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INDICATOR ASSESSMENT OF THE OBJECTIVES OF THE WHITE PAPER ON TRANSPORT

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Abstract

In 2001, the European Commission published the White Paper "European transport policy for 2010: time to decide". The White Paper analysed the existing situation with regard to transport and set out an ambitious action programme up to 2010.

The ASSESS project has been set up to provide the technical support to the Commission for the 2005 mid-term assessment. In particular, the project carried out an assessment of both the achievements to date, the possible policy implementation scenarios to the year 2010, and to the year 2020.

A large part of the ASSESS work was the indicator assessment of the objectives for 4 policy implementation scenarios. Other valuable work within ASSESS include the analysis of the level implementation of the measures in 2005, forecasting implementation scenarios for 2010 and 2020, and the concluding recommendations on measures and objectives.

1 INDICATOR ASSESSMENT APPROACH

The goal of the indicator assessment was to analyse the impact of the White Paper on the evolution of the transport situations, and on the effects on the environment, social effects and economic effects. Both the past developments (1990-2005) and future projections (2005-2020) are assessed.

First, the objectives in the White Paper have been quantified into indicators. The choice of indicators has been done focussing on sustainability, in a pragmatic way.

The choice to focus on sustainability indicators was given by the White Paper itself, which claims to have sustainability as an overall goal.

Of course, the White Paper has some – not much – more concrete goals, as the objective of reducing the number of fatal accidents with 50%. If they could directly be related to the overall sustainability goal, these sub-goals have been taken into account. Other goals, as e.g. the "promotion of motorways of the seas" are not considered, as they are either not quantifiable, or even more important: meant to serve a broader sustainability goal.

For most of sustainability objectives (economic, environmental, social) the White Paper has at least defined the preference direction, for a few there are quantitative targets given. Many White Paper objectives concern however organisational issues which are considered in the study as means to achieve the overall ends. Of these overall ends, only very few are precisely quantified.

Secondly, four scenarios have been developed, in increasing level of ambition.

Thirdly, these scenarios have been analysed with a set of models, of which the core model was the SCENES transport model. The SCENES output then was processed into TREMOVE (vehicle stock, emissions, fuel consumption, and government revenues), CGE (regional welfare), SLAM (logistics), a noise model, the SWOV road safety model and a macro-economic model.

The parallel running of these models, in a short time period, turned out to be one of the main challenges within the ASSESS study.

At last, the model results were then translated into indicators.

2 INDICATORS FOR THE WHITE PAPER OBJECTIVES

The list of indicators for the ASSESS project has been set up taking into account 3 considerations:

- The list of indicators does not only cover the specific White Paper objectives, but also the wider sustainability objective. The indicators reflect the social, environmental and economic dimensions of sustainability, based on literature, as SUMMA en TERM.
- They are disaggregated in way that they match with the more detailed White Paper objectives. As the White Paper's final objective was to ensure the sustainability of transport in terms of environmental damage, safety and congestion, despite the foreseeable growth in transport volume and without restricting (too much) mobility, the results against these objectives are also assessed.
- They are quantifiable from the model results (SCENES, TREMOVE etc.), for the 4 scenarios, for at least 2000-2020.

The table below gives an overview of the indicators that could be calculated form the modelling work in ASSESS and the White Paper (main text and annexes) objectives that relate to them.

Table 1: ASSESS indicators and the related quantified objectives of the White Paper

Indicator	Scope	Unit	Quantitative objective in the White Paper
Transport volume	freight • rail • road • inland waterways • sss	tkm	• Breaking the link between the growth of car transport and economic growth: road haulage +35 % instead of predicted 50 %.
	passengers • car • bus/coach • train/metro • air • walk/cycle	pkm	• Passenger car transport +21 % against a rise in GDP of 43 %. • Maintain and improve the competitive position of Europe's air industry by creating of the single European sky and regulating the unavoidable expansion of airport infrastructure. *(White Paper p. 37)*
Modal share	freight • rail • road • inland waterways	% of tkm	• Realising a modal shift from road and air to rail and water by providing fair competition between modes and link-up modes for successful intermodality. • Maintain rail freight market share in the central and eastern European countries (35 %). *(White Paper p. 89)* • Raising the modal share of short sea shipping by linking up waterways on sea with an inland traffic. *(White Paper p. 12, 27, 41-42)* • Raising the modal share of inland waterway transport f. ex. by establishing 'waterways branches' and transhipment facilities. *(White Paper p. 12, 41-42)* • Improve the organisation of intermodal transport.
	passengers • car • bus/coach • train/metro • air • walk/cycle	% of pkm	• Realising a modal shift from road and air to rail and water by providing fair competition between modes and link-up modes for successful intermodality. *(White Paper p. 45-46, 104)* • Increase rail market share of passenger traffic (6 % → 10 %) and goods traffic (8 % → 15 %) *(White Paper p. 25, 27)* • Stimulating rail usage by increasing the quality *White Paper p. 30)* • Better use of public transport and rational use of the car.
Transport intensity	freight	pkm/population	• No quantitative targets
	passengers	tkm/ton	• No quantitative targets
Economic growth		GDP	• No quantitative targets
Employment		working places	• No quantitative targets
Spatial distribution of economic impacts		GDP/capita	• Completing the routes identified as the priorities for absorbing the traffic flows generated by enlargement, and improving access to outlying areas *(White Paper p.18 and 50)*

Transport growth and decoupling	passengers freight	pkm/GDP tkm/GDP	• Internalisation of external costs by gradually replacement of existing transport taxes with infrastructure charges and fuel taxes *(White Paper p. 16)*
Accessibility		hours	• Removing the bottlenecks in the railway network. *(p. 50-51)* • Developing motorways of the sea and airport capacity. *(White Paper p. 50-51)* • Completing the Alpine routes and providing a better passage of the Pyrenees. *(White Paper p. 53)* • Everyone should enjoy a transport system that meets their needs and expectations, in terms safety, costs, user rights and obligations and clean (public) transport accessibility.
Vehicle stock and ownership	• car • truck		• No quantitative targets
Safety	road	# fatalities	• Everyone should enjoy a transport system that meets their needs and expectations, in terms safety, costs, user rights and obligations and clean (public) transport accessibility. • Reduce the (human) costs of traffic accident and the number of deaths on the road with 50 %. *(White Paper p. 66)* • Improve safety of long tunnels in the TENs. *(White Paper p. 58)*
Energy consumption		ktoe	• Raising the share of substitute fuels (6 % biofuel penetration rate by 2010) *(White Paper p. 83)* • Replacement of 20 % of conventional fuels with substitute fuels by 2020 *(White Paper p. 83)*
Climate change		ton GHG	• No quantitative targets.
Air quality		ton Nox, PM, SO2	• No quantitative targets • Everyone should enjoy a transport system that meets their needs and expectations, in terms safety, costs, user rights and obligations and clean (public) transport accessibility.
Noise exposure		% Ln>55dB(A)	• No quantitative targets
Land take and fragmentation	Road	km²	• Everyone should enjoy a transport system that meets their needs and expectations, in terms safety, costs, user rights and obligations and clean (public) transport accessibility.

3 SCENARIOS

The indicators were developed for 2000-2020, which included 2 periods.

Firstly, it has been assessed to what extent the implementation activities in the period 2001-2005 are in conformance with what has been proposed in the White Paper.

Secondly, the developments in the transport sector for 2005-2020 have been estimated on basis of four policy scenarios. The four policy scenarios are:

(i) Null scenario (N-scenario): assumes that none of the White Paper measures has been implemented, neither at the European level nor in the Member States. The N-scenario is the autonomous trend development and acts as the reference case.

(ii) Partial implementation scenario (P-scenario): includes only measures that will most likely be implemented before 2010. This means that the measure is already implemented or that there are clear indications that implementation will take place soon. The latter is the case when approved EU-directives include deadlines for Member States to adapt national legislation accordingly. This scenario is derived from the results of the policy review up to 2005 described in Annexes I and II.

(iii) Full implementation scenario (F-scenario): includes all measures introduced in the White Paper and in the White Paper action program (in the Annex 1 of the White Paper).

(iv) Extended scenario (E-scenario): for most measures the extended scenario follows the full scenario while for some measures the partial scenario is followed because there is no indication that the full implementation is feasible. An example of the latter case is kerosene tax. Since global implementation seem infeasible a compromise that applies the tax only to intra-European flights is included in the extended scenario. Additional to this two policy changes has been introduced. Firstly, the extended scenario includes more pricing measures, most importantly higher prices for freight haulage and introduction of road pricing for passengers. Secondly, it includes a faster uptake by market parties of the opportunities that are enabled by the new EU legislation on liberalisation by providing the financial incentives and technological means. This means a faster implementation of the RIS, EMRTS and SESAME technological projects in respectively inland waterways, rail and air transport, a faster introduction of Galileo applications and more effort on competitive tendering and market opening in the rail sector to accelerate reform in the passenger sector.

Sometimes the implementation and the impact of measures takes longer than 2010 (the time-horizon of the White Paper). For example, some of the TEN-projects have been started within the period 2000-2010 but they will be finalised in the period 2010-2020. Also pricing for passenger road transport in the extended scenario will only be introduced in from 2011 onwards. To show the impacts of these measures the scenarios are developed and evaluated for both the year 2010 and 2020.

The impact of each measure on relevant transport sector variables are quantified by using various literature sources, among others the results of several European projects. Estimations have been made with regard to the size of the impact when a measure is not fully implemented yet.

4 INDICATOR SUMMARY

This chapter gives an overview to what extent the White Paper objectives of reducing congestion and bottlenecks, greenhouse gases, conventional air pollution and noise pollution as well as improving safety and quality for transport users and those affected by the use of transport may be attained.

The table below summarises the transport, economic, social and environmental consequences of the White Paper measures. The main source for the figures is the modelling results of the four scenarios for both passenger and freight in EU25. An elaborate analysis can be found in the ASSESS reports.

Table 2: Transport performance in EU25 for all 4 scenarios, relative to 2000(=100)

EU25		1990	1995	2000	2005	2010				2020			
						N	P	F	E	N	P	F	E
pkm	pkm/year	82	88	100	108	117	117	118	118	135	135	136	127
tkm	tkm/year	83	88	100	108	117	116	116	116	139	136	133	131
intensity pass.	pkm/population			100	107	114	114	115	115	130	130	131	123
intensity freight	tkm/ton			100	102	103	100	100	100	113	107	107	103
accessibility (travel time)	hours			100	99	99	98	96	95	98	97	95	94
GDP (baseline)	euro			100	113	127	127	127	127	162	162	162	162
GDP+ (impact)	euro			100	113	127	134	134	134	162	163	164	165
employment (baseline)	euro			100	104	108	108	108	108	116	116	116	116
employment+ (impact)	euro			100	104	108	108	108	108	116	117	117	117
car park	1000 cars	78	88	100	106	114	114	116	116	132	132	134	124
truck park	1000 trucks	66	82	100	115	119	118	118	117	135	134	132	128
safety	road fatalities	134	112	100	86	77	68	45	28	56	49	24	13
energy	toe			100	103	102	102	102	102	107	107	106	99
CO2	ton			100	103	102	103	103	103	107	108	107	101
PM	ton			100	87	76	77	77	77	67	69	68	65
NOx	ton			100	80	63	65	64	64	49	52	51	48
SO2	ton			100	96	92	89	89	89	94	90	89	84
noise	% hindered persons			100	104	107	107	108	108	115	116	116	113
land take	km² road			100	100	102	107	120	118	107	113	123	121
fragmentation	km² road			100	100	102	110	130	130	111	120	135	134

Almost all indicators show a remarkable progress in the right direction. Road safety has improved greatly since 2001. Emissions have dropped. Rail freight transport is growing. As expected, the different future scenarios considered have an increasing degree of impact, with more ambitious policy implementation producing better outcomes. However, almost none of the quantitative targets set in the White Paper on transport will be reached by 2010.

4.1 Growths in freight transport demand

In the freight transport sector, the decline in rail transport appears to have ended in the majority of countries, and in the major economies like Germany and the UK, rail freight has been increasing rapidly in recent years. Growth in short sea shipping appears to be strong in a number of countries, and inland waterway traffic has largely maintained a healthy growth momentum on key corridors. In a number of countries, road freight traffic growth has been slower than the GDP growth in recent years, although more empirical observations are required to ascertain this trend.

Nevertheless, if the recent trends simply continue without strengthening the policy implementation, the White Paper targets on modal balance may not be met by 2010. The possible trajectories of transport demand growth have been tested using the SCENES transport model, using up to date economic and demographic projections and reasonable assumptions regarding foreign trade growth, fuel prices, passenger and freight user prices, and the trends in freight logistics. Compared with earlier transport demand forecasts, ASSESS has made use of more recent GDP projections (which are lower than previous ones), and has benefited from a longer time series of freight demand observations.

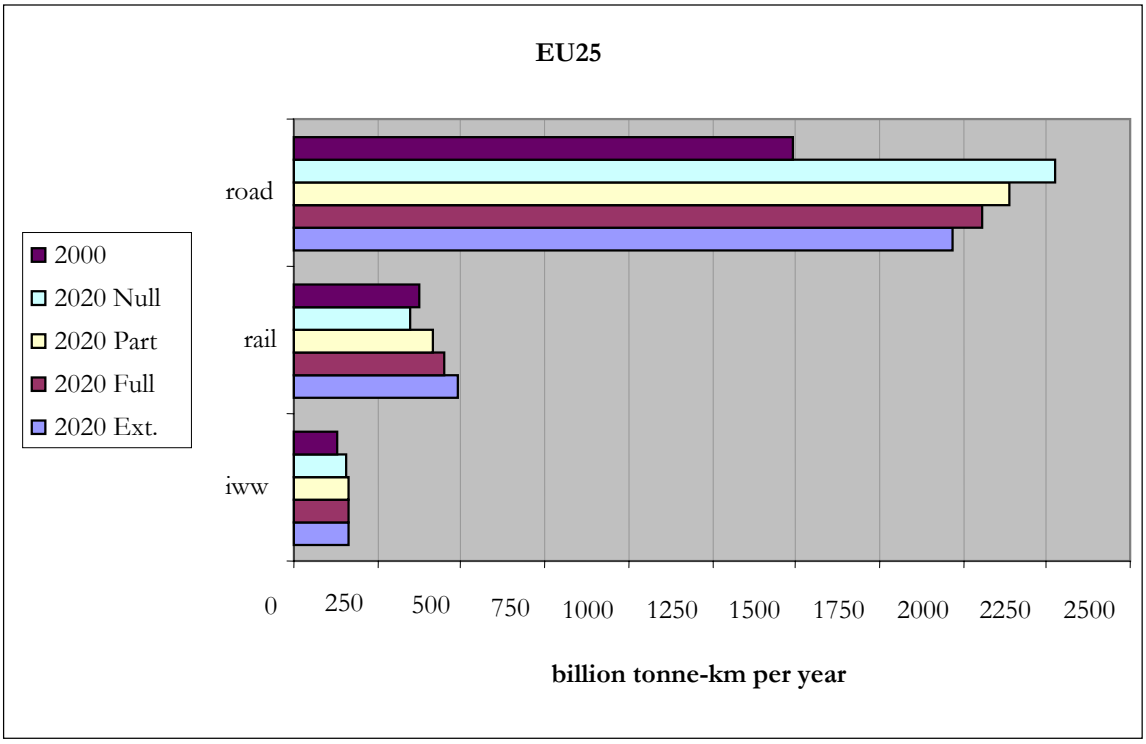

Figure 1: Scenario results by freight mode (tonne-km per year)

"iww" denotes inland waterway.

In the N scenario, SCENES suggests that, among the inland transport modes, road freight would grow strongly. In the EU25, the growth rates from 2000 to 2010 and from 2000 to 2020 are respectively 23% and 52%. Rail freight declines in general, whilst inland waterway gains a modest growth in some countries mainly for lower value, bulk goods.

Compared with the SCENES forecasts prior to the ASSESS project, the current freight demand forecast for the Null scenario is lower for road and inland waterways, and there is a slightly sharper decline in rail freight t-km. First of all, this reflects a generally lower GDP growth assumptions (the GDP growth in EU15 is about 0.5% lower per year than assumed by the earlier runs). Secondly, we have assumed that the trend of rail decline in a number of countries, which is observed in the recent years, would continue in the Null scenario in the absence of White Paper policy measures.

Under the most likely scenario (P), the overall freight demand growth for inland modes when measured in tonne-kilometres are likely to be between 17%-22% for the period 2000-2010, and between 36-45% for 2000-2020 in EU25. The growth in freight transport in the most likely (P) scenario is slightly lower than in the Null scenario, mostly due to somewhat higher costs.

The road tonne-km growth is likely to be between 21-26% for 2000-2010, and 43-55% for 2000-2020. Rail tonne-km growth is to be between 3-8% for 2000-2010, and 11-13% for 2000-2020. Short sea shipping demand, when measured in total tonnes received at the ports, is likely to grow by 16 and 36% respectively for 2010 and 2020.

This suggests that the policy measures under this scenario are likely to reverse the decline of rail freight which occurred during the 1990s, but they would not be sufficient to achieve the original White Paper target of retaining the modal split pattern of 1998 for freight demand for EU25 as a whole.

Under the (theoretical) Full scenario, the social marginal cost pricing (SMCP) is applied for trucks in all Member States. This appears to have a significant impact on the modal balance between road on the one hand, and rail and inland waterway on the other. Compared with 2000, road demand rises by 19% under the Full scenario, compared with 21% under Partial in 2010. For 2020, the difference between the Partial and the Full scenarios are even larger for road freight demand: under the Full scenario it is 38% relative to 2000, compared with 43% under Partial, for EU25. Rail freight tonne-kms have a much stronger growth across the EU25, by 8% in 2010 and 19% in 2020, relative to the year 2000.

However, the road and rail percentages indicate that only a limited proportion of the freight tonne-kms are transferred from road to rail under SMCP. The tests by the model suggest that a significant proportion of road freight demand reduction is through a shortening of the average lengths of road haulage. In other words, only a limited range of goods (such as the weighty goods like bulk building materials, metals, and some chemical products, plus certain long distance movements of containers from sea ports) can be transferable from road to rail. For the other products, particularly the voluminous goods such as food and finished consumer products, the road demand reduction is likely to result mainly from an adjustment in the geographic patterns of sourcing. That is, the goods required by consumers will be provided by suppliers from within a shorter distance range relative to the Partial scenario.

The Tipmac SMCP on trucks is applied fully under the Extended scenario. As a result, in EU25 the truck tonne-kms reduce by 5% by 2010, and 13% by 2020, relative to the Null scenario.

Table 3: Scenario results, freight mode split (% of land tonne-km)

Region	Mode	Obs	Null		Partial		Full		Ext	
		2000	**2010**	**2020**	**2010**	**2020**	**2010**	**2020**	**2010**	**2020**
EU15	road	77.8	80.4	82.6	79.5	80.3	79.0	78.7	78.5	76.8
	rail	14.7	12.4	10.6	13.3	12.5	13.7	13.9	14.1	15.6
	iww	7.5	7.1	6.8	7.2	7.2	7.3	7.4	7.4	7.6
	total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
NMS10	road	57.7	70.6	77.9	67.6	72.6	64.5	70.6	62.8	67.9
	rail	40.9	28.4	21.3	31.4	26.6	34.5	28.5	36.2	31.2
	iww	1.4	1.0	0.8	1.0	0.8	1.0	0.9	1.0	0.9
	total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
EU25	road	74.7	78.7	81.7	77.4	78.8	76.4	77.1	75.7	75.1
	rail	18.7	15.2	12.6	16.5	15.3	17.4	16.8	18.1	18.6
	iww	6.6	6.1	5.7	6.1	6.0	6.2	6.1	6.3	6.3
	total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

"iww" denotes inland waterway.

4.2 Growths in passenger transport demand

Based on the assumptions of population and car ownership growth, and the characteristics of each passenger demand segment, the SCENES model suggests that, in EU25, the total passenger travel demand (in passenger km) will grow by 17% by 2010 and 34% by 2020.

This overall growth is characterised by slower percentage rises in EU15 (by 16% and 32% respectively for the period between 2000 and 2010, and 2000 and 2020) and much faster increases in the EU10 new Member States (30% and 60% respectively).

Over this period, the population is stable in EU15 and slightly declining in some EU10 countries, so the growth of passenger demand stems mainly from the increasing mobility of the individuals. Within each geographic area, the growth rates are also quite distinct between different demand segments, with long distance holiday and business travel growing more strongly than shorter distance travel like commuting, education and personal business. This has significant implications for growths on different modes.

The modes that see significant demand growths would be car (17% and 36% respectively for 2010 and 2020, in EU25) and air (51% and 105% respectively for 2010 and 2020, in EU25). Train, bus and walking/cycling are expected to grow more slowly in terms of passenger-km. Passenger train/metro/tram services may still rise in some countries, especially in those where commuting and other journeys have been getting longer but road congestion has constrained the growth of peak time road travel. In EU10, bus and train demand is likely to decline.

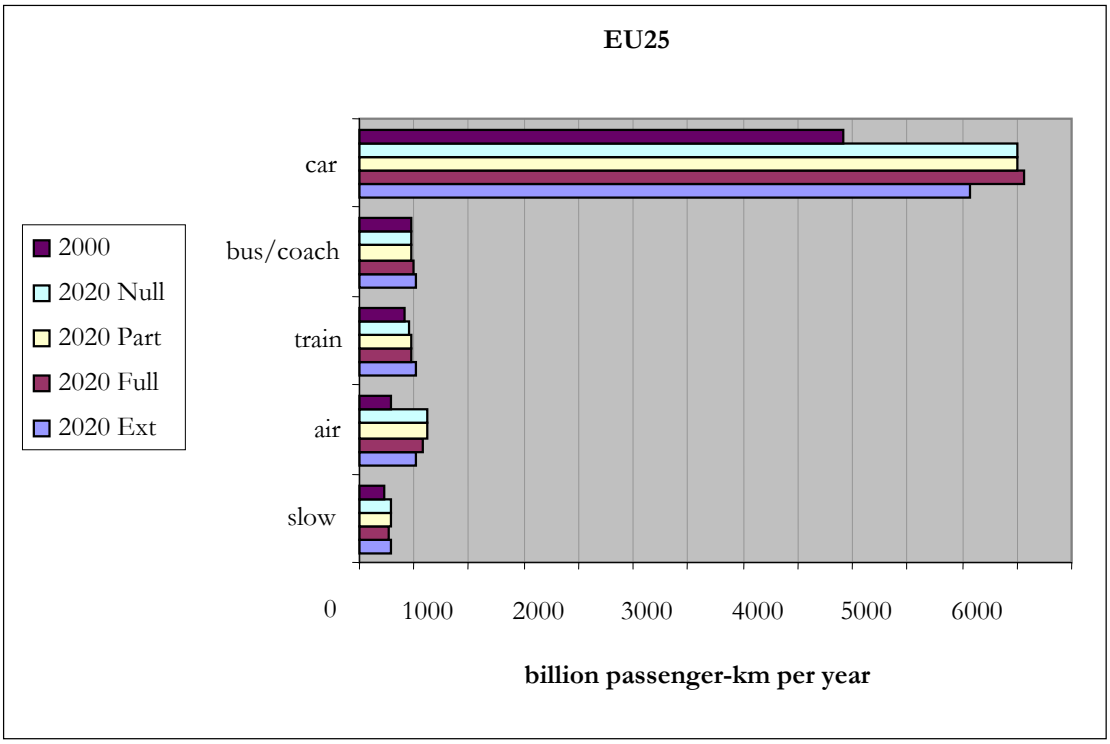

Figure 2: Scenario results by passenger mode (billion passenger-km per year for EU25)

Both the Null and Partial scenario show the same passenger growth. Only the improvements in rail services under the Partial scenario have led to a modest gain in passenger train demand compared to the Null scenario.

The Full and Extended scenarios differ however.

The most significant input for passenger demand in the Full scenario is the imposition of a harmonised 7% VAT on air travel. Because of this taxation, air passenger demand is likely to grow more slowly than in the Null and Partial scenarios. Nonetheless, air passenger demand will still rise significantly, particularly in the longer term.

The Extended scenario includes social marginal cost pricing for passenger transport, which will increase car operating costs would rise on average by 38%. On air, this implies an increase of air fares by 20%. As a result, the car and air demand reduces. Bus, train and walk/cycle modes gain. Overall, this also reduces the total passenger mobility by 5% compared with the Null and Partial scenario: the total passenger-km grow by 27% in EU25 relative to 2000, compared with the 34% under the Null scenario.

Table 4: Scenario results, passenger mode split (% of passenger-km)

Region	Mode	Obs	Null		Partial		Full		Ext	
		2000	2010	2020	2010	2020	2010	2020	2010	2020
EU15	Car	76.6	76.0	76.4	75.9	76.2	76.7	76.7	76.6	75.6
	Bus/coach	7.5	6.8	5.9	6.8	5.8	6.9	6.0	6.9	6.7
	Train/metro	6.6	6.3	5.9	6.4	6.1	6.4	6.1	6.3	6.9
	Air	5.3	6.9	8.2	6.9	8.3	6.1	7.7	6.3	7.2
	Walk/cycle	4.0	3.9	3.6	3.9	3.6	3.9	3.5	3.8	3.9
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
NMS10	Car	66.6	73.6	77.9	73.5	77.7	73.7	77.8	73.8	75.1
	Bus/coach	16.0	11.4	8.5	11.4	8.5	11.4	8.6	11.4	9.7
	Train/metro	10.5	7.8	6.1	7.9	6.3	7.9	6.4	7.8	7.7
	Air	2.9	3.7	4.3	3.6	4.3	3.4	4.1	3.4	4.1
	Walk/cycle	3.9	3.5	3.1	3.5	3.1	3.5	3.1	3.5	3.4
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
EU25	Car	75.7	75.8	76.6	75.7	76.3	76.5	76.8	76.4	75.3
	Bus/coach	8.2	7.3	6.1	7.2	6.1	7.3	6.3	7.3	7.0
	Train/metro	6.9	6.5	5.9	6.6	6.1	6.6	6.1	6.5	7.0
	Air	5.1	6.6	7.8	6.6	7.9	5.8	7.3	6.0	6.9
	Walk/cycle	4.0	3.9	3.6	3.9	3.6	3.8	3.5	3.8	3.8
	Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

4.3 Congestion, travel times and accessibility

Congestion (average road trip time) will reduces 3.7% for freight and 0.2% for passengers in 2010 compared to 2000[1] and accessibility will increase (travel time between regions) when implementing the White Paper policies. When carrying out the policies in the extended scenario the effect will be the largest. Freight will gain the most, in the order of rail, road maritime, inland waterways in the NMS, in the EU15 for freight the order is inland waterway, rail, maritime and road.

Due to the implementation of the White Paper the growth of the average road freight travel time is reduced with 2.3%, and there is no effect on the average travel time by car. The aim of the White paper measures is to reduce congestion on the road. The results show that there will indeed be an improvement. This is the case in 2010 and also in 2020.

With this ranking also objectives concerning intermodality are attained. Overall the reduction of travel times for freight amount to 4.9% in the EU25 in 2010 in the extended scenario leading to a more efficient use of the network and vehicle stock. For passenger transport, travel times reduce with 2.0% in 2010 in the extended scenario.

The accessibility of the regions will increase, the extended scenario leads to a better accessibility of regions, it should be kept in mind that some peripheral regions in NMS are not equally enjoying improved accessibility as others.

4.4 Decoupling

The White Paper objective "breaking the link between the growth of transport and economic growth", aimed for a reduction of the road freight growth between 1998 and 2010 from the expected 50% to the desired 38%. However, the model results show that the growth without White Paper policy intervention

[1] Null scenario: overall 6.8% decrease (2010 versus 2000) of trip time due to changes in transport demand, and faster transport by rail and inland shipping. However, road transport trip time will increase with 9.1% for freight transport and 3.1% for cars. Full scenario: overall 1.7%, less decrease because of the rail success. This leads to a general increase in rail trip length and therefore trip time in Europe. The road travel time now reduces 3.7% for freight and 0.2% for passengers (2010 compared to 2000).

is only 23% (and not 50%), due to lower GDP growth rates than expected in the period 2001-2005. Due to the implementation of the White Paper the growth of the road freight transport is reduced with another 2.2%.

For passenger transport by car, the goal was an increase in traffic of 21% against a rise in GDP of 43%. Based on the model results it is possible to confirm that the growth in car passenger transport is 17%, lower than anticipated. However, when the White Paper would be fully implemented or when the extended policy scenario would be implemented, then passenger transport by car is growing faster than the reference development of the Null scenario in 2010, but slower in 2020[2].

4.5 Road safety

In the White Paper, the goal is stated to halve the number of people killed in traffic between 2001 and 2010. According to the safety analysis, none of the Member States will reach the 50% reduction in 2010 (P scenario).

The assessments of the future number of fatalities were carried out in April and May of 2005, using the then available data on the number of fatalities. The assessment was part of the midterm review of the Road Safety Action Program (Ecorys, 2005).

For the N-scenario, where none of the White Paper measures have been implemented, the predictions of the number of fatalities in 2010 and 2020 are based upon autonomous changes, corrected (in a negative way) for those White Paper measures that have been implemented and effective. According to this scenario, none of the EU Member States would reach a 50% reduction in 2010 and for some Member States there would even be an increase in fatalities (Slovakia and Czech Republic). For the 25 EU Member States the overall predicted relative fatalities for this scenario is 87%.

According to the partial and most likely implementation (P-scenario), none of the Member States will reach the 50% reduction in 2010. Some states are approaching the objective (Latvia, France, Portugal), whereas Czech Republic still shows an increase in fatalities. For the 25 EU Member States the overall predicted relative fatalities for this scenario is 73%.

In case of a full implementation of the White Paper, it is estimated that the EU as a whole the objective will be reached in 2010. The majority of the Member States still show a prediction of relative fatalities which is higher than 50%, although not to a great extent. The overall estimate for all 25 Member States is 49%. However, in this scenario a rather rigorous implementation of (among other things) e-safety is assumed, which is responsible for a large part of the reduction. Without this measure, the reduction of the full scenario would be 25%.

4.6 Energy consumption

The figures for energy consumption and CO_2 for 2000-2020 are being estimated with the TREMOVE model[3].

In the EU25 total energy consumption will remain almost stable. The growth in transport activity can be compensated mainly by increases in the fuel efficiency for all road vehicles. However, the expected growth in air traffic emissions – with their higher specific climate impact – risks to offset all improvements for surface transport. In the new Member States, transport energy consumption will increase. The growth in transport activity is much stronger in these countries, and is not offset by the improvements in energy efficiency.

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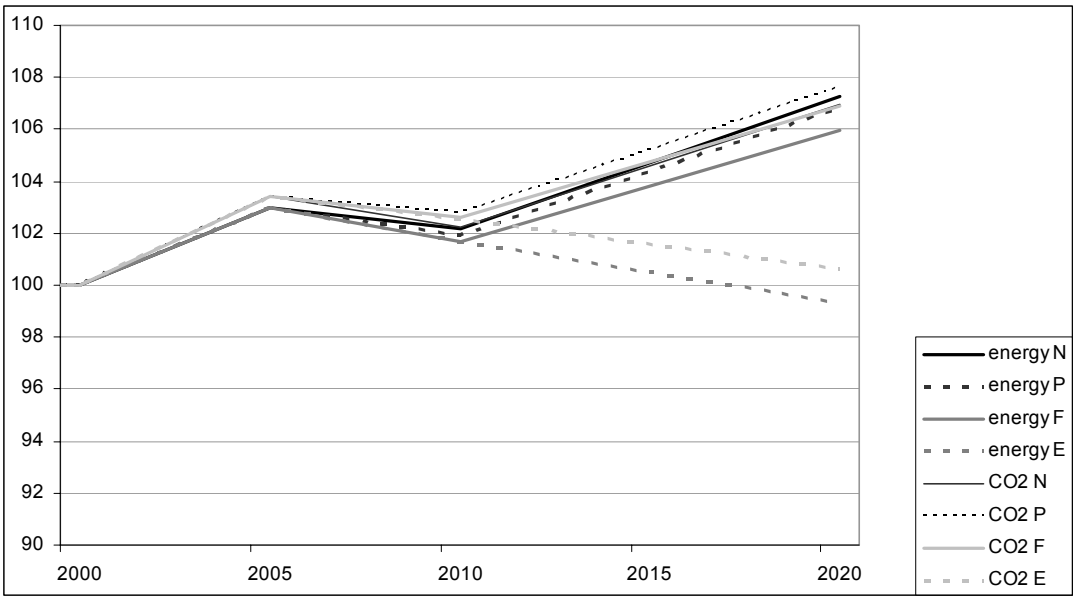
[2] The reason is that, due to the White Paper, air transport will grow slower and therefore car transport grows faster. This car transport growth slows down again in 2020, when social marginal cost pricing is introduced.

[3] See ASSESS Annex VII for a description of TREMOVE and the model results?

Figure 3 : EU25 total energy consumption and CO2 emissions for all modes (2000 = 100)



A further analysis of the components that lead to an almost constant energy consumption is given in the table below. The table shows clearly that the technological component, which is the voluntary agreement of car producers to reduce CO_2 emissions of new cars, as well as of the continuous development of technologies to reduce fuel costs in the road freight sector, balances out the activity growth. However, the voluntary agreement is not a White Paper measure.

The influence is modal shift is rather modest, and negative. The reason for this is the increase of the truck share in the total tonne-km (both road and rail increase, but road increases faster).

Table 5: Determinants of energy consumption in transport, EU15

Energy consumption increase versus 2000 due to:	2010 N	2010 F	2020 N	2020 F
growth in tonne-km and passenger-km	15,10%	15,55%	31,89%	32,11%
modal shift	0,83%	0,63%	1,79%	1,35%
technological improvement	-13,08%	-13,38%	-22,55%	-22,85%
TOTAL	**1,05%**	**0,75%**	**4,60%**	**3,56%**

4.7 Climate change

Despite the growth in transport, CO_2 emissions[4] from transport only grow modestly from 2000 to 2010 and 2020. It seems however out of reach, that emissions go down on an average 8% between 1990 and 2008/2012, according to the Kyoto agreement[5]. This would need major efforts.

The stableness of the transport CO_2 emissions is due to the fact that the transport activity growth will be compensated mainly by increases in the fuel efficiency for all road vehicles, through dieselisation of the fleets as well as through genuine technology improvements. In the new Member States the emissions will increase, due to the much stronger growth in transport activity.

[4] Both exhaust as life cycle (well to wheel) emissions.
[5] Although the Kyoto agreement is mentioned once (p. 22) in the White Paper, it is not a specific White Paper objectives.

In the P and F scenario it is also expected that the 5.75% (2010) and 8% objectives on biofuel penetration are reached. This leads to a CO_2-gain in the EU15 states by 2020, as well as a significant reduction of the CO_2 growth in the new Member States.

The figures below show the different components of the CO_2 emissions: the exhaust emissions and the well-to-wheel emissions. For the well-to-wheel component, a variant with and without the biofuel policy is shown.

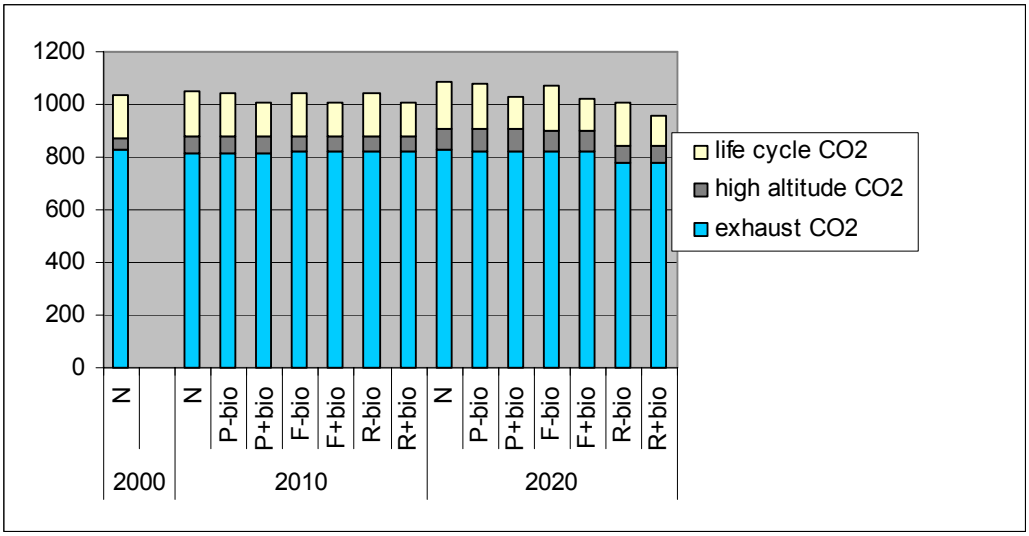


Figure 4 :EU15 CO_2 emissions by scenario, in million tonnes

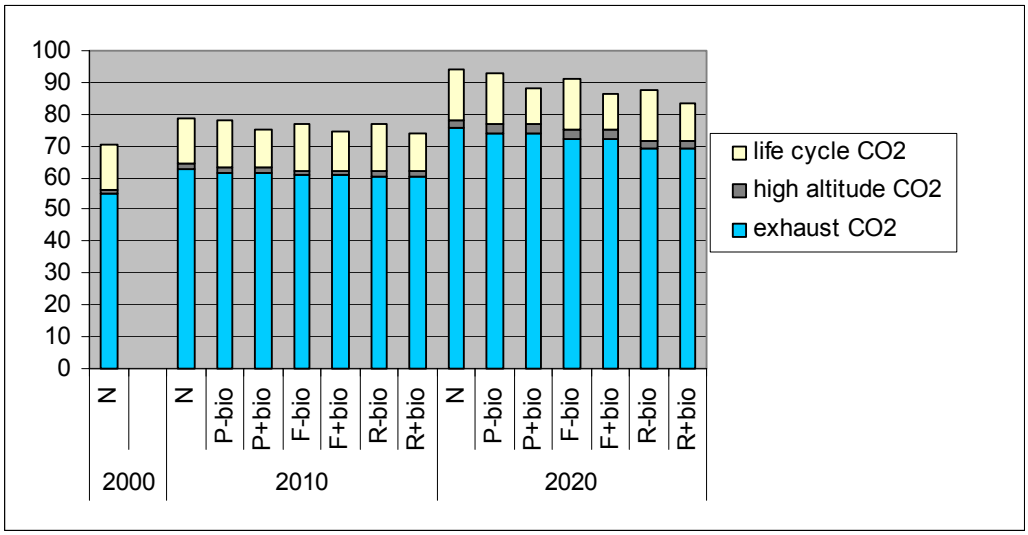


Figure 5 : NMS CO_2 emissions by scenario, in million tonnes

Source: TREMOVE
Life cycle: well-to-wheel emissions. High altitude: air transport emissions.
-/+ bio: excluding or including the biofuel policy, visible in the life cycle emissions.

4.8 Emissions and air quality

Although TREMOVE also includes calculations for pollutants as CO and volatile organic compounds (as methane and benzene), the discussion in this section is restricted to the pollutants considered to be most relevant in this project, i.e. NO_x, particulates (PM) and SO_2. It should be recalled that most of

environmentally relevant actions of the EU, notably effective in reducing CO_2 and pollutant emissions from road vehicles, is outside explicit White Paper measures.

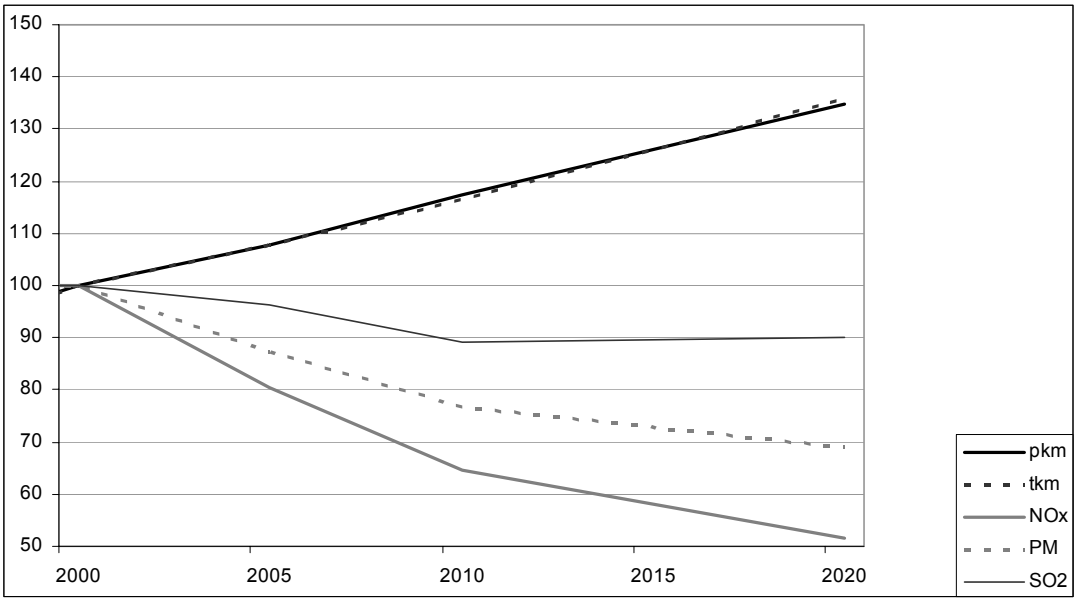
Overall, there is no significant change in total emissions for these pollutants between the N and P scenario. The F scenario shows a modest decrease in overall emissions compared to the N and P scenarios, due to a lower tonne-km growth and a slightly higher passenger-km growth[6] than the N and P scenarios. In the E scenario, full implementation of marginal social cost pricing in the freight sector and partial marginal social cost pricing for passenger car and air transport will lead to a further decrease in the emissions.

The major driver in all scenarios for the future reduction in NOx and particulate (PM) emissions is the introduction of road vehicles complying to the most recent emission standards (EURO IV for cars and EURO V for trucks). For busses the policy promoting a faster introduction of clean vehicles of course accelerates this effect.

SO_2 emissions decrease strongly in the 2005-2010 period, this is in first place the result of the introduction of low(er) sulphur fuels in the road transport sector. In later years the emission levels follow the growing activity levels.

Focussing at rail transport, the dialogue with the rail industry leads to a significant decrease in rail exhaust emissions, notably for NO_x and SO_2 emissions. Note that part of this positive effect will be compensated by increases in electricity consumption and a related increase in lifecycle emissions, i.e. in the emissions from electricity power plants.

Figure 6 : EU25 passenger-km, tonne-km, and PM, NOx and SO_2 emissions for all modes (2000 = 100)



4.9 Other environmental indicators

The noise exposure and annoyance of the population is set to increase in all scenarios with only relatively minor differences between them. Total road traffic remains about 10 times more annoying than rail transport. The extended scenario gives the lowest increase in the number of people being highly annoyed.

[6] The small increase is due to lower bus and train costs, and lower car travel times.

Land take and fragmentation are no White Paper objectives, they however are part of the more general sustainability objective. Both are determined by the infrastructure and the intensity of the infrastructure use. In particular road transport is expected to increase strongly and the traffic pattern to become spatially more spread out. Therefore the use intensity on the whole network is expected to increase, and hence fragmentation effects. Their impact will be the worse in regions/countries, the lower the prior use intensity has been or the more confined traffic has been before.

4.10 Macroeconomic impact

The estimate of the macroeconomic impact of the ASSESS policy scenarios has been carried out using the ASTRA System Dynamics model, a system dynamics model at the European scale focused on describing the linkages between transport, economy and environment[7].

The results of the assessment are moderately positive: implementing the measures of the White Paper is positively affecting the EU economic growth, particularly when marginal effects can be detected, although the impacts on GDP and employment are quite small. This moderately positive impact is higher when the investment and policy measures are well integrated and charging policies are compensated by a proportionate reduction of direct taxes.

Figure 7: ASTRA results: absolute difference between yearly growth rates with respect to the Null scenario

	GDP			Employment		
Scenarios	**EU25**	**EU15**	**NMS10**	**EU25**	**EU15**	**NMS10**
Partial	0.047	0.047	0.044	0.024	0.026	0.022
Full	0.080	0.081	0.066	0.040	0.044	0.028
Extended	0.100	0.100	0.093	0.049	0.053	0.039

ASTRA model

To understand the size of the effects one can take into account that a difference of 0.1 in the yearly growth rate leads to a 2% higher GDP at 2020.

Impacts on GDP and employment are higher for the Extended scenario, while the Partial scenario is the one with more limited macroeconomic impacts, and the Full scenario is in between. As the main feature of the Extended scenario is the full implementation of the charging (with a correspondent reduction of direct taxes) the better performance of this scenario can be explained by a more efficient distribution of resources between private and public consumptions, due to the introduction of pricing policies together with the reduction of direct taxes.

4.11 Regional welfare

An analysis of the TEN network[8] with the CGE model shows that the overall effect of the TEN for EU25 is +0.16% of GDP. For the 15 old Member States we calculate an impact of +0.16% and for the new Member States an effect of +0.25%. One can see that some of the projects especially in the periphery and the new Member States have a considerably higher impact than those in the centre of Europe.

[7] LOTSE - Quantification of technological scenarios for long-term trends in transport. JRC – IPTS Seville

[8] In the first scenario we analysed the effect of the addition of the complete list of TEN priority projects (see European Union, 2004) excluding the high-speed rail interoperability project on the Iberian Peninsula, Malpensa Airport, the Danube river improvement between Vilshofen and Straubing and the global navigation and positioning satellite system Galileo to the European transport network. The reason for this exclusion of projects, is that the CGE runs rely on the IASON project runs, where this decision was taken, see Deliverable 6 of IASON.

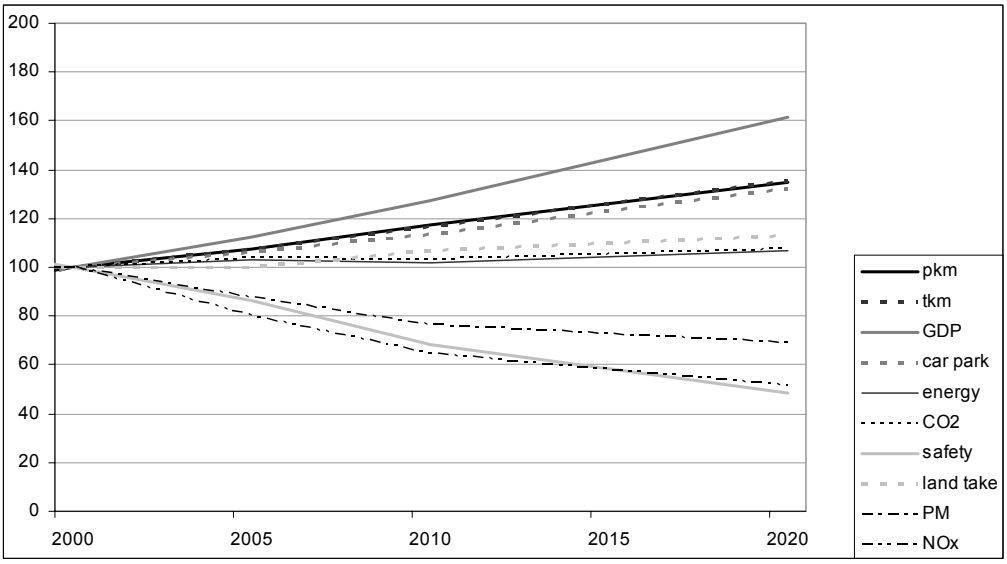
The result of the analysis on regional welfare shows that for 2010 for all scenarios the effects on cohesion tend toward a slightly more unequal distribution of GDP/capita and the Gini-coefficient, with regions where we observe above average negative impacts as well in the periphery as well as in the centre of Europe. Thus, with respect to the distribution of GDP/capita it tends to favour the regions with a lower GDP/capita in the reference situation rather than the richer regions, so the policy package contributes to the achievement of the territorial cohesion goal. However, cohesion indicator values are rather low, not more than 0.3, so this relationship cannot be considered as strong.

5 CONCLUSIONS

The main conclusion is that the White Paper objectives will not be reached.

The figures below summarise the economic, social and environmental consequences of the White Paper measures, for the expected implementation levels in 2010 and 2020.

Figure 8: Transport performance in EU25 for the most likely implementation of the White Paper measures (P scenario), relative to 2000 (=100)



Almost all indicators show a remarkable progress in the right direction. Road safety has improved greatly since 2001. Emissions have dropped. Rail freight transport is growing. As expected, the different future scenarios considered have an increasing degree of impact, with more ambitious policy implementation producing better outcomes.

The accessibility of the regions will increase, the full White Paper implementation leads to a better accessibility of regions than the current implementation level. It should be kept in mind that some peripheral regions in NMS are not equally enjoying improved accessibility as others.

Implementing the measures of the White Paper is positively affecting the EU economic growth, particularly when marginal effects can be detected, although the impacts on GDP and employment are quite small. This moderately positive impact is higher when the investment and policy measures are well integrated and charging policies are compensated by a proportionate reduction of direct taxes.

According to the safety analysis, none of the Member States will reach the 50% reduction in 2010. Some states are approaching the objective (Latvia, France, Portugal). For the 25 EU Member States the overall predicted reduction is 27%. In case of a full implementation of the White Paper, including rigorous measures as e-safety, it is estimated that the EU as a whole the objective will be reached in 2010.

An almost stable energy consumption and CO_2 exhaust emissions is predicted. The stableness of the transport emissions is mainly because the transport activity growth will be compensated by increases in the fuel efficiency for all road vehicles – a measure not included in the White Paper.

The major driver for the future large reduction in conventional emissions is the introduction of road vehicles emission and fuel standards, again a measure that not belongs to the White Paper.

This analysis shows also that the target of decoupling transport growth from economic growth does not influence the sustainability effects of transport. It should be revised towards a decoupling of the negative consequences of traffic, not traffic itself.

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Full reports can be downloaded for the websites of DG TREN (ec.europa.eu/transport) and Transport & Mobility Leuven (www.tmleuven.be) under "ASSESS" and/or "White Paper".

References can be found in the reports. This paper is mostly based on the Final Report and on Annex XVII.