The European Sustainable Transport Policy Agenda linked to relevant models – A Review

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1. Introduction:

As leader of workpackage 3, UCD is coordinating the development of policy scenarios in cooperation with all of the modelling groups. This entails a detailed consultation process. The time horizon for all analyses is in the medium to long term (2015-2030). The scenario building involves the forecasting of future states given the implementation of currently known policies, simulation of deviations from the business as usual (BAU) strategies and backcasting of policy patterns given certain policy targets. Each of the scenarios will be evaluated using the *Impact Assessment* (IA) criterion.[2]

The use of scenario construction is a widely used methodology in the forecasting and estimation of potential developments at a global, regional and national level. In this research, we categorise the type of scenario developments before focusing on the likely policy area that will face modellers in the area of transport and sustainability. This is done by using scenarios to hypothesise the major developments in European transport policy in the medium to long term. These scenarios can then inform modellers of the expected policy 'environment' that models will need to be cognisant of. In addition, we can use this methodology to inform modellers in other sectors looking to link their models to the policy process as it stands and as it is proposed to develop.

Given the variety of models employed in the *TranSust.Scan* project, complete harmonisation will not be possible at this stage. This fact was recognised at the partner meeting in Vienna. We propose instead to ensure, where possible, that each model is cognisant of a wider set of assumptions or a "storyline" such as those outlined by the Intergovernmental Panel on Climate Change (IPCC – for more see Nakicenovic and Swart, 2000). Then, focus falls upon a number of strategies outlined by the European Union (EU) to identify likely policy developments in the European arena. Thus, by highlighting these likely developments, we will be able to inform modellers in the area of transport of the policy world that will be relevant to the construction and development of models.

The template that this paper adopts is twofold:

- Firstly, we investigate the EU policy system to assess where it stands now as regards a specific policy area and what objectives have been set out in the

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[2] "Impact assessment (IA) is a process aimed at structuring and supporting the development of policies. It identifies and assesses the problem at stake and the objectives pursued. It identifies the main options for achieving the objective and analyses their likely impacts in the economic, environmental and social fields. It outlines advantages and disadvantages of each option and examines possible synergies and trade-offs" http://ec.europa.eu/governance/impact/index_en.htm .For more on Impact Assessment as a tool in European policy: http://www.europarl.europa.eu/comparl/envi/pdf/externalexpertise/ieep/impact_assessment_brief.pdf

medium to long term – we do this by conducting a review of the latest EU policy strategies, paying particular attention to how the scenarios that hypothesise future policy developments have been constructed;
- Secondly, we outline the tools (i.e. goals and actions) that have been or are proposed to be employed by policymakers to achieve their stated objectives. Each strategy outlines the ultimate policy goals that policymakers should be aiming for and the actions prescribed for the achievement of these goals, scenario analysis adopts these actions in order to test the validity of the stated objective;

The aim of such a review is to allow modellers in this project have greater insights as to how specific policies are likely to develop. By asking modellers how such models can help inform the policy arena, it is hoped that models can be adjusted to take account of new policy developments. Additionally, we hope to identify opportunities to develop policy choices and actions that are not currently in the policy mix.

In this paper, we focus particularly transport and on informing the IMACLIM model developed by the SMASH partners. This model is a transport model that includes local and global environmental impacts. It includes 12 regions and Europe is represented at an aggregated level. For this reason, and to improve policy applicability to the other sectors covered in this project, we restrict our policy analysis to the aggregated European level. For now, we ignore intra-regional and national developments.

Using our review of European transport policy, we present a number of scenarios that aim to present the world as it exists and the likely environment moving into the future. Most strategies outline a 'business as usual' (BAU) or 'no action' storyline in which policy developments are severely limited and these are used as comparisons with scenarios in which interventions are made. In this way, welfare impacts can be estimated. In this research, the focus is on assessing the impact of scenarios that incorporate changes in a number of policy strategies in the medium to long term. This "scanning" of relevant strategies, as outlined by the European Union, allows for the presentation of a number of differing world views.

While the focus is on transport in this paper, it is proposed that this template is adopted for the assessment of policy developments in the other sectors covered by this project. The TranSust.Scan project is a multi-sectoral project that uses models encompassing a large number of policy areas. A review of these models suggests that the following areas are relevant in the context of this project:

- Transport
- Land Use (including agriculture)
- Carbon Capture and Storage (CCS)
- Energy
- Knowledge Spillovers and Technology
- Climate Change
- Air Pollution (Urban)

This paper focuses on developing a policy template for the transport sector. This is done through the assessment of various scenarios that have already been hypothesised

and tested to inform the policy process. We are interested in the answering the following questions:

- What are the proposed medium to long term targets as defined by policy (for instance, in relation to emissions, kilometres travelled, freight tonnes carried etc.)
- What instruments and tools are being used to achieve these targets?

In answering these questions, we aim to inform out partners of the expected policy arena. To do this, we must find out how the models can be adapted so that the policy developments can be incorporated. For the SMASH group, we see the minimalist strategy for doing this is to outline the policies as given and incorporate them into the IMACLIM model (where possible and applicable) and use this model to estimate the least cost approach. A wider strategy involves using the model capabilities to identify potential opportunities arising from a wider range of policy changes. In this paper, we attempt to do both by informing the IMACLIM model of the baseline scenarios as they are likely to develop. These policy developments are then incorporated into the IMACLIM model and subsequently a baseline is developed. Where our SMASH partners focus on the construction of the baseline, this paper will set out the policy developments. At the conclusion, we highlight some of the baseline developments as they have been modelled thus far.

2. Scenarios as a Tool to Incorporate Policy Developments into Modelling:

To incorporate the likely policy arena more fully into the modelling strategies, we review a wide arrange of scenarios developed by various relevant institutions. However, we first must frame the concept of scenario construction and how it is utilised to forecast potential developments in the sphere of sustainability. IPCC (2006) in outlining recommendations on new emissions scenarios recognises three strata of scenario construction and development[3]:

- Category 1: long-term, global emission scenarios (time horizon of 100 years and more) for a limited number of regions and sectors based on a few story lines with appropriate reflection of socio-economic drivers in order to assess the impacts on the climate system of possible emission trajectories and the possible adaptation and mitigation requirements;
- Category 2: short-to-mid-term global emission scenarios (generally 20-40 years ahead) for a larger number of regions and sectors than for category 1 scenarios, usually based on reference or "best-guess" scenarios with appropriate sensitivity analysis or probabilistic assessments for major drivers and parameters. These scenarios should reflect historical trends and, if possible, future transitions and they should incorporate developing country dynamics properly. Category 2 scenarios may be based also on storylines. They should be connectable with the long-term scenarios of category 1;
- Category 3: short-to-mid-term emission scenarios (up to 50 years ahead) for specific regions or nations with considerable detail, which would primarily have a regional or national function in terms of climate change policy development and evaluation (both mitigation and adaptation); these scenarios

[3] Final Report Recommendations on New Emission Scenarios, Prepared by the IPCC Task Group on New Emission Scenarios (TGNES) March 28, 2006

would preferably be consistent with the scenarios described under category 1 and 2.

There is only a weak link between geographical and time scales and the indicated time scales for each category of scenarios must be interpreted as reflecting general tendencies.

Many scenarios are available already, Special Report on Emissions Scenarios from the Intergovernmental Panel on Climate Change (Nakicenovic and Swart, 2000) have developed 40 such scenarios. These scenarios of overall demographic, economic and technological development were used by the Intergovernmental Panel on Climate Change to assess uncertainties on future greenhouse gas emissions in absence of climate change policies. These scenarios were all constructed from four main "storylines". We can adopt such a storyline approach such that each model, at a minimum, is cognisant of global conditions as hypothesised. The storylines focused on five elements and here constructed to 2100:

1. Population
2. Economic Growth
3. Global Income Equality
4. Technological Change
5. Energy Demand

Nakicenovic and Swart (2000) describe the four storylines as follows:

1. The A1 storyline and scenario family outlines a world of rapid economic growth, low population growth and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita incomes. There are four groups of scenarios in this storyline that describe alternative directions of technological change in the energy system.
2. The A2 storyline and scenario family describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in high population growth. Economic development is primarily regionally orientated and per capita economic growth and technological changes are more fragmented and slower than in other storylines.
3. The B1 storyline and scenario family describes a convergent world with the same low population growth as in the A1 storyline, but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improved equity, but without additional climate initiatives.
4. The B2 storyline and scenario family describes a world in which the focus is on local solutions to economic, social, and environmental sustainability. It is a world with moderate population growth, intermediate levels of economic growth, and less rapid and more diverse technological changes than in either the B1 or A1 storylines. This scenario is also orientated toward environmental protection and social equity but focuses on local and regional levels.

The IPCC research used the B2 'median' option, in which all of these options are set at the median of projections so that economic and demographic trend assumptions are plausible and uncontroversial. In the area of passenger transportation, the research reduces the assumption that urban and transport infrastructure will be a particular focus in policymaking. In this research, where it is impossible, for operational and modelling design issues, to harmonise the models, we propose that each model should be tied into this B2 median storyline. In this way, while focusing on incorporating scenarios related to category three where possible, we will be able to say that all models adhere to the B2 median storyline.

3. Review of Strategies:

The European Union (EU) defines the core environmental challenges facing urban areas as *inter alia*: poor air quality, high levels of traffic and congestion, high level of greenhouse gases and urban sprawl (CEC, 2006a). The main policy aim in the area of transport sustainability is to extend the use of good urban management practices focused on reducing congestion and increasing accessibility (CEC, 2006b). These objectives are achieved by using effective transportation systems that offer high mobility, encourage innovation, protects the environment and increases accessibility. Urban transport accounts for 40% of CO_2 emissions from road transport and up to 70% of other pollutants. A large number of strategies have been developed by a number of research institutions that attempt to predict future policy paths in the area of transport. We focus on a number of these in this research. In addition, a brief review of one of the primary models used by European policymakers in this area is conducted. The first model under investigation, TREMOVE, has been used to inform a number of strategies in the transport and environmental area. The second model we refer to, POLES has been used by policymakers to develop scenarios in a European and World context to 2030. Before this, we focus on outlining the policy goals and actions outlined in the European Union Sustainable Development Strategy, the 2001 European Commission Transport White Paper and the Mid Term Review of the Transport White Paper, conducted in 2006.

3.1 European Union Sustainable Development Strategy[4]:

The first of these is the European Union Sustainable Development Strategy (Council of the European Union, 2006). This strategy, renewed in 2006 is an update of a European Council strategy adopted in Gothenburg in 2001. It aims to improve the quality of life and well-being for present and future generations by promoting a dynamic economy with full employment and high levels of education, health, social and territorial cohesion and environmental protection. The key environmental objective is to prevent and reduce environmental pollution and promote sustainable consumption while breaking the link between economic growth and environmental degradation. The strategy is to work in tandem with the Lisbon Strategy for Growth and Jobs and it is recognised in these two strategies that economics, social and environmental objectives can reinforce each other. The EU SDS identifies seven key challenges with corresponding targets, operational objectives and actions. These are outlined below:

- Climate Change and Clean Energy
- Sustainable Transport

[4] Renewed Sustainable Development Strategy: European Council DOC 10117/06: http://register.consilium.europa.eu/pdf/en/06/st10/st10117.en06.pdf

- Sustainable Consumption and Production
- Conservation and Management of Natural Resources
- Public Health:
- Social Inclusion, Demography and Migration
- Global Poverty and Sustainable Development Challenges

Of these, the first two areas are directly relevant to the transport policy process. This project is also concerned with the impact of emissions on public health. We briefly outline some of the main objectives and targets associated with each policy area and some of the actions that the SDS outlines:

3.1.1 Climate Change and Clean Energy - Objective and Targets:

- The EU-15 target is for an 8% reduction in emissions in the period 2008-2012 over 1990 levels. This aims for a global surface average temperature not to rise by more than 2 degrees Celsius compared on pre-industrial levels.
- By 2010, 12% of energy consumptions, on average, and 21% of electricity consumption as a common but differentiated target, should be met by renewable sources, considering raising their share to 15% by 2015.
- By 2010, 5.75% of transport fuel should consist of biofuels (Directive 2003/30/EC), rising to 8% by 2015.
- Reach an overall saving of 9% of final energy consumption over 9 years until 2017 (as per the Energy End-use Efficiency and Energy Services Directive).

Actions:

- The EU will prepare options for a post-2012 arrangement consistent with meeting the 2 degree Celsius objective on foot of the Montreal Climate Action Plan under the UN Framework Convention on Climate Change.
- The EU looks to exploring with other parties strategies for achieving necessary emissions reductions. Eventually the aim is to reduce emissions from developed countries by 15-30% by 2020 over 1990 levels.
- The second phrase of the European Climate Change Programme will prioritise measures to exploit cost-effective emissions reductions options for cars and aviation using *inter alia* carbon sequestration and storage.
- Consider the extension of the EU Emission Trading Scheme (EU ETS) to other greenhouse gases and sectors, specifically aviation.
- An Action Plan on Energy Efficiency producing an energy saving potential of 20% by 2020.
- Promoting the wider use of biofuels in the longer term and encouraging research into the second generation of biofuels.
- Promote the use of biomass to diversify EU fuel supply sources and reduce greenhouse gas emissions beyond 2010.
- Member States should enhance to efficiency of power stations through the use of combined heat and power.

3.1.2 Sustainable Transport - Objective and Targets:

- The overall objective is to ensure that transport systems meet society's economics, social and environmental needs whilst minimising their undesirable impacts on the economy, society and the environment

- Decouple economic growth and the demand for transport
- Achieving sustainable levels of transport energy use
- Reducing pollutant emissions from transport to levels that minimise effects on human health and/or the environment
- Achieving a shift towards environmentally friendly transport modes
- Reducing transport noise
- Modernising the EU framework for public passenger transport services to encourage better efficiency by 2010
- For light duty vehicles, average new car fleet should achieve CO_2 emissions of 140g/km (2008/09) and 120g/km (2012).

Actions

- EU and Member States to encourage engine efficiency and modal shift
- EU and Member States improve energy efficiency in transport by making use of cost-effective instruments
- Development of Trans-European Network and inter-modal links for freight.
- Infrastructure charging based upon external costs

3.1.3 Public Health - Objectives and Targets:

- Promote good health and improve protection against threats;
- Improving food and feed legislation;
- Reducing health inequalities;
- Ensuring that by 2020 all chemicals, including pesticides are produces handled and used in ways that don't pose threats to human health and environment;
- Improving information on environmental protection

Actions:

- Collaboration with European Centre for Disease Prevention and Control (ECDC) and WHO;
- Improvements in the food and deed legislation according to principles of Articles 14 and 15 of Regulation (EC) 178/2002;
- Increase information of environmental pollution and adverse health impacts
- Commission propose a strategy for improving indoor air quality, especially VOC emissions
- Further implementation of the Transport Health and Environment Pan European Programme (PEP) through the integration of environmental and health aspects into transport policy decision-making, monitoring and impact assessment

3.2 White Paper on European Transport Policy for 2010:

In 2001, the European Commission also published a White Paper on European Transport Policy towards 2010. These projections have been developed using the TREMOVE model developed by the University of Lueven.[5] This in turn developed on modelling work done as part of the SCENES project under the 4th Framework.[6] The White Paper has recently been reviewed and updated as part of a mid-term review. In

[5] http://www.tremove.org/

[6] http://www.iww.uni-karlsruhe.de/SCENES/Download/SCENES_fin_rep.pdf

the white paper, a null hypothesis, describing a reference base case is outlined along with three economic policy options, these are outlined below:

- Option A, focus on road transport through pricing alone (not accompanied by complementary measures in other transport modes). The lack of measures to reinvigorate other modes would lessen the impact of this approach;
- Option B, compliment road transport pricing with measures to increase the efficiency of other modes. However, this does not include investment in new infrastructure;
- Option C, the White Paper is based upon this approach and involved a series of measures ranging from pricing to revitalising alternative modes of transport and targeted investment in the trans-European network. The aim is to allow the modes of the other modes to return to their 1998 levels and set the stage for further shifts from 2010 onwards. It reverses the historical bias towards roads in the last 50 years. More than 60 measures are set out in the White Paper to break the link between transport and economic growth. The ultimate aim reduce growth in road haulage from 50% between 1998 and 2010 to 38% and to see an increase in passenger transport by car by 21% as opposed to a rise in GDP of 43%.

The measures outlined as part of Option C are grouped into the following categories:

- Shifting the balance between modes of transport
  - Improving quality in the road sector;
  - Revitalising the railways;
  - Controlling the growth in air transport;
  - Adapting the maritime and inland waterway transport system;
  - Linking up the modes of transport;
- Eliminating bottlenecks
- Placing users at the heart of transport policy
  - Unsafe roads;
  - The facts behind the costs to the user
  - Rights and obligations of users
- Managing the effects of transport globalization.[7]

The resulting impacts on passenger kilometres, tonne kilometres, vehicle kilometres and on emissions of Carbon Dioxide (CO_2) for each of the options as well as the anticipated trend are outlined in table 1:

Table 1: Comparison of options according to their increasing impact between 1998 and 2010

1998 = 100 EU 15	**Passenger Kilometres**	**Tonne Kilometres**	**Vehicle Kilometres**	**CO_2 Emissions**
Anticipated Trend	124	138	126	127
Option A	124	138	115	117
Option B	124	138	115	115
Option C	124	138	112	110
GDP	143	143	143	143

[7] A full explanation of these measures is outlined in Appendix 1.

The results are outlined in real terms and by sector in table 2 for the original 15 member of the European Union. The second column outlines the estimated position as it stood in 1998. Column 3 outlines the estimates of passenger kilometres, tonne kilometres and tonnes of CO_2. The last three columns outline the estimates by sector for each of the three options hypothesised.

Table 2: Illustration of Results of Approaches

EU 15	**1998**			**2010 Anticipated Trend**			**2010 – Option A**			**2010 – Option B**			**2010 – Option C**		
	Bn Pkm-Tkm	Bn Veh km	Mi T CO_2	Bn Pkm-Tkm	Bn Veh Km	Mi T CO_2	Bn Pkm-Tkm	Bn Veh km	Mi T CO_2	Bn Pkm-Tkm	Bn Veh km	Mi T CO_2	Bn Pkm-Tkm	Bn Vehkm	Mi T CO_2
Cars	3776	2221.2	434.2	4650	2735.3	435.4	4650	2486.6	412.2	4650	2486.6	412.2	4559	2438	404.1
Bus-Coach	415	24.4	18.7	441	25.9	19.8	441	25.9	19.8	441	23.6	18.0	501	26.8	20.5
Metro-Train	50	0.5	0	53	0.5	0.0	53	0.5	0.0	53	0.5	0.0	61	0.5	0.0
Railway	290	1.5	6.4	327	1.7	7.2	327	1.7	7.2	327	1.5	6.5	400	1.8	8.0
Air	241	1.9	59.3	458	3.7	112.7	458	3.7	112.7	458	3.3	102.4	408	3.0	91.2
Total Passengers	4772	2249.5	518.6	5929	2767.1	593.1	5929	2518.4	551.9	5929	2515.5	539.1	5929	2470.1	523.8
Growth 1998-2010	-	-	-	24%	23%	14%	24%	12%	6%	24%	12%	4%	24%	10%	1%
Road	1255	313.8	271.1	1882	470.5	406.5	1882	427.7	369.6	1882	427.7	369.6	1736	694.5	340.9
Railway	241	1.3	1.9	272	1.5	2.2	272	1.5	2.2	272	1.4	2.0	333	1.7	2.4
Inland Waterways	121	0.3	3.6	138	0.4	4.1	138	0.4	4.1	138	0.4	3.8	167	0.4	4.6
Pipelines	87	-	1.0	100	-	1.0	100	-	1.0	100	-	1.0	100	-	1.0
Shortshipping	1166	0.3	23.3	1579	0.4	31.6	1579	0.4	31.6	1579	0.4	28.7	1635	0.4	29.7
Total Goods	2870	315.76	300.9	3971	472.8	445.4	3971	430	408.5	3971	429.8	405.1	3971	397.0	378.6
Growth over 1998	-	-	-	38%	50%	48%	38%	36%	36%	38%	36%	35%	38%	26%	26%
Total	**-**	**2565.2**	**819.5**	**-**	**3239.9**	**1038.5**	**_**	**2948.4**	**960.4**	**-**	**2945.3**	**944.2**	**_**	**2867.1**	**902.4**
Growth 1998-2010	-	-	-	-	26%	27%	-	15%	17%	-	15%	15%	-	12%	10%
Growth in GDP 1998-2010	-	-	-	-	43%	43%	-	43%	43%	-	43%	43%	-	43%	43%

Source: for the 1998 data on passenger-km and tonne-km, "EU Transport in Figures, Statistical Pocketbook, European Commission 2000". The data on CO2 emissions and vehicle-km are estimates produced by the Commission's departments. Passenger kilometre: transport of a passenger over one kilometre. Tonne kilometre: transport of one tonne over one kilometre. Vehicle kilometre: number of kilometres covered by a vehicle. CO2: estimates of carbon dioxide emissions. These take account, in the anticipated trend and the three options, of the gains in vehicle energy efficiency expected from the voluntary agreement with the automobile industry (ACEA, KAMA, JAMA). GDP: hypothetical growth of GDP of 3% per year.

3.3 Keep Europe Moving – Sustainable Mobility for our Continent, Mid-Term Review of the European Commission's 2001 Transport White Paper:

Since the White Paper was published in 2001, a mid-term review has been conducted to review its progress. In addition, some projections have been tentatively forwarded to 2020. These projections have again been developed using the TREMOVE model

developed by the University of Lueven. The TREMOVE model uses data disaggregated by country level (it covers 21 countries and 8 sea regions). However, for the White Paper, results are presented are presented aggregated to the EU 15 level. The IMACLIM model used by our SMASH partners uses data from Europe as a single region, while not directly comparable; we present data as it is presented in the White Paper, on an EU wide level.

3.3.1. Recent evolution of transport in the European Union:

The EU published a mid-term review of the White Paper on European Transport Policy for 2010. As part of this review, Transport and Mobility in the Catholic University of Lueven developed scenarios to run their model, TREMOVE on. This had two aims; firstly to assess the conformance of the transport implementation activities with the original White Paper over the period 2001-2005. Secondly, it assessed whether the objectives were still feasible given policy and trend developments.

Its modal review of the recent development and patterns in the EU transportation reported a rapidly growing market. Road transport now accounts for 44% of total freight transport and 84% of total passenger transport (76% private car, 8% by bus and coach). The growth in road transport between 1995 and 2004 is in the region of 35% for freight movements and 19% by passenger car. Buses and coaches have grown by 5% in that period. Road transport growth has been particularly evident in the accessions states (EU-10). This sector now accounts for 25% of total consumption.

The growth in rail transport has been more modest with a 6% and 9% increase in freight and passenger transport respectively over the period 1995 and 2004. Rail transport accounts for 10% of freight transport and 7% of total passenger transport. The share of rail transport in total energy consumption is 0.8%.

Waterborne transport accounts for 42% of total freight transport (an increase of 31% over 1995) but less than 1% of total passenger transport. In contrast, airborne transport accounts of 0.1% of transported freight but 8% of total passenger (this representing an increase of 55% over 1995). By 2005, low cost carriers accounted for 25% of the available seats and the number of intra- EU routes grew been 1992 and 2004. Airborne transport now accounts of 4% of total energy consumption

3.3.2. Scenario Construction:

As part of the analysis, four policy scenarios were developed to recognise assess the level of implementation of the original White Paper:

1) The Null Scenario: This assumes that none of the White Paper Measures have been implemented at either a European or Member Stat Level.
2) The Partial Implementation Scenario: This scenario only includes measures that will most likely be implemented before 2010. This means measures already implemented or show clear indications that implementation is imminent. The include already approved EU-directive with deadlines for Member States (policy review up to 2005 described in Annexes I and II)
3) Full Implementation Scenario: Includes all measures introduced in the White Paper and in the White Paper action programme (Annex 1 of the White Paper).

4) Extended Scenario: This scenario largely follows the previous scenario while for some measures, the partial scenario is followed because there is no indication that the full implementation scenario will be achieved (i.e. kerosene tax for aviation) In addition, this scenario includes more pricing measures, higher prices for freight haulage and the introduction of road pricing for passengers.

All four scenarios are developed to 2010, however because of some time-lags the effects are shown for both 2010 and 2020. Using these assumptions, the key trends foreseen as a baseline for the EU-25 to 2020 is outlined as follows:

Table 3: Key Trends Foreseen as a baseline[8]:

Most Likely 2000-2020 Transport Activity Growth in the EU-25	
GDP	52%
Overall Freight Transport	50%
Overall Passenger Transport	35%
Road Freight Transport	55%
Rail Freight Transport	13%
Short Sea Shipping	59%
Inland Navigation	28%
Private Car	36%
Rail Passenger Transport	19%
Air Transport	108%

Some of the actions in the area of road transport, rail transport, waterborne transport and airborne transport are outlined in Appendix 2.

4 Models employed to develop Strategy Scenarios:

4.1 TREMOVE:[9]

As alluded to already, TREMOVE, developed by the Catholic University of Leuven for the European Directorate General Environment, is the main modelling tool used to hypothesize and test scenarios in this area. TREMOVE models both passenger and freight transport in the EU-15 for the period 1995-2020 (6 extra countries are also modelled). It is a policy assessment model, disaggregated at a country level, studying the impact of transport and environmental policies on emissions in the transport sector. The four scenarios were developed in the preceding ASSESS project (4th framework funding). The model is an integrated simulation model that analyses the strategic impacts of the costs and effects of a wide range of policy instruments at a local, regional and European level.

The transport demand module, for a given year and transport, represents the number of passenger-kilometres and ton-kilometres in each region. Demand is also broken into peak and off-peak demand. Private transport and business travel are modelled separately with the demand for private transport being a result of the decision making process of all households in a country. Therefore, households choose their preferred consumption bundle, given a budget constraint. Business transport demand is determined by generalised prices and the demand is modelled as a result of the

[8] Adapted from Mid-Term Review of the European Commission's 2001 Transport White Paper
[9] This section is adapted from ASSESS Final Report Annex VII TREMOVE Model Results: http://ec.europa.eu/transport/white_paper/mid_term_revision/doc/annexes/annex_07.pdf

decision processes within firms (freight transport and business passenger trips). Transport users react to the generalised prices of transport and price is represented as a sum of detailed price components.

The baseline line transport demand simulation is taken from the SCENES model, the TREMOVE model then allows for changes in transport demand resulting from various policy scenarios. The prices can be affected by technological measures and new taxation or regulation policies, resulting in a change in travel demand. This results in changes in transport volumes and substitution occurs between modes. Congestion is also taken account for by alterations in travel speeds and time price of transport. The welfare model evaluates policies by calculating the differences in welfare from the base case and scenarios with altered policies.

The vehicle stock and emissions modules use data of vehicle stock, disaggregating the sales by mode into sales by vehicle type and technology (the vehicle stock is estimated by comparing these estimates to scrappage estimates). Fuel consumption and emissions factors are also calculated and inputted using EU monitoring data. Finally, a lifecycle assessment model is used to estimate lifecycle emissions. Factors from RAINS, PRIMES and MEET models are all used to estimate such emissions.

Recent policy applications of TREMOVE have included the assessment of the EU Clean Air for Europe Programme and the following policies have been evaluated:

- Reduction of car emissions beyond the EURO IV standard levels;
- Fuel efficiency improvements beyond the 2008/2009 voluntary agreements of the car industry;
- Increased road fuel excise taxes for financing development aid;
- Heavy duty truck road charge schemes with charges covering external polluting costs;
- Shore side electricity, after-treatment technology and changes in fuel specifications for marine vessels.

The ASSESS project, using the SCENES models, developed and tested four scenarios of the White Paper:

- 'Do Nothing' (N) scenario;
- 'Partial' (P) scenario;
- 'Full Implementation' (F) scenario;
- 'Extended' (E) scenarios.

The SCENES results were fed into the TREMOVE model as an input along with some additional White Paper measures which could not be measured in the original model. The following data was used in both the SCENES and TREMOVE models:

- Vehicle Speeds and travel times by transport mode;
- Occupancy rates for cars, motorcycles, mopeds, buses, coaches and light duty trucks;
- Fuel costs, excise taxes and VAT rates;
- Transport costs for all modes except cars, motorcycles, mopeds and light duty trucks;
- Network tax levels;
- The proportion of high speed train traffic in total passenger train transport.

Addition policy measures included in the TREMOVE scenarios include:

- Enter dialogue with the rail industries in the context of a voluntary agreement to reduce adverse environmental impacts;
- Promote the use of clean vehicles in urban public transport;
- The environmental Impact of the Single European Sky programme;
- Introduction of a minimum share of biofuels consumption in road transport.

Results are presented at EU-15 level and separately for four of the new member states in the following form:

- Modal share of passenger transport by scenario for 2000, 2005, 2010 and 2020;
- Modal shares of freight transport by;
- Energy consumption by mode and scenario (ktoe);
- Transport sector greenhouse gas emissions;
- Transport sector non-greenhouse gas pollutant emissions

Finally, overall welfare impacts of the scenarios are estimated by calculating the overall welfare differences between the base and three hypothetical scenarios. These are calculated as the sum of the following four components:

- Changes in aggregated utility level of households;
- Changes in aggregated production costs of firms;
- Welfare changes stemming from changes in government tax revenues;
- Changes in external environmental costs.

4.2 POLES Model

While the TREMOVE model has been the primary model employed to inform the Commissions White Paper on Transport, it is only one of many models employed by policymakers. The European Directorate General Energy and Transport has produced a number of papers hypothesising scenarios to the year 2030. The research entitled "European energy and transport – Trends to 2030" outlines a number of scenarios. Here we are concerned with the baseline scenario and the inputs. These scenarios are based upon the POLES model.[10] The trends are set at the following levels:

- Current EU
- Enlarged EU (25)
- Candidate Countries and Wider Europe in Global Cont

The model is also disaggregated into the following regions:

- North America
- Europe OECD
- OECD Pacific
- CEEC
- CIS

[10] The POLES model is a global sectoral model of the world energy system operational since 1997. This is partially funded under the JOULE II and JOULE III programmes of Research DG (DG-XII). It produces detailed long terms (2030) world energy and CO2 emission outlooks with demand, supply and price projections by main region. The world is split into 26 regions. Reference Manual "Poles 2.2 European Commission, DG XII, December 1996". Key macroeconomic and demographic assumptions are based upon the PRIMES project, for more see: http://ec.europa.eu/dgs/energy_transport/figures/trends_2030/appendix1_en.pdf

- Latin America
- Middle East
- Africa
- Asia

4.2.1 Assumptions:

WORLD

The world described in this baseline is abundant oil and gas resources and relatively moderate economic growth over the period to 2030.

Demographic Assumptions:

World population is expected by 1.0% per annum on average to 2030. Three are significant regional differences. The population of OECD Europe is projected to be stable and the population of Central and eastern European Countries (CEEC) is likely to decline slightly.

Table 4: World Population Trends 1990 to 2030 (Annual Growth Rate)[11]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
North America	0.9	0.7	0.6	0.5	0.6
Europe OECD	0.5	0.2	0.1	0.0	0.1
OECD Pacific	0.5	0.3	0.0	-0.2	0.0
CEEC	0.1	0.0	-0.2	-0.3	-0.2
CIS	0.5	0.1	0.0	0.0	0.0
Latin America	1.7	1.4	1.1	0.9	1.1
Middle East	2.6	2.0	1.7	1.3	1.6
Africa	2.8	2.3	2.1	1.8	2.1
Asia	1.6	1.2	0.9	0.7	0.9
World	**1.5**	**1.2**	**1.0**	**0.8**	**1.0**

Macroeconomic Development:

World GDP (PPS) is expected to grow by 2.9% per annum between 2000 and 2030. There will be a progressive slow down over the period.

2000-2010 +3.3% per annum
2010-2020 +3.0% per annum
2020-2030 +2.5% per annum

Table 5: Annualised % Change for GDP 1990 to 2030 (Annual Growth Rate)[12]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
North America	3.1	2.3	1.9	1.6	1.9
Europe OECD	2.0	2.1	2.0	1.5	1.9
OECD Pacific	1.6	1.6	1.9	1.7	1.7
CEEC	0.9	3.7	2.6	2.3	2.9
CIS	-5.0	3.3	3.7	2.7	3.2
Latin America	3.3	3.5	3.1	2.5	3.0
Middle East	3.5	3.8	3.5	3.1	3.5
Africa	2.4	3.1	3.2	3.1	3.1
Asia	7.1	5.5	4.3	3.4	4.4
World	**3.0**	**3.3**	**3.0**	**2.5**	**2.9**

[11] Adapted from Energy and Transport Outlook to 2030
[12] Adapted from Energy and Transport Outlook to 2030

World Energy System:
A review of the world energy system is also conducted as part of this, a review of the economic conditions, population and CO_2 assumptions are outlined:

Table 6: Selected Factors 1990 to 2030 (Annual Growth Rate)[13]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
Population (%Growth PA)	1.5	1.2	1.0	0.8	1.0
GDP $95-pps (%Growth PA)	3.0	3.3	3.0	2.5	2.9
Per Capita GDP $95/cap (%Growth PA)	1.4	2.1	2.0	1.7	1.9
CO2 Emissions (%Growth PA)	1.2	2.2	2.3	1.9	2.1
CO2 Emissions/cap (%Growth PA)	-0.3	1.0	1.3	1.1	1.1

EU-25
Analysis of the EU-25 as part of this research is conducted using Primes (for the EU-15) and ACE (for 10 Acceding Countries). However, a number of inputs are used in deriving the population and macroeconomic estimates. For instance, for GDP projections for EU-25, projections are based on Economic and Financial Affairs DG of April 2002 for the short term (2001-2003) and on macroeconomic forecasts from WEFA (now DRI-WEFA) adjusted to reflect recent development, for the horizon to 2030. Results of the GEM-E3 model were used for current EU-15 member states but not for acceding countries.

Table 7: Pop Trends in EU-25 1990 to 2030 (Annual Growth Rate)[14]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
EU-15	0.34	0.24	0.07	-0.04	0.09
ACC	-0.05	-0.18	-0.24	-0.36	-0.26
EU-25	**0.28**	**0.17**	**0.02**	**-0.09**	**0.03**
Source: EUROSTAT. Economic and Financial Affairs DG, PRIMES, ACE					

Table 8: Evolution of GDP in EU-25 1990 to 2030 (Annual Growth Rate)[15]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
EU-15	2.04	2.43	2.31	2.18	2.30
ACC	1.70	3.82	3.64	2.97	3.48
EU-25	**2.03**	**2.49**	**2.38**	**2.22**	**2.36**
Source: EUROSTAT. Economic and Financial Affairs DG, PRIMES, ACE					

[13] Adapted from Energy and Transport Outlook to 2030
[14] Adapted from Energy and Transport Outlook to 2030 Part IV
[15] Adapted from Energy and Transport Outlook to 2030 Part IV

Table 9: Evolution of Sectoral value Added in EU-25 (Annual Growth Rate)[16]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
Gross Value Added	2.03	2.60	2.44	2.26	2.43
Industry	1.34	2.47	2.44	2.22	2.38
Construction	0.18	1.93	2.08	1.83	1.94
Services	2.45	2.80	2.54	2.36	2.57
Agriculture	1.12	1.09	1.06	0.84	1.00
Energy Branch	1.84	1.29	1.62	1.47	1.46
Source: EUROSTAT. Economic and Financial Affairs DG, PRIMES, ACE					

Table 10: Passenger Transport Activity in EU-25 (Annual Growth Rate)[17]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
Road Transport	1.6	1.5	1.3	1.1	1.3
-Public Road	0.2	0.2	0.6	0.4	0.4
-Cars and Motorbikes	1.8	1.6	1.4	1.1	1.4
Rail Transport	-0.1	0.3	1.5	1.2	1.0
Aviation	5.8	4.2	4.0	3.3	3.8
Inland Navigation	1.6	1.8	1.5	1.5	1.6
TOTAL	**1.7**	**1.5**	**1.6**	**1.3**	**1.5**
EU-15	1.8	1.5	1.4	1.2	1.4
ACC	0.2	2.1	2.8	2.2	2.4
Source: PRIMES, ACE					

Table 11: CO2 Emissions by Sector in EU-25 (Annual Growth Rate)[18]

	90/00	**00/10**	**10/20**	**20/30**	**00/30**
Industry	-1.8	-1.2	-0.2	0.0	-0.5
Tertiary	-1.3	0.1	0.2	0.5	0.3
Households	-1.2	0.4	0.3	-0.2	0.2
Transports	2.0	1.4	0.9	0.4	0.9
Electricity-Steam	-0.4	0.1	1.5	1.5	1.0
District Heating	-9.6	-1.8	-4.1	-3.1	-3.0
New Fuels	-	-	20.6	3.9	-
Energy Branch	1.3	-0.7	-0.3	-0.4	-0.5
TOTAL	**-0.4**	**0.2**	**0.8**	**0.6**	**0.5**
EU-15	0.1	0.3	0.7	0.6	0.5
ACC	-2.6	0.1	0.9	0.7	0.6
Source: PRIMES, ACE					

EU-25 energy and transport reference case to 2030 (baseline):

DG Energy and Transport have also produced a document, "European energy and transport – Scenarios on key drivers"[19]. This report covers alternative energy futures as distinct from the baseline development that shows the effects of current trends and policies. The key drivers concern either different framework conditions for energy

[16] Adapted from Energy and Transport Outlook to 2030 Part IV
[17] Adapted from Energy and Transport Outlook to 2030 Part IV
[18] Adapted from Energy and Transport Outlook to 2030 Part IV
[19] http://ec.europa.eu/dgs/energy_transport/figures/scenarios/index_en.htm

and transport policies, such as higher world energy prices, higher or lower economic growth, or they are about different policy approaches on, for example, energy efficiency, renewables, nuclear energy, modal split in transport and climate change. The analysis covers the European Union of 25 Member States and extends to the year 2030.

5. Application of Scenario Assumptions for Transport: Case Study of the IMACLIM Model of SMASH Partners:

The completed baseline incorporates the policy scenarios as developed above and particularly adopts the assumptions made in the POLES model. The model is separated into the baseline and an additional "factor 4" scenario.[20] Results are presented at a country by country level for EU-15, EU-25 and EU-27 as well as for four additional countries (Norway, Iceland, Switzerland and Gibraltar). In addition, results are broken down by year from 2000 to 2050. Obviously, reproduction of such detailed results is beyond the scope of this paper but an overview of the main assumptions is outlined below.

Economic and demographic results are outlined as per the POLES model assumption for each country on a European basis. Road mobility is measured in billions of passenger kilometres and billions of vehicle kilometres and projections for the former are made for each of the following modes:[21]

Table 12: Mode Heading for Road Mobility in IMACLIM Model Baseline:

Mode:
Light Duty Vehicle (LDV), gasoline
LDV, diesel
LDV, CNG and LPG
LDV, hybrid (gasoline)
LDV, hybrid (diesel)
LDV, H2 fuel cells
LDV, gas fuel cells
LDV, electric
LDV, thermic H2
Small bus, gasoline
Small bus, diesel
Large bus, gasoline
Large bus, diesel

For Light Duty Vehicles, the assumptions for Europe are based upon the IMACLIM-R model using the corresponding POLES projections. For buses, the POLES projections are broken down in fuels and sizes following the Sustainable Mobility Project (SMP).

[20] Detail of SMP's assumptions regarding emission coefficients are described in full on the "Polut" tab of SMP at **http://www.wbcsd.org/web/publications/mobility/smp-model-spreadsheet.xls**. The next stage is to add emissions of carbon dioxide. There are some issues related to doublecounting issue with CO emissions.

[21] Projections for the latter, vehicle kilometes include 2-wheelers

Road freight is measured in billions of ton kilometres and results are presented annually for heavy and medium freight vehicles segregated into diesel and petrol. The assumptions come again from the POLES model.

Vehicle stocks and characteristics are presented using estimates for thousands of on-road vehicles disaggregated by LDV class (as in table 12) and for 2-wheelers. These estimates are based upon assumptions in IMACLIM-R for the corresponding POLES projection for LDV's. The characteristics are presented as annual average kilometrage disaggregated into LDV and 2-wheelers. Load factors are estimated for small and large buses on an annual basis and are based upon assumptions in the SMP model. Estimates are also made as to the load factors of freight trucks as well as the average lifespan of vehicles and the vintage on an annual basis to 2050.

Fuel consumption and efficiency is estimated using billion litres of fuel consumption (and litres per 100km) on a yearly basis for 6 classes of light duty vehicle. Such estimates are also made for new vehicles. Finally emissions on a yearly basis disaggregated into 6 classes of light duty vehicle, 2 wheelers, buses (large and small, diesel and gasoline) and freight trucks (medium and large, diesel and gasoline) are estimated for the following pollutants:

- Particulate Matter (PM);
- Nitrogen Oxide (NO_X);
- Volatile Organic Compound (VOC);
- Carbon Monoxide (CO);
- Lead[22].

Conclusions:

This paper dealt with two broad themes, firstly, a review of the policy developments in the area of transport and its relationship with energy consumption and the environment were outlined, secondly, we briefly outlined some of the assumptions underpinning some of the major models in use by policymakers in this area. Together, this aims to aid modellers in the informing of European policy by presenting the likely arena and the tools (i.e. models, assumptions and scenarios) that were used to allow for such forecasting. The fact that the two models we have focused on, TREMOVE and POLES, have been widely used in long term strategy formation by policymakers is testament to their ability to inform and influence the decision making process. The final element of this paper was briefly outlining some of the assumptions that have been adopted by our SMASH partner is the assessment of mobility issues in the context of the TranSust.Scan project.

The template that we have adopted in this paper has two clear elements. Firstly, we reviewed the policy arena as it stands in a particular area and the likely developments in the medium and long terms. Secondly, using this review we were able to identify the medium and long term goals and the actions prescribed to achieve long term objectives. It is proposed that we can use this template for a policy analysis in other areas of research in this project. Additionally, a brief overview of some of the assumptions underpinning the models, allows modellers to review the compatibility of their models to those already in use by decision makers.

[22] Lead emissions are disaggregated into light duty vehicles (gasoline and hybrid gasoline), 2-wheelers, small and large bus (both gasoline) and medium and Heavy freight truck (gasoline).

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APPENDIX I: ACTION PROGRAMME WHITE PAPER 2001:
The measures proposed in the White Paper may be summarised as follows:

1. SHIFTING THE BALANCE BETWEEN MODES OF TRANSPORT

1.1. Improving quality in the road sector

- Harmonise inspections and penalties by the end of 2001 in order to:
  - promote efficient, uniform interpretation, implementation and monitoring of existing road transport legislation;
  - establish the liability of employers for certain offences committed by their drivers;
  - harmonise the conditions for immobilising vehicles;
  - increase the number of checks which Member States are required to carry out (currently on 1% of days actually worked) on compliance with driving times and drivers' rest periods.
- Keep the road transport profession attractive by promoting the necessary skills and ensuring satisfactory working conditions.
- Harmonise the minimum clauses in contracts governing transport activity in order to allow tariffs to be revised should costs increase (e.g. a fuel price rise).

1.2. Revitalising the railways

- Gradually open up the railway market in Europe. By the end of 2001 the Commission will submit a second package of measures for the rail sector with a view to:
  - opening up the national freight markets to cabotage;
  - ensuring a high level safety for the railway network based on rules and regulations established independently and a clear definition of the responsibilities of each player involved;
  - updating the interoperability directives for all components of the high-speed and conventional railway networks;
  - gradual opening-up of international passenger transport;
  - promoting measures to safeguard the quality of rail services and users' rights. In particular, a directive will be proposed to lay down the terms of compensation in the event of delays or failure to meet service obligations. Other measures relating to the development of service quality indicators, terms of contract, transparency of information for passengers and out-of-court dispute resolution mechanisms will also be proposed.
- Step up rail safety by proposing a directive and setting up a Community structure for Railway Interoperability and Safety.
- Support the creation of new infrastructure, and in particular rail freight freeways.
- Enter into dialogue with the rail industries in the context of a voluntary agreement to reduce adverse environmental impact.

1.3. Controlling the growth in air transport.

- Propose the introduction by 2004, in the context of the Single Sky, of:
  - a strong regulator with adequate resources independent of the various interests at stake, and capable of setting objectives allowing traffic to grow while guaranteeing safety;

- a mechanism enabling the military to maintain defence capabilities while using the scope for cooperation to ensure more efficient overall organisation of airspace;
- social dialogue with the social partners, which could begin with the air traffic controllers, allowing consultation, following the experience in other sectors, on aspects of the common aviation policy that have a considerable social impact. This dialogue could lead to agreements between the organisations concerned;
- cooperation with Eurocontrol to draw on its expertise and know-how to develop and administer the Community rules;
- a surveillance, inspection and penalties system ensuring effective enforcement of the rules.

- In the framework of the International Civil Aviation Organisation, rethink air transport taxation and negotiate the introduction of a kerosene tax by 2004 and differential *en route* air navigation charges.
- Launch a debate in 2002 on the future of airports in order to:
  - make better use of existing capacity;
  - review the airport charges systems;
  - integrate air transport into a logical system with the other modes of transport;
  - determine what new airport infrastructure is required.
- Present a revision in 2003 of the slot allocation system, in order to improve market access while taking account of the need to reduce environmental impacts at Community airports.
- Negotiate with the United States a Joint Transatlantic Aviation Agreement to replace the current open skies agreements.

1.4. Adapting the maritime and inland waterway transport system

- Develop the infrastructure needed to build veritable "motorways of the seas".
- Simplify the regulatory framework for maritime and inland waterway transport by encouraging in particular the creation of one-stop offices for administrative and customs formalities and by linking up all the players in the logistics chain.
- Propose a regulatory framework for safety controls for passengers embarking on ships offering European cruises in order to combat the risk of attacks, along the lines of what is done in air transport.
- Tighten up the maritime safety rules in cooperation with the International Maritime Organisation and the International Labour Organisation, in particular:
  - by incorporating the minimum social rules to be observed in ship inspections, and
  - by developing a genuine European maritime traffic management system.
- Encourage the reflagging of the greatest possible number of ships to Community registers, based on the best practices developed in social and fiscal matters, by proposing in 2002 measures on tonnage-based taxation and the revision of the guidelines on State aid to maritime transport.
- Improve the situation of inland waterway transport through:

- the current standardisation of technical requirements for the entire Community waterway network by 2002;
- greater harmonisation of boatmasters' certificates throughout the Community's inland waterway network, including the Rhine. The Commission will present a proposal on this subject in 2002;
- harmonisation of conditions in respect of rest periods, crew members, crew composition and navigation time of inland waterway vessels. The Commission will present a proposal on this subject in 2002.

1.5. Linking up the modes of transport

- Establish by 2003 a new programme to promote alternative solutions to road transport (Marco Polo), which could have a budget of some 30 million euros per year in help launch commercial projects.
- Propose by 2003 a new Community framework for the development of the profession of freight integrator and the standardisation of transport units and freight loading techniques.

2. ELIMINATING BOTTLENECKS

- In 2001 revise the trans-European network guidelines in order to eliminate bottlenecks by encouraging corridors with priority for freight, a rapid passenger network and traffic management plans for major roads, and adding to the "Essen" list such projects as, by way of illustration:
  - a high-capacity railway route through the Pyrenees for freight;
  - East European high-speed train/combined transport Paris-Stuttgart-Vienna;
  - the Fehmarn bridge/tunnel between Germany and Denmark;
  - the Galileo satellite navigation project;
  - improvement of the navigability of the Danube between Straubing and Vilshofen;
  - the Verona-Naples rail link, including the Bologna-Milan branch;
  - the interoperability of the Iberian high-speed rail network.
- In 2001 increase to 20% the maximum funding under the trans-European network budget for the main bottlenecks, including those still remaining on the Union's frontiers with the accession candidate countries, and then introduce conditionality rules.
- In 2004 present a more extensive revision of the trans-European network aimed in particular at integrating the networks of the accession candidate countries, introducing the concept of "motorways of the seas", developing airport capacities and improving territorial cohesion on the continental scale.
- Establish a Community framework for allocating revenue from charges on competing routes to the construction of new infrastructure, especially rail infrastructure.
- Harmonise minimum safety standards for road and rail tunnels belonging to the trans-European transport network.

3. PLACING USERS AT THE HEART OF TRANSPORT POLICY

3.1. Unsafe roads

- Set a target for the EU of reducing by half the number of people killed on European roads by 2010.

- By 2005 harmonise the rules governing checks and penalties in international commercial transport on the trans-European road network, particularly with regard to speeding and drink-driving.
- Draw up a list of "black spots" on trans-European routes where there are particularly significant hazards and harmonise their sign-posting.
- Require coach manufacturers to fit seat belts on all seats of the vehicles they produce. A directive to this end will be proposed in 2003.
- Tackle dangerous driving and exchange good practices with a view to encouraging responsible driving through training and education schemes aimed in particular at young drivers.
- Continue efforts to combat the scourge of drink-driving and find solutions to the issue of the use of drugs and medicines.
- Develop a methodology at European level to encourage independent technical investigations, e.g. by setting up a committee of independent experts within the Commission.

3.2. The facts behind the costs to the user

- In 2002 propose a framework directive setting out the principles and structure of an infrastructure-charging system and a common methodology for setting charging levels, offset by for the removal of existing taxes, and allowing crossfinancing.
- Make the tax system more consistent by proposing uniform taxation for commercial road transport fuel by 2003 to round off the internal market.
- In 2002 propose a directive guaranteeing the interoperability of means of payment on the trans-European road network.

3.3. Rights and obligations of users

- In 2001 increase air passengers' existing rights through new proposals concerning in particular denied boarding due to overbooking, delays and flight cancellations.
- In 2001 put forward a regulation concerning requirements relating to air transport contracts.
- By 2004, and as far as possible, extend the Community measures protecting passengers' rights to include other modes of transport, and in particular the railways, maritime transport and, as far as possible, urban transport services. This concerns in particular service quality and the development of quality indicators, contract conditions, transparency of information to passengers and extrajudicial dispute settlement mechanisms.
- Propose an adjustment of procedures for notifying State aid, particularly in cases relating to compensation for public service obligations on links to the Community's outlying regions and small islands.
- Clarify the general principles which should govern services of general economic interest in the field of transport in order to provide users with a service of quality, in keeping with the Commission communication on services of general interest in Europe.

4. MANAGING THE EFFECTS OF TRANSPORT GLOBALISATION

- Link the future Member States to the EU's trans-European network by means of infrastructure of quality with a view to maintaining the modal share of rail transport at 35% in the candidate countries in 2010 by mobilising private-sector finance.
- Make provision in the Community's future financial perspective for adequate public funding of infrastructure in the new member countries.
- Develop the administrative capacities of the candidate countries, notably by training inspectors and administrative staff responsible for enforcing transport legislation.
- Full membership for the European Community in the main international organisations, in particular the International Civil Aviation Organisation, the International Maritime Organisation, the Rhine Navigation Commission, the Danube Commission and Eurocontrol.
- By 2008 develop for the EU a satellite navigation system with global cover, over which it will have control and which will meet its accuracy, reliability and security requirements (Galileo).

ANNEX 2[23] Mid-term Review of the European Commission's 2001 Transport White Paper

Situation in the transport sector – facts and projections

Part 1: Basic facts and recent evolution by mode – general data

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Road transport

- direct **employment**: around 1.7 million in passenger transport (bus, coach, taxi operations); 2.6 million in freight transport
- **share in total freight transport**: 44% (slightly rising)
- **share in total passenger transport**: around 84% (76% private car, 8% bus and coach)

Growth between 1995 and 2004:

- + 35% in freight transport;
- + 19% for passenger cars and + 5% for buses and coaches in passenger transport

- particularly **strong growth in the EU-10:**

national international total

Road freight transport growth 2000-2004 (%)			
	national	international	total
EU-15	8.3	16.9	10.5
EU-10	16.6	47.7	31.8
EU-25	9.0	23.0	12.9

- **share in total energy consumption:** 25.2%
- **vehicle efficiency** in toe/Mtkm or toe/Mpkm: trucks 72.4, car 37.8, public road transport 14.5

Rail transport

- direct **employment:** around 1.2 million
- **share in total freight transport**: 10% (decreasing slightly)
- **share in total passenger transport**: around 7% (6% for interurban trains, 1% for urban tram and metro)

- Growth between 1995 and 2004:

- + 6% in freight transport (+ 15% in EU-15, - 9% in EU-10);
- + 9% in passenger transport (+ 8% for interurban trains, + 14% for urban rail (tram and metro))

- the **share of new companies** which have entered the **rail freight** market has reached about 10% (in terms of tkm performed)
- **high-speed rail** accounts for 21.5% in 2004 of total pkm of interurban rail transport
- **share in total energy consumption:** 0.8%
- **vehicle efficiency** in toe/Mtkm or toe/Mpkm**:** passengers 16.0 ; freight 5.5

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[23] Source: EU Energy and Transport in Figures; Eurostat; OAG; ECSA, PRIMES.

Waterborne transport
- direct **employment:** around 200,000, roughly 80% of which in maritime transport and 20% in inland waterway transport
- **share in total freight transport:** 42% (intra-EU maritime 39%, inland waterways 3%; both more or less stable)
-**share in total passenger transport:** below 1% in intra-EU passenger transport, slightly
decreasing

- Growth between 1995 and 2004: + 29% in freight transport (+ 31% in intra-EU maritime transport, + 9% on inland waterways)
- average yearly growth of worldwide **container traffic** between 2001 and 2004: 13.5%
- **share (of inland navigation) in total energy consumption:** 0.5%
- **vehicle efficiency** (of inland navigation) in toe/Mtkm: 17.5

Airborne transport
- direct **employment:** around 400,000
- **share in total freight transport:** 0.1% in terms of tkm in intra-EU traffic
-**share in total passenger transport:** 8% (only intra-EU flights included; increasing
strongly)
- growth between 1995 and 2004: + 55% in intra-EU passenger transport
- **market share of low-cost carriers** in scheduled intra-EU traffic (in terms of available seats): 25% in 2005
- growth in number of **intra-EU routes:** +100% between 1992 and 2004
- **share in total energy consumption:** 4.0%
