl ^O	Continuation of EU Research Programmes on best practices and drafting of Recommendations for Member States concerning the design of city and regional planning in order to create settlement and transport structures which allow for low distances in transport and trip number reduction.
9	Mobility management for commercial enterprises (EMAS) ^O	Make transport efficiency, including business cars, subject of the EMAS assessment and certification procedure
10	Internalisation of external costs ^F	Framework Directive on the internalisation of external costs (covering all motorised means of transport: road, water, air, rail) which lays down a multi-year programme for phasing in external costs and defines the key parameters to be incorporated in the methodology for calculating these costs. The detailed cost methodology has then to be developed by expert groups (e.g. as part of the work of the European Mobility Agency) and adopted at Committee level.
11	Improvement of the boundary conditions for energy efficient public transport (PT) ^K	Continuation of the revision of EU regulation 1191/69 with the objective to establish a „controlled“ competition for local and regional public transport and to define general criteria concerning energy consumption and environmental performance to be considered in the open tenders. The aim is to establish a high quality standard and services of PT under consideration of high environmental standards (EEV)
12	Improvement of the boundary conditions for railways ^O	Liberalisation of the railway market and acceleration of the inter-operability programme
13	Improvement of the boundary conditions for TEN-projects	Equivalent investments and funding of TEN-rail projects against road projects (appropriate financing). Following the current investment rates for the different transport modes in the TEN will lead to the situation that nearly all planned road projects will be finished in 2010 but only 50 % of the rail projects. So investment procedures have to be re-ordered to avoid discriminating rail projects and to halt or increase the share of rail transport.

<p>14</p>	<p>Enabling EU-wide city tolls or access restriction zones*^{G, H, K, O}</p>	<p>Directive which lays down key parameters of passenger cars and light duty vehicles (and maybe in future also other vehicles) concerning their energy efficiency and environmental performance which must be shown on a label attached to the cars (e.g. on the number plate). One should aim at combining the EURO-emissions classes with CO₂ emission (fuel consumption) classes to single indicators (e.g. passenger cars EURO I and earlier with CO₂ below 90 g/km = A1). This label would enable cities to define harmonised local toll - or access restriction - zones (e.g. no access for vehicles with labels A4 etc), and would facilitate the enforcement. This could also be combined with “Congestion charging” which encourages the use of other modes of transport, and it is also intended to ensure that for those who have to use roads, journey times are quicker and more reliable.</p>
<p>15</p>	<p>Improvement of bicycle infrastructure^{E, O}</p>	<p>Provision of a fixed share of the structural fund for the construction and renovation of bicycle lanes and provision of safe bicycle parking facilities in order to prevent theft and vandalism.</p>
<p>16</p>	<p>Cargo centres in support of MARCO POLO^{D, O}</p>	<p>Provision of a fixed share of the structural fund for the construction and renovation of cargo centres which enable modal shift activities (e.g. from road to rail or inland vessel and vice versa)</p>
<p>17</p>	<p>1) EU minimum standards for road signing and traveller information; 2) Support for the application of IT-systems based on “GALILEO”^{*, O}</p>	<p>1) About 8 % of total VMT is lost due to lost-the-way or longer routing than optimal. In most countries road side driver information [road signs etc.] are below standard or lacking and lead to unnecessary VMT and time losses for p.t. travellers. This increases fuel use, pollution, road accidents and driver stress. All road authorities must apply minimum standards to be set at EU level [ranging from highway system info to city maps and visibility of street corner nameplates]. All cars must contain a set of national road and city maps. 2) The use of telematics for freight transportation helps to increase capacity utilisation of vehicles, avoid empty trips, and facilitate transfer to rail or ship. GPS-equipped vans and cars can avoid “getting lost” extra VMT, reducing stress and f.c. In public transport guidance systems, priority at traffic lights and dedicated lanes within towns and cities can reduce journey times, avoid delays and reduce costs and CO₂ emissions. Traffic control systems improve parking management and make it easier for people to change from their cars to public transport by constant provision of up-to-the-minute traffic and travel information.</p>
<p>18</p>	<p>CO₂ emission trading for appropriate well-defined commercial transport sectors¹</p>	<p>Set-up CO₂ emission trading for appropriate well-defined commercial transport sectors, e.g. feebate schemes. These schemes define average energy (CO₂-) performances for well-defined means of transport as a function of selected technical parameters. Individual means of transport which are above the average have to pay a fee; those which are below receive a bonus payment (e.g. a tax reduction). (Alternatively one could set up a “grandfathered cap”</p>

		system, as recently proposed by the Commission for aircrafts. However, in this case the unit efficiency is not the only target, but the overall energy consumption). The required average performance (or the cap) is modified over time in order to provide a continuous incentive to improve the performance. Applies for new means of transport only.
19	Increase of technical unit efficiency of coaches and buses ^{B, O}	Subsidy programme for the renewal of the fleets (lighter constructions, more efficient engines) in order to increase the fuel efficiency; further development of EEV under energy aspects.
20	Integrated transport and land use planning for regional development ^O	EU funding of projects implying changes of settlement structures should be bound to regional development plans (e.g. spending of the cohesion fund). A high density in urban areas is for example probably necessary, but not enough to decrease travel demand. So called “decentralised concentration” where smaller urban centres are established within a larger urban area is one example of a potentially low transport society. Best practice examples should be disseminated.
21	Increase of technical unit efficiency of railways ^O	Subsidy programme (e.g. scrappage incentive) for the renewal of locomotives and wagons (modern engines and lighter constructions) in order to increase the fuel efficiency (in case of wagons by increasing the payload).
22	Increase of technical unit efficiency of passenger cars ^O	Long-term mandatory emission limit values should be phased in, laid down in a Directive, based on appropriate technical parameters like surface or weight or consumption/output power, if appropriate designed as “top runner“ approach. If necessary supplementary steps should be set towards downsizing of currently excessive power and weight values of all cars and vans, e.g. by setting in addition max. weight and power limits based on currently achieved values which are stepwise decreased.
23	Increase of technical unit efficiency of two wheelers (TW); downsizing power and performance levels	Long-term mandatory CO ₂ emission limits should be phased in, laid down in a Directive, based on appropriate technical parameters like consumption/output power. Power output and performance levels should go down radically by EU regulation.
24	Increase of technical unit efficiency of light duty vehicles: CO ₂ -based vehicle tax ^O	Directive on vehicle taxes: Tax should be based on CO ₂ emissions. (Extension of the proposal recently made for passenger cars).
25	Usage of low friction lubricants for engines ^O	Mandatory usage of low friction lubricants for all vehicles or engines used in motorised means of transport.
26	Efficient tyres ^{*, O}	Mandatory usage of low resistance tyres and pressure sensors for new road vehicles, and for minimum tyre pressures. Restrictions to applying wider tyres.
27	Energy-efficiency based EEV standards for all road vehicles and for buses used for public transport ^{K, O}	Definition of an EU-wide energy-efficiency based EEV-standard to be taken into account for all public calls for tenders in the EU. One simple approach could be to take the average current fuel consumption as point of reference and to define energy-efficiency based EEV as such vehicles which are by a certain percentage below the

		average.
28	Increase of R&D support ^O	Member States, the European Commission, manufacturers and the research community should define a R&D programme for different fuel/technology options ("Future Engines & Future Fuels" R&D Programme), it should be coordinated with existing projects and include lower power/performance levels for all vehicles.
29	Increase of technical unit efficiency by public procurement measures ^{*, K}	The public service should be obliged to allocate a certain share of the procurement budget for the procurement of means of road transport which meet certain performance criteria (EEV criteria), including fuel consumption requirements. The first step, however, is to define a clean vehicle or an EEV for all types of vehicles.
30	Regional Marketing Strategies	
31	Ecodriving programs (road) ^{*, J, O}	Ecodriving should be set up by the Commission and Member States in a programmed way as part of ENV/EN/TRANS[road safety] policies for saving fuels, achieving Kyoto targets, improving air quality/4C and reducing road casualties as set in EU resolutions and govt. notes in these fields. Specific targets and packages of measures under the ecodriving program umbrella to be earmarked for short and longer term and budget requirements.
32	Introducing standard in car driver feedback and assistance systems [board computer, cruise control, gearshift indicator] ^J	All means of transport, but in particular LDV/HDV road vehicles should offer standard in-car feedback systems, such as real-time consumption meters [board computer] and gear shift indicators and eco-zoning in RPM gauges [like already in HDV]; moreover high mileage vehicles should have [adaptive] cruise control, and vans should be equipped with [interactive] speed limiters, etc. Appropriate proposals have to be worked out for the individual means of transport and made mandatory as standard equipment of new vehicles At EU level a speed retarder in delivery vans should become obligatory. In the Netherlands, vans cause about 20 % of CO ₂ emissions from road transport. Studies in the Netherlands show that emissions from vans can be reduced by 8 % (CE, 1998).
33	Ecodriving standard in driving school curricula and driving license tests	Currently taught old-fashioned driving practise leads to 10 %-20 % more fuel consumption and extra pollution/noise etc. Driving school training is the source of life-long suboptimal driving habits. Ecodriving [low revving] should start at driving schools and be part of driver exams. As a start all driving school trainers must be trained in ecodriving free from costs, as done in NL.
34	Public information campaigns [*]	The public needs to be well informed about the environmental impact of the different modes of transport, the individual means of transport and how to use them best. The Commission should take initiative for EU-wide information campaigns, with priority on saving fuel and on ecodriving practise

35	Lower highway speed limits and improving enforcement	Mandatory highway speed limits should be set at max. 130 km/h and preferably 80/100/120 km/h [according to the road environment]. Enforcement programmes must be implemented at EU level and minimum levels of enforcement must be agreed; best practises to be exchanged and police cooperation enhanced by expert level info/work programmes.
36	Improving traffic flow management	Improving traffic flow management by EU-concerted actions towards restructuring and reviewing main roads/HDV through routes priority schedules at traffic lights and signalling, at crossings etc., car entry restrictions, introducing “green wave”-schedules, pedestrian/cyclist tunnel constructions, reconstructing bumpy railroad crossings, homogenising structural stop & go traffic conditions.
37	International informational exchange	The THE PEP ⁴³ clearing house of UNECE and WHO will be officially opened in autumn 2005. It is designed as an interactive internet-based system to exchange knowledge regarding the integration of transport, health and environment. It includes many regional and local approaches and measures (best practice) to improve energy efficiency. To benefit of them EU-wide the existing experience should be provided by all EU Member States, exchanged and actively used.
38	Mobility Management Centres ^o	EU guidelines for the establishment of “Mobility Management Centres”: This is an umbrella concept for a number of measures aiming at getting people to travel less and shift modes on a voluntary basis. Mobility Management comprises transport instruments, measures, products and services that meet the needs of travellers in a sustainable way.
39	Mobile air conditioning	Improvement of energy efficiency of mobile air conditioning systems by 1. measuring the efficiency based on an EU wide harmonised method, and 2. setting minimum efficiency requirements.
40	Vehicle efficiency labelling ^o	Modification of car labelling as laid down in Directive 99/96 in order to improve its efficiency, e.g. by introducing clear, and more consumer friendly labels.
41	Mandatory-ecodriving training of all professional and high-mileage drivers (rail included) and employee reward and feedback systems for improving corporate practises ^y	Eco-driving training for all professional and high-mileage drivers should be mandatory for all vehicle operating companies. Employers of high mileage/business/HDV drivers should set up reward/feedback systems to stimulate employees to apply eco-driving [as part of mobility/energy management systems]

- * Measure is also mentioned in the Green Book
- A, B, C, ... Measure is also mentioned in the JEGTE’s discussion paper related to the 2001 White Paper
- ^o Potentially part of the Commission’s 2006 work programme

⁴³ THE PEP = Transport, Health, Environment Pan-European Programme of the UNECE and the WHO (www.thepep.org)

Documentation sheet (1)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	National policy goals/benchmarks for energy consumption in the transport sector
Short description	Indicative national energy consumption goals/benchmarks for the transport sector for the target year 2020, accompanied with national Action Plans, should be set. The Action Plans should also be taken into account by the Commission for developing further the EU transport policy. Member States should report in 5 years intervals on the progress made. These reports should, inter alia, be used by the Commission for adjusting, or revising, the EU transport policy.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways, ...)	Transport, general.
Expected impact on energy consumption	Reduction of energy consumption compared to a non-target situation in the transport sector since the setting of targets and the drafting of action plan will lead to a targeted transport policy.
Quantified example(s)	Numerical national targets in Germany are: <ul style="list-style-type: none"> ➤ Reduction of transport intensity by 20 % for passenger transport (pkm/GNP) and 5 % for freight transport (tkm/GNP) until 2020 (compared to 1999) ➤ Reduction of land resources used for residential and traffic purposes to 30 ha per day These figures could be translated into a national energy consumption target (Nachhaltigkeitsbericht 2002).
Expected synergies	As a rule the reduction of energy consumption in the transport sector results in environmental synergies with regard to air-, and maybe noise-pollution.
Justification for action level EU	To reduce the energy consumption of the transport sector is EU policy. National targets and plans have to be approximated and monitored at EU level. However, in the light of the sensitivity of the issues one could wonder, whether it is not more appropriate to stick out the level of national policies without goals/benchmark settings.
Technical aspects	A monitoring and consultation process needs to be established
Cost aspects	Unknown
Political aspects	Currently a proposal for a Directive on end-use energy efficiency and energy services (covering also transport) is already under discussion. The proposal might be covered by this Directive. There is general hesitation in some Member States due to potential political pressure in case of non-delivery. Thus, MS require a master plan from the Commission which ensures compliance before embarking on a goal-setting policy (classical hen-egg problem).
Other aspects	Policy is strongly linked to CO ₂ policy, e.g. in NL CO ₂ reduction targets for road transport were set in 1990 for the period 1986-2010 [at 10%], but were abandoned by 2000 due to lack of implementation and follow-up measures. Targets and action plans need to be cross-checked with other EU policies (climate change, CAFE, alternative fuels policy etc.); this applies also for the reporting since MS provide already now information on their transport policies as a part of their GHG reporting.

Documentation sheet (2)	
Measure number (Chapter-No, e.g. III)	III/VI
Title of measure	EU wide energy efficiency benchmarks/targets for individual modes or means of transport
Short description	Indicative EU-wide energy efficiency benchmarks/targets for individual modes or means of transport, e.g. energy consumption/tkm for road, rail and inland water ways, or energy consumption/passenger*km for cars, light duty vehicles, buses, diesel trains, etc. for the target year 2020, accompanied with EU Action Plans, should be set. These Action Plans should also be reviewed in 5 years intervals.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways, ...)	All individual modes (should be combined with “national energy consumption targets for the transport sector”)
Expected impact on energy consumption	Reduction of energy consumption, compared to a non-target situation; in the individual sectors of transport the setting of targets and the drafting of action plans will lead to a targeted transport policy. To set sub-targets/benchmarks for individual modes of transport allows a fine-tuning of EU- and national policies.
Quantified example(s)	In Germany a modal shift target has been fixed: the doubling of rail freight transport until 2015. NL targets were set for doubling the share of public transport (from 1986-2010) but were abandoned due to lack of instrumental and political support.
Expected synergies	As a rule the reduction of energy consumption in the transport sector results in environmental synergies with regard to air-, and maybe noise-pollution.
Justification for action level EU	To reduce the energy consumption of the transport sector is EU policy. National targets and plans have to be approximated and monitored at EU level.
Technical aspects	Methodologies for the calculation of benchmarks need to be established. A monitoring and consultation process needs to be established.
Cost aspects	Unknown
Political aspects	Hesitation in some Member States due to potential political pressure in case of non-delivery
Other aspects	Policy is strongly linked to CO ₂ policy. Some MS believe that a CO ₂ approach would be more relevant than an energy consumption approach. Targets and action plans need to be cross-checked with other EU policies (climate change, CAFE, alternative fuels policy etc.).

Documentation sheet (3)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Use of the "enhanced cooperation" mechanism
Short description	Enhanced cooperation should be used by EU Member States; an appropriate proposal for the approximation of taxation policies, e.g. vehicle and fuel taxes and the development of sub-regional policies, e.g. national targets and sub-targets should be forwarded by the Commission.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All modes of transport.
Expected impact on energy consumption	Reduction of energy consumption, compared to a non-enhanced cooperation situation. Subgroups of MS (eight or more) should coordinate their fuel tax policies (e.g. for alternative fuels) in order to enlarge and approximate markets. They could also coordinate targets for individual sectors of transport and draft joint action plans (e.g. sea transport in the Baltic Sea, improved modal shift in Central Europe). This would contribute to the fine-tuning of EU- and national policies.
Quantified example(s)	None
Expected synergies	As a rule the reduction of energy consumption in the transport sector results in environmental synergies with regard to air-, and maybe noise-pollution.
Justification for action level EU	To reduce energy consumption of the transport sector is EU policy. Enhanced cooperation would create large regions with a coordinated and regionally or sub-regionally tailored transport policy which could improve the overall effectiveness of the EU transport policy.
Technical aspects	A monitoring and consultation process needs to be established
Cost aspects	Unknown
Political aspects	The idea is that the Commission could forward proposals which are known to be not supported by all MS and to aim to achieve adoption under Council and EP, making use of the enhanced cooperation clause in the Treaty. "Enhanced cooperation" is therefore not a measure as such, but a policy approach foreseen in the Treaty. Its application was considered time by time in the Commission in difficult policy areas (e.g. taxation) which require amenity, but are not applied yet. The proposal is to consider the application of this policy option seriously for the development of the transport/energy policy. Hesitation in some Member States due to potential problems related to the liberalised EU transport market and unhampered access to markets and regions.
Other aspects	Enhanced cooperation needs to be cross-checked with other EU policies (taxation, climate change, CAFE, alternative fuels policy etc.).

Documentation sheet (4)	
Measure number (Chapter-No, e.g. III)	III/V
Title of measure	Establishment of a European Mobility Agency
Short description	<p>The mission of this Agency could be to support the implementation of the agreed EU policy on transport, in particular</p> <ul style="list-style-type: none"> ○ To study measures and develop methodologies related to the internalisation of external costs of all modes of transport, ○ To guide the planning and assessment of TEN-projects, ○ To collect data and information on energy efficient transport and to make it available to the public, ○ The monitoring of its success of the EU transport policy, ○ To support the Extended Impact Assessment work of the Commission, ○ To prepare and organise EU-wide public information campaigns.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	All
Expected impact on energy consumption	To centralise the support for the development of key aspects of the EU transport policy could have a positive impact on energy reduction policy.
Quantified example(s)	None
Expected synergies	The work of the Agency could also help reducing air pollution and noise from transport activities.
Justification for action level EU	Only appropriate level since the Agency would support EU policy.
Technical aspects	Fine-tuning of tasks between Agency, Commission, EUROSTAT and other Agencies necessary.
Cost aspects	Relevant (lump sum per person working in the Agency about 150 000 € p.a.).
Political aspects	Support of Council and EP necessary. (A recent EP paper mentioned the need for such an Agency). Some MS fear additional bureaucracy, others believe that the tasks are well covered by other EU organisations like DG TREN, EEA, Eurostat.
Other aspects	There might be hesitation in the EU Commission to forward such a proposal due to fears that such an Agency could become too influential. There might be an interest of MS to host an EU institution with the results that they prefer the establishment of many highly specialised agencies.

Documentation sheet (5)	
Measure number (Chapter-No, e.g. III)	III/IV
Title of measure	Re-shaping of the fuel taxes for motorised transport
Short description	Minimum tax rates based on energy content of the fuel, taking into account a (simplified=lump factors) WTW energy balance, should be set for commercial and non-commercial purposes for all transport fuels (including those for which such rates are already set), For enhanced effectiveness and co-operation the minimum tax should be raised. Adjustments for specific policies (e.g. specific modes of transport (public transport), CO ₂ reduction, introduction of special fuel types and qualities) should be made, whenever appropriate.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	All means of transport
Expected impact on energy consumption	Would focus policies, technology development and behaviour more on energy consumption and would provide a fair and energy-related competition among fuels.
Quantified example(s)	None
Expected synergies	None
Justification for action level EU	Harmonisation or approximation of fuel taxes is an EU policy field
Technical aspects	Measurement of energy content of fuels is standardised. Lump factors for WTW are known but need to be agreed and time by time adjusted. At the pumps no changes are necessary; the delivered quantities would be measured in volume, as done today.
Cost aspects	Mainly administrative transformation cost; not significant.
Political aspects	Re-adjustment of total cost burden for individual modes of transport (vehicle taxes versus fuel taxes) in some cases necessary. Agreements on tax ranges under enhanced cooperation are politically sensitive.
Other aspects	Split into commercial and non-commercial consumption for some fuels (diesel) necessary in order to fine-tune costs. Not to be applied to air transport.

Documentation sheet (6)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Energy tax escalator
Short description	Introduction of a long-term scheduled EU energy tax escalator for non-commercial fuels, starting with an annual escalator of (just to give an order of magnitude, the level of the escalator needs to be adjusted to the price of the fuel) about 1 € cents / MJ.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	All fuels used for non-commercial transport
Expected impact on energy consumption	Shifts private transport to more fuel efficient modes and/or supports introduction of fuel efficient means of transport. Elasticities are in the range of -0,15 (short term) to -0,3 (long term; 10 % increase in fuel price results in 3 % decrease of driven miles)
Quantified example(s)	“Ecotax” programmes in Germany and UK
Expected synergies	Less driven miles of energy-intensive motorised individual transport results, as a rule, in less air pollution and less noise.
Justification for action level EU	Gives harmonised signals for the whole market. Avoids (further) distortion of competition in the fuel provider market.
Technical aspects	None
Cost aspects	None (energy tax escalator might be necessary anyway in order to compensate for expected increase of unit energy efficiency which might result in a so-called “re-bounce-effect” (= increase of driven mileage due to decrease of running costs per driven mile))
Political aspects	Hesitation in some MS to deal with such issues at EU level. Hesitation in some MS to put extra burden on citizens
Other aspects	Large variations of fuel prices might minimise expected effect of tax escalator

Documentation sheet (7)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Consequent application of the Extended Impact Assessment
Short description	EU policies “all transport related policies” (e.g. fiscal, trade, agricultural and regional policies etc.) may have unwanted effects on additional transport demand. A transport assessment scheme to specifically include energy use in the assessment as well as the transport demand implications of other policies should be developed and systematically applied by the Commission in the standard ExIA for all Commission proposals (transport assessment)
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All transport related polices
Expected impact on energy consumption	Reduction in energy consumption due to the systematic identification of transport intensive proposals and their optimisation with regard to energy consumption
Quantified example(s)	None
Expected synergies	As a rule the reduction of energy consumption in the transport sector results in environmental synergies with regard to air-, and maybe noise-pollution.
Justification for action level EU	Can only be done at EU level
Technical aspects	Requires well-defined methodologies for impact assessment and their consequent systematic application
Cost aspects	Increases administrative costs, but these costs might be small compared to potential savings
Political aspects	Internal procedures of the Commission; no direct Council or EP involvement.
Other aspects	None

Documentation sheet (8)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Reduction of urban sprawl
Short description	Continuation of EU Research Programmes on best practices and drafting of Recommendations for Member States concerning the design of city and regional planning in order to create settlement and transport structures which allow for low distances in transport and trip number reduction.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All means
Expected impact on energy consumption	With settlement structures getting more compact, and people living in multifunctional neighbourhoods, travel distances get shorter. There are better options for walking, cycling and PT supply.
Quantified example(s)	Not evaluated
Expected synergies	Positive effects on nature and landscape, decreasing land take.
Justification for action level EU	Problems are similar in EU Member States; new members without measures taken will undergo the same undesirable development. Exchanging information and good practice experiences will be very helpful.
Technical aspects	Not evaluated
Cost aspects	Diminishing urban sprawl will save development expenses.
Political aspects	Enhanced cooperation is needed between different local authorities as well as different governmental departments, as transport and housing for example. As local governments are autonomous in their decisions the influence of the EU is limited.
Other aspects	There may be valuable input by projects dealing with urban design launched by the Commission's Urban Thematic Strategy. See 2006/TREN/029

Documentation sheet (9)	
Measure number (Chapter-No, e.g. III)	III/V
Title of measure	Mobility management for commercial enterprises (EMAS)
Short description	Make transport efficiency, including business cars, subject of the EMAS assessment and certification procedure
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, ..)	All means of transport
Expected impact on energy consumption	Reduction of energy consumption due to optimised delivery transport and procurement of more unit-efficient (road) vehicles
Quantified example(s)	The building society Schwäbisch Hall, Lufthansa Technik Hamburg, Infineon Dresden, Kärcher Winnenden, GTZ Eschborn, Bodelschwingsche Anstalten Bethel, Stadtverwaltung Münster, MTU Friedrichshafen. Carbon assessment for commercial enterprises carried out by the French environmental agency (ADEME) / environmental reports of commercial firms must integrate carbon assessment. In Amsterdam companies with over 100 employees applying for an environmental licence must develop plans for mobility management, including the reduction of car use and parking spaces and the stimulation of cycling and car pooling. Computer programmes which support such activities are available free of charge. ⁴⁴
Expected synergies	As a rule the reduction of energy consumption in the transport sector results in environmental synergies with regard to air-, and maybe noise-pollution.
Justification for action level EU	EMAS regulations falls under EU responsibility (e.g. detailed guidelines are published by the Commission)
Technical aspects	In order to provide reference points, general efficiency indicators for the sectors covered by EMAS would be helpful as well as EEV indicators
Cost aspects	Overall savings for firms and for society can be expected
Political aspects	None. Since EMAS is a voluntary action it fits as well to the deregulation policy.
Other aspects	EMAS is still not sufficiently applied in all MS. It should be mentioned that the Commission launched a large number of projects on mobility management in the recent years, e.g. EMOTIONS (emotional approach to promoting sustainable transport) http://www.emotional-campaigns.net/page_project.shtml EPOMM (European Platform on Mobility Management) http://www.epomm.org INPHORMM (information and publicity to reduce motorised mobility) http://europa.eu.int/comm/transport/extra/inphormmia.html MOBILS (mobility management) MOMENTUM (mobility management) http://www.nea.nl/english/news.html MOSAIC (mobility management) http://europa.eu.int/comm/transport/extra/mosaicia.html Might be covered by the planned Communication 2006/TREN/010

⁴⁴See for example: <http://www.ecotransit.org/base/index.en.phtml>

Documentation sheet (10)	
Measure number (Chapter-No, e.g. III)	III/V
Title of measure	Internalisation of external costs
Short description	Framework Directive on the internalisation of external costs (covering all motorised means of transport: road, water, air, rail) which lays down a multi-year programme for phasing in external costs and defines the key parameters to be incorporated in the methodology for calculating these costs. The detailed cost methodology has then to be developed by expert groups (e.g. as part of the work of the European Mobility Agency) and adopted at Committee level.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	All means transport (applied outside cities)
Expected impact on energy consumption	The internalisation of external costs increases, as a rule, the transport costs. This leads to less (unnecessary) transport. Since, taking the current situation, the more energy efficient means of transport (e.g. rail, waterways) are less costly, there should be a shift towards these means of transport resulting in less energy consumption.
Quantified example(s)	Some examples can be given of charging systems recently introduced in Europe. Austria introduced a kilometre charge on its motorways in 2004, varying from 0.13 to 0.27 €/km, depending on the number of axles. London introduced a congestion-charging scheme to improve the accessibility of the city centre. In France, Spain Portugal, Italy and Greece on large parts of the motorways network distance related toll charges have been introduced. A number of Italian and British towns are developing electronic urban road pricing systems, and Stockholm plans to introduce a system in 2005/2006. In Germany, kilometre charging for heavy duty vehicles (HDV) on motorways has been introduced from 1/1/2005.
Expected synergies	As a rule the reduction of energy consumption in the transport sector results in environmental synergies with regard to air-, and maybe noise-pollution.
Justification for action level EU	Only appropriate level due to need for liberalised transport market. (EU Directives cover already infrastructure costs.)
Technical aspects	In a first phase for freight transport only. Technical charging systems for rail, waterways and air need to be developed (systems for road need to be harmonised (this is under way)). In a second phase passenger transport should be considered as well.
Cost aspects	Significant implementation costs. Due to multi-year planning cost-efficient adaptation effects possible
Political aspects	MS and the EU may have to re-adjust the total cost burden (taxes, fuel taxes, etc.) for individual means of transport.
Other aspects	Public and political resistance to raising car/aviation costs is a high barrier. This item needs more political than economical research. Only some EU policies cover infrastructure, some others infrastructure costs.

Documentation sheet (11)	
Measure number (Chapter-No, e.g. III)	V
Title of measure	Improvement of the boundary conditions for energy efficient public transport (PT)
Short description	Continuation of the revision of EU regulation 1191/69 with the objective to establish a „controlled“ competition for local and regional public transport and to define general criteria concerning energy consumption and environmental performance to be considered in the open tenders. The aim is to establish a high quality standard and services of PT under consideration of high environmental standards (EEV).
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Public transport (buses, tram, rail)
Expected impact on energy consumption	For instance: every per cent shift of transport in German towns from cars to PT modes (pkm) CO ₂ emissions would drop by 240,000 tonnes. A 5 % shift would reduce CO ₂ emissions by 1.2 to 1.4 million tonnes
Quantified example(s)	Competitive tendering of bus services in the Helsinki Metropolitan Area, City of Dijon; PT Procurement in Gothenburg; Preparing for Competitive tendering in the Cities of Frankfurt (Oder), Frankfurt/Main and Region of Hannover (http://www.increase-public-transport.net/index.php?id=726)
Expected synergies	PM-reduction in urban areas; reduction of congestions and accidents
Justification for action level EU	In order to come up to larger scale modal shifts to PT the introduction of controlled competition in EU countries is essential. The new Regulation at EU-Level will promote the provision of efficient and attractive PT in the Member States.
Technical aspects	Strong environmental standards are aimed at busses (EEV).
Cost aspects	Expenses for PT are half or less the expenses for cars, if all costs are considered. An incentive system should improve the quality of PT.
Political aspects	Contribute to quality of life of low income groups by ensuring their mobility
Other aspects	On 20.7.2005 the Commission published its proposal of a regulation which should replace 1191/69. In contrast to earlier versions the proposal mentions “environment” only in recital 4 as a side aspect. In the light of these developments one could wonder, whether there is not a need for a separate Directive which requires providing public transport in metropolitan areas and which lays down, inter alia, environmental and energy efficiency criteria to be met by metropolitan public transport systems. These criteria would then become part of the performance criteria to be met by the operator selected in accordance with the Commissions proposal for the 1191/69 substitute. Refer to relevant EU studies e.g. MARETOPE (impacts of organisational change in public transport); ISOTOPE (transport operation of passengers) http://www.nea.nl/english/news.html http://europa.eu.int/en/comm/dg07/extra/res-isotope.html QUATTRO (quality in tendering urban public transport) http://www.nea.nl/english/news.html http://europa.eu.int/en/comm/dg07/extra/res-quattro.html http://www.eur.nl/quattro/

Documentation sheet (12)	
Measure number (Chapter-No, e.g. III)	V
Title of measure	Improvement of the boundary conditions for railways
Short description	Liberalisation of the railway market and acceleration of the interoperability programme
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Enhancement of the market conditions for passenger and freight transport on railways by speeding up travel and transport times
Expected impact on energy consumption	Strengthening railways will support modal shift from road to rail and thus will help to reduce energy consumption in transportation.
Quantified example(s)	Recent non stop transalpine cargo train connections (e.g. between Germany and Italy); freight trains in the USA
Expected synergies	Higher Transport safety; less road traffic will lead to less congestion, less air/noise pollution, less energy use.
Justification for action level EU	The targeted transportation takes place between EU countries. EU wide implementation is crucial for its acceptance and success.
Technical aspects	Unification of technical standards
Cost aspects	Incentive funds are necessary for the implementation of ERMTS (European Rail Traffic Management System)
Political aspects	The control on Member States concerning railway liberalisation should be enforced.
Other aspects	Road transport experiences a much higher liberalisation degree than rail transport. The issue might also be covered by the planned Communication 2006/TREN/003

Documentation sheet (13)	
Measure number (Chapter-No, e.g. III)	III/V
Title of measure	Improvement of the boundary conditions for TEN-projects
	Equivalent investments and funding of TEN-rail projects against road projects (appropriate financing). Following the current investment rates for the different transport modes in the TEN will lead to the situation that nearly all planned road projects will be finished in 2010 but only 50 % of the rail projects. So investment procedures have to be re-ordered to avoid discriminating rail projects and to halt or increase the share of rail transport.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Halt (most new member states) or increase (old member states) the share of rail in passenger and freight transport
Expected impact on energy consumption	Lower the energy use per transport demand
Quantified example(s)	For long distance trips energy efficiency of rail is more than 30 % higher compared to cars. The advantage of rail depends very much on vehicle loads. For its Euro city train 'Transalpin' from Vienna to Innsbruck the Austrian railway company calculated an energy efficiency rate of 1:9 compared to the car. With freight transport, the efficiency gain is even larger, rail and ships consuming only one fourth of primary energy compared to trucks.
Expected synergies	Supports also other modal split related measures
Justification for action level EU	The TEN are developed at EU level and are financed to a considerable amount by EU money (TEN budget, structural funds)
Technical aspects	None
Cost aspects	Reordering of investments to avoid follow up costs for health and environment
Political aspects	The TEN-Transport are seen as the backbone of intra EU transport between the member states and as a prerequisite of economic development. The White Paper wants to ensure the modal share of rail in freight transport at 35 % in the new EU-Member States up to 2010. But the current realisation seems to be more oriented to prestige projects than to the real needs of mobility and regional economic development
Other aspects	There are different reasons for the inadequate promotion of rail projects. Among others: <ul style="list-style-type: none"> - long delays in implementation of cross border projects because of different technical standards, multilateral coordination needs and unequal project development between Member States - higher coordination and preparation needs for rail projects, so Member States start with the easier realisable road projects - higher investment costs per length of the link - stronger demand by the co-financing IFI's for rail projects related to cost benefit aspects - road orientation as part of the new lifestyle and values in the Member States

Documentation sheet (14)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Enabling EU-wide city tolls or access restriction zones
Short description	Directive which lays down key parameters of passenger cars and light duty vehicles (and maybe in future also other vehicles) concerning their energy efficiency and environmental performance which must be shown on a label attached to the cars (e.g. on the number plate). One should aim at combining the EURO-emissions classes with CO ₂ emission (fuel consumption) classes to single indicators (e.g. passenger cars EURO I and earlier with CO ₂ below 90 g/km = A1). This label would enable cities to define harmonised local toll - or access restriction - zones (e.g. no access for vehicles with labels A4 etc), and would facilitate the enforcement. This could also be combined with “Congestion charging” which encourages the use of other modes of transport, and it is also intended to ensure that for those who have to use roads, journey times are quicker and more reliable.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, ..)	All road vehicles
Expected impact on energy consumption	Provides incentives to purchase vehicles without access restrictions and therefore supports the turnover of the fleets and the development of efficient and low polluting cars.
Quantified example(s)	London, Rome, Bergen, Oslo, Trondheim, Singapore. London is the largest existing scheme in Europe where drivers have to pay currently £8 per day, if they wish to continue driving in central London during the scheme’s hours of operation. Before the charging scheme, London suffered the worst traffic congestion in the UK and was amongst the worst in Europe. It has been estimated that London lost between £2–4 million every week in terms of lost time caused by congestion. Research undertaken by Transport for London has shown that congestion charging will lead to reduced traffic levels which are equivalent to those enjoyed during the school holidays ⁴⁵ .
Expected synergies	Significant reduction of air pollution and transport related energy consumption in cities possible
Justification for action level EU	Harmonisation and economy of scale aspects require action at EU level. In a report by a working group of the Joint Expert Group on Transport and Environment it was recommended that the Commission should assist the Member States in the continued introduction of such zones ⁴⁶ .
Technical aspects	Easy to implement at EU level; flexibility given to local level
Cost aspects	No significant costs (performance indicators would become standardised information on registration papers and car plates)
Political aspects	Doubts, whether the incorporation of CO ₂ levels could be justified. Requires adaptation steps in cities which apply already to tolls, etc.
Other aspects	Could be considered for off-road machinery as well. The issue might also be covered by the planned Communication 2006/TREN/029

⁴⁵ <http://www.cclondon.com/>

⁴⁶ JEGTE WG paper “Report from the Working Group on Environmental Zones - Exploring the issue of environmentally-related road traffic restrictions, February 2005”.

Documentation sheet (15)	
Measure number (Chapter-No, e.g. III)	V
Title of measure	Improvement of bicycle infrastructure
Short description	Provision of a fixed share of the structural fund for the construction and renovation of bicycle lanes and provision of safe bicycle parking facilities in order to prevent theft and vandalism.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Passenger transport
Expected impact on energy consumption	Half of all car trips in EU-15 are less than 6 km, which is about half an hour cycling distance. With the provision of attractive cycling infrastructure parts of short distance trips will be shifted from car to bicycle.
Quantified example(s)	In Germany shifting 30 % of car trips less than 6 km to cycling would bring down CO ₂ emission of road transport by 4%.
Expected synergies	Reduction of air pollution and noise in urban areas. Improving public health while cutting health costs.
Justification for action level EU	Improving transport infrastructure as well as improving quality of life in urban areas are goals of the EU cohesion policy.
Technical aspects	Most EU cities have plenty of space, as for example empty broad sidewalks or car lanes, for separate cycle lanes. In many cases painting a line will do to mark the cycle lane.
Cost aspects	Compared to motorised transport modes moderate investments in cycling infrastructure and service would produce high mobility gains.
Political aspects	Presumably high public acceptance, but local authorities have to be persuaded.
Other aspects	Many good practice examples throughout Europe, not the least in The Netherlands. The Commission has been active already, assembling good practice examples, working out implementation tools and networking (see the EU funded projects ADONIS, WALCYNG, BYPAD, and NATCYP). The issue might also be covered by the planned Communication 2006/TREN/029

Documentation sheet (16)	
Measure number (Chapter-No, e.g. III)	V
Title of measure	Cargo centres in support of MARCO POLO
Short description	Provision of a fixed share of the structural fund for the construction and renovation of cargo centres which enable modal shift activities (e.g. from road to rail or inland vessel and vice versa)
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Freight transport
Expected impact on energy consumption	The current funding does not reflect the strong need for cargo centres to close the structural gaps between different modes of transport. Strengthening cargo centres will help to ease modal shifts to train and vessels and therefore will help to reduce energy consumption in transportation. Benefits are i.a. the move to more efficient modes of transportation and the avoidance of congestion with the related dissipation of energy.
Quantified example(s)	Cargo centres will help to achieve the goal of the MARCO POLO programme to transfer 12 billion tonnes/km annually off road freight to short-sea shipping, rail and inland waterways
Expected synergies	Less road traffic will lead to less congestion, less air/noise pollution, less energy use
Justification for action level EU	The targeted transportation takes place between EU countries. Acceptance and success depend on EU wide implementation.
Technical aspects	Cargo centres need coordination to ensure time efficiency of inter modal shift.
Cost aspects	Increase of the MARCO POLO funds to provide enough money for cargo centres
Political aspects	The share of the structural fund in support of cargo centres has to be negotiated as cargo centres favour certain modes of transport (train/vessel).
Other aspects	Distribution of structural funding among projects needs to be reconsidered. The issue might also be covered by the planned Communication 2006/TREN/010

Documentation sheet (17)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	1) EU minimum standards for road signing and traveller information; 2) Support for the application of IT-systems based on “GALILEO”
Short description	1) About 8% of total VMT is lost due to lost-the-way or longer routing than optimal. In most countries road side driver information [road signs, etc.] are below standard or lacking and lead to unnecessary VMT and time losses for p.t. travellers. This increases fuel use, pollution, road accidents and driver stress. All road authorities must apply minimum standards to be set at EU level [ranging from highway system info to city maps and visibility of street corner nameplates]. All cars must contain a set of national road and city maps. 2) The use of telematics for freight transportation helps to increase capacity utilisation of vehicles, avoid empty trips, and facilitate transfer to rail or ship. GPS-equipped vans and cars can avoid “getting lost” extra VMT, reducing stress and f.c. In public transport guidance systems, priority at traffic lights and dedicated lanes within towns and cities can reduce journey times, avoid delays and reduce costs and CO ₂ emissions. Traffic control systems improve parking management and make it easier for people to change from their cars to public transport by constant provision of up-to-the-minute traffic and travel information.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Virtually all means of transport
Expected impact on energy consumption	Decrease of energy consumption by less “got lost” VMT and nervous driving and by higher occupancy and load factors, modal shift and less congestion
Quantified example(s)	Several countries, regions, railways and towns apply best standards for driver/traveller information. Existing satellite based IT-systems such as GPS tracking in general and the German road toll system.
Expected synergies	Decrease of VMT, pollution, transport and infrastructure costs as well as road accidents
Justification for action level EU	Most countries/regions/municipalities are inactive as regards this problem. „GALILEO” itself is a strongly funded EU-project. Its commercial use must be a main concern for the EU.
Technical aspects	Roadside information is already state-of-the art
Cost aspects	The high investment costs of the GALILEO initiative may be redeemed by commercial use. Roadside information systems are cost-effective and low cost per unit. Implementing minimum standards can be gradually. In-car sets of maps are low cost measures.
Political aspects	Independence from the existing American GPS system is a substantial motive for the EU.
Other aspects	Satellite navigation will also make car and lorry use easier and might lead to additional transport demand, but GPS seems to provoke more ecodriving style by the relaxing effect of guidance to destinations without stress of getting lost. The issue might also be covered by the planned Communication 2006/TREN/010

Documentation sheet (18)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	CO ₂ emission trading for appropriate well-defined commercial transport sectors
Short description	Set-up CO ₂ emission trading for appropriate well-defined commercial transport sectors, e.g. feebate schemes. These schemes define average energy (CO ₂ -) performances for well-defined means of transport as a function of selected technical parameters. Individual means of transport which are above the average have to pay a fee; those which are below receive a bonus payment (e.g. a tax reduction). (Alternatively one could set up a “grandfathered cap” system, as recently proposed by the Commission for aircrafts. However, in this case the unit efficiency is not the only target, but the overall energy consumption). The required average performance (or the cap) is modified over time in order to provide a continuous incentive to improve the performance. Applies for new means of transport only.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Passenger cars, light duty vehicles, heavy duty vehicles, aircrafts (alternative option to limit values)
Expected impact on energy consumption	Would provide a permanent and long-term incentive for improving the unit efficiency of the individual means of transport
Quantified example(s)	None
Expected synergies	Since the emissions of conventional pollutants are regulated, no obvious synergy.
Justification for action level EU	Avoidance of distortion of competition (since only the commercial sector is covered) and policy of scale since the targets are products
Technical aspects	Monitoring process needs to be defined. EU-wide standardised methods for the determination of fuel consumption (CO ₂ -emissions) necessary. (Already available for light commercial vehicles).
Cost aspects	Transaction costs have to be kept under control. As a rule, this is possible, if the feebate is integrated into the national routine taxation systems
Political aspects	General hesitation to add costs on commercial transport (overall the measure would be cost neutral, but for individual firms it could be a burden)
Other aspects	It has to be checked, whether this proposal correlated well with other proposals in order to avoid overregulation of a specific sector/mean of transport. E.g. for vessels to be seen in conjunction with the scrappage incentive proposal.

Documentation sheet (19)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Increase of technical unit efficiency of coaches and buses
Short description	Subsidy programme for the renewal of the fleets (lighter constructions, more efficient engines) in order to increase the fuel efficiency; further development of EEV under energy aspects.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Passenger transport, coaches and buses, in particular those used for public transport
Expected impact on energy consumption	Reduction of fuel consumption at 25 % of fleet average
Quantified example(s)	None
Expected synergies	Significant reductions of NOx and PM emissions to be expected. Lower operating cost
Justification for action level EU	Introduction of EU-Regulation for fuel consumption inclusive consumption limits for coaches and buses in form EEV standards
Technical aspects	Lighter constructions and hybridising
Cost aspects	Lower operating cost but higher investment cost (trade off)
Political aspects	Costs. But policy has to decide, whether investment into improved unit efficiency is the better solution, e.g. compared to investment into new infrastructure
Other aspects	Measures could also be linked to “Public procurement” The issue might also be covered by the planned Communication 2006/TREN/029

Documentation sheet (20)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Integrated transport and land use planning for regional development
Short description	EU funding of projects implying changes of settlement structures should be bound to regional development plans (e.g. spending of the cohesion fund). A high density in urban areas is for example probably necessary, but not enough to decrease travel demand. So called “decentralised concentration” where smaller urban centres are established within a larger urban area is one example of a potentially low transport society. Best practice examples should be disseminated.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All means
Expected impact on energy consumption	Preventing urban sprawl will shorten distances travelled and slow down transport growth. Exploitation of Public Transport vehicles will increase, implying decreasing energy use per passenger kilometre.
Quantified example(s)	According to empirical research on new housing in the city of Hamburg, car travel volumes are about 30 % lower for inhabitants living in moderately integrated sites compared to sites where public transport supply and shopping facilities are poor. Another study calculated for the town of Oranienburg that locating residential areas with access to public transport would bring about a potential for cutting private motor traffic of approximately 27% of vehicle kilometres as compared to a similar scenario without access to public transport.
Expected synergies	Positive effects on nature and landscape, decreasing land take.
Justification for action level EU	EU funding programmes should pursue EU environment and transport targets.
Technical aspects	Guidelines and criteria for effective regional planning have to be developed.
Cost aspects	Additional costs for local and regional governments are limited as regional plans can be used for many purposes.
Political aspects	Might be criticised as augmenting bureaucracy.
Other aspects	The issue might also be covered by the planned Communication 2006/TREN/029

Documentation sheet (21)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Increase of technical unit efficiency of railways
Short description	Subsidy programme (e.g. scrappage incentive) for the renewal of locomotives and wagons (modern engines and lighter constructions) in order to increase the fuel efficiency (in case of wagons by increasing the payload).
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	Freight transport (railway)
Expected impact on energy consumption	Decrease of energy use
Quantified example(s)	e.g. Cargo wagon “Hbbilns” by SBB (Federal Swiss Railways) The UIC (Int. Union of Railways) is working on this subject intensely: < www.railway-energy.org >
Expected synergies	Wagon stock renewal may also comprise other improvements such as noise emission reduction.
Justification for action level EU	As a substantial amount of cargo wagons are in use for cross border traffic, an approach on EU level is important.
Technical aspects	Lighter constructions
Cost aspects	Higher investment cost, but increased payload (trade off)
Political aspects	None
Other aspects	The issue might also be covered by the planned Communication 2006/TREN/003

Documentation sheet (22)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Increase of technical unit efficiency of passenger cars
Short description	Long-term mandatory emission limit values should be phased in, laid down in a Directive, based on appropriate technical parameters like surface or weight or consumption/output power, if appropriate designed as “top runner“ approach. If necessary supplementary steps should be set towards downsizing of currently excessive power and weight values of all cars and vans, e.g. by setting in addition max. weight and power limits based on currently achieved values which are stepwise decreased.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Passenger cars and vans
Expected impact on energy consumption	Depends on limits which should take into account the current discussions on the 120 g/km target and future targets. Break in current (upgrading) trends in real fuel consumption.
Quantified example(s)	None
Expected synergies	Less accidents, modal shift, increase the efficient techniques
Justification for action level EU	Directive for CO ₂ -emission limit values in EU-regulation as moving targets with periodical value-adaptation in correlation with years. Car industry is captive in power and performance competition and can not act alone towards downsizing, so the EU should create a level playing field.
Technical aspects	Technology to reduce CO ₂ emissions in average down to 120 g/km or less is already available. Downsizing is feasible with current technology but with less-of-the-same [kWh/km/hr].
Cost aspects	Low costs for administrative effort. Downsizing is highly cost-effective compared to new technology.
Political aspects	Strong resistance from car and auto sport lobby
Other aspects	Difficulties with classification especially over-/under level. The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (23)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Increase of technical unit efficiency of two wheelers (TW); downsizing power and performance levels
Short description	Long-term mandatory CO ₂ emission limits should be phased in, laid down in a Directive, based on appropriate technical parameters like consumption/output power. Power output and performance levels should go down radically by EU regulation.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Two and three wheelers and quads
Expected impact on energy consumption	Middle term: 30 % energy saving Long term: 50 % energy saving
Quantified example(s)	None
Expected synergies	Lower NOx-Emissions decrease the hotspots on hot summer days. Lower performance can reduce accident/casualty rates.
Justification for action level EU	Two Wheelers (TW) are (especially in conglomerations) alternatives to passenger cars for transport - less space, less CO ₂ . But the efficiency of TW is not very high in comparison to passenger cars. The currently fleet fuel-consumption of TW in the EU is too high. As to downsizing the motor industry is captive in upgrading power and performance levels to current unacceptable levels from a safety, energy and environmental viewpoint. So, the EU must act to unlock this blockade.
Technical aspects	Good balanced carburettors or better direct injection and only 1-cylinder for exactly harmonised air fuel ratio, 4-stroke engines, because of flashing losses by 2-stroke engines, variomatic gear changing and max. 650 cm ³
Cost aspects	Technology is available, cost effects are not very high
Political aspects	Heavy resistance from motor industry and lobby
Other aspects	It could decrease driving fun because of less acceleration, less velocity.

Documentation sheet (24)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Increase of technical unit efficiency of light duty vehicles: CO ₂ -based vehicle tax
Short description	Directive on vehicle taxes: Tax should be based on CO ₂ emissions. (Extension of the proposal recently made for passenger cars).
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Cars and light commercial vehicles (and two wheelers, if necessary and appropriate)
Expected impact on energy consumption	The potential of this measure is in the order of 6% within 8 years.
Quantified example(s)	None
Expected synergies	None
Justification for action level EU	Fiscal measures are a key tool for achieving a move to any low carbon transport system.
Technical aspects	None
Cost aspects	The costs of this measure are very low in relation to the reduction in emissions that can be achieved, since, if it is organised in a volume-neutral way, only the basis of assessment for the vehicle tax would change.
Political aspects	Harmonisation of taxation of passenger cars and light duty vehicles
Other aspects	The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (25)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Usage of low friction lubricants for engines
Short description	Mandatory usage of low friction lubricants for all vehicles or engines used in motorised means of transport.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All vehicles and engines used in motorised means of transport
Expected impact on energy consumption	2 – 5 % energy saving
Quantified example(s)	None
Expected synergies	PM-reduction
Justification for action level EU	Defining a quality standard, e.g. using the European eco label could facilitate the widespread use of low-viscosity oils. Legislation defining a uniform quality standard could then be introduced in the Member States of the European Community.
Technical aspects	The term “low-viscosity oil” is not clearly defined; oils of different qualities are currently being marketed as low-viscosity oil. For example, 10W40 engine oils are sold as low-viscosity oils, although the flow properties of these oils are by no means ideal.
Cost aspects	None
Political aspects	None
Other aspects	The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (26)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Efficient tyres
Short description	Mandatory usage of low resistance tyres and pressure sensors for new road vehicles, and for minimum tyre pressures. Restrictions to applying wider tyres.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All road vehicles
Expected impact on energy consumption	2 – 9 % energy saving
Quantified example(s)	None
Expected synergies	All emissions and noise reduction. Less accidents
Justification for action level EU	In Germany the eco-label “Blue Angel” ⁴⁷ is used by manufacturers to a very low extent. A European eco label is needed. A price comparison of low rolling resistance tyres with conventional tyres showed that there is little or no price difference. A limit value for the rolling resistance coefficient of tyres could facilitate the blanket use of low rolling resistance tyres. Standard Europe-wide labelling of rolling resistance and noise values on the sidewall of the tyre could support prompt implementation. Raising minimum tyre pressure values will prevent current high rates of under inflated tyres and accidents due to loss of control/run-off tyres. Reducing current trade-off due to ever increasing tyre dimensions can not be left to the market.
Technical aspects	The German tyre market already has a wide range of tyres with low rolling resistance. Studies by the Federal Environmental Agency have shown that low rolling resistance tyres can be purchased from various suppliers in all sizes tested (summer and winter tyres) and in virtually all categories of tyre. It must be said that tyre manufacturers tend to use their own individual system of labelling, so that low rolling resistance tyres are not always called that, but are sold under the name of “Economy,” “Energy,” “Fuel-saver” or similar terms. Circa half of all tyres are under inflated. Standard tyre pressure rates are too much comfort-oriented and lead to dangerously lower values when not checked regularly. Raising minimum values with 10% improves all effects and reduces risks due to under inflation [preferably combined with monitors].
Cost aspects	Low
Political aspects	Resistance to restricting wider tyres by car lobby/business
Other aspects	The issue might also be covered by the planned Communication 2006/ENV/013

⁴⁷ <http://www.blauer-engel.de>

Documentation sheet (27)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Energy-efficiency based EEV standards for all road vehicles, including buses used for public transport
Short description	Definition of an EU-wide energy-efficiency based EEV-standard to be taken into account for all public calls for tenders in the EU. One simple approach could be to take the average current fuel consumption as point of reference and to define energy-efficiency based EEV as such vehicles which are by a certain percentage below the average. For buses see as well http://www.lowcvp.org.uk/workinggroups/bus/
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	Two wheelers, passenger cars, light commercial vehicles, heavy duty vehicles
Expected impact on energy consumption	Depends on vehicle type, but overall small in short term. Gives signals which have long-term repercussions on the market.
Quantified example(s)	To be evaluated
Expected synergies	To be evaluated
Justification for action level EU	Only co-ordinated EU action creates a market large enough to be of significance
Technical aspects	To be evaluated
Cost aspects	To be evaluated
Political aspects	To be evaluated
Other aspects	The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (28)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Increase of R&D support and focus the available funds on energy efficiency
Short description	Member States, the European Commission, manufacturers and the research community should define a R&D programme for different fuel/technology options ("Future Engines & Future Fuels" R&D Programme), it should be coordinated with existing projects and include lower power/performance levels for all vehicles. The programme should be focused in such a way that the development and demonstration of the latest most fuel efficient technology is supported
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All motorised means of transport
Expected impact on energy consumption	Centralised funding for R&D and demonstration projects from the European Commission which allocates funding on the basis of anticipated improved energy performance.
Quantified example(s)	To be evaluated
Expected synergies	To be evaluated
Justification for action level EU	Gives the Industry a clear, consistent message across Europe, which makes it easier to plan the development of new energy efficient technologies across many Member States.
Technical aspects	To be evaluated
Cost aspects	To be evaluated
Political aspects	To be evaluated
Other aspects	The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (29)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Increase of technical unit efficiency by public procurement measures
Short description	The public service should be obliged to allocate a certain share of the procurement budget for the procurement of means of road transport which meet certain performance criteria (EEV criteria), including fuel consumption requirements. The first step, however, is to define a clean vehicle or an EEV for all types of vehicles.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All means of road transport (TW, PC, LCV, HDV)
Expected impact on energy consumption	Small, because the public markets are relatively small, but provides support for energy efficient technologies.
Quantified example(s)	National examples: In France, public services must purchase 20 % of clean vehicles which are electric, LPG and NG vehicles. Another bill is on its way: the other 80 % must emit less than 140 gCO ₂ /km (exemption at 199 g/km for definite functions).
Expected synergies	Depends on EEV settings. If just fuel consumption is addressed none, since emissions of other pollutants are regulated
Justification for action level EU	Economy of scale (National or local measures might not create enough demand in order to influence the markets)
Technical aspects	EU-wide standardised fuel consumption measurement methods necessary (Currently not available for HDV). Performance criteria have to be defined, e.g. as absolute values (g CO ₂ /km not to be exceeded) or in relation to technical parameters (e.g. defined as a function g CO ₂ /kW which is an indicator of the performance of the power train of the vehicle).
Cost aspects	No significant impact on procurement costs; monitoring costs to be checked
Political aspects	Might create hesitation in MS with a strong motor vehicle industry
Other aspects	Exemption is (military) or might be necessary for some sectors (e.g. fire brigades and ambulances)

Documentation sheet (30)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Regional Marketing Strategies
Short description	Financial incentives for the development and implementation of regional strategies which support the marketing of products, in particular agricultural products, in the region where they are produced
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All means of freight transport
Expected impact on energy consumption	Reduction of energy consumption due to avoidance of unnecessary freight transport
Quantified example(s)	There seems to be a number of regional marketing initiatives within EU 25
Expected synergies	Reduction of other pollutants due to decrease of transport volume
Justification for action level EU	Should be part of EU wide marketing strategy of agricultural products which is dominated by export incentives
Technical aspects	Not evaluated
Cost aspects	Not evaluated
Political aspects	Not evaluated
Other aspects	Not evaluated

Documentation sheet (31)	
Measure number (Chapter-No, e.g. III)	VI
Title of measure	Ecodriving programs
Short description	Ecodriving should be set up by the Commission and Member States in a programmed way as part of ENV/EN/TRANS[road safety] policies for saving fuels, achieving Kyoto targets, improving air quality/4C and reducing road casualties as set in EU resolutions and govt. notes in these fields. Specific targets and packages of measures under ecodriving program umbrella to be earmarked for short and longer term and budget requirements.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	All vehicles/drivers, LDV and HDV and professional drivers as a priority, involving all relevant [car/fuel/transport] business and NGO organisations which represent and address specific target groups or the mass of drivers
Expected impact on energy consumption	The long-term potential for individual reductions in consumption and CO ₂ and pollution is 10 % on average if effective measures are implemented simultaneously at EU and MS levels. EU15 estimate= 50 Mton CO ₂ reduction at 5-10 euro/ton CO ₂ [NL data].
Quantified example(s)	Many fleet owners in D/NL/CH/S have their drivers trained and made large savings, most of all in accident and damage reduction [up to 40 %, equally reducing stress-related absenteeism], less in fuel use [up to 10 %, less in HDV]. The energy saving scheme “EnergieSparen” by the German TOC “Deutsche Bahn (DB)” identified energy savings of up to 20 % individually. The scheme included technical adjustments on board as well as the training of 22,000 train drivers. DB states, that this scheme has saved 32,000,000 € since 2002 so far.
Expected synergies	Reduction of air pollution, noise and accidents and consumer costs [wear, tyres etc.] of >10 %;
Justification for action level EU	Without a targeted top-down approach driver behaviour will not improve due to lack of incentives at EU and MS level. MS are rather inactive and need guidance in setting up ecodriving programs. Reduction potentials [no regret, but yet not harvested] for all effects justify EU action.
Technical aspects	Modern engines and vehicles have large surplus in power and performance, which add to fuel use/emissions when old fashioned high-RPM driving style is performed. Driver behaviour can/should be more close to EU test cycle pattern.
Cost aspects	Very low cost measure! NL program 5-10 Euro/ton CO ₂ ! Relatively low budgets needed compared to new technology.
Political aspects	No car lobby resistance, since ecodriving is not anti-car! Politicians are not aware of large potentials and no-regret character of active programming and behaviour change
Other aspects	Training capacity for on-the-road ecotraining of the mass millions of licensed drivers must be built-up. Gradual build-up of program implementation is best practise, learning from more advanced countries. The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (32)	
Measure number (Chapter-No, e.g. III)	IV/VI
Title of measure	Introducing standard in car driver feedback and assistance systems [board computer, cruise control, gearshift indicator]
Short description	All means of transport, but in particular LDV/HDV road vehicles should offer standard in-car feedback systems, such as real-time consumption meters [board computer] and gear shift indicators and eco-zoning in RPM gauges [like already in HDV]; moreover high mileage vehicles should have [adaptive] cruise control, and vans should be equipped with [interactive] speed limiters, etc. Appropriate proposals have to be worked out for the individual means of transport and made mandatory as standard equipment of new vehicles At EU level a speed retarder in delivery vans should become obligatory. In the Netherlands, vans cause about 20 % of CO ₂ emissions from road transport. Studies in the Netherlands show that emissions from vans can be reduced by 8 % (CE, 1998).
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Currently all means of transport, but in particular road vehicles and a minority of LDV/HDV are standard equipped with in-car feedback and support instruments for saving fuel.
Expected impact on energy consumption	In-car instruments are the key to do-it-yourself ecodriving savings and can reduce [without training] f.c. by 5 % - 10 %.
Quantified example(s)	NL tests as of 1990
Expected synergies	Less pollution and noise, less accidents
Justification for action level EU	The car market is not willing to supply in-car instruments as low cost standard equipment, fiscal incentives [NL] can only help temporarily, so EU must act to achieve equal level pl.f. and overcome manufacturer's inertia [by regulation or agreement]
Technical aspects	These instruments are current technology and low-cost practise off-factory [retrofit is less cost-effective] and available also for automatic clutch and transmission systems [best practise in Toyota/Lexus hybrids]. Minimum standards needed to avoid below standard effects or driver non-use.
Cost aspects	Incremental low [0-100 euro] costs compare with standard vehicle; in-car is the only "accessory" that pays back [cf. air co!]
Political aspects	None
Other aspects	Car industry is pressing on improving driver behaviour next to EU emission standards. They can show responsibility now by acting more on standard in-car instruments and driver information, not tagging high prices to such [so-far] accessories.

Documentation sheet (33)	
Measure number (Chapter-No, e.g. III)	VI
Title of measure	Ecodriving standard in driving school curricula and driving license tests
Short description	Currently taught old-fashioned driving practise leads to 10 %-20 % more fuel consumption and extra pollution/noise etc. Driving school training is the source of life-long suboptimal driving habits. Ecodriving [low revving] should start at driving schools and be part of driver exams. As a start all driving school trainers must be trained in ecodriving free from costs, as done in NL.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	All driver training schools and all driver category exams
Expected impact on energy consumption	Up to 10 % average. Lower effects if not accompanied by in-car feedback
Quantified example(s)	Experiences from German driving schools for passenger cars validate an economical driving style, that can be bring about fuel savings of up to 25% individually. NL driving school trainers [circa 6000] have followed special ecodriving training costing less than 1 M euro [program costs].
Expected synergies	Reduction of noise and accidents, Eco-driving style-concepts of the driving schools are adoptable for all areas of transport
Justification for action level EU	Further approximation of national regulations. Importance of reduction potentials legitimates EU interference with national training practises.
Technical aspects	In-car instruments, such as standard fitting of board computers and green-zone RPM gauges, would help the student/driver to apply ecodriving. All vehicles can apply ecodriving [less RPM] and all trainers can do so once eco-trained themselves. N.B.: ecodriving is not a specialty, it is avoiding high RPM and using high gears at lower speeds, just that!
Cost aspects	Very low cost measure! Costs are circa 200 euro per trainer
Political aspects	None
Other aspects	Regulation and budget must speed-up this priority action

Documentation sheet (34)	
Measure number (Chapter-No, e.g. III)	III/VI
Title of measure	Public information campaigns
Short description	The public needs to be well informed about the environmental impact of the different modes of transport, the individual means of transport and how to use them best. The Commission should take initiative for EU-wide information campaigns, with priority on saving fuel and on ecodriving practise.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Apply ecodriving practise Decrease motorised transport demand Use more energy efficient modes Buy low energy cars Use of renewable energy
Expected impact on energy consumption	Lower the energy use in transport generally
Quantified example(s)	NL campaigning on fiscal incentives and ecodriving, as part of packages of measures and supported by below-the-line communication and free publicity E.M.Week?!
Expected synergies	The above mentioned strategies reduce also the emissions of pollutants into air, reduce noise, and indirectly land take and land fragmentation.
Justification for action level EU	Within its campaign “Sustainable Energy Europe 2005-2008” EU encourages local, national and EU-wide actions for the increased use of renewable energy sources, more energy efficiency, clean transport and alternative fuels. Inertia of MS and businesses in addressing media and the public towards more practical energy savings – especially missing the potentials and synergies of ecodriving - brings about the need for EU action and coordination.
Technical aspects	Mass media campaigning should be translated into culture-specific MS level strategies, programs and commercials
Cost aspects	Mass media commercials cost millions; involving business partner organisations saves costs. Depending on the concrete action, combined approaches with low cost micro-media can guarantee high cost effectiveness [NL campaign]
Political aspects	some politicians do not like gov. communication on behaviour
Other aspects	marketing and behavioural expertise needed

Documentation sheet (35)													
Measure number (Chapter-No, e.g. III)	VI												
Title of measure	Lower highway speed limits and improving enforcement												
Short description	Mandatory highway speed limits should be set at preferably 80/100/120 km/h [according to the road environment]. Enforcement programmes must be implemented and minimum levels of enforcement must be agreed; best practises to be exchanged and police cooperation enhanced by expert level info/work programmes.												
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	All road vehicle categories												
Expected impact on energy consumption	<p>Significant reduction of energy consumption and emissions if ranges for limits were set and, as far as possible, fully enforced as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Km/h</th> <th style="text-align: center;">TW/PC/LCV</th> <th style="text-align: center;">HDV/buses</th> </tr> </thead> <tbody> <tr> <td>City</td> <td style="text-align: center;">30 as a rule /50 on main streets</td> <td></td> </tr> <tr> <td>Rural</td> <td style="text-align: center;">70 - 90</td> <td style="text-align: center;">70</td> </tr> <tr> <td>highway</td> <td style="text-align: center;">80-100-120</td> <td style="text-align: center;">80-100</td> </tr> </tbody> </table> <p>A minimum enforcement rule, e.g. minimum annual number of speed controls/registered car or .../road length, to be applied throughout the EU.</p>	Km/h	TW/PC/LCV	HDV/buses	City	30 as a rule /50 on main streets		Rural	70 - 90	70	highway	80-100-120	80-100
Km/h	TW/PC/LCV	HDV/buses											
City	30 as a rule /50 on main streets												
Rural	70 - 90	70											
highway	80-100-120	80-100											
Quantified example(s)	To illustrate the order of magnitude of energy reductions to be expected: Estimates for Germany calculated in the nineties indicate an energy reduction for passenger cars of about 19 % for 100 km/h and about 10 % for 120 km/h. Energy reduction effects for rural and urban driving less clear. For city driving the actual usage pattern are more important, but positive effects on noise and accidents obvious. NL: differentiated limits [30x-fold] upgraded enforcement quantities, better tactics and administrative quality have reduced total road transport emissions of CO ₂ and NO _x by 2 % -4 % as of 1988												
Expected synergies	Significant noise reduction (estimates: 1,5- 3,2 dB(A) for 100 km/h and 0,5-1,0 dB(A) for 120 km/h) and reduction of emissions of conventional pollutants (NO _x , CO, HC) especially at air quality hotspots [NL data]. Reduction of accidents. Might have positive long-term effects on city and road planning as well as on vehicle design [less upgrading]. High cost reductions												
Justification for action level EU	Further approximation of national regulations. All MS but Germany have speed limits for highways; all MS have speed limits for cities and rural roads but most MS do not enforce them sufficiently [30 %-80 % of drivers in excess of any limit]. Common interests overrule subsidiarity principle reasoning as used so far by MS with too high or no limits as needed.												
Technical aspects	Modern automatic digital camera/computer systems can achieve 100 % enforcement and swift penalty processing. In-car instruments such as cruise control help in better self-control.												
Cost aspects	Savings due to reduced energy consumption, less accidents etc. Extra budgets for extra policing through reprocessing fines into budgets [like in NL]												
Political aspects	Hesitation with regard to speed limits in one, and with regard to enforcement rules in many MS since it is a sensitive issue.												
Other aspects	Enforcement is a crucial part of the proposal, see France, NL												

Documentation sheet (36)	
Measure number (Chapter-No, e.g. III)	VI
Title of measure	Improving traffic flow management
Short description	Improving traffic flow management by EU-concerted actions towards restructuring and reviewing main roads/HDV through routes priority schedules at traffic lights and signalling, at crossings etc., car entry restrictions, introducing “green wave”-schedules, pedestrian/cyclist tunnel constructions, reconstructing bumpy railroad crossings, homogenising structural stop & go traffic conditions
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Road traffic, railroads crossing roads
Expected impact on energy consumption	2 % -5 % reduction
Quantified example(s)	Rotterdam Overschie speed reduction case
Expected synergies	Less NOx/PM emissions and less noise en vehicle costs
Justification for action level EU	EU level coordination and stimuli needed [agreements, rules, information, budgets?] plus criteria from best practises, because local govts have no interest so far in reducing traffic energy use; so far no obligation exists to address energy losses due to traffic mismanagement > review schemes must be regulated top-down
Technical aspects	No problem, know how and good practise are abundant
Cost aspects	Low cost [extra road construction not included] high cost-benefit
Political aspects	Redistribution of priorities may provoke protests, political awareness lacking, public interest through local benefits [env!]
Other aspects	Combined reasoning needed [energy /4C/noise/cost-benefits] and steps set to prevent traffic volumes to increase

Documentation sheet (37)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	International informational exchange
Short description	The THE PEP ⁴⁸ clearing house of UNECE and WHO will be officially opened in autumn 2005. It is designed as an interactive internet-based system to exchange knowledge regarding the integration of transport, health and environment. It includes many regional and local approaches and measures (best practice) to improve energy efficiency. To benefit of them EU-wide the existing experience should be provided by all EU Member States, exchanged and actively used.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	Improve the transport energy efficiency at the local or regional level by using good practice of other countries regarding technological improvements, transport avoiding and promoting environmental friendlier (more energy efficient) modes.
Expected impact on energy consumption	Lower the energy use in transport generally
Quantified example(s)	None directly available
Expected synergies	The other mentioned measures of this paper would be made better available and also related regional implementation strategies and technology. The above mentioned strategies (technological improvements, transport avoidance and promoting environmental friendlier modes) reduce also the emissions of pollutants into air, water and soil, reduce noise emissions, land take and land fragmentation.
Justification for action level EU	All EU-member states have also committed to THE PEP. So not an additional EU system should be established but the UNECE / WHO ones used. European wide exchange of knowledge
Technical aspects	Depending on the applied practice
Cost aspects	Relatively low: approximately 200,000 € per year to maintain the system, some additional human resource within the member states to provide the relevant information to the system
Political aspects	
Other aspects	The quality of the THE PEP clearing house depends on an ongoing contribution of relevant information by the member states

⁴⁸ THE PEP = Transport, Health, Environment Pan-European Programme of the UNECE and the WHO
(www.thepep.org)

Documentation sheet (38)	
Measure number (Chapter-No, e.g. III)	III
Title of measure	Mobility Management Centres
Short description	EU guidelines for the establishment of “Mobility Management Centres”: This is an umbrella concept for a number of measures aiming at getting people to travel less and shift modes on a voluntary basis. Mobility Management comprises transport instruments, measures, products and services that meet the needs of travellers in a sustainable way.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Passenger and freight transport. Examples of Mobility Management measures are campaigning, carpooling, mobility centres, flexible mobility services, accessibility guides etc. The tools of Mobility Management are based on information, communication, organisation, coordination, regulation and promotion ⁴⁹ .
Expected impact on energy consumption	Mobility Management wants to create attractive alternatives to individual car use and thus increase the number of travels with sustainable transport modes such as walking, cycling, public transport and carpooling. These measures enhance the effectiveness of more infrastructure-oriented measures of traffic planning, for example new tramlines, new roads and new bike paths.
Quantified example(s)	In Sweden, for example, Mobility Management services are often provided by a local traffic office. Commuter oriented offices in Copenhagen was established in 2002 in order to provide transport planning services to companies and public organisations. In Finland a variety of local projects has been carried out and the interest in Mobility Management is growing rapidly. See also ARTIST (urban transport and tourism) ⁵⁰
Expected synergies	Less air pollution and less noise
Justification for action level EU	Guidelines would help to achieve high standards of such Centres throughout the EU.
Technical aspects	None
Cost aspects	Mobility Management tools do not necessarily require large investments measured against their high potential to change mobility behaviour. In a recent evaluation ⁵¹ it was found that when launching a Mobility Management project it is important to show direct financial benefits for the companies involved. They commonly derive from savings related to car parking and improved health of employees.
Political aspects	Subsidiarity?
Other aspects	The issue might also be covered by the planned Communication 2006/TREN/010

⁴⁹ EPOMM, European Platform On Mobility Management, <http://www.epommweb.org/>

⁵⁰ <http://www.t-ti.com/artist/index.html>

⁵¹ Mobility Management in the Nordic Countries (TemaNord 2005:539) Nordic Council of Ministries.

Documentation sheet (39)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Mobile air conditioning
Short description	Improvement of energy efficiency of mobile air conditioning systems by 1. measuring the efficiency based on an EU wide harmonised method, and 2. setting minimum efficiency requirements.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Passenger cars, light duty vehicles, heavy duty vehicles
Expected impact on energy consumption	There is an estimated difference in the efficiency between the best and the worst mobile air conditioning system currently used of about a factor of 2
Quantified example(s)	Not evaluated
Expected synergies	Repercussions on emissions of conventional (regulated) pollutants to be proven; needs to be assessed further.
Justification for action level EU	The only appropriate level for performance vehicle requirements
Technical aspects	Technical solutions are known. Preparatory technical work on appropriate test procedures has been carried out by the Commission.
Cost aspects	Currently evaluated by the Commission
Political aspects	Voluntary approach might be more cost efficient than legislation
Other aspects	The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (40)	
Measure number (Chapter-No, e.g. III)	IV
Title of measure	Vehicle efficiency labelling
Short description	Modification of car labelling as laid down in Directive 99/96 in order to improve its efficiency, e.g. by introducing clear, and more consumer friendly labels.
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,...)	Passenger cars, light duty vehicles, two wheelers
Expected impact on energy consumption	Influences the consumer's choice of new vehicles. Estimates range between 0, 5 – 5 % energy savings in the long run.
Quantified example(s)	NL labelling scheme
Expected synergies	Might have an impact on the gasoline/diesel mix of the PC and LDV fleets
Justification for action level EU	Labelling is EU wide regulated already now, needs just to be improved.
Technical aspects	None
Cost aspects	Negligible
Political aspects	Resistance in some MS due to potential impact on vehicle market
Other aspects	The issue might also be covered by the planned Communication 2006/ENV/013

Documentation sheet (41)	
Measure number (Chapter-No, e.g. III)	V/VI
Title of measure	Mandatory-ecodriving training of all professional and high-mileage drivers (rail included) and employee reward and feedback systems for improving corporate practises
Short description	Eco-driving training for all professional and high-mileage drivers should be mandatory for all vehicle operating companies. Employers of high mileage/business/HDV drivers should set up reward/feedback systems to stimulate employees to apply eco-driving [as part of mobility/energy management systems]
Target(s) (e.g. Passenger transport, freight transport, all means of transport, railway, road, waterways,....)	Passenger and freight transport [all surface modes] in road transport, public transport, fleet owners & business cars/ delivery vans (train drivers included). Professional drivers [HDV, taxi, business car] are high mileage drivers with often high fuel use, pollution and risk per km, so it is most effective to [post-graduate] train these drivers first. Sustaining ecodriving in practise [not paying fuels themselves] it is only by reward/ feedback systems that such drivers uphold better fuel efficiency.
Expected impact on energy consumption	The long-term potential for structural reductions in specific consumption and CO ₂ is estimated 5 %- 10 % after training and with corporate-specific stimuli and feedback.
Quantified example(s)	Many fleet owners in D/NL/CH/S have their drivers trained and made large savings, most of all in accident and damage reduction [up to 40 %, equally reducing stress-related absenteeism], less in fuel use [up to 10 %, less in HDV]. The energy saving scheme “EnergieSparen” by the German TOC “Deutsche Bahn (DB)” identified energy savings of up to 20 % individually. The scheme included technical adjustments on board as well as the training of 22,000 train drivers. DB states, that this scheme has saved 32,000,000 € since 2002 so far.
Expected synergies	Economical benefits for the fleet owners/corporations by saving fuel, maintenance and accidents/damages; improved pollution control and less stress behind the wheel
Justification for action level EU	Harmonized approach needed, avoidance of competition trade-offs. Introduction in national regulations; significance for forthcoming directives related to the rail package [?]
Technical aspects	All vehicles and drivers can apply ecodriving elements in current practise but will not do so unless stimulated by training and in-vehicle or in-corporate feedback. Therefore standard installation of fuel consumption displays [board computer] is necessary, beginning in professional high-mileage vehicles
Cost aspects	Low cost measure, since there is quick return on investment. Cost of driver training circa 200 Euro/1 day.
Political aspects	None
Other aspects	Issuing a voucher for training in economical driving to people buying new vehicles or a reduction in insurance premiums for drivers who have completed this kind of training course would have a positive effect on propagating ecodriving.

X ANNEX 2 – Responses to Green Paper Questions

The Green Paper on Energy Efficiency contains far-reaching policy proposals e.g.:

- reduction of 20 % of the EU's 2005 energy consumption levels by 2020
- mandatory national energy efficiency targets
- encouraged use of the "enhanced cooperation" mechanism of the Amsterdam Treaty to introduce progressive fiscal measures,

and identifies the transport sector as one of those offering the greatest potential reductions: It lists a number of specific measures for the transport sector, e.g.:

- Organising air traffic management
- Optimising traffic management
- Developing a market for clean vehicles
- Charging of infrastructure to induce changes in behaviour
- Improve tyres used for road transport
- Considering city tools
- Improving public transport
- Specific regional and local level financing instruments.

In its Communication the Commission invited all interested circles to reply to a number of questions related to the proposals made in the Green Paper, taking into account their cost-effectiveness and their contribution to energy saving, to environmental protection, to job creation and to the reduction of imports of oil and gas.

In the following the replies of the Working Group to the questions regarding the general policy and the transport related options identified in the Green Paper are presented. However, it should be underlined that the replies given are not final but present the current state-of-play. This is already visible by the fact that the answers are linked to the documentation sheets. These sheets, however, have not been discussed in detail by the Working Group up to now. Therefore the replies should be considered as a contribution to the discussion rather than firm statements. Finally, it should be kept in mind that the expertise assembled in the Working Group does not cover all questions in all details. This had also repercussions on the quality of the replies.

1. How could the Community and the Commission in particular, better stimulate European investment in energy efficiency technologies? How could funds spent supporting research in this area be better targeted? (Section 1.1)

As a matter of principle, European investments should aim at reducing energy use in transport in general and should not just concentrate on energy efficiency improvements. Nevertheless, energy efficient technologies might need special start-up support which could be provided by regulations and funds. Regulations, for example, could be used to mobilise tax incentives. Funds could provide direct subsidies and could be established at local, regional, national or EU level. As far as the EU level is concerned the earmarking of the EU regional funds and structural funds for special transport related programmes could be considered, e.g. in order to stimulate investments into GALILEO and MARCO POLO related projects. Moreover, the transport related Community programmes are of high importance. Improved research coordination, focusing on energy efficient technologies and enhancing synergies

among the programmes might be helpful in this respect. In any case support should be given to technologies which have a clear potential to become profitable in acceptable periods time.

2. The emission trading mechanism is a key tool in developing a market-based response to meeting the goals of Kyoto and climate change. Could this policy be better harnessed to promote energy efficiency? If so, how? (Section 1.1)

First of all it should be recalled that the reduction of greenhouse gases does not automatically lead to a reduction of the energy consumption. However, there are strong synergies and one should carefully check the energy reduction opportunities associated with emission trading. In practical terms the design of the trading systems decides on its effectiveness. For transport, keeping in mind that schemes could be considered for the post - 2012 period, several options exist, e.g. the establishment of mode or sub-mode specific feebate-trading systems or separate transport specific up-stream type systems. Trading systems seem to be more appropriate for professional modes of transport since these are more cost sensitive. Moreover, the transaction costs should lower compared to private modes of transport. However, if such trading schemes were fully linked to the general ETS one could expect that transport related sources would be on the side of purchasers of emission rights. Therefore, while this linkage would be positive for the overall economic efficiency of the CO₂ reduction programmes, it could have negative repercussions on other transport-related issues since the pressure to increase energy efficiency and optimise transport usage could be weakened. Among other things this needs to be studied when designing trading schemes. Closed schemes would avoid this risk. For private modes of transport (two wheelers, passenger cars) well-designed long-term emission limits for new vehicles seem to be more appropriate since they provide reliable boundary conditions for future vehicle development and policy planning and implementation. Finally there is another aspect which needs consideration: the repercussion of trading schemes on the overall costs and the revenue balance. As a rule transport taxes are a major source of revenues. The incorporation of transport in general or individual modes of transport might require re-adjusting the existing equilibrium.

3. In the context of the Lisbon strategy aiming to revitalise the European economy, what link should be made between economic competitiveness and a greater emphasis on energy efficiency? In this context, would it be useful to require each Member State to set annual energy efficiency plans, and subsequently to benchmark the plans at community level to ensure a continued spread of best practice? Could such an approach be used internationally? If so, how? (Section 1.1.3)

Since transport is mainly a cost factor in the private and commercial bills, and since energy needs to be imported, it is obvious that less energy use and improved energy efficiency enhances the competitiveness of firms and helps to keep the national and the EU trade in balance, apart from the strategic consequences of further oil dependency. The question of annual energy efficiency plans and subsequent benchmarking is more complex since it is linked to the on-going discussions on the Energy Services Directive and already existing obligations to submit to the Commission information on national GHG emission inventories and allocation plans which include information on energy consumption. Moreover, the approach “energy efficiency plans/benchmarking” requires to define clear methodologies for determining “energy efficiency”, a task which is not trivial. Thus, one could wonder whether it is not more appropriate to concentrate on energy consumption in transport rather than on energy efficiency. The Energy Services Directive is not transport specific and air and maritime transport means are excluded for measurement reasons. Therefore, there might be

an added value in setting indicative national energy consumption targets for the transport sector for a defined target year, e.g. 2020, accompanied with National Action Plans. However, one should carefully check how this fits into the existing or proposed policies. Moreover, while it is likely that National Action Plans, e.g. up-dated in 5 years intervals, would be helpful for the Commission's work on developing and adjusting further the EU transport policy, one should check whether the information already available now to the Commission could not be better used for this purpose.

4. Fiscal policy is an important way to encourage changes in behaviour and the use of new products that use less energy. Should such measures play a greater role in European energy efficiency policy? If so, which sort of measures would be best suited to achieve this goal? How could they be implemented in a manner that does not result in an overall increase in the tax burden? How to really make the polluter pay? (Section 1.1.4)

The effectiveness of economic instruments must not be overestimated since the current willingness to spend is and will be rather high [see for example low cost elasticities on car ownership and use and on aviation]. However, fiscal policy can give important signals if seen as part of the overall costs/price balance for transport. Obviously, in order to reduce the energy consumption in transport the overall costs of transport should, in the long-term, increase in order to control transport demand. However, since to a significant extend the overall costs for transport are influenced by market forces, fiscal systems must be well-designed in order to provide incentives for increased energy efficiency. Moreover, as important as the absolute costs seems to be to give the right signals, i.e. to differentiate taxes (in absolute or relative terms) in such a way that incentives for the design and successful marketing of energy efficient means of transport and their use is given. Moreover, it is important to design systems without loopholes, e.g. to cover just private car but not company cars. In order to make the polluter really pay one should also consider other measures, e.g. the incorporation of external costs.

5. Would it be possible to develop state aid rules that are more favourable to the environment, in particular by encouraging eco-innovation and productivity improvements? What form could these rules take? (Section 1.1.5)

In the transport sector state-aids exist already in some countries, e.g. direct or indirect subsidies for alternative fuels powered vehicles, passenger cars with low CO₂ emissions in general; other countries support hybrid vehicles, or electric vehicles, state aids for public transport, etc. The issue therefore is: Should the rules applied in Member States be approximated or even harmonised in order to give even stronger signals to the market? For this purpose one would need guidelines to be applied throughout the EU. Moreover, there are also potentially "negative" state-aids, e.g. financial incentives which tend to increase transport like housing-aids which increase the urban sprawl, state aids for road and infrastructure construction which finance not well-assessed projects etc. These, could also be subject of further considerations.

6. Public authorities are often looked to for an example. Should legislation place specific obligations on public authorities, for example to apply in public buildings the measures that have been recommended at Community or national level. Could or should public authorities take account of energy efficiency in public procurement? Would this help build viable markets for certain products and new technologies? How could this be implemented in practice in a way that would promote the development of new technologies and provide incentives to industry to research new energy efficient products and processes? How could

this be done in a manner that would save money for Public authorities? As regards vehicles, please see question 20. (Section 1.1.6)

Again there seems to be a link to the on-going discussions on the Energy Services Directive. Apart from that, the general answer is: in theory, yes, public authorities should give good examples and provide leadership in this respect. There are possibilities: Public authorities could give a good example in the efficient use of environmentally-friendly means of transport, e.g. providing free or price-reduced public transport tickets for the staff, organising an efficient parking management etc. All this could be part of a mobility plan to be established by individual public authority institutions. In addition, public authorities could be part of compensation programmes within which voluntarily payments are made to funds in order to cover external costs of business trips. In practice, however, little happens in this respect: The reasons might be that public authorities have to apply cost efficiency rules similar to those applied in private firms, and that they do not want to restrict the boundary conditions of life of staff more than done in other businesses. If action at EU level is desired one could think of guidelines and recommendations as well as exchange of best practices approaches. With regard to energy-efficient public procurement public authorities could play a significant role. Helpful in this respect could be the establishment of common criteria, e.g. for public procurement.

7. Energy efficiency funds have in the past been used effectively. How can the experience be repeated and improved? Which measures can be adopted usefully at:

- international level
- EU level
- national level
- regional and local level?

(Section 1.1.7. See also question 22)

Funds, paid out of tax papers money, are limited in volume. Therefore, they have to be well-targeted, and it must be ensured that they are an efficient way of public spending. Funds could be used for many purposes, including eco-driving support, information campaigns, business procurement activities, etc. Therefore, for the EU-level one should consider to exchange views among Member States and to approximate the spending rules in order to give stronger signals to the market and to citizens. Interesting seems to be to design funds which are based on continuous income. With regard to the funds raising, there is no lack of ideas, e.g. road pricing or zone pricing in cities (which, in an enhanced form, could be linked to energy efficiency classes of vehicles). This would allow public authorities to raise funds which could than be used to support environmentally friendly means of transport. In the enhanced form it would at the same time provide incentives to purchase fuel-efficient road vehicles in order to reduce the economic burden of the fee.

8. not relevant

9. not relevant

10. not relevant

11. A major challenge is to ensure that the vehicle industry produces ever more energy efficient vehicles. How can this best be done? What measures should be taken to continue to improve energy efficiency in vehicles and at which level? To what extent should such

measures be voluntary in nature and to what extent mandatory?
(Section 1.2.3)

In this area, action at EU level is without any doubt the appropriate level of action. It should be recalled that the EU applies different approaches for environmental issues created by one and the same vehicle: regulation for conventional pollutants and voluntary agreements for specific CO₂ emissions. Energy efficiency, however, is not covered at all. Moreover, experience shows that market forces alone cannot do the job, and that the success of voluntary agreements remains doubtful. The regulator has to give stronger signals, including legislation. There is a need for a mixed strategy which distinguishes between the different types of vehicles (two wheelers, passenger cars, light commercial vehicles, heavy duty vehicles) and their intended use (private, commercial). In any case packages have to be designed which include energy efficiency requirements for the vehicles, economic measures and the involvement of the general public, e.g. via information campaigns (review of Directive 99/94). As far as the unit efficiencies are concerned, for two wheelers and passenger cars, in the long run (post 2008 or 2012), emissions limits values seem to be the best solution because such measures provide a reliable long-term planning framework for industry and governments. For commercial vehicles (light and heavy duty vehicles) emissions trading measures seem to be best suited since they result in overall higher cost efficiency, and they are practically easier to implement. An alternative strategy could be to control buying habits by taxing new vehicles and increase circulation and fuel taxes, possibly accompanied by emission trading. Moreover, an EU Directive on speed retarders for vans should be introduced shortly.

12. Public information campaigns on energy efficiency have shown success in certain Member States. What more could and should be done in this area at:

- international level
- EU level
- national level
- regional and local level?

(Section 1.2.4)

Information campaigns are helpful at all levels. Within the EU one could enhance the effectiveness by agreeing on a number of concrete and practicable key messages [see the NL ecodriving campaign] to be considered in the campaigns at all levels. In any case the budgets for such campaigns need to be increased since well-designed long-term campaigns are needed in order to change driver behaviour. Such campaigns should not stand alone but be linked to concrete action and should be well targeted to achieve maximal impact. Moreover, information campaigns should address specific groups like children in order to enhance effectiveness. Linked to question 12, the Commission should consider establishing an EU data bank on the energy efficiency (and CO₂ emissions) of vehicles, seeing that it is still difficult for citizens in some Member States to obtain such basic information in an appropriate form.

13. not relevant

14. not relevant

15. not relevant

16. not relevant

17. A new balance between modes of transport – a major theme of the strategy set out in the White Paper that the Commission adopted in 2001 on a European transport policy for 2010 – is still a top priority. What more could be done to increase the market share of rail, maritime and inland waterway transport? (Section 4.2)

While there is general support for the “new-balance” policy, there is also a common understanding that the share of the modes has to fit to the transport needs. Therefore not in all cases a one-sided policy seems to be appropriate. The issue is complex and packages of measures are necessary, including the internalisation of external costs and improvements of the logistic, e.g. logistic centres which allow a fast change between modes. In addition, the infrastructure needs to be modernised, based on well-designed overall master plans for cities, regions and the EU. For the new balance more than energy efficiency or energy consumption has to be taken into account, e.g. emissions of conventional pollutants, noise etc. This can best be done by internalising infrastructure and external costs for all modes of transport and full application of the polluters pays principle. However, one should not neglect that individual means of transport improve their environmental performance, or have at least a great potential to do so. For example, it is most likely faster to improve the environmental performance of trucks as regards NO_x, SO₂ and PM₁₀ emissions than to expect short-term repercussions from the discussions on external costs. Thus, it might be interesting to assess the future environmental performance of the different modes of transport before investing heavily in new rail and waterway infrastructure. Finally, in some projects the energy consumed to build and maintain infrastructure is not negligible and should therefore be taken into account as well.

18. In order to improve energy efficiency it is necessary to complete certain infrastructure projects from the trans-European transport network. How should the investments needed for infrastructure projects be developed, using what sources of financing? (Section 4.2)

As a part of the liberalisation of the transport market infrastructure investments have to be fully recovered via user charges. If this was guaranteed there would be investment problems since both, public and private investments, had to meet the same cost-efficiency criteria, and only such TEN investments would be made which ensure attractive pay-back times. However, in order to provide fair investment conditions the external costs need to be fully taken into account as well when deciding on priority projects. Since this is currently not the case the investments have to be predominantly made in the environmentally most efficient mode of transport. Public-private partnerships are a possibility to raise the necessary capital. However, since the private side will only be interested in highly profitable projects one has to be careful in order to keep the overall costs for public hands under control. See documentation sheets 3, 4, 7, and 13.

19. Among the measures that could be adopted in the transport sector, which have the greatest potential? Should priority be given to technological innovations (tyres, engines...), particularly through standards defined jointly with the industry, or to regulatory measures such as a limit on fuel consumption of cars? (Sections 4.3-4.5)

Experience shows that technological innovations are not enough since they were in the past overcompensated by the increase in transport volume. Thus, in the light of the still increasing energy consumption of transport, all possible measures have to be considered. In this respect it is crucial to identify cost efficient packages of measures and the most appropriate level of action/application. This includes an optimisation of the overall transport balance (modes, including non-motorised modes) as well as of the individual means of transport, e.g. the

improvement of their specific energy consumption and a better balanced vehicle use. In the long run energy consumption limits should be considered for passenger cars and two wheelers. For commercial vehicles incentive systems and trading might be more appropriate. In addition, sufficient priority should be given to „no regret” low cost and short term effective [but “soft” labelled] measures such as enforcing speed limits and ecodriving. All three tracks [Chapter VI] must be followed to achieve sufficient reductions in energy use via practicable measures in each track.

20. Should public authorities (state, administrations, regional and local authorities) be obliged in their public procurement to buy a percentage of energy efficient vehicles for their fleets? If so, how could this be organised in a manner that is technology neutral (i.e. it does not result in distorting the market towards one particular technology)? (Section 4.3)

Yes, public authorities should support the introduction of energy-efficient technology within the public procurement programmes. However, energy performance cannot be the sole criteria. For this purpose general performance specifications should be defined which should be taken into account in the public call for tenders. Moreover, since the share of cars purchased by public authorities is rather small, such a measure should be accompanied by other measures, e.g. fiscal measures for private and company cars.

21. Infrastructure charging, notably paying to use roads, has started to be introduced in Europe. A first proposal was made in 2003 to strengthen the charging of professional road transport. Local congestion charges have now been introduced in some cities. What should be the next steps in infrastructure charging? How far should “external costs” such as pollution, congestion and accidents be directly charged to those causing them in this manner? (Section 4.4)

The EU Eurovignette Directive, although not specific for energy consumption, is of great importance from the transport, economic and environmental points of view, since it defines the framework within which Member States can use road user charges to help make goods transport more environmentally compatible. In the interests of sustainable freight transport, the currently discussed proposal should be modified in order to ensure that the external costs are gradually included when setting the level of tolls, that particulate traps for trucks can be promoted through lower toll rates, that the requirements for applying mark-ups for sensitive regions are relaxed, and that the application of a road toll is given preference over time-based road user charges, environmentally unsound exemptions from the toll are limited and restrictions are placed on the possibility of reducing other fiscal burdens as compensation for the toll. In particular the phase in option can be designed as “no regret” measure since existing scientific evidence suggests that all for heavy goods transport the external cost are in any case above about 60 % of the infrastructure costs. Thus, one could allow, for example, an annual increase of the infrastructure costs of about 6 % over the next 10 years. Such a step would open possibilities for other modes of transport to internalise external costs and would lead to an overall better adjusted balance between the modes.

At local level decisions should be left in the hands of Member States. However, it might be helpful to standardise the labelling of cars with regard to their environmental performance in order to allow Member States to set-up harmonised city toll systems.

22. In certain Member States, local or regional energy efficiency project financing schemes, managed by energy efficiency companies, have proven very successful. Should this be extended. If so, how? (Section 5.1)

Applicable for transport?

23. Should energy efficiency issues be more integrated in the Union's relationships with third countries, especially its neighbours? If so, how? How can energy efficiency become a key part of the integration of regional markets? Is it necessary to encourage the international financial institutions to pay more attention to demand management issues in their technical and financial assistance to third countries? If so, what could be the most effective mechanisms or investments? (Section 6)

Energy consumption and energy efficiency is a key issue for international relationships. It is also a key issue of bilateral contacts. There are many ways to address this issue in the relationships with third countries. A key step is to define minimum performance criteria for all means of transport, covering energy consumption and other environmental issues. These could be used as expert recommendations on clean and energy efficient vehicles in many ways, e.g. with regard to the integration in international or regional (bi- or multilateral) markets. The performance criteria could be used for public procurement programmes, with regard to financial institutions; they could also be used for investment programmes, with regard to the clean GHG mechanisms (linking Directive) as benchmarks and so on.

Another important field of action are the international financial institutions since these institutions are a major capital provider for transport-related projects. They should draft and update publicly accessible environmental handbooks to be used by their staff when assessing investment proposals. Based on these handbooks all investments should pass a well-defined transport efficiency impact assessment. This includes also projects which are not directly transport-related but which contribute to the generation of transport demand. The investment decisions and the underlying assessment documents should be made public.

24. How could advances in energy efficiency technology and processes in Europe be put to effective use in developing countries? (Section 6.3)

Technology transfer and leaderships (guiding documents like the performance criteria mentioned above) are the two most obvious options. However, to be more concrete, e.g. the EU could stop the export of (second-hand) out-dated technology, e.g. by high export taxes, in order to avoid that these vehicles with high pollution and high energy consumption are used elsewhere. Moreover, public authorities in the EU should be obliged to check systematically the transport-related repercussions of the national and EU aid programmes.

25. Should the Union negotiate tariff or non tariff advantages within the WTO for energy efficient products and encourage other members of WTO to do the same? (Section 6)

It seems to be worth looking into pros and cons: could energy efficient product standards be promoted and transferred through trade rules?