ASSESS

Assessment of the contribution of the TEN and other transport policy measures to the mid-term implementation of the White Paper on the European Transport Policy for 2010

FINAL REPORT
ANNEX VI RESULTS FROM THE SCENES MODEL

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Preface

This is ANNEX VI of the final report for *'Assessment of the contribution of the TEN and other transport policy measures to the mid-term implementation of the White Paper on the European Transport Policy for 2010'.*

Project title: ASSESS

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Scope

Scope of the ASSESS study

The ASSESS study is about the ***"Assessment of the contribution of the TEN and other transport policy measures to the mid-term implementation of the White Paper on the European Transport Policy for 2010"***.

The European Commission's White Paper of 12.9.2001 "European transport policy for 2010: time to decide" aims to promote a sustainable transport policy. The White Paper proposes to achieve sustainability by gradually breaking the link between transport growth and economic growth, principally in three ways: changing the modal split in the long term, clearing infrastructure bottlenecks and placing safety and quality at the heart of the transport policy.

As foreseen, the White Paper on Transport undergoes in 2005 an overall ***assessment concerning the implementation of the measures it advocates and to check whether its targets*** - for example, on modal split or road safety - ***and objectives are being attained or whether adjustments are needed.***

ASSESS provides technical support to the Commission services for the above mid-term assessment of the White Paper.

The analysis accounts for the economic, social and environmental consequences of the proposed measures and their contribution to sustainable development objectives. It provides also a detailed analysis of those effects of enlargement likely to affect the structure and performance of the EU transport system.

The study takes a three pillar approach based on the use of analysis, indicators and models. National transport policies are reviewed for compatibility and coherence with the White Paper objectives. The models used allow a detailed analysis of the freight market, the passenger market and their infrastructure networks under a number of scenarios.

Scope of this Annex

Annex VI reports the SCENES model development and scenario testing results for *'Assessment of the contribution of the TEN and other transport policy measures to the mid-term implementation of the White Paper on the European Transport Policy for 2010'* .

The report contains:

- Documentation of the SCENES modelling approach and the enhancements for ASSESS
- Summary of the input assumptions for modelling the alternative future scenarios
- Scenario testing results from the SCENES model
- Assessment of the scenario testing results

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VI.1. Introduction

The SCENES model is a European-wide multi-modal integrated passenger and freight transport model. SCENES uses standard European nomenclature and NUTS 2003 GIS data to define the geographic areas. For the purpose of this project, all New Member States are incorporated within the model as internal zones. The base year of SCENES has been updated from 1995 to 2000. This means that all main input data underpinning the base year modelling have been updated accordingly, including the national accounts, population size and profiles, the transport networks and road vehicle operating costs. The model enhancements have also incorporated an additional item, namely the updating of national input-output tables for EU15 for years 2000, 2010 and 2020, which was carried out as part of a parallel DG TREN SCENES modelling task. The model provides transport demand forecasts for both 2010 and 2020, based on a set of macro-economic and trade assumptions derived from the GDP forecasts that are consistent with DG TREN's recent energy analyses, and road vehicle operating costs derived from recent fuel price assumptions for 2010 and 2020 also provided by DG TREN.

The SCENES freight demand module for the EU15 countries (i.e. the older Member States) is based on a sophisticated regional economic model using spatial input-output techniques, whereas for the EU10 (i.e. the New Member States) the freight demand matrices are estimated using DG-TREN's TEN-STAC study (TEN-STAC, 2004) and Eurostat's COMEXT trade matrices.

The passenger demand model uses a uniform trip generation and distribution mechanism for all EU25, within which the travel demand is estimated according to the age, employment and car ownership profiles of the population of each model zone. It covers all short and long passenger trips, including car/motorcycle, bus/coach, train/metro/tram, air, and walking/cycling.

The SCENES forecasts have been made at the broad geographic and demand segment levels as defined by the zoning and transport demand segmentation adopted in the model. As a result, they should be considered as forecasts at the strategic level, rather than at the detailed local level.

The model implementation, input assumptions, and scenario test results are summarised below. Where appropriate, we also highlight any weaknesses and uncertainties in the results.

VI.2. Development of SCENES for ASSESS

This chapter presents the SCENES modelling approach. In particular it is focused on the new SCENES model enhancements for ASSESS. Those who are interested in the technical details of the original model are referred to existing documentation, notably SCENES (2000) and SCENES (2001).

VI.2.1. Overview of modelling approach

The SCENES model is a **European-wide multi-modal integrated passenger and freight transport model.** It was developed through the European Commission's Fourth Framework Research Programme and has since been extensively used in research and policy studies of DG-TREN and other Commission services.

Geographic coverage. SCENES uses standard European nomenclature and NUTS2003 GIS data to define the geographic areas (which are called model zones; see definition of the zones later in this Section). For the EU25, it operates at the NUTS2 level for passenger and freight demand modelling, and at the NUTS 3 level for road traffic analysis. All EU10 New Member States are incorporated within the SCENES model as internal zones, including Cyprus and Malta. The SCENES model also covers Switzerland and Norway at a NUTS2-equivalent level, although the extent of transport demand modelling is limited. The Candidate Countries are included as external zones of the model at the country level. Other countries in Europe and in the rest of the world are covered in broad geographic areas that reflect the main trade routes by land and sea.

Model Base Year and Forecast Years. For the purpose of this project, the Base Year of the SCENES has been updated from 1995 to 2000. This means that all main input data underpinning the Base Year modelling have been updated, including the national accounts, population size and profiles, and transport supply. The model provides forecast for both 2010 and 2020.

Transport demand modelling. The freight demand model is based on a sophisticated regional economic model (REM) using input-output techniques for EU15, and trade-based matrices of goods movements for EU10 that are estimated using data from a recent DG-TREN project, TEN-STAC (2004), and from the European foreign trade database COMEXT. The passenger demand model uses a uniform trip generation and distribution mechanism for all EU25, based on the age, employment and car ownership profiles of the population in each model zone; it also covers all short and long passenger trips, including car/motor-cycle, bus/coach, train/metro/tram, air, and walking/cycling.

Transport networks are coded in the model for highways, rail, inland waterways, ferries and short sea shipping. The model uses a detailed European road and rail networks for assignment.

Vehicle operating cost and tariff functions are coded for each type of travel. Travel costs, times and generalised costs are output from the transport model and fed into the demand model. Any change in the transport model, be it through transport cost or infrastructure change, or any change in the travel speeds, has a bearing on the demand for travel. This feedback affects the distribution and hence the average length of trips, and thus passenger- and tonne-kilometres.

The model is calibrated in the Base Year (2000) on observed national totals of travel by mode, and known international patterns of passenger and freight transport. The sub-national pattern of passenger and

freight traffic is generated by the model, based on typical travel behaviour for each freight and passenger demand segment defined in the model.

The model is designed, in the first instance, to produce European-level transport forecasts. But, comprising as it does a wide range of demographic, economic, socio-economic and transport factors, and being built as a 'bottom up' model from the zonal level, a greater level of detail is possible, and indeed many country and sector specific results have been reported.

Calibration of SCENES is focused on passenger and tonne kilometres rather than vehicle-km, largely because the available data is more detailed and considered more reliable. However, new vehicle-km data collected for this project has been used to refine the vehicle occupancy and truck load factor calibration in this new version of the model for ASSESS, and vehicle-km results are output and post-processed for emissions anaylsis in the Tremove model.

Forecasts for 2010 and 2020. Previously, 2010 was not a main forecast year for SCENES. Some estimates were made for 2010 for past projects, based on interpolation of model results. For policy analysis purposes of this project, both 2010 and 2020 have now been established as main forecasting years in the model. This includes the definition and coding of model inputs such as:

(a) road and rail networks, and network variations for alternative scenarios;
(b) defining the transport cost and tariff functions, particularly for road vehicles based on fuel price assumptions
(c) demographic projections, including population size and the profile of age, employment and car ownership
(d) macro-economic projections based on the DG TREN's GDP and gross value added forecast at the national level, and foreign trade growth assumptions made by this study.

VI.2.2. Model enhancements for ASSESS

VI.2.2.1. Model zones: a fuller geographic coverage of Europe

The SCENES model uses a zoning system based on the 2003 version of the European Union's Nomenclature of Territorial Units for Statistics (NUTS2003), level 2. This simplifies the use of European data sources by NUTS region, which is the standard system adopted by EUROSTAT and the Member States. The NUTS system is revised periodically in order to keep in step with administrative boundary changes in the Member States. This means that the old SCENES zoning system was no longer fully compatible with post-1998 data. Besides this, SCENES did not previously include Malta and Cyprus. However, SCENES does not include overseas departments (e.g. the Canary Islands, the Azores, etc.) beyond Europe and the Mediterranean.

Within the ASSESS project, SCENES was upgraded to use the NUTS2003 boundaries for the EU25 (247 zones), as well as similar level boundaries in Norway and Switzerland., using a digital map layer supplied by GISCO for the purposes of this project. Using the latest zoning system enabled the use of the most recent EUROSTAT published data. The new zoning system retains the same external zones (i.e. areas outside the EU25) as did the previous system, with one zone per country for most neighbouring countries and the Candidate Countries, and one zone for a group of countries further beyond.

VI.2.2.2. New national input-out tables for EU15: a better representation of production, consumption and trade

The recently published input-output (IO) tables from the Eurostat have been used to replace the older 1995-series IO tables used by the previous SCENES model. The number of product categories remains to be 24 as in the previous SCENES model.

The IO tables used are for the year 2000, except in the countries which have not yet published their IO tables for 2000. For these countries the earlier IO tables are brought forward to the Year 2000 using national accounts data published by Eurostat and IO matrix derivation techniques.

Table 1 National Input-Output Tables used by the SCENES model: year of source tables

Country	Year represented by the source national IO table	Updated to
Austria, Belgium, Germany, Denmark, Finland, France, Italy, the Netherlands, Sweden	2000	
Portugal	1999	2000
Ireland	1998	2000
UK	1995	2000
Spain	1995	2000
Greece	1998	2000
Luxemburg	**1995 SCENES (i.e. updated from the 1995 IO table contained in the previous SCENES model)**	2000

The IO tables for 2000 are then projected forward to 2010 and 2020. The future year tables have the same structure as those for 2000. The key is to work out the growth ratio of different parts in IO tables in terms of domestic intermediate production growth, the consumption growth of private and public sectors, and investment. Two data sets were used for the projection. One is the growth assumptions for the components of GDP and the Value Added by industry from DG-TREN's energy analyses, and the other is the observed ratios between foreign trade growth rates and GDP growth rates derived from the Eurostat data and used to make the assumptions on future foreign trade growth rates by product category.

The work on the adoption of new IO tables and their projection to 2010 and 2020 was not part of the ASSESS tender. and has been carried out in a parallel SCENES application project for DG TREN.

VI.2.2.3. Transport networks updated to 2000: an improved base for the simulation of future network improvements

The changes to the zoning system and the change of base year to 2000 required updates to the Base Year network for 2000, e.g. the connection of the new zones to the modeled networks, such as Malta and Cyprus, the inclusion of major additions to the road and rail networks that were completed between 1995 and 2000, and in particular, the development of the low-cost airline network.

SCENES was already equipped with coding of most Trans-European Network projects, and these were assembled into future year networks for 2010 and 2020 as closely as possible for the respective scenario, in line with the project list presented in Annex V. The SCENES future year networks that were built upon also include some likely infrastructure building by Member States that are not TEN projects, but such infrastructure additions are held constant across all policy scenarios.

VI.2.2.4. Road vehicle operating costs: reflect recent fuel price projections

Previous SCENES car operating costs were based on UK fuel consumption, adjusted to the fuel price in different countries. This has now been comprehensively improved using vehicle operating cost data provided by the TREMOVE model. This TREMOVE data is the projections of fuel consumption per vehicle kilometre in each country and by road category (urban, non-urban, motorway, etc.), reflecting TREMOVE's detailed understanding of vehicle fleets and engine efficiencies. Updated VAT and fuel excise rates by fuel type have also been also taken from TREMOVE. Once the fuel consumption has been determined, DG-TREN resource cost projections as of June 2005 have been used to develop the Base vehicle operating cost functions, upon which the policy scenario cost changes are built further.

Road freight operating costs by truck type thus derived have been reviewed and where appropriate, modified slightly to take into account of inflation over time. Compared with the previous SCENES mode, the overall truck fuel costs in real terms appear to be stable. This is because fuel is only a small component of these costs, and over time the efficiency gains are being offset by increased fuel prices.

Car fuel costs when projected to 2010 and 2020 tend to decrease slightly, with the engine efficiency gains more than off-setting the increased fuel prices.

VI.2.2.5. Improved modal choice calibration for freight modes: better capturing the nature and extent of modal shift

In order to better capture the nature and extent of modal shift between road, rail and inland waterway freight modes, the original SCENES modal choice model parameters have been revised. The original modal choice parameters are shown to produce price elasticities that are higher than the values published in the freight demand literature (e.g. as reviewed in McKinnon, 2004 and Jin, Williams and Shahkarami, 2005). The revisions carried out in ASSESS have reduced the concentration parameters of the discrete choice model for freight mode choice and therefore adjusted downwards the price elasticities in order to reflect the realistic modal shift between the freight modes.

VI.2.2.6. Post-processing of the model results

The model output have been post-processed in order to meet the input requirements of a number of other models used by ASSESS (they are TREMOVE, CGEurope, SLAM, SWOV, ASTRA and the indicator-based multi-criteria analysis). To meet the specification of these models, the SCENES Base Year transport demand totals have been controlled to the observed national totals as developed by the stock-taking exercise (see Jin, Bak, Gercek and De Ceuster, 2005). In addition, a post-processing procedure has been set up to carry out consistency checks against price elasticities and observed trend since 2000. Where the model output values are outside the range indicated by price elasticities and trend growth at the national level, the control totals have been corrected before reporting. The geographical patterns of transport demand produced by the model are developed further to provide NUTS3 level results in differentiating transport demand in different land use area types. For the policy scenario runs that include large, pricing-related reductions of road demand, the demand responses to road de-congestion have also been estimated in the post-processing.

VI.3. Input assumptions for 2010 and 2020

The model input assumptions for the future years can be broadly categorised into two groups. The first group includes the background assumptions concerning such as the development of the economy, demography, car ownership profiles, and road vehicle fuel costs, which represents the general development expected in the Member States. A second group include the alternative future scenarios for 2010 and 2020, which are defined by the policy scenarios developed in this study.

VI.3.1. Background input assumptions for the model

SCENES requires a number of background input assumptions that relate to the development of the economy, demography, car ownership profiles, and road vehicle fuel costs, which are shared by all alternative future scenarios.

VI.3.1.1. Macro-economic assumptions

The main macro-economic assumptions for EU25 have been provided by DG TREN (2005). A compatible macro-economic forecast for Switzerland and Norway is not available. The EU25 forecast includes the overall GDP and household consumption expenditure growths, and the growth of value-added arising from production in different industries. This data is summarised below. Growths in imports and exports are assumed by this study in line with the GDP forecast, by assuming that foreign trade will continue to grow at a faster rate than domestic production. In defining the foreign trade growth rates, observed historic ratios between foreign trade and domestic production growths by industry by Member State (from the Eurostat macro-economic data) have been used. In adopting the historic ratios some capping has been necessary in order to maintain a minimum amount of domestic production for each industry, even in those sectors that have recently seen very high foreign trade growth rates. As a rule the foreign trade growth rates are assumed to follow the observed historic trends, which are higher (up to 100%) than the growth rates of the value added of the industry for a given product category. However, it is also assumed that the domestic production of any manufacturing product category will retain at least 15% of the total value consumed by industry (except in cases where this proportion was already lower than 15% by 2000, in which case the 2000 proportion is retained for 2010 and 2020).

These growth rates are used for projecting the national input-output tables of the EU15 countries forward to 2010 and 2020, and they influence the demand for domestic and foreign trade, and hence freight transport demand, particularly the growth in the average lengths of haul and the market catchment area of products.

Compared with the macro-economic assumptions used in previous SCENES tests, the growth rates adopted for this study are generally lower, reflecting the downward revisions in the recent GDP forecasts.

Table 2: Average annual growth rates of GDP growth: EU25

Member States	Growth rates		
	2000-2010	**2010-2020**	**2000-2020**
AT	1.93%	1.95%	1.94%
BE	2.02%	2.03%	2.02%
DE	1.24%	1.69%	1.46%
DK	1.66%	1.52%	1.59%
ES	2.76%	2.64%	2.70%
FI	2.34%	1.88%	2.11%
FR	1.95%	2.06%	2.01%
EL	3.79%	3.05%	3.42%
IE	5.04%	3.54%	4.29%
IT	1.19%	2.02%	1.61%
LU	4.05%	4.83%	4.44%
NL	1.42%	1.83%	1.63%
PT	1.28%	2.75%	2.01%
SE	2.39%	2.32%	2.35%
UK	2.68%	2.41%	2.55%
CZ	3.39%	3.34%	3.37%
EE	5.64%	4.16%	4.90%
HU	3.68%	3.24%	3.46%
LV	7.35%	5.05%	6.20%
LT	6.50%	4.87%	5.68%
PL	3.92%	4.37%	4.14%
SK	4.60%	4.32%	4.46%
SI	3.57%	2.41%	2.99%
CY	3.66%	3.45%	3.55%
MT	1.32%	3.43%	2.37%
EU25	2.04%	2.24%	2.14%

Source: DG TREN, 2005.

Table 3: Summary annual growth rates of value added by industry 2000-10: EU25

Growth Rate (2000-2010)				
Country	VA-agriculture	VA-industry & energy	VA-construction	VA-services
AT	1.76%	2.58%	1.37%	1.80%
BE	0.04%	1.11%	1.22%	2.32%
DE	0.72%	1.34%	-2.36%	1.84%
DK	0.46%	0.53%	1.31%	2.00%
ES	0.00%	2.17%	4.22%	2.75%
FI	0.60%	2.24%	2.00%	2.62%
FR	-1.21%	1.85%	0.75%	2.06%
GR	0.22%	1.85%	5.26%	4.32%
IE	0.77%	5.30%	6.45%	4.96%
IT	0.42%	0.52%	1.93%	1.48%
LU	-2.59%	3.23%	5.43%	4.20%
NL	-0.85%	0.40%	0.43%	1.83%
PT	1.06%	0.33%	-1.74%	2.11%
SE	2.07%	3.25%	2.63%	2.17%
UK	0.24%	-0.05%	3.45%	3.48%
CZ	-0.23%	3.87%	0.89%	3.21%

Growth Rate (2000-2010)				
Country	VA-agriculture	VA-industry & energy	VA-construction	VA-services
EE	-1.29%	7.68%	8.84%	4.89%
HU	6.20%	2.96%	6.10%	3.64%
LV	2.73%	8.12%	9.48%	7.31%
LT	0.85%	8.26%	9.06%	5.79%
PL	3.97%	4.29%	-0.11%	4.10%
SK	3.50%	4.92%	4.31%	4.95%
SI	-2.00%	4.23%	2.54%	3.61%
CY	2.80%	2.93%	5.40%	3.74%
MT	N/A	2.61%	2.49%	0.76%

Source: DG TREN, 2005.

Table 4: Summary annual growth rates of value added by industry 2010-20: EU25

Growth Rate (2010-2020)				
Country	VA-agriculture	VA-industry & energy	VA-construction	VA-services
AT	1.37%	2.00%	1.57%	2.04%
BE	0.82%	1.51%	1.34%	2.11%
DE	1.06%	1.61%	1.50%	1.95%
DK	0.67%	1.26%	1.42%	1.61%
ES	1.31%	2.63%	2.63%	2.73%
FI	0.39%	1.86%	0.83%	2.13%
FR	0.28%	1.99%	1.48%	2.06%
GR	1.18%	2.27%	2.77%	3.33%
IE	0.62%	3.52%	3.36%	3.57%
IT	0.94%	2.20%	0.45%	2.19%
LU	0.49%	4.50%	3.91%	4.89%
NL	0.72%	1.34%	1.25%	1.99%
PT	2.58%	2.20%	2.32%	3.15%
SE	0.92%	2.56%	2.23%	2.44%
UK	0.18%	1.32%	2.19%	2.72%
CZ	0.88%	2.85%	3.62%	3.37%
EE	0.81%	4.18%	4.79%	4.17%
HU	1.57%	2.66%	5.02%	3.53%
LV	1.31%	5.40%	5.37%	5.14%
LT	1.28%	5.04%	5.62%	5.10%
PL	2.61%	4.20%	4.97%	4.65%
SK	2.61%	4.22%	4.97%	4.34%
SI	0.83%	2.27%	2.92%	2.45%
CY	1.70%	3.13%	3.47%	3.64%
MT	N/A	2.70%	3.22%	3.74%

Source: DG TREN, 2005.

Table 5: Summary annual growth rates of value added by industry 2000-20: EU25

Growth Rate (2000-2020)				
Country	VA-agriculture	VA-industry & energy	VA-construction	VA-services
AT	1.57%	2.29%	1.47%	1.92%
BE	0.43%	1.31%	1.28%	2.22%
DE	0.89%	1.47%	-0.45%	1.90%
DK	0.56%	0.90%	1.37%	1.80%
ES	0.66%	2.40%	3.42%	2.74%
FI	0.49%	2.05%	1.41%	2.37%
FR	-0.47%	1.92%	1.11%	2.06%
GR	0.70%	2.06%	4.01%	3.82%
IE	0.70%	4.40%	4.90%	4.26%
IT	0.68%	1.35%	1.19%	1.83%
LU	-1.06%	3.86%	4.66%	4.54%
NL	-0.06%	0.87%	0.84%	1.91%
PT	1.82%	1.26%	0.27%	2.63%
SE	1.49%	2.91%	2.43%	2.30%
UK	0.21%	0.63%	2.82%	3.10%
CZ	0.32%	3.36%	2.25%	3.29%
EE	-0.25%	5.92%	6.80%	4.53%
HU	3.86%	2.81%	5.56%	3.59%
LV	2.01%	6.75%	7.40%	6.22%
LT	1.07%	6.64%	7.32%	5.44%
PL	3.29%	4.25%	2.40%	4.38%
SK	3.05%	4.57%	4.64%	4.65%
SI	-0.59%	3.25%	2.73%	3.02%
CY	2.25%	3.03%	4.43%	3.69%
MT	N/A	2.65%	2.85%	2.24%

Source: DG TREN, 2005.

VI.3.1.2. Population

The overall population growth rates for EU25 are also provided by DG TREN (2005). In addition, the population growth rates for Switzerland and Norway have been collected from respective national sources. They are assembled and shown in the table below. These growth rates are similar to those assumed by the previous SCENES model.

Table 6: Average annual growth rates of population: EU 27

Country	Growth rate		
	2000-2010	2010-2020	2000-2020
AT	0.30%	0.22%	0.26%
BE	0.30%	0.22%	0.26%
DE	0.08%	-0.02%	0.03%
DK	0.24%	0.11%	0.17%
ES	1.11%	0.21%	0.66%
ES	1.11%	0.21%	0.66%
FI	0.23%	0.21%	0.22%
FR	0.46%	0.33%	0.40%
GR	0.32%	0.14%	0.23%
IE	1.30%	0.96%	1.13%
IT	0.29%	-0.06%	0.12%
LU	0.84%	0.88%	0.86%
NL	0.46%	0.32%	0.39%
PT	0.44%	0.08%	0.26%
PT	0.44%	0.08%	0.26%
SE	0.35%	0.41%	0.38%
UK	0.38%	0.32%	0.35%
CZ	-0.15%	-0.22%	-0.18%
EE	-0.43%	-0.52%	-0.47%
HU	-0.23%	-0.29%	-0.26%
LV	-0.58%	-0.57%	-0.57%
LT	-0.45%	-0.50%	-0.47%
PL	-0.21%	-0.20%	-0.21%
SK	-0.10%	-0.14%	-0.12%
SI	0.13%	0.01%	0.07%
CY	1.16%	1.00%	1.08%
MT	0.81%	0.72%	0.76%
CH	0.23%	0.08%	0.16%
NO	0.48%	0.52%	0.50%

Note: The source for EU25 is DG TREN (2005). For Spain (ES) and Portugal (PT), the population growth rates presented above include the off-shore island territories. The model input values are slightly different, as the island territories are not include in SCENES for transport modelling purposes. For Norway, the population projection is from Statistics Norway, Population projections. National and regional figures, 2002-2050, "MMMM medium national growth" variant (http://www.ssb.no/folkfram_en/tab-2002-12-05-03-en.html). For Switzerland, source is Swiss Federal Statistical Office, "Evolution future de la population", middle scenario (http://www.bfs.admin.ch/bfs/portal/fr/index/themen/bevoelkerung/zukuenftge_bevoelkerungsentwicklung0/blank/kennzahlen0/schweiz/drei_grundszenarien.html).

It is assumed that SCENES3 zones within one country share the same growth rate since the population forecast data are only available at national level. There is scope to implement differentiated zonal growth rates in SCENES, and this can be done in a future project when more detailed population projection data is available.

The Base Year data for 2000 from DG TREN is cross checked with the Eurostat published forecast. The discrepancies between the DG TREN and Eurostat datasets for year 2000 are very small for most of coutries except for France, Italy and UK. After referring to the official data from France and Italy and comparing them with Eurostat data, it was concluded that data from Eurostat for those two countries are more suitable for use in SCENES. For France, Eurostat does not include overseas departments but the DG TREN one does. The projection data for year 2010 and 2020 from DG TREN are consistent with corresponding data from Eurostat.

VI.3.1.3. Other background assumptions

In addition to the macro-economic and population assumptions above, SCENES forecasting requires a range of assumptions regarding the development of car ownership, and the implied logistics operations and land use location patterns. It would helpful to state the assumptions about these.

a. Passenger demand model

The passenger demand is derived from population in each NUTS 2 zone, segmented into 5 person categories (children under 16 years of age, adults in full time employment under 65, adults in part time employment under 65, economically inactive adults under 65, and persons of 65 and over). The total population growth in each country is in line with the national population forecast. The underlying geographic patterns of population and employment in the base year in each NUTS 2 zone are carried forward to the future in the absence of spatially disaggregate forecasts.

The passenger demand model also requires a forecast car ownership per 1000 head in each of the forecast years 2010 and 2020, for each EU25 country. These are based on national forecasts collected by WSP during the TREMOVE 2 project in 2003 (TML, 2005; for car ownership data see table below). Car stock forecast is built up based on data from Tremove at the country level. By using the Eurostat Year 2000 car stock data and Tremove year 2020 car stock projections, year 2010 data is estimated using linear interpolation.

Table 7: Car ownership forecasts in SCENES (cars per 1000 population)

Country	Eurostat published	Assumption for this study	
	2000	**2010**	**2020**
AT	512	592	672
BE	457	495	532
DE	533	549	566
DK	348	354	359
ES	437	494	552
FI	412	456	501
FR	478	496	515
GR	289	373	457
IE	349	420	491
IT	565	622	678
LU	630	656	682
NL	412	466	520
PT	352	381	410
SE	451	497	542
UK	420	493	566
CZ	335	395	455
EE	338	419	500
HU	231	321	410
LV	234	280	327
LT	334	378	422
PL	258	350	442
SK	236	306	376
SI	437	471	506
CY	388	409	431
MT	497	530	563
CH	495	508	520
NO	410	437	463

Note: The car stock data for 2000 is from Eurostat

Given the population by NUTS 2 zone, segmentation of population, and total car ownership, the model endogenously assigns a level of car access to individuals that is affected by their cost and ease of use of car modes. It then applies trip rates by population segment based on typical journey making behaviours by demand segment (as revealed in the UK National Travel Survey), using the total trip rates from a recent Eurostat survey on passenger trips (Eurostat, 2005) as control totals.

In addition, the concentration parameters of the passenger distribution model have been reduced through time to simulate the behaviour of journey lengthening through time, in line with more detailed modeling studies on passenger demand in city regions (e.g. Jin et al, 2002).

b. Freight demand model

The Regional Economic Model (REM) that generates freight transport demand is updated in the future year based on the growth of production, consumption, investment and trade. The input-output table from the base year is projected forward using the DG TREN (2005) macro-economic assumptions. Final demand from consumers is apportioned within each country based on zonal population sizes. The Base

Year zonal production patterns are assumed to persist into the future, although the more detailed location patterns within the zone may still evolve (see assumptions in the Null scenario below).

c. Passenger transport model

Car occupancies depend upon the trip purpose and car ownership level of the traveller, based on recent data collected for 2001-2003 from different Member States. In this structure, increased car ownership in the model will result in reduced average occupancies by purpose, because the people who have full access to car tend to have a lower average car occupancy than those who have to share a car with others or have no car of their own. The average occupancies by purpose and car ownership level are not changed in the future, though in SCENES this could easily be done if such data is available. In other words, car occupancies would drop because individual travellers have greater access to cars, and not because the occupancies change within the same car ownership situation for the same type of journey.

Note that average occupancies in the outputs of SCENES that feed into TREMOVE are trip-kilometre weighted, so that long distance car journeys that have higher occupancy have a greater weight than commuting trips. These averages will therefore tend to be higher than average occupancies per trip.

Costs and travel speeds by country and mode are scenario-specific parameters and are specified by scenario below.

A new mode for low cost airline travel was added to the model with its own network based on flight routes of budget carriers with more than a few services a week. This low cost airline travel is in competition with other passenger modes including conventional airlines. The low cost airlines have lower fares in the model. However, the model also includes a representation of the additional time required to access the airports used by such budget carriers in various model zones.

d. Freight transport model

The assignment unit for freight is a tonne for each mode except for road transport. For example, the rail freight system is modelled in aggregate as a network that moves tonnes, and there is no direct modelling of freight train units (though the tones may be converted into trains using average loads per train).

For road freight, the number of trucks corresponding to a certain level of traffic in tonnes is obtained by means of average load factors for each type of commodity on each of the three vehicle sizes. These loading factors are updated using recent observed vehicle-km information collected for this study, and also include for the effect of empty running of vehicles.

Compared with the previous SCENES model, an addition vehicle size was defined in the model for non-bulk freight, so that three vehicle classes are modeled: they are medium rigid, large rigid and articulated trucks.

Modal costs, and travel speeds are scenario-specific and are specified by scenario below.

e. Network Speeds

The crowding effects of non-road modes are not modeled in the SCENES model. The travel speeds are those derived from the SCENES network. These are essentially average speeds of scheduled services. The access, waiting and loading times at each end of such services are included in the model, such that the modes have realistic door to door travel times which are a crucial component for mode choice decisions.

For road, average journey speeds that take into account the Base Year congestion conditions are input into the model. Because intrazonal traffic is not assigned to the road network it is not possible to work out the congested speeds entirely from the road link capacities, free-flow speeds and loads. Therefore the free-flow speeds are reduced to "congested speeds" in advance of the road assignment based on a banding of the traffic density in the zone (total vehicle-km/surface area) which tends to give slow speeds in predominantly urban zones, and vice versa. Some further estimates of congestion reduction were made for the TREMOVE model in post-processing the Extended scenario, where SMCP charging of cars significantly reduces the demand for road space.

VI.3.2. Input assumptions for alternative future scenarios

In this section the specific assumptions of the alternative future scenarios are summarised in turn for the convenience of the reader. However, those who are interested in the design and specification of the policy scenarios should refer to the main report and Annex V for details.

Below the assumptions are discussed for the Null scenario, two alternative Partial Scenarios, the Full scenario and the Extended scenario. Summary tables are then presented which compare the key cost and price variables between the scenarios.

It is important to note that the Null, Partial A, Full, Extended scenarios and the passenger part of Partial B share the basic assumptions concerning pricing structures and freight growth trends, so that comparisons can be made between them e.g. in calculating demand elasticities. The freight part of Scenario Partial B is based on different assumptions of pricing and freight growth trends, and similar comparisons cannot be made regarding demand elasticities.

VI.3.2.1. The Null scenario

The Null scenario represents a contra-factual situation in which of no White Paper policy measures had been applied. In the absence of the White Paper policy measures, the transport situation is assumed to follow the recently observed trend since the late 1990s. Road congestion would worsen around a number of metropolitan areas. Road building would continue, e.g. in EU10. Road freight haulage costs may fall in some areas because of labour costs, whilst rail freight services would be constrained by supply limitations. There would be continuing changes in freight logistics and land use which would in many cases favour road freight. In order to represent these changes, the model and post-processing parameters have been adjusted so that the modelled growth trajectories for 2010 and 2020 reflect the observed trend between the late 1990s and 2003/2004, which represents the period prior to the application of the White Paper measures. These model adjustments are then applied equally to all four scenario tests so that they are compared on a consistent basis. Given that there would be compensating changes over time both within the monetary costs and within the travel times under the Null scenario, for simplicity it is assumed that the input transport cost functions and average speeds on network links are the same as for the 2000 model run.

VI.3.2.2. The Partial scenarios

The Partial scenarios represent perhaps the most likely outcome of the implementation of the main White Paper measures, given the progress so far. Annex V provides the details of the assumptions concerning implementation of the policy measures. Two variants of the Partial scenario have been tested to investigate the effect of different assumptions of pricing and freight logistics trends on the model results (for details of these assumptions, also see Annex V).

First of all, it is useful to point out that the two Partial scenarios share a number of common assumptions. These include a number of improvements made to rail, shipping and inter-modal services, albeit at a modest scale, in terms of transit time changes and service quality improvements. There is little change from the Null scenario in passenger travel costs and times under either scenario.

The differences between the two variants concern alternative assumptions of pricing and freight logistics trends. The first scenario, Partial A, implements a small fraction of the Social Marginal Cost Pricing (SMCP) tolling for all freight modes and all road types, while Partial B charges road freight for motorway use only based on a projection of current national motorway tolls and the Eurovignette. The details of these tolls and some small differences in road freight costs are listed in Annex V. Besides differences in road charging, the A and B scenarios are also based on different assumptions regarding freight and logistics growth trends. Partial B generally assumes a slightly stronger tonne-km growth trend based on a longer trend series extending back to the mid 1990s.

Under the Partial A Scenario, road freight costs rise by 18% on average in 2010 relative to those in 2000, and by 20% in 2020. Partial B has assumed largely the continuing development of the current truck tolls, which implies different degrees of motorway charging; on average the increase in future year road costs is lower in Partial B than Partial A. There is also a much greater variation in road tolling between countries, for example in Partial B Germany introduces and maintains the present day Maut tolls which are larger than the charges in Germany in Partial A.

For consistency both A and B have the same costs and SMCP charges for non-road freight modes, but this SMCP is at most 20% of the small Tipmac charges for these modes and is so small as to have very limited impact.

VI.3.2.3. The Full scenario

Under the Full scenario, the road freight costs rise further as a result of a limited application of SMCP. The average road costs rise by 20% on average (including those measures already included in the Partial scenario) by 2010, and 27% by 2020. The Full scenario includes additional rail freight service improvements in addition to those in the Part scenario, including rail freight transit time and border crossing time reductions, improvements of service reliability, and inter-modal service enhancements.

On passenger modes, there are a range of measures that improve bus and train services. Average car speeds are increased as a result of better traffic management that is supported by the Galileo programme. On air, the application of VAT to air fares increases the price of air travel by 7%.

VI.3.2.4. The Extended scenario

The Extended scenario includes all policy measures put forward in the Full scenario. Under this scenario, there is full scale SMCP charging for road freight, and partial scale SMCP for passenger cars and air travel. Moreover, the rail freight services are to improve their quality of services significantly, over and above those assumed under the Full scenario.

VI.3.2.5. Summary of key cost and pricing inputs

For a summary of the quantified cost and pricing inputs, see Table 8. Table 9 and Table 10. These tables give further details of the main cost changes by country and mode, resulting from social marginal cost pricing (SMCP) and tax changes. "Unit cost" here is defined as the total modelled user expenditure on a transport mode divided by the total tonne-km, representing an average cost per tonne-km. The SMCP charge divided by the unit cost gives an approximate percentage, which is an indication of the size of the SMCP pricing relative to the user cost of the mode. Because SMCP changes freight movement patterns in the Regional Economic Model (for example, increased costs result in a reduced average journey length), and because loading costs etc. mean that the unit cost is smaller for longer journeys for most freight movements, Table 9 and Table 10 are cost estimates based on the resultant patterns of movements under each policy scenario.

Table 8: Quantified inputs to model: changes from base year model

				Null		Partial A		Partial B		Full		Extended	
Item	**Unit**	**Packages**	**Scope**	**2010**	**2020**	**2010**	**2020**	**2010**	**2020**	**2010**	**2020**	**2010**	**2020**
Road Freight cost	relative (%)	A,B	X14	0%	0%	15%	15%	10%	10%	15%	15%	15%	15%
	relative (%)	A,B	W11	0%	0%	10%	10%	5%	5%	10%	10%	10%	10%
	SMCP (% of full)	O1		0%	0%	10%	20%	0%	0%	20%	50%	50%	100%
	Eurovignette tolls, see Annex V			-	-	-	-	yes	yes	-	-	-	-
	Tax harmonisation	O2,O3		-	-	-	-	-	-	yes	yes	yes	yes
Road Freight time	relative (%)			0%	0%	-1%	-1%	-1%	-1%	-2%	-3%	-1%	-2%
Rail Freight cost	relative (%)	D,N1,N2	unitised	0%	0%	-1.5%	-4%	-1.5%	-4%	-3.5%	-6.5%	-5.5%	-10%
	relative (%)	D,N1,N2	bulk	0%	0%	-1%	-3%	-1%	-3%	-2.5%	-5%	-4%	-8%
	SMCP (% of full)	O1		0%	0%	10%	20%	10%	20%	20%	50%	50%	100%
	Tax harmonisation	O2,O3		-	-	-	-	-	-	yes	yes	yes	yes
Rail Freight time	relative (%)	C,D,N1,N2	unitised	0%	0%	-5%	-9%	-5%	-9%	-7%	-12%	-9%	-15%
	relative (%)	C,D,N1,N2	bulk	0%	0%	-5.5%	-11%	-5.5%	-11%	-6%	-12%	-7%	-14%
Ship cost	relative (%)	K	liquid bulk	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%
	SMCP (% of full)	O1		0%	0%	10%	20%	10%	20%	20%	50%	50%	100%
Ship time		n/a											
IWW cost	relative (%)	M		0%	0%	1%	1%	1%	1%	3%	3%	1%	1%
	SMCP (% of full)	O1		0%	0%	10%	20%	10%	20%	20%	50%	50%	100%
	Tax harmonisation	O3		-	-	-	-	-	-	yes	yes	yes	yes
IWW time	relative (%)	L		0%	0%	-1%	-2%	-1%	-2%	-2%	-3%	-3%	-5%
Sea ports cost	relative (%)	J,N1,N2		0%	0%	-4.5%	-8.5%	-4.5%	-8.5%	-9%	-15%	-10%	-16%
Inland ports cost	relative (%)	N1,N2		0%	0%	-4%	-7%	-4%	-7%	-9%	-15%	-10%	-16%
Rail/Road terminal cost	relative (%)	N1,N2		0%	0%	-2%	-2%	-2%	-2%	-4%	-5%	-5%	-6%
Sea ports time	relative (%)	J1,J2,N1,N2		0%	0%	-5%	-7%	-5%	-7%	-11%	-13%	-12%	-15%
Inland ports time	relative (%)	J2,N1,N2		0%	0%	-4%	-5%	-4%	-5%	-10%	-11%	-11%	-13%
Rail/Road terminal time	relative (%)	N1,N2		0%	0%	-3%	-4%	-3%	-4%	-7%	-8%	-8%	-10%
Rail time at borders	relative (%)	C	intra EU-15	0%	0%	-5%	-10%	-5%	-10%	-5%	-10%	-5%	-10%
	relative (%)	C	NMS borde	0%	0%	-10%	-20%	-10%	-20%	-10%	-20%	-10%	-20%
Road load factor	relative (%)	N1	X14	0%	0%	2%	2%	2%	2%	5%	5%	5%	5%
	relative (%)	N1	W11	0%	0%	1%	1%	1%	1%	2%	2%	2%	2%
Car cost	SMCP (% of full)	O1		0%	0%	0%	0%	0%	0%	0%	0%	0%	25%
	Tax harmonisation	O2		-	-	-	-	-	-	-	-	-	-
Car Time	relative (%)	Q		0%	0%	0%	0%	0%	0%	-2%	-2%	-3%	-3%
Bus cost	SMCP (% of full)	O1		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Bus time & other disutility		misc								-1%	-2%	-2%	-4%
Rail pass cost	relative (%)	E2		0%	0%	-1%	-1%	-1%	-1%	-1%	-2%	-1%	-2%
	SMCP (% of full)	O1		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Tax harmonisation	O2,O3		-	-	-	-	-	-	yes	yes	yes	yes
Rail pass time	relative (%)	E1		0%	0%	-1%	-2%	-1%	-2%	-2%	-3%	-2%	-3%
Air cost	relative (%)	G,H,I,P2		0%	0%	1%	0%	1%	0%	1%	-2%	0%	-2%
	SMCP (% of full)	O1		0%	0%	0%	0%	0%	0%	0%	0%	0%	25%
	Tax harmonisation	O2,O3		-	-	-	-	-	-	yes	yes	yes	yes
Air time	relative (%)	G,H,I		0%	0%	-4%	-5%	-4%	-5%	-5%	-8%	-7%	-11%
Airport terminal time	relative (%)	Q		0%	0%	0%	0%	0%	0%	-2%	-2%	-5%	-5%
Pass Rail station terminal time	relative (%)	Q		0%	0%	0%	0%	0%	0%	-2%	-2%	-5%	-5%

X14 = FIN, ITA, SPA, SWE (+ NO) and NMS-10; W11 = remaining 11 EU (+ CH)

Table 9: 2020 Extended Scenario SMCP charges as proportion of average 2020 Null-scenario unit cost

	FREIGHT					PASSENGER (25%)*	
Country	**Road**	**Rail**	**IWW**	**Ship**	**Freight average**	**Car**	**Air**
AT	25%	2.6%	4.3%		18.5%	35%	9%
BE	17%	3.7%	5.7%	41.3%	18.3%	49%	12%
DK	14%	3.6%		10.6%	13.0%	35%	10%
FI	32%	1.6%		6.6%	20.2%	47%	8%
FR	21%	4.1%	6.1%	74.7%	22.6%	36%	11%
DE	19%	3.5%	5.8%	32.6%	17.6%	33%	9%
GR	23%	1.6%		101.5%	33.2%	45%	5%
IE	31%	1.3%		7.6%	24.4%	51%	8%

IT	34%	2.3%	5.6%	57.7%	31.3%	46%	12%
LU	19%	4.7%	9.6%		16.0%	49%	6%
NL	19%	2.7%	4.1%	6.9%	13.6%	30%	19%
PT	27%	1.6%		15.5%	20.8%	22%	6%
ES	22%	1.5%		18.2%	18.8%	36%	7%
SE	18%	1.8%	3.8%	20.2%	15.0%	18%	8%
UK	20%	2.3%		8.9%	16.8%	38%	11%
EU-15	**21%**	**2.7%**	**4.8%**	**28.3%**	**19.0%**	**37%**	**10%**
CZ	32%	4.8%	8.1%		29.5%	41%	10%
EE	32%	4.6%	9.9%	63.8%	39.4%	17%	11%
HU	36%	2.3%	7.5%		32.6%	35%	10%
LV	37%	3.2%	8.8%	53.8%	33.7%	19%	7%
LT	40%	3.3%	9.0%	59.9%	36.3%	22%	9%
PL	38%	1.8%	6.7%	32.3%	31.8%	38%	11%
SK	38%	3.4%	2.6%	57.6%	35.9%	40%	9%
SI	30%	2.5%	7.5%	53.7%	24.6%	26%	8%
CY	17%			52.3%	26.0%	43%	9%
MT	14%			49.1%	24.9%	44%	9%
NMS-10	**36%**	**2.5%**	**6.1%**	**43.8%**	**31.9%**	**36%**	**10%**
EU-25	**24%**	**2.6%**	**4.9%**	**31.9%**	**21.6%**	**37%**	**10%**
Range	14 to 40%	1 to 5%	0 to10%	0 to102%	13 to 39%	17 to 55%	5 to 19%

Note: * Passenger percentages refer to the 25% of TIPMAC passenger charges applied in the 2020 Extended scenario, not the full TIPMAC charges themselves. Freight charges refer to the 100% TIPMAC charges applied in the 2020 Extended scenario.

Table 10: Tax and excise changes in the Extended scenario, as percentage of 2020 Null unit cost

Country	HDV excise and VAT	IWW VAT	Rail freight VAT	Passenger air VAT
AT	0.8%	-3%	-3%	7%
BE	9.5%	1%	1%	7%
DK	15.0%	7%	7%	7%
FI	2.4%	-1%	-1%	7%
FR	4.6%	2%	2%	7%
DE	-12.2%	-9%	-9%	7%
GR	6.9%	-1%	-1%	7%
IE	13.7%	7%	7%	7%
IT	-1.1%	-3%	-3%	7%
LU	-3.5%	-11%	-11%	7%
NL	9.5%	1%	1%	7%
PT	5.4%	2%	2%	7%
ES	-0.3%	0%	0%	7%
SE	5.6%	1%	1%	7%
UK	-9.3%	0%	0%	7%
CZ	5.7%	2%	2%	7%
EE	-1.6%	-11%	-11%	7%
HU	-7.5%	-8%	-8%	7%
LV	5.0%	2%	2%	7%
LT	13.6%	2%	2%	7%
PL	7.0%	0%	0%	7%
SK	-8.5%	-12%	-12%	7%
SI	2.5%	-2%	-2%	7%
CY	1.6%	-8%	-8%	7%
MT	12.4%	2%	2%	7%
Average	-2.6%	-5%	-3%	7%
Range	-12 to 15%	-12 to 7%	-12 to 7%	7% in all cases

VI.4. Model Results

VI.4.1. Introduction

This section presents the main results of the model, in terms of transport demand changes by scenario for 2010 and 2020. The scenarios are first discussed in turn in terms of freight and passenger transport demand on the inland modes (i.e. road, rail and inland waterway for freight, and car, bus/coach, rail/metro/tram, air and walking/cycling for passenger). Then the scenario results are summarised in a series of maps at the Member States level. This is then followed by a separate section on short sea shipping trends. The separation of the discussions on inland modes and short sea shipping stems from the fact that transport demand is measured in different ways, and the short sea shipping data that is available for modelling purposes currently carries a significant level of uncertainty.

VI.4.2. The Null Scenario

a. Freight transport demand

Table 11 presents for the Null scenario the SCENES results of freight transport demand among inland transport modes for the time periods between 2000 and 2010, and 2000 and 2020.

Table 11: Null scenario – Freight transport demand, billion tonne-km per year

		observed	Null scenario		% change over period	
Region	**Mode**	**2000**	**2010**	**2020**	**2000-2010**	**2000-2020**
EU15	Road	1319	1553	1873	18%	42%
	Rail	250	240	240	-4%	-4%
	Inland waterway	127	138	155	9%	22%
	All	**1696**	**1931**	**2268**	**14%**	**34%**
NMS10	Road	175	291	405	66%	131%
	Rail	124	117	111	-6%	-11%
	Inland waterway	4	4	4	-3%	3%
	All	**304**	**412**	**520**	**36%**	**71%**
EU25	Road	1495	1844	2278	23%	52%
	Rail	374	357	351	-5%	-6%
	Inland waterway	131	142	159	8%	21%
	All	**2000**	**2343**	**2788**	**17%**	**39%**

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%. In EU15, the growths are slower, albeit from a high base: the road freight growth rates are 18% and 42% respectively for 2010 and 2020. In the EU10, road freight is expected to have much stronger growth, of 66% and 131% respectively for 2010 and 2020.

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 SCENES runs, although there are some

variations between countries). Lower GDP growth implies lower rates of growth in the production and consumption of goods, and in the imports of raw materials and the exports of components and finished products. This then would lead to lower freight demand growth. 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.

b. Passenger transport demand

Table 12 presents the SCENES results for the Null scenario in terms of passenger travel growth from 2000 to 2010 2020.

Table 12: Null scenario – Passenger travel demand, billion passenger-km per year

		observed	Null scenario		% change over period	
Region	**Mode**	**2000**	**2010**	**2020**	**2000-2010**	**2000-2020**
EU15	Car	4094	4706	5393	15%	32%
	Bus/coach	402	423	413	5%	3%
	Train/metro	351	392	416	12%	19%
	Air	284	428	579	51%	104%
	Walk/cycle	215	244	257	13%	19%
	All	**5345**	**6193**	**7058**	**16%**	**32%**
NMS10	Car	325	468	608	44%	87%
	Bus/coach	78	73	67	-7%	-15%
	Train/metro	51	50	48	-4%	-7%
	Air	14	23	34	62%	134%
	Walk/cycle	19	23	24	19%	29%
	All	**488**	**636**	**781**	**30%**	**60%**
EU25	Car	4419	5175	6002	17%	36%
	Bus/coach	480	495	480	3%	0%
	Train/metro	403	442	464	10%	15%
	Air	298	451	612	51%	105%
	Walk/cycle	234	266	281	14%	20%
	All	**5833**	**6829**	**7839**	**17%**	**34%**

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.

Under the Null scenario, 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.

The more detailed results for this scenario by Member States are presented in the Appendix in Table 22 and Table 25.

VI.4.3. The Partial Scenarios

a. Freight demand – Partial A

The Partial A scenario is based on the same freight growth trend assumption as the Null scenario. Compared with the Null scenario, the policies implemented under the Partial A scenario lead to a lower rate of growth in road freight demand. Compared with 2000, the road freight growth rates are respectively 21% and 43% for 2010 and 2020 in EU25. Compared with the Null, this is 2% lower by 2010 and 6% lower by 2020. Given that the road costs are 18% higher than in Null in 2010, and 20% higher in 2020, the average demand elasticity with respect to price changes is around 0.1 for 2010 and 0.3 for 2020. These are in line with the expected magnitudes of changes: the measures that lead to the road cost increases (including driving restrictions on heavy goods vehicles on designated roads, driver training and social harmonisation of road transport) are still in the process of being implemented. Thus by 2010 the transport system will have only a very short period to adjust. That is why that demand changes are more modest by 2010 compared with the Null. However, by 2020, the impact of these cost changes is likely to lead to larger impacts.

b. Freight demand – Partial B

The Partial B scenario is based on a different freight growth trend assumption from the Null scenario, with generally higher tonne-km growth. The assumptions of cost and pricing changes for trucks are also different. It is therefore not directly comparable with either Null or Partial A above, or the Full and Extended scenarios to be presented below. For this reason it is not meaningful to calculate demand elasticities or policy impacts relative to the other scenario results, as done above with Partial A.

Under the Partial B assumptions there is greater freight demand growth in all land modes across the EU-25, including modest rail expansion of 8% and 13% in 2010 and 2020 respectively, and inland waterway expansion of 11% and 28%. However, road freight growth is much stronger, at 26% and 55%.

Table 13: Partial scenarios - Freight transport demand, billion tonne-km per year

			observed	Scenario tonne-km		% change over period	
Scenario	**Region**	**Mode**	**2000**	**2010**	**2020**	**2000-2010**	**2000-2020**
PARTIAL A	**EU15**	Road	1319	1523	1753	15%	33%
		Rail	250	254	273	2%	9%
		IWW	127	139	157	9%	24%
		All	**1696**	**1916**	**2183**	**13%**	**29%**
	NMS10	Road	175	280	387	60%	120%
		Rail	124	130	142	5%	14%
		IWW	4	4	5	-1%	7%
		All	**304**	**415**	**533**	**36%**	**75%**
	EU25	Road	1495	1803	2139	21%	43%
		Rail	374	384	414	3%	11%
		IWW	131	143	162	9%	23%
		All	**2000**	**2331**	**2715**	**17%**	**36%**
PARTIAL B	**EU15**	Road	1319	1 588	1 907	20%	45%

Scenario	Region	Mode	observed 2000	Scenario tonne-km 2010	2020	% change over period 2000-2010	2000-2020
		Rail	250	269	280	8%	12%
		Inland waterway	127	141	164	11%	29%
		All	**1696**	**1 998**	**2 352**	**18%**	**39%**
	NMS10	Road	175	298	411	70%	134%
		Rail	124	134	142	8%	14%
		Inland waterway	4	4	4	0%	6%
		All	**304**	**437**	**558**	**44%**	**83%**
	EU25	Road	1495	1 886	2 318	26%	55%
		Rail	374	403	422	8%	13%
		Inland waterway	131	146	169	11%	28%
		All	**2000**	**2 435**	**2 909**	**22%**	**45%**

c. Rail freight demand

As a result of road cost increases, and the improvements on rail, shipping and inter-modal transport, rail freight is expected to grow by a modest amount in the EU25 (scenario A: 3% and 11%, scenario B: 8% and 13% in 2010 and 2020 respectivey). Both appear to be lower than the growth in total tonne-km in those scenarios respectively. In other words, the Partial scenarios are likely to see a halt the decline of rail freight in the majority of the countries and a modest growth in rail freight, but the growth is unlikely to be sufficient to achieve the target of retaining the observed modal balance of 1998.

d. Passenger demand

There is only one passenger "Partial" scenario, as both Partial A and B have the same passenger assumptions. When this scenario is compared with the Null scenario, overall passenger demand does not appear to be significantly different. The improvements in rail services under the Part scenario have led to a modest gain in passenger train demand in the overall summary statistics. However, this may mask significant growths on certain corridors, particularly on high speed rail.

Table 14: Partial scenario – Passenger travel demand, billion passenger-km per year

Region	Mode	observed 2000	Partial scenario 2010	2020	% change over period 2000-2010	2000-2020
EU15	Car	4094	4704	5388	15%	32%
	Bus/coach	402	422	413	5%	3%
	Train/metro	351	398	429	13%	22%
	Air	284	427	586	50%	106%
	Walk/cycle	215	244	256	13%	19%
	All	**5345**	**6195**	**7071**	**16%**	**32%**
NMS10	Car	325	468	607	44%	87%
	Bus/coach	78	73	66	-7%	-15%
	Train/metro	51	50	49	-2%	-4%
	Air	14	23	34	61%	136%
	Walk/cycle	19	23	24	19%	29%
	All	**488**	**637**	**781**	**30%**	**60%**
EU25	Car	4419	5172	5995	17%	36%
	Bus/coach	480	495	479	3%	0%
	Train/metro	403	449	479	11%	19%
	Air	298	450	619	51%	108%
	Walk/cycle	234	266	281	14%	20%
	All	**5833**	**6832**	**7852**	**17%**	**35%**

The more detailed results for this scenario by Member States are presented in the Appendix in Table 22 and Table 25.. Also see section VI.4.6 for a graphical comparison of the freight growths on inland modes by Member States.

VI.4.4. The Full Scenario

a. Freight demand

Under the Full scenario, the 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 IWW 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 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 heavy 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 light and volumenous goods such as food and finished consumer products with packaging and handling euqipment, the road demand reduction is likely to result mainly from an adjustment in the geographic patterns of out-sourcing. That is, the goods required by consumers will be provided by suppliers from within a shorter distance range relative to the Partial scenario.

Table 15: Full scenario - Freight transport demand, billion tonne-km per year

		observed	Full scenario		% change over period	
Region	**Mode**	**2000**	**2010**	**2020**	**2000-2010**	**2000-2020**
EU15	Road	1319	1503	1690	14%	28%
	Rail	250	261	299	5%	20%
	IWW	127	140	158	10%	24%
	All	**1696**	**1904**	**2147**	**12%**	**27%**
NMS10	Road	175	268	365	53%	108%
	Rail	124	143	148	15%	19%
	IWW	4	4	5	0%	8%
	All	**304**	**415**	**518**	**37%**	**70%**
EU25	Road	1495	1771	2056	19%	38%
	Rail	374	404	446	8%	19%
	IWW	131	144	163	10%	24%
	All	**2000**	**2319**	**2665**	**16%**	**33%**

b. Freight demand, internal market, and economic growth

Compared with road traffic growth, the growth in rail freight demand under the Full scenario would seem modest. This in part stems from the fact that the evolution of the European economy in the next two decades is likely to erode further the traditional base of rail freight market, such as the bulk products used as raw materials for manufacturing. This indicates that it would be necessary for the rail freight operators

to adapt to the changes in the commodities mix, and to win new customers through improving reliability, responsiveness and general quality of service, which are generally the prerequisites for delivering higher value consumer goods and components for input into production. Furthermore each country should enable and support the interconnectivity and interoperability of national networks as well as the access to such networks. This will help to develop new markets in the medium to long distance transport of finished products and components, e.g. to and from the sea ports and major manufacturing and distribution sites. The realisation of this potential for rail freight development could contribute significantly to the broadening of the catchment for both producers and consumers in the internal market, support the GDP growth of the Member States, and reinforce the trade ties between different regions within the EU, whilst maintaining the long term environmental sustainability of freight transport.

c. Passenger demand

The most significant input for passenger demand under this scenario is the imposition of a harmonised 7% VAT on air travel. As a result 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: compared with the Null scenario, the air passenger demand growth rate for 2010 is dampened by -12% in 2010, but only -5% in 2020.

Table 16: Full scenario – Passenger travel demand, billion passenger-km per year

		observed	Full scenario		% change over period	
Region	**Mode**	**2000**	**2010**	**2020**	**2000-2010**	**2000-2020**
EU15	Car	4094	4768	5453	16%	33%
	Bus/coach	402	429	428	7%	7%
	Train/metro	351	399	432	13%	23%
	Air	284	377	548	33%	93%
	Walk/cycle	215	241	252	12%	17%
	All	**5345**	**6213**	**7113**	**16%**	**33%**
NMS10	Car	325	472	612	45%	88%
	Bus/coach	78	73	68	-7%	-13%
	Train/metro	51	51	50	-1%	-3%
	Air	14	22	32	52%	126%
	Walk/cycle	19	22	24	18%	28%
	All	**488**	**640**	**786**	**31%**	**61%**
EU25	Car	4419	5240	6064	19%	37%
	Bus/coach	480	502	496	5%	3%
	Train/metro	403	449	482	12%	20%
	Air	298	399	580	34%	95%
	Walk/cycle	234	264	276	13%	18%
	All	**5833**	**6853**	**7899**	**17%**	**35%**

The policy measures to encourage public transport (i.e. bus and rail modes) have led to a further increase in its travel demand. The Full scenario sees a slightly better modal balance, as well as a slight increase in the overall passenger mobility.

The more detailed results for this scenario by Member States are presented in the Appendix in Table 24 and Table 26. Also see section VI.4.6 for a graphical comparison of the freight growths on inland modes by Member States.

VI.4.5. The Extended Scenario

a. Freight demand

The Tipmac SMCP on trucks is applied fully under the 'Extended ' scenario (50% by 2010 and 100% by 2020). This causes overall truck operating costs to rise on average by 27% in 2010, and 40% in 2020. As a result, in EU25 the truck tonne-kms reduce by 5% by 2010, and 13% by 2020, relative to the Null scenario. The relatively small reduction in road demand by 2010 reflects the fact that road demand adjustments are likely to be limited because of short time horizon, even if such charges are to be introduced right away. The scope of longer term adjustment is indicated by the results for 2020, which implies an average demand elasticity around 0.3.

Under this scenario, rail and IWW tonne-km growth rates could come close to that for trucks, for EU25 as a whole. The improvements in rail freight service quality have led to a further increase in rail demand.

Table 17: Extended scenario - Freight transport demand, billion tonne-km per year

		observed	Extended scenario		% change over period	
Region	**Mode**	**2000**	**2010**	**2020**	**2000-2010**	**2000-2020**
EU15	Road	1319	1487	1626	13%	23%
	Rail	250	266	329	7%	32%
	IWW	127	141	161	11%	27%
	All	**1696**	**1894**	**2116**	**12%**	**25%**
NMS10	Road	175	262	345	49%	97%
	Rail	124	151	158	21%	27%
	IWW	4	4	5	1%	11%
	All	**304**	**417**	**508**	**37%**	**67%**
EU25	Road	1495	1749	1971	17%	32%
	Rail	374	417	488	12%	30%
	IWW	131	145	166	11%	26%
	All	**2000**	**2312**	**2625**	**16%**	**31%**

b. Passenger demand

For the 'Extended ' scenario, car operating costs would rise on average by 38% if a quarter of the Tipmac SMCP values are to be introduced. On air, a quarter of the Tipmac SMCP values are also introduced, which imply 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 passenger mobility by 5% compared with the Null scenario: the total passenger-km grow by 27% in EU25 relative to 2000, compared with the 34% under the Null scenario.

Table 18: Extended scenario – Passenger travel demand, billion passenger-km per year

Region	Mode	observed	Extended scenario		% change over period	
		2000	2010	2020	2000-2010	2000-2020
EU15	Car	4094	4772	5018	17%	23%
	Bus/coach	402	431	447	7%	11%
	Train/metro	351	395	461	12%	31%
	Air	284	390	479	37%	69%
	Walk/cycle	215	239	257	11%	20%
	All	**5345**	**6227**	**6662**	**16%**	**25%**
NMS10	Car	325	474	562	46%	73%
	Bus/coach	78	73	72	-6%	-8%
	Train/metro	51	50	58	-3%	12%
	Air	14	22	31	54%	114%
	Walk/cycle	19	22	26	18%	35%
	All	**488**	**642**	**748**	**31%**	**53%**
EU25	Car	4419	5246	5579	19%	26%
	Bus/coach	480	505	519	5%	8%
	Train/metro	403	445	518	11%	29%
	Air	298	412	510	38%	71%
	Walk/cycle	234	262	283	12%	21%
	All	**5833**	**6869**	**7410**	**18%**	**27%**

The more detailed results for this scenario by Member States are presented in the Appendix to this Annex, in Table 24 and Table 26. Also see section VI.4.6 for a graphical comparison of the freight growths on inland modes by Member States.

VI.4.6. Scenario freight results mapped by country

This section presents the growth rates by country for the Partial A, Partial B, Full and Extended scenarios. The Null scenario is omitted in the presentation to avoid clutter. There is one map for each of the modes, namely road freight, rail freight, inland waterway, and then a summary of tonne-km across these three inland modes. The average growth in the EU-15, NMS-10 and EU-25 are also shown in a box on the left hand side of the map. All the numbers plotted in these maps can be found in the Appendix of this Annex. The Appendix also presents the absolute values of the tonne-kms.

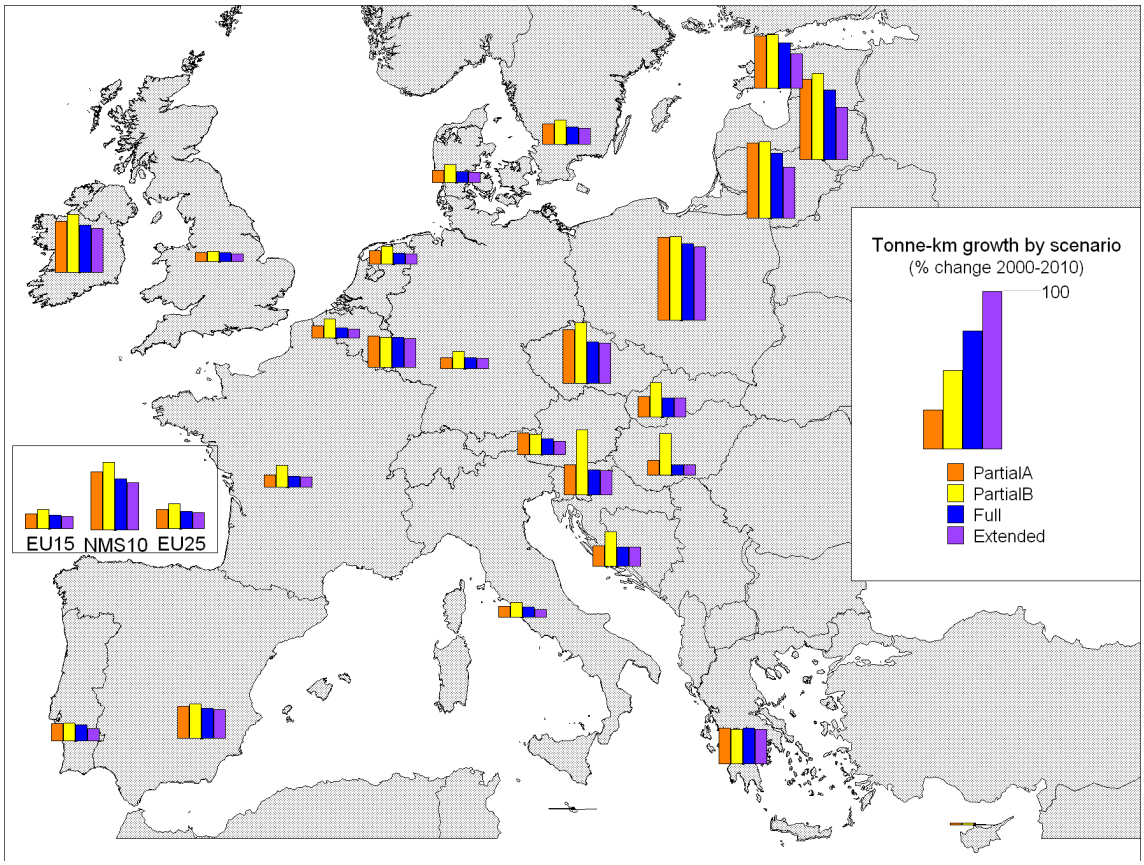

Figure 1: Road freight tonne-km growth, 2000-2010, by country and scenario

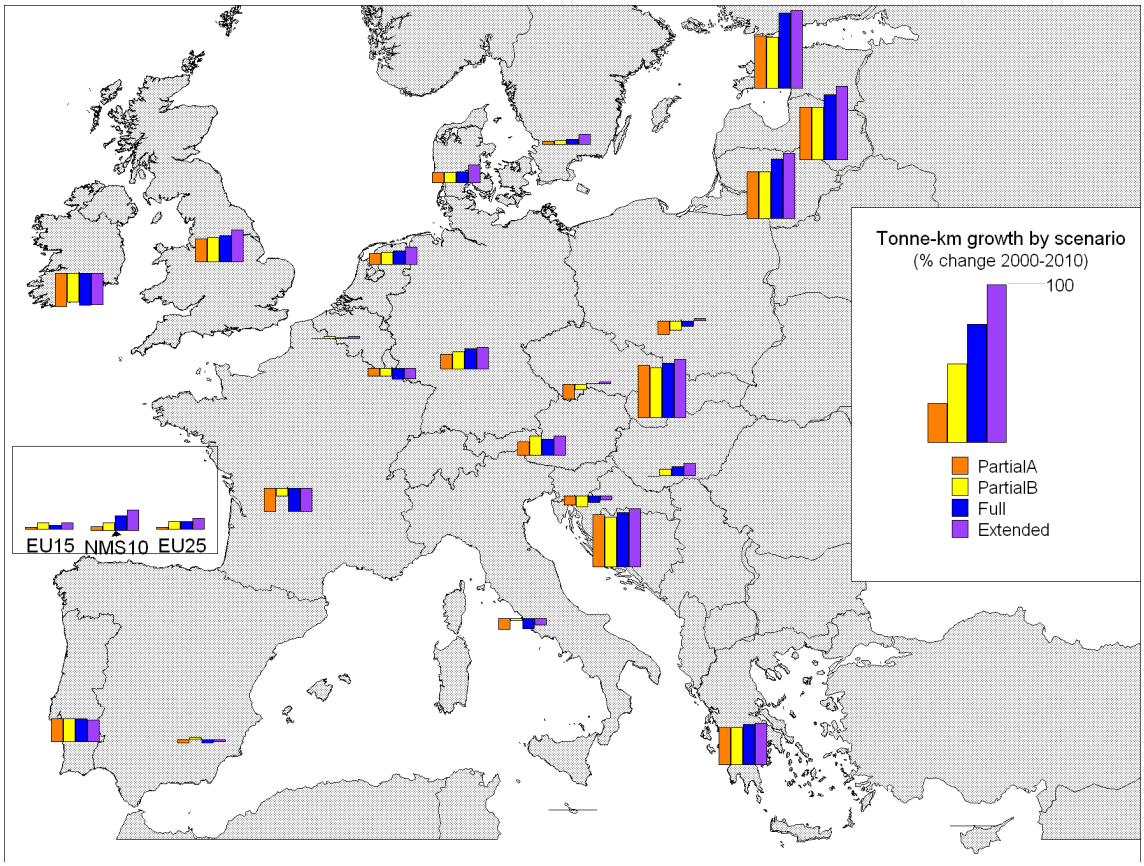

Figure 2: Rail freight tonne-km growth, 2000-2010, by country and scenario

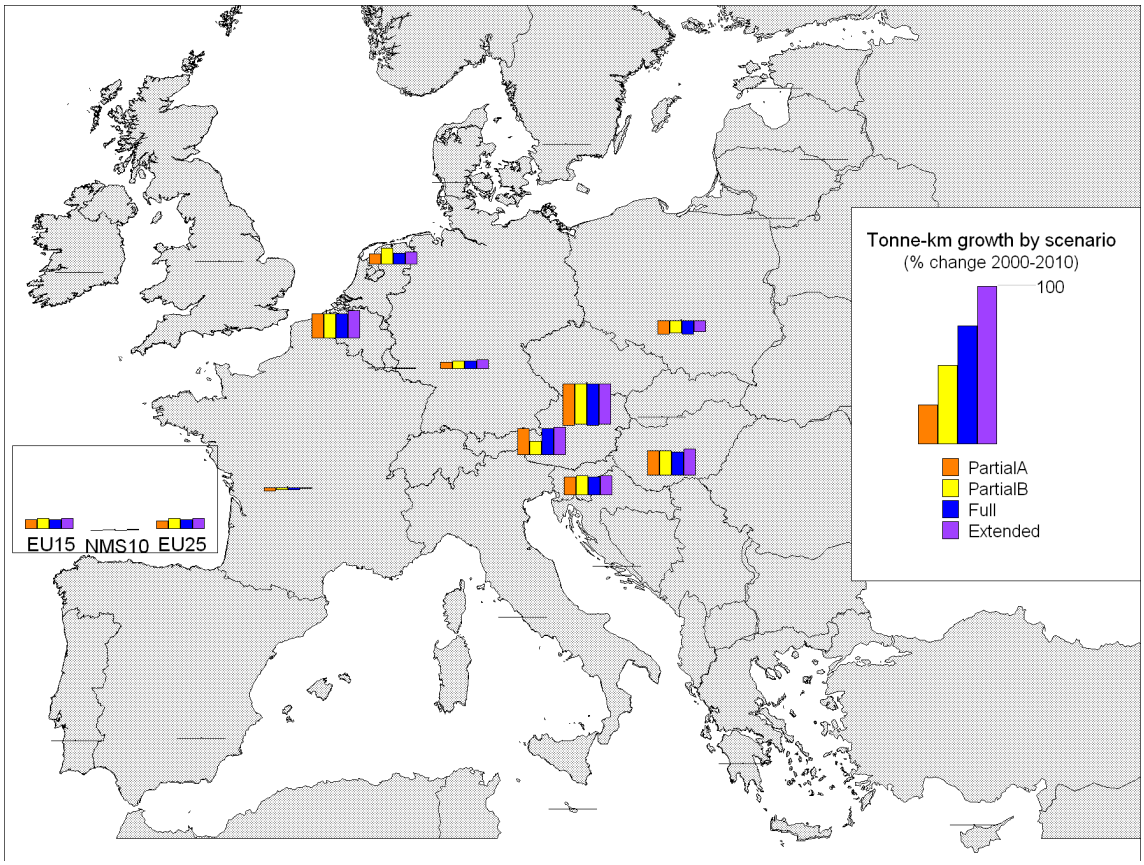

Figure 3:Inland waterway freight tonne-km growth, 2000-2010, by country and scenario

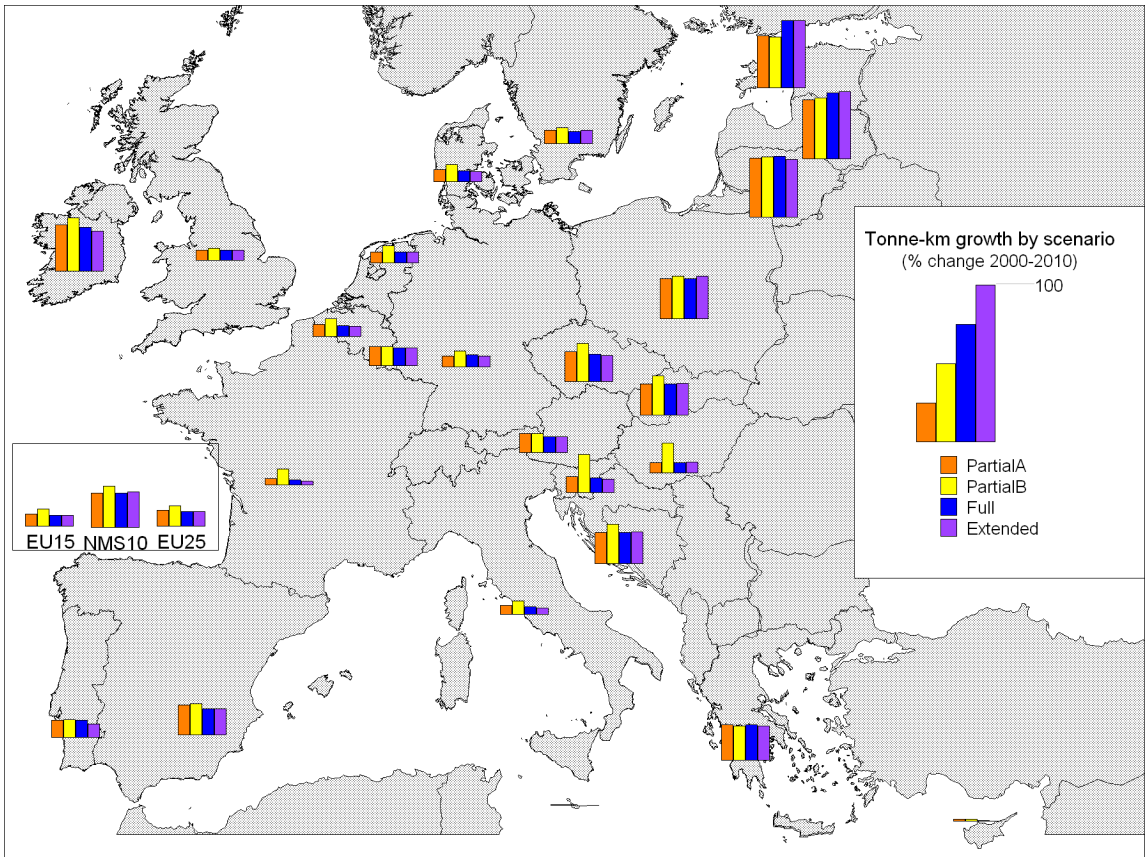

Figure 4: All land modes (road, rail, iww): freight tonne-km growth, 2000-2010, by country and scenario

VI.4.7. Short Sea Shipping

Short Sea Shipping (SSS) data is presented separately here for several reasons. The observed data available is still short of the kind of detail required for strategic freight modelling, and the reliable period of the EU-13 data series only covers the years 2000-2004, which is quite a short trend. (EU-13 refers to the fact that Austria and Luxembourg as land-locked countries are not included in these statistics). Statistics for the new member states are not available. During this period the SSS sector grew rapidly in almost all member states (see Xenellis, 2005). It is still unclear how to best calibrate the SCENES model based on this useful yet limited data, so that the model results in this section cannot be regarded as adequately validated.

Also, shipping data is primarily collected as tonnes passing through ports, which are best presented separate from the tonne-km statistics in the rest of this annex. (The SCENES model can straightforwardly measure tonnes moving through ports in the model, though there is some uncertainty over the precise choice of ports due to the lack of consistent observed data for all ports).

Tonne-km statistics for shipping available from DG TREN (2004b) are presented in an aggregate form and are not broken down by origin or destination country. For the purpose of this project it would be appropriate to work at this aggregate level until further observed data is available.

VI.4.7.1. Commodities: petroleum versus other shipping

Eurostat statistics show that roughly half of European short sea shipping is liquid bulk, primarily petroleum products. Planning the flow of petroleum is a very specialised exercise, depending very much on the particular logistic structures of a few large petroleum firms and the location of their plants. As such its modeling is excluded in the SCENES model. Some other liquid bulk freight is present in the model but it cannot meaningfully be compared with the statistics available so far.

For this reason, the tables below excludes all liquid bulk from both the observed and modelled totals.

VI.4.7.2. Roll-on and roll-off shipping

SCENES models both accompanied and unaccompanied roll-on, roll-off (Ro-Ro) traffic as ferries within the truck mode, and not within the "coastal shipping" mode containing other SSS. Demand for Ro-Ro thus arises naturally from demand for road freight transport and is not a separate mode. (Rail freight can also be conveyed over some ferry links, but only very small volumes are moved this way). Thus Ro-Ro is also omitted from both modelled and observed data below.

VI.4.7.3. Comparison of observed and modelled growth rates

The tables below show the annual and total growth of shipping tonnage and total growth in tonne-km. The "observed" values presented are based on the trend 1998-2004 in the (unpublished) Eurostat data available, for commodities other than liquid bulk and Ro-Ro units as above.

This trend is extremely sensitive to the end years chosen and to spikes or dips in the data that may simply be artifacts of the data collection process in some countries. This is true even if a log-linear regression is used rather than a "start to end" interpolation. It is possible to obtain plausible growth rates between 1.8% per year and 4.0% per year, which would amount to 40% to 120% respectively over a 20 year period. This is not to claim that the higher rate is likely to persist for decades, but merely indicates just how

strongly the SSS sector was growing in the period 2000-2003. Further data would be required to refine this growth trend.

The SCENES figures are near the lower end (40%) of this estimate. The Partial B scenario, which is based on similar periods of growth trend, showed growth of 16% and 36% in 2010 and 2020 respectively.

Considering the different SCENES results, shipping grows more strongly in the partial than null scenarios, and more strongly again in the full and extended scenarios. This is a combination of improvements in shipping costs and times resulting from policy measures in these scenarios, and also modal shift because of increased charging and other costs of road freight. The impact of the scenarios on short sea shipping is thus roughly in the same direction as its impact on inland waterway and rail modes.

Table 19:Percentage growth per year in SSS tonnes received at EU13 ports

		Scenarios				
Year	**Trend**	**Null**	**Partial A**	**Partial B**	**Full**	**Extended**
1998-2004	1.8 - 4.0%					
2000-2010		1.1%	1.5%	1.5%	2.0%	2.1%
2000-2020		1.3%	1.6%	1.6%	1.9%	2.0%

Note: Excludes liquid bulk and Ro-Ro traffic from both modelled and observed
Source for observed data: Xenellis (2005).

Table 20:Percentage growth overall in SSS tonnes received at EU13 ports

		Scenarios				
Year	**Trend**	**Null**	**Partial A**	**Partial B**	**Full**	**Extended**
2000-2010	20-50% *	11%	16%	16%	22%	23%
2000-2020	40-120% *	29%	37%	36%	45%	48%

*: extrapolation of trend 1998-2004 to future time period
Note: Excludes liquid bulk and Ro-Ro traffic from both modelled and observed
Source for observed data: Xenellis (2005).

Table 21:Percentage growth in SSS tonne-km in European waters

		Scenarios				
Year	**Trend**	**Null**	**Partial A**	**Partial B**	**Full**	**Extended**
1998-2004	9.9%					
2000-2010	27% *	20%	25%	24%	29%	30%
2000-2020	61% *	52%	61%	59%	67%	70%

*: extrapolation of trend 1998-2004 (9.9% over 6 years) to future time period
Note: Excludes liquid bulk and Ro-Ro traffic.
Source for observed data: DG TREN (2004b).

VI.4.8. Assessment of the model results

The analysis of the current statistics suggests that the White Paper measures may be starting to have a positive effect on the evolution of transport demand in Europe. In the freight transport sector, the decline in rail transport appears to have come to an end in the majority of Member States, 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 Member States, road freight traffic growth has been slower than the GDP growth in recent years, although more empirical observa-

tions are required to ascertain this trend. In passenger rail transport, there has been strong growth in West Europe and the decline in the new Member States has been largely halted. In a number of metropolitan and urban areas, there have been remarkable examples of successful initiatives to promote public transport and walking/cycling.

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 European 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. Four main policy scenarios have been developed within the ASSESS project, corresponding to different levels of expectations in policy implementation. For the most likely scenario, two alternative tests have been made in order to examine the possible variations in demand growth as a result of the model assumptions on pricing and freight logistic trends. Compared with earlier transport demand forecasts such as TEN-STAC (2004) and the previous SCENES forecasts (e.g. SCENES, 2001; TML, 2005), the ASSESS Project 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 up to 2003/04.

Under the most likely scenario, the overall freight demand growth for inland modes (i.e. road, rail and inland waterway) when measured in tonne-kilometres are likely to be between 17%-22% for the period 2000-2010, and between 36-45% for 2000-2020[1]. 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 in 2010 and around 36% in 2020; in tonne-km terms the short sea shipping growth is likely to be around 25% in 2010 and 60% in 2020. This suggests that the policy measures under this scenario are likely to reverse the decline of rail freight which occurred during the 1990s and encourage positive progress with inland and short sea shipping, 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.

The model results are dependent upon

- The economic and trade growth as defined by macro-economic projections
- The assumptions of the cost changes between the scenarios
- The assumptions of other changes in transport services, including travelling speeds and times, and the improvements of the quality of the services

The model results are cross-checked with the recent observed rates of demand growth by mode in the member states, and the freight and passenger demand elasticity with respect to price changes conform to the observed values in published transport demand literature. In this sense the results are robust and they reflect well the differences in inputs between the alternative scenarios.

Because of the sheer spatial scale of the model which covers all EU25 and beyond, the network details and spatial interaction at the local level may not all be accurate. Consistent observed data is lacking at this level to check the model outputs. As a result, spatially detailed results will need to be examined with care and only used where there is corroborating evidence at the local level.

[1] All figures quoted in this paragraph refer to EU25.

Although there is a substantial body of research on demand elasticities with respect to price changes, the actual impact of price changes on demand may still be affected by new adaptations the transport users may make in freight logistics and in daily activity patterns of passenger travel. Although the model is consistent with the known demand elasticities, the results will need to be continuously examined as new evidence emerge (such as from the road charging schemes for trucks that have been implemented recently in some European countries). This is especially so given the SMCP measures may be implemented in very different ways from previous cost measures, and they may evolve in different directions through time.

The assumptions on rail freight service quality improvements need to be monitored through time, using the indicators of actual growth in tonne-km performance as the data becomes available. It would be very useful to carry out such comparisons in the next few years, as the emerging observed data will help to validate the assumptions made in the model, and to build up the evidence base for relating actual performance improvements and the changes in the time and modal specific constant components of the generalised cost functions for freight transport demand in the model.

During the ASSESS study some limited national demand forecasts have been made available to the study team by DG TREN. These national forecasts adopt the recent macro-economic assumptions that are compatible with those used in the study, and therefore can be compared to some extent with the SCENES forecasts. However, the current availability of such forecasts is limited, and the details of the nderlying assumptions often patchy. More comparisons with these national forecasts may be possible as they emerge, for example over the next few months as the national representatives provide further quantitative forecasts to the White Paper Review process.

The SCENES model has the potential to be improved in the future so that it can be used to test a wider range of policy inputs with increased precision. The experience of the ASSESS work indicates that future model improvements would particularly benefit from

- having a finer zoning system to improve the resolution in representing the geography and economic activities in Europe, and
- shortening the time intervals (e.g. 3-5 years) as the model is run into the future, e.g. the model is run to test policy inputs for 2005, 2010, 2015 and 2020.

These would help to quantify more precisely e.g. the TENs impacts at the corridor and local levels. The modelling technology for detailed zoning has already been developed and tested since the original development of SCENES. For instance a transport module with 10,000 zones has been developed for the National Transport Model of Great Britain (Williams and Lindsay, 2002). A full regional land use and transport model using the same technology is being developed in the UK (WSP, 2005). With faster PC-based computing running the SCENES model at shorter time intervals has also become feasible. These improvements will help to answer the questions which are beyond the scope of the ASSESS project.

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Appendix: Detailed demand forecasts by scenario and country

This appendix presents detailed SCENES transport demand results by country, mode and scenario.

Table 22: Freight demand by Member State for Null and Partial A scenarios

State	Mode	Observed	Null scenario		Partial A scenario		Null: % change over period		Partial A: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Austria	Road	27.5	34.8	42.2	33.7	39.2	26%	53%	23%	43%
	Rail	16.6	18.3	18.5	19.1	2-	11%	12%	15%	20%
	IWW*	2.4	3.1	3.5	3.1	3.6	27%	45%	27%	47%
	All	46.5	56.2	64.3	55.9	62.8	21%	38%	20%	35%
Belgium	Road	38.4	44.4	50.8	43.6	48.9	16%	33%	14%	27%
	Rail	7.7	7.5	7.7	7.7	8.1	-3%	0%	1%	5%
	IWW	7.2	8.9	9.4	9.1	9.7	23%	31%	26%	34%
	All	53.2	60.7	67.9	60.3	66.6	14%	28%	13%	25%
Germany	Road	346.3	391.7	458.8	389.3	430.8	13%	32%	12%	24%
	Rail	76.8	78.9	80.7	88.6	94.2	3%	5%	15%	23%
	IWW	66.5	71.4	82.1	71.4	82.9	7%	24%	7%	25%
	All	489.6	542.0	621.6	549.3	607.9	11%	27%	12%	24%
Denmark	Road	17.8	20.6	23.5	20.1	22.3	16%	32%	13%	26%
	Rail	2.0	2.1	2.3	2.2	2.4	6%	12%	10%	20%
	IWW	-	-	-	-	-	-	-	-	-
	All	19.8	22.8	25.8	22.3	24.7	15%	30%	13%	25%
Spain	Road	133.1	187.1	247.3	178.5	232.1	41%	86%	34%	74%
	Rail	11.6	11.0	11.6	11.2	11.9	-6%	0%	-4%	3%
	IWW	-	-	-	-	-	-	-	-	-
	All	144.7	198.1	258.9	189.7	244.1	37%	79%	31%	69%
Finland	Road	28.5	30.0	31.7	29.1	29.5	5%	11%	2%	3%
	Rail	10.1	10.6	10.6	10.7	10.8	4%	5%	6%	7%
	IWW	-	-	-	-	-	-	-	-	-
	All	38.6	40.5	42.3	39.8	40.3	5%	10%	3%	4%
France	Road	266.5	310.0	365.5	303.3	345.5	16%	37%	14%	30%
	Rail	55.4	40.6	36.8	42.0	46.3	-27%	-34%	-24%	-16%
	IWW	9.1	8.8	8.9	8.8	9.1	-4%	-2%	-3%	0%
	All	331.0	359.4	411.2	354.1	400.9	9%	24%	7%	21%
Greece	Road	18.8	26.2	34.0	25.7	32.5	39%	81%	37%	73%
	Rail	0.4	0.6	0.5	0.6	0.6	32%	27%	39%	50%
	IWW	-	-	-	-	-	-	-	-	-
	All	19.2	26.8	34.6	26.3	33.2	39%	80%	37%	73%
Ireland	Road	8.3	13.5	17.3	12.7	15.8	62%	109%	53%	91%
	Rail	0.5	0.3	0.3	0.3	0.3	-38%	-42%	-36%	-39%
	IWW	-	-	-	-	-	-	-	-	-
	All	8.8	13.8	17.6	13.0	16.1	57%	101%	48%	84%
Italy	Road	185.1	212.4	260.3	206.9	230.2	15%	41%	12%	24%
	Rail	22.8	19.4	18.1	2-	23.1	-15%	-21%	-12%	1%
	IWW	-	-	-	-	-	-	-	-	-
	All	207.9	231.7	278.4	226.9	253.3	11%	34%	9%	22%
Luxembourg	Road	2.4	3.2	3.4	3.1	3.3	34%	45%	32%	40%
	Rail	0.6	0.6	0.6	0.6	0.6	-12%	-7%	-9%	-3%
	IWW	0.4	0.4	0.5	0.4	0.5	0%	22%	0%	23%
	All	3.4	4.1	4.5	4.1	4.4	22%	33%	21%	30%
Ned	Road	43.1	49.4	59.6	49.1	57.4	15%	38%	14%	33%
	Rail	4.6	5.1	5.5	5.2	5.6	11%	19%	12%	21%
	IWW	41.3	45.5	50.6	45.9	51.4	10%	23%	11%	24%
	All	89.0	100.0	115.7	100.2	114.4	12%	30%	13%	29%

(continued)

(continuation of table)

State	Mode	Observed	Null scenario		Partial A scenario		Null: % change over period		Partial A: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Portugal	Road	14.3	17.2	21.5	16.8	19.8	21%	51%	18%	38%
	Rail	2.2	2.7	2.9	2.7	3.0	25%	31%	24%	37%
	IWW	-	-	-	-	-	-	-	-	-
	All	16.5	20.0	24.4	19.5	22.7	21%	48%	18%	38%
Sweden	Road	31.4	39.1	50.1	38.3	46.5	25%	60%	22%	48%
	Rail	20.1	20.1	21.0	20.9	22.3	0%	5%	4%	11%
	IWW	-	-	-	-	-	-	-	-	-
	All	51.4	59.2	71.2	59.1	68.7	15%	38%	15%	34%
UK	Road	158.0	173.6	206.3	172.9	199.0	10%	31%	9%	26%
	Rail	18.1	22.3	23.0	22.5	23.5	23%	27%	24%	30%
	IWW	-	-	-	-	-	-	-	-	-
	All	176.1	195.9	229.2	195.4	222.5	11%	30%	11%	26%
Czech R.	Road	37.3	59.4	79.5	57.8	76.3	59%	113%	55%	105%
	Rail	17.5	13.6	9.1	14.7	15.6	-22%	-48%	-16%	-11%
	IWW	0.8	0.4	0.4	0.4	0.4	-44%	-49%	-43%	-47%
	All	55.6	73.5	89.0	73.0	92.4	32%	60%	31%	66%
Estonia	Road	2.7	4.3	7.2	4.2	6.8	61%	166%	54%	150%
	Rail	8.1	11.5	12.1	12.5	14.3	42%	50%	54%	76%
	IWW	-	-	-	-	-	-	-	-	-
	All	10.8	15.8	19.3	16.6	21.0	47%	79%	54%	95%
Hungary	Road	19.1	22.9	31.7	22.0	3-	20%	66%	15%	57%
	Rail	8.8	8.3	7.6	8.8	9.0	-6%	-14%	0%	2%
	IWW	0.9	1.1	1.3	1.1	1.3	21%	42%	25%	49%
	All	28.8	32.2	40.5	31.9	40.3	12%	41%	11%	40%
Latvia	Road	4.8	9.7	14.3	8.8	12.7	102%	198%	83%	165%
	Rail	13.3	19.8	24.0	20.5	25.8	49%	80%	54%	94%
	IWW	-	-	-	-	-	-	-	-	-
	All	18.1	29.5	38.3	29.3	38.5	63%	111%	62%	113%
Lithuania	Road	7.8	15.1	22.4	13.8	20.2	94%	189%	78%	160%
	Rail	8.9	12.5	16.4	13.2	17.1	40%	84%	48%	92%
	IWW	-	-	-	-	-	-	-	-	-
	All	16.7	27.6	38.8	27.0	37.3	65%	133%	62%	123%
Poland	Road	72.2	139.1	193.4	134.1	185.2	93%	168%	86%	157%
	Rail	54.0	37.7	31.9	46.3	49.4	-30%	-41%	-14%	-9%
	IWW	1.2	1.0	0.8	1.0	0.8	-18%	-34%	-15%	-30%
	All	127.3	177.7	226.1	181.4	235.4	40%	78%	42%	85%
Slovak R.	Road	21.4	29.0	43.3	28.1	42.0	36%	103%	31%	96%
	Rail	11.2	9.7	4.9	10.1	5.2	-14%	-56%	-10%	-53%
	IWW	1.4	1.6	1.9	1.6	2.0	18%	39%	19%	41%
	All	34.0	40.3	50.2	39.8	49.1	19%	48%	17%	45%
Slovenia	Road	5.3	6.7	8.1	6.4	8.2	26%	53%	21%	55%
	Rail	2.6	3.8	4.9	4.0	5.1	48%	88%	54%	98%
	IWW	-	-	-	-	-	-	-	-	-
	All	7.9	10.5	13.0	10.4	13.4	33%	65%	32%	69%
Cyprus	Road	1.2	1.2	1.3	1.2	1.3	3%	9%	2%	8%
	Rail	-	-	-	-	-	-	-	-	-
	IWW	-	-	-	-	-	-	-	-	-
	All	1.2	1.2	1.3	1.2	1.3	3%	9%	2%	8%
Malta	Road	3.7	3.8	3.9	3.8	3.9	2%	6%	1%	5%
	Rail	-	-	-	-	-	-	-	-	-
	IWW	-	-	-	-	-	-	-	-	-
	All	3.7	3.8	3.9	3.8	3.9	2%	6%	1%	5%

Table 23: Freight demand by Member State for Partial A and B scenarios

State	Mode	Observed	Partial A scenario		Partial B scenario		Partia A: % change over period		Partial B: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Austria	Road	27.5	33.7	39.2	33.3	40.2	23%	43%	21%	46%
	Rail	16.6	19.1	20.0	20.0	20.8	15%	20%	20%	25%
	IWW*	2.4	3.1	3.6	2.8	3.6	27%	47%	15%	46%
	All	46.5	55.9	62.8	56.1	64.5	20%	35%	20%	39%
Belgium	Road	38.4	43.6	48.9	46.4	55.7	14%	27%	21%	45%
	Rail	7.7	7.7	8.1	7.8	8.0	1%	5%	2%	4%
	IWW	7.2	9.1	9.7	9.0	10.1	26%	34%	25%	40%
	All	53.2	60.3	66.6	63.3	73.7	13%	25%	19%	38%
Germany	Road	346.3	389.3	430.8	408.3	491.7	12%	24%	18%	42%
	Rail	76.8	88.6	94.2	90.6	98.3	15%	23%	18%	28%
	IWW	66.5	71.4	82.9	71.8	83.1	7%	25%	8%	25%
	All	489.6	549.3	607.9	570.7	673.2	12%	24%	17%	37%
Denmark	Road	17.8	20.1	22.3	21.1	24.7	13%	26%	19%	39%
	Rail	2.0	2.2	2.4	2.2	2.5	10%	20%	11%	22%
	IWW	-	-	-	-	-	-	-	-	-
	All	19.8	22.3	24.7	23.4	27.2	13%	25%	18%	37%
Spain	Road	133.1	178.5	232.1	180.5	232.0	34%	74%	36%	74%
	Rail	11.6	11.2	11.9	12.0	13.1	-4%	3%	3%	13%
	IWW	-	-	-	-	-	-	-	-	-
	All	144.7	189.7	244.1	192.4	245.1	31%	69%	33%	69%
Finland	Road	28.5	29.1	29.5	30.8	31.4	2%	3%	8%	10%
	Rail	10.1	10.7	10.8	10.7	11.0	6%	7%	6%	9%
	IWW	-	-	-	-	-	-	-	-	-
	All	38.6	39.8	40.3	41.5	42.4	3%	4%	7%	10%
France	Road	266.5	303.3	345.5	327.3	405.1	14%	30%	23%	52%
	Rail	55.4	42.0	46.3	50.4	47.0	-24%	-16%	-9%	-15%
	IWW	9.1	8.8	9.1	8.8	9.1	-3%	0%	-3%	0%
	All	331.0	354.1	400.9	386.5	461.2	7%	21%	17%	39%
Greece	Road	18.8	25.7	32.5	25.7	33.1	37%	73%	36%	76%
	Rail	0.4	0.6	0.6	0.6	0.6	39%	50%	38%	50%
	IWW	-	-	-	0.0	0.0	-	-	-	-
	All	19.2	26.3	33.2	26.2	33.7	37%	73%	37%	75%
Ireland	Road	8.3	12.7	15.8	13.3	16.8	53%	91%	60%	102%
	Rail	0.5	0.3	0.3	0.3	0.3	-36%	-39%	-30%	-40%
	IWW	-	-	-	-	-	-	-	-	-
	All	8.8	13.0	16.1	13.6	17.1	48%	84%	55%	94%
Italy	Road	185.1	206.9	230.2	214.7	249.1	12%	24%	16%	35%
	Rail	22.8	2-	23.1	22.1	23.3	-12%	1%	-3%	2%
	IWW	-	-	-	-	-	-	-	-	-
	All	207.9	226.9	253.3	237.0	272.6	9%	22%	14%	31%
Luxembourg	Road	2.4	3.1	3.3	3.1	4.0	32%	40%	31%	71%
	Rail	0.6	0.6	0.6	0.6	0.6	-9%	-3%	-9%	-4%
	IWW	0.4	0.4	0.5	0.4	0.4	0%	23%	0%	0%
	All	3.4	4.1	4.4	4.0	5.0	21%	30%	20%	49%
Ned	Road	43.1	49.1	57.4	51.4	65.1	14%	33%	19%	51%
	Rail	4.6	5.2	5.6	5.2	5.5	12%	21%	13%	20%
	IWW	41.3	45.9	51.4	48.3	57.8	11%	24%	17%	40%
	All	89.0	100.2	114.4	104.9	128.4	13%	29%	18%	44%

(continued)

(continuation of table)

State	Mode	Observed	Partial A scenario		Partial B scenario		Partial A: % change over period		Partial B: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Portugal	Road	14.3	16.8	19.8	17.0	21.1	18%	38%	19%	48%
	Rail	2.2	2.7	3.0	2.7	2.9	24%	37%	24%	35%
	IWW	-	-	-	-	-	-	-	-	-
	All	16.5	19.5	22.7	19.7	24.1	18%	38%	20%	46%
Sweden	Road	31.4	38.3	46.5	39.2	47.7	22%	48%	25%	52%
	Rail	20.1	20.9	22.3	21.1	22.5	4%	11%	5%	12%
	IWW	-	-	-	-	-	-	-	-	-
	All	51.4	59.1	68.7	60.3	70.2	15%	34%	17%	36%
UK	Road	158.0	172.9	199.0	175.8	189.6	9%	26%	11%	20%
	Rail	18.1	22.5	23.5	22.6	23.7	24%	30%	25%	31%
	IWW	-	-	-	-	-	-	-	-	-
	All	176.1	195.4	222.5	198.4	213.3	11%	26%	13%	21%
Czech R.	Road	37.3	57.8	76.3	60.6	85.1	55%	105%	62%	128%
	Rail	17.5	14.7	15.6	16.4	15.7	-16%	-11%	-6%	-10%
	IWW	0.8	0.4	0.4	0.4	0.4	-43%	-47%	-43%	-47%
	All	55.6	73.0	92.4	77.4	101.2	31%	66%	39%	82%
Estonia	Road	2.7	4.2	6.8	4.2	6.9	54%	150%	55%	157%
	Rail	8.1	12.5	14.3	12.4	14.2	54%	76%	52%	75%
	IWW	-	-	-	-	-	-	-	-	-
	All	10.8	16.6	21.0	16.5	21.1	54%	95%	53%	95%
Hungary	Road	19.1	22.0	3-	27.4	37.6	15%	57%	43%	97%
	Rail	8.8	8.8	9.0	9.4	9.6	0%	2%	7%	9%
	IWW	0.9	1.1	1.3	1.1	1.3	25%	49%	25%	45%
	All	28.8	31.9	40.3	37.9	48.5	11%	40%	32%	68%
Latvia	Road	4.8	8.8	12.7	9.1	13.6	83%	165%	89%	185%
	Rail	13.3	20.5	25.8	20.5	26.0	54%	94%	54%	95%
	IWW	-	-	-	-	-	-	-	-	-
	All	18.1	29.3	38.5	29.5	39.6	62%	113%	63%	119%
Lithuania	Road	7.8	13.8	20.2	14.0	21.4	78%	160%	80%	175%
	Rail	8.9	13.2	17.1	13.2	17.4	48%	92%	48%	95%
	IWW	-	-	-	-	-	-	-	-	-
	All	16.7	27.0	37.3	27.2	38.8	62%	123%	63%	132%
Poland	Road	72.2	134.1	185.2	135.1	187.6	86%	157%	87%	160%
	Rail	54.0	46.3	49.4	48.6	48.8	-14%	-9%	-10%	-10%
	IWW	1.2	1.0	0.8	1.0	0.8	-15%	-30%	-13%	-28%
	All	127.3	181.4	235.4	184.7	237.3	42%	85%	45%	86%
Slovak R.	Road	21.4	28.1	42.0	35.9	44.9	31%	96%	68%	110%
	Rail	11.2	10.1	5.2	9.9	5.1	-10%	-53%	-12%	-55%
	IWW	1.4	1.6	2.0	1.7	1.9	19%	41%	20%	40%
	All	34.0	39.8	49.1	47.5	51.9	17%	45%	40%	53%
Slovenia	Road	5.3	6.4	8.2	7.2	9.0	21%	55%	36%	69%
	Rail	2.6	4.0	5.1	4.0	5.1	54%	98%	52%	95%
	IWW	-	-	-	-	-	-	-	-	-
	All	7.9	10.4	13.4	11.2	14.0	32%	69%	41%	78%
Cyprus	Road	1.2	1.2	1.3	1.2	1.3	2%	8%	2%	8%
	Rail	-	-	-	-	-	-	-	-	-
	IWW	-	-	-	-	-	-	-	-	-
	All	1.2	1.2	1.3	1.2	1.3	2%	8%	2%	8%
Malta	Road	3.7	3.8	3.9	3.7	3.9	1%	5%	1%	5%
	Rail	-	-	-	-	-	-	-	-	-
	IWW	-	-	-	-	-	-	-	-	-
	All	3.7	3.8	3.9	3.7	3.9	1%	5%	1%	5%

Table 24: Freight demand by Member State for Full and Extended scenarios

State	Mode	Observed	Full scenario		Extended scenario		Full: % change over period		Ext.: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Austria	Road	27.5	32.2	36.0	31.4	34.1	17%	31%	14%	24%
	Rail	16.6	19.4	20.7	2-	21.8	17%	25%	21%	31%
	IWW*	2.4	3.1	3.6	3.1	3.7	27%	48%	28%	51%
	All	46.5	54.6	60.3	54.5	59.5	17%	29%	17%	28%
Belgium	Road	38.4	42.6	46.4	42.0	45.4	11%	21%	10%	18%
	Rail	7.7	7.7	8.9	7.9	9.2	1%	15%	3%	20%
	IWW	7.2	9.1	9.7	9.3	10.1	26%	35%	28%	39%
	All	53.2	59.3	64.9	59.2	64.6	11%	22%	11%	21%
Germany	Road	346.3	387.7	430.9	384.5	414.7	12%	24%	11%	20%
	Rail	76.8	93.3	99.6	94.1	108.9	21%	30%	23%	42%
	IWW	66.5	72.1	83.3	72.5	84.6	9%	25%	9%	27%
	All	489.6	553.1	613.8	551.1	608.2	13%	25%	13%	24%
Denmark	Road	17.8	19.8	21.5	19.6	20.8	12%	21%	11%	17%
	Rail	2.0	2.3	2.4	2.4	2.7	12%	20%	19%	31%
	IWW	-	-	-	-	-	-	-	-	-
	All	19.8	22.1	23.9	22.0	23.5	12%	21%	11%	19%
Spain	Road	133.1	174.3	222.0	172.9	215.0	31%	67%	30%	62%
	Rail	11.6	11.2	12.2	11.4	13.0	-4%	5%	-2%	12%
	IWW	-	-	-	-	-	-	-	-	-
	All	144.7	185.4	234.1	184.2	228.0	28%	62%	27%	58%
Finland	Road	28.5	28.3	27.9	27.8	27.1	-1%	-2%	-2%	-5%
	Rail	10.1	10.8	11.0	10.9	11.7	7%	9%	8%	16%
	IWW	-	-	-	-	-	-	-	-	-
	All	38.6	39.1	38.9	38.7	38.8	1%	1%	0%	0%
France	Road	266.5	298.2	326.3	295.8	313.8	12%	22%	11%	18%
	Rail	55.4	42.0	60.6	42.3	69.0	-24%	9%	-24%	25%
	IWW	9.1	8.9	9.2	9.0	9.5	-3%	1%	-2%	4%
	All	331.0	349.1	396.1	347.0	392.3	5%	20%	5%	19%
Greece	Road	18.8	25.8	31.0	25.6	29.9	37%	65%	36%	59%
	Rail	0.4	0.6	0.7	0.6	0.7	42%	62%	44%	73%
	IWW	-	-	-	-	-	-	-	-	-
	All	19.2	26.4	31.7	26.2	30.6	37%	65%	36%	59%
Ireland	Road	8.3	12.4	14.6	12.1	13.6	50%	76%	46%	64%
	Rail	0.5	0.3	0.3	0.3	0.3	-34%	-36%	-32%	-33%
	IWW	-	-	-	-	-	-	-	-	-
		8.8	12.8	14.9	12.5	14.0	45%	70%	42%	59%
Italy	Road	185.1	204.4	215.0	201.1	202.1	10%	16%	9%	9%
	Rail	22.8	20.3	25.7	21.1	31.1	-11%	13%	-7%	36%
	IWW	-	-	-	-	-	-98%	-100%	-98%	-100%
	All	207.9	224.7	240.7	222.3	233.2	8%	16%	7%	12%
Luxembourg	Road	2.4	3.1	3.2	3.1	3.1	31%	36%	30%	33%
	Rail	0.6	0.6	0.6	0.6	0.6	-12%	-8%	-11%	-5%
	IWW	0.4	0.4	0.5	0.4	0.5	-1%	23%	-1%	24%
	All	3.4	4.0	4.2	4.0	4.2	19%	26%	19%	25%
Ned	Road	43.1	48.3	55.1	47.7	53.6	12%	28%	11%	24%
	Rail	4.6	5.3	5.7	5.4	6.1	15%	24%	18%	31%
	IWW	41.3	46.1	51.8	46.7	53.0	12%	25%	13%	28%
	All	89.0	99.7	112.5	99.8	112.6	12%	26%	12%	27%
Portugal	Road	14.3	16.6	18.8	16.3	17.9	17%	32%	14%	25%
	Rail	2.2	2.7	3.0	2.7	3.0	24%	36%	23%	38%
	IWW		-	-	-	-	-		-	-
	All	16.5	19.3	21.8	18.9	20.9	18%	32%	15%	27%

(continued)

(continuation of table)

State	Mode	Observed	Full scenario		Extended scenario		Full: % change over period		Ext.: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Sweden	Road	31.4	37.0	43.7	36.5	41.8	18%	39%	16%	33%
	Rail	20.1	21.4	23.5	22.2	25.7	6%	17%	10%	28%
	IWW	-	-	-	-	-	-	-	-	-
	All	51.4	58.3	67.2	58.7	67.5	13%	31%	14%	31%
UK	Road	158.0	172.8	198.0	170.7	192.9	9%	25%	8%	22%
	Rail	18.1	23.0	24.1	24.3	25.5	27%	33%	34%	41%
	IWW	-	-	-	-	-	-	-	-	-
	All	176.1	195.8	222.1	195.0	218.4	11%	26%	11%	24%
Czech R.	Road	37.3	53.7	71.3	52.8	68.3	44%	91%	42%	83%
	Rail	17.5	17.6	15.9	17.9	17.9	0%	-9%	2%	2%
	IWW	0.8	0.4	0.4	0.4	0.4	-43%	-48%	-42%	-46%
	All	55.6	71.6	87.6	71.2	86.6	29%	58%	28%	56%
Estonia	Road	2.7	4.0	6.1	3.7	5.4	47%	124%	36%	100%
	Rail	8.1	14.4	14.7	14.7	16.6	78%	81%	81%	104%
	IWW	-	-	-	-	-	-	-	-	-
	All	10.8	18.4	20.7	18.3	21.9	70%	92%	70%	103%
Hungary	Road	19.1	21.3	29.3	21.1	29.1	11%	53%	10%	52%
	Rail	8.8	9.6	9.2	1-	10.6	9%	5%	14%	21%
	IWW	0.9	1.1	1.3	1.1	1.4	25%	51%	28%	58%
	All	28.8	32.1	39.9	32.3	41.1	11%	39%	12%	43%
Latvia	Road	4.8	8.3	10.9	7.4	6.2	73%	127%	54%	30%
	Rail	13.3	22.2	26.5	23.4	26.8	67%	99%	76%	101%
	IWW	-	-	-	-	-	-	-	-	-
	All	18.1	30.5	37.3	30.8	33.1	69%	106%	70%	83%
Lithuania	Road	7.8	13.0	17.7	11.8	12.2	67%	127%	52%	57%
	Rail	8.9	14.4	16.7	14.9	17.1	61%	87%	67%	92%
	IWW	-	-	-	-	-	-	-	-	-
	All	16.7	27.4	34.4	26.8	29.3	64%	106%	60%	76%
Poland	Road	72.2	129.3	176.8	126.9	171.0	79%	145%	76%	137%
	Rail	54.0	50.5	53.9	55.5	58.3	-6%	0%	3%	8%
	IWW	1.2	1.0	0.8	1.0	0.9	-14%	-29%	-12%	-26%
	All	127.3	180.9	231.5	183.5	230.1	42%	82%	44%	81%
Slovak R.	Road	21.4	27.1	40.4	26.7	40.1	27%	89%	25%	88%
	Rail	11.2	10.4	5.4	10.6	5.6	-8%	-51%	-5%	-50%
	IWW	1.4	1.6	2.0	1.7	2.0	19%	42%	20%	45%
	All	34.0	39.2	47.8	39.1	47.8	15%	41%	15%	41%
Slovenia	Road	5.3	6.4	7.8	6.4	7.8	21%	48%	21%	46%
	Rail	2.6	4.1	5.3	4.2	5.5	57%	103%	60%	110%
	IWW	0.0	-	-	-	-	-	-	-	-
	All	7.9	10.5	13.1	10.6	13.2	33%	66%	34%	67%
Cyprus	Road	1.2	1.2	1.3	1.2	1.3	1%	6%	0%	6%
	Rail	-	-	-	-	-	-	-	-	-
	IWW	-	-	-	-	-	-	-	-	-
	All	1.2	1.2	1.3	1.2	1.3	1%	6%	0%	6%
Malta	Road	3.7	3.7	3.9	3.7	3.9	0%	4%	0%	5%
	Rail	-	-	-	-	-	-	-	-	-
	IWW	-	-	-	-	-	-	-	-	-
	All	3.7	3.7	3.9	3.7	3.9	0%	4%	0%	5%

Table 25: Passenger demand by Member State for Null and Partial scenarios

State	Mode	Observed	Null scenario		Partial scenario		Null: % change over period		Partial: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Austria	Car	70.9	82.4	94.8	82.3	94.7	16%	34%	16%	34%
	Bus/coach	13.1	13.5	13.8	13.5	13.8	3%	6%	3%	5%
	Train	11.0	13.2	13.7	13.4	14.1	20%	25%	22%	29%
	Air	4.6	7.2	10.2	7.2	10.3	56%	121%	57%	124%
	Walk/cycle	4.5	4.6	5.0	4.6	5.0	3%	12%	3%	12%
	All	104.0	120.9	137.6	121.1	138.0	16%	32%	16%	33%
Belgium	Car	107.3	122.0	136.6	121.9	136.4	14%	27%	14%	27%
	Bus/coach	13.2	13.1	12.1	13.1	12.1	-1%	-8%	-1%	-8%
	Train	8.6	9.3	9.7	9.5	10.0	9%	13%	10%	16%
	Air	6.5	10.0	13.7	10.0	13.9	53%	111%	53%	115%
	Walk/cycle	7.2	8.0	8.4	8.0	8.4	12%	17%	12%	17%
	All	142.8	162.4	180.6	162.5	180.8	14%	26%	14%	27%
Germany	Car	871.8	1005.3	1172.6	1004.9	1171.5	15%	35%	15%	34%
	Bus/coach	69.0	81.8	85.6	81.7	85.4	19%	24%	18%	24%
	Train	82.3	84.5	92.5	85.6	95.1	3%	12%	4%	16%
	Air	38.3	54.9	70.7	54.0	73.1	43%	85%	41%	91%
	Walk/cycle	54.5	60.3	63.9	60.3	63.8	11%	17%	11%	17%
	All	1115.9	1286.8	1485.4	1286.6	1488.9	15%	33%	15%	33%
Denmark	Car	59.8	63.4	67.1	63.4	67.0	6%	12%	6%	12%
	Bus/coach	9.1	9.2	9.0	9.2	9.0	1%	-1%	1%	-2%
	Train	5.3	5.5	5.7	5.6	5.9	4%	7%	6%	11%
	Air	6.3	8.9	11.9	8.9	12.1	42%	88%	41%	92%
	Walk/cycle	7.3	7.5	8.8	7.5	8.8	3%	20%	3%	20%
	All	87.9	94.6	102.4	94.6	102.8	8%	17%	8%	17%
Spain	Car	315.2	404.6	494.2	404.4	493.6	28%	57%	28%	57%
	Bus/coach	50.3	54.3	49.0	54.2	48.9	8%	-3%	8%	-3%
	Train	25.4	34.6	40.3	35.1	41.6	36%	59%	38%	64%
	Air	59.3	93.0	126.4	92.9	127.1	57%	113%	57%	114%
	Walk/cycle	15.5	19.5	20.1	19.5	20.1	26%	30%	26%	30%
	All	465.7	606.0	730.0	606.2	731.2	30%	57%	30%	57%
Finland	Car	56.6	62.9	74.2	62.8	73.9	11%	31%	11%	31%
	Bus/coach	7.7	7.5	7.1	7.5	7.1	-3%	-7%	-3%	-7%
	Train	3.9	4.2	4.3	4.3	4.6	7%	10%	11%	19%
	Air	5.7	8.5	11.5	8.4	11.6	48%	101%	48%	103%
	Walk/cycle	3.3	3.4	3.7	3.4	3.7	4%	12%	4%	12%
	All	77.2	86.5	100.8	86.5	100.9	12%	31%	12%	31%
France	Car	711.9	815.2	921.5	814.7	919.8	15%	29%	14%	29%
	Bus/coach	43.0	43.6	40.2	43.6	40.1	2%	-7%	1%	-7%
	Train	80.0	97.1	103.9	98.6	106.9	21%	30%	23%	34%
	Air	27.2	39.8	53.9	39.6	55.1	46%	98%	45%	103%
	Walk/cycle	28.2	32.8	35.0	32.8	35.0	16%	24%	16%	24%
	All	890.3	1028.6	1154.5	1029.3	1156.9	16%	30%	16%	30%
Greece	Car	96.3	111.8	129.8	111.8	129.8	16%	35%	16%	35%
	Bus/coach	21.7	21.1	20.2	21.1	20.2	-3%	-7%	-3%	-7%
	Train	3.1	3.5	3.9	3.6	4.1	13%	25%	16%	32%
	Air	21.4	31.9	43.3	31.9	43.4	49%	102%	49%	103%
	Walk/cycle	4.9	6.0	6.3	6.0	6.3	22%	29%	22%	28%
	All	147.3	174.3	203.4	174.3	203.7	18%	38%	18%	38%

(continued)

(continuation of table)

State	Mode	Observed 2000	Null scenario 2010	Null scenario 2020	Partial scenario 2010	Partial scenario 2020	Null: % change over period 2000-2010	Null: % change over period 2000-2020	Partial: % change over period 2000-2010	Partial: % change over period 2000-2020
Ireland	Car	33.7	43.6	57.1	43.5	57.1	29%	70%	29%	69%
	Bus/coach	6.1	6.7	6.9	6.7	6.9	9%	13%	9%	13%
	Train	1.4	1.7	1.9	1.7	1.9	20%	35%	22%	39%
	Air	5.1	8.8	13.2	8.8	13.3	72%	159%	72%	161%
	Walk/cycle	2.1	2.2	2.4	2.2	2.4	6%	15%	6%	15%
	All	48.4	62.9	81.6	62.9	81.7	30%	68%	30%	69%
Italy	Car	793.5	843.7	897.1	843.4	896.4	6%	13%	6%	13%
	Bus/coach	94.0	95.1	92.8	95.1	92.7	1%	-1%	1%	-1%
	Train	52.5	50.2	48.1	51.0	49.4	-4%	-8%	-3%	-6%
	Air	27.2	38.8	50.0	38.7	50.2	43%	84%	42%	85%
	Walk/cycle	32.6	39.7	39.5	39.7	39.5	22%	21%	22%	21%
	All	999.8	1067.6	1127.5	1067.8	1128.2	7%	13%	7%	13%
Luxem-bourg	Car	5.1	5.9	6.5	5.9	6.5	15%	27%	15%	27%
	Bus/coach	0.9	0.9	0.9	0.9	0.9	5%	2%	5%	2%
	Train	0.3	0.3	0.3	0.3	0.3	-3%	-4%	-2%	-3%
	Air	0.5	0.8	1.1	0.8	1.1	63%	122%	66%	124%
	Walk/cycle	0.2	0.2	0.3	0.2	0.3	18%	36%	18%	36%
	All	7.1	8.3	9.2	8.3	9.2	17%	29%	17%	30%
Netherlands	Car	142.1	164.6	191.8	164.6	191.7	16%	35%	16%	35%
	Bus/coach	7.5	7.2	6.4	7.2	6.4	-4%	-14%	-4%	-15%
	Train	16.2	19.7	22.5	20.0	23.3	22%	39%	24%	44%
	Air	9.6	15.0	20.7	15.0	21.1	56%	116%	56%	120%
	Walk/cycle	19.5	19.0	19.5	19.0	19.5	-3%	0%	-3%	0%
	All	194.9	225.5	260.9	225.8	262.0	16%	34%	16%	34%
Portugal	Car	93.5	100.0	115.4	100.0	115.4	7%	23%	7%	23%
	Bus/coach	11.8	12.7	11.4	12.7	11.4	8%	-4%	8%	-4%
	Train	4.3	4.4	4.4	4.5	4.6	4%	3%	6%	7%
	Air	8.8	13.4	18.6	13.4	18.7	52%	111%	52%	112%
	Walk/cycle	3.8	4.2	4.6	4.2	4.6	12%	22%	12%	22%
	All	122.2	134.8	154.4	134.9	154.7	10%	26%	10%	27%
Sweden	Car	91.9	105.0	122.2	105.0	122.1	14%	33%	14%	33%
	Bus/coach	9.3	9.5	9.6	9.5	9.5	2%	3%	2%	3%
	Train	10.4	12.5	12.4	12.7	12.8	21%	19%	23%	24%
	Air	12.6	18.6	24.1	18.8	23.9	48%	91%	50%	90%
	Walk/cycle	5.8	6.1	6.8	6.1	6.8	5%	17%	5%	17%
	All	130.0	151.8	175.0	152.2	175.2	17%	35%	17%	35%
UK	Car	644.0	775.9	912.1	775.8	911.8	20%	42%	20%	42%
	Bus/coach	45.0	46.3	48.3	46.2	48.1	3%	7%	3%	7%
	Train	46.7	51.4	52.7	52.3	54.5	10%	13%	12%	17%
	Air	50.5	78.4	109.4	78.3	110.5	55%	117%	55%	119%
	Walk/cycle	25.7	30.1	32.3	30.1	32.2	17%	26%	17%	25%
	All	811.9	982.0	1154.8	982.6	1157.2	21%	42%	21%	43%
Czech R.	Car	63.9	90.7	115.9	90.7	115.8	42%	81%	42%	81%
	Bus/coach	9.4	8.8	8.2	8.8	8.2	-6%	-12%	-6%	-12%
	Train	15.4	14.9	15.2	15.2	15.7	-3%	-1%	-1%	2%
	Air	2.2	3.8	6.0	3.8	6.1	76%	179%	75%	183%
	Walk/cycle	3.6	4.2	4.9	4.2	4.9	17%	37%	17%	37%
	All	94.4	122.3	150.2	122.6	150.7	30%	59%	30%	60%

(continued)

(continuation of table)

State	Mode	Observed 2000	Null scenario 2010	Null scenario 2020	Partial scenario 2010	Partial scenario 2020	Null: % change over period 2000-2010	Null: % change over period 2000-2020	Partial: % change over period 2000-2010	Partial: % change over period 2000-2020
Estonia	Car	4.3	6.0	7.9	6.0	7.9	38%	83%	38%	82%
	Bus/coach	2.6	2.5	2.3	2.5	2.2	-6%	-14%	-7%	-15%
	Train	0.3	0.2	0.2	0.2	0.3	-7%	-8%	-6%	-4%
	Air	0.2	0.4	0.6	0.4	0.6	102%	205%	101%	206%
	Walk/cycle	0.1	0.1	0.2	0.1	0.2	15%	24%	15%	24%
	All	7.5	9.2	11.1	9.2	11.1	22%	48%	22%	47%
Hungary	Car	46.6	60.8	75.1	60.8	75.0	31%	61%	31%	61%
	Bus/coach	18.7	17.3	15.5	17.3	15.5	-8%	-17%	-8%	-18%
	Train	10.3	9.8	9.2	9.9	9.5	-5%	-10%	-4%	-8%
	Air	1.6	3.6	5.9	3.6	5.9	126%	268%	124%	270%
	Walk/cycle	3.3	3.7	3.9	3.7	3.9	12%	16%	12%	16%
	All	80.5	95.2	109.6	95.3	109.8	18%	36%	18%	36%
Latvia	Car	6.6	9.9	13.3	9.8	13.2	49%	100%	49%	99%
	Bus/coach	2.3	2.1	2.0	2.1	2.0	-9%	-15%	-10%	-16%
	Train	1.3	1.2	1.2	1.2	1.2	-7%	-12%	-6%	-11%
	Air	0.2	0.2	0.2	0.2	0.2	30%	41%	29%	40%
	Walk/cycle	0.2	0.2	0.2	0.2	0.2	15%	24%	15%	24%
	All	10.6	13.6	16.9	13.6	16.8	28%	59%	28%	58%
Lithuania	Car	14.3	20.2	25.0	20.2	24.9	41%	75%	41%	74%
	Bus/coach	2.2	2.0	1.8	2.0	1.8	-7%	-15%	-7%	-16%
	Train	0.6	0.6	0.6	0.6	0.6	-5%	-10%	-3%	-6%
	Air	0.2	0.3	0.3	0.3	0.3	30%	51%	29%	52%
	Walk/cycle	0.1	0.1	0.2	0.1	0.2	16%	27%	16%	26%
	All	17.4	23.2	27.8	23.2	27.7	33%	60%	33%	60%
Poland	Car	149.7	231.9	311.1	231.7	310.3	55%	108%	55%	107%
	Bus/coach	31.7	30.0	27.6	30.0	27.5	-5%	-13%	-6%	-13%
	Train	19.7	19.3	17.8	19.7	18.5	-2%	-10%	0%	-6%
	Air	1.7	3.2	5.0	3.2	5.1	85%	193%	83%	195%
	Walk/cycle	9.4	11.5	12.3	11.5	12.3	23%	31%	23%	31%
	All	212.2	296.0	373.9	296.1	373.6	39%	76%	39%	76%
Slovak R.	Car	23.9	30.2	36.9	30.2	36.9	26%	54%	26%	54%
	Bus/coach	8.4	8.0	7.2	8.0	7.2	-5%	-15%	-5%	-15%
	Train	3.2	2.5	2.3	2.6	2.4	-20%	-27%	-18%	-24%
	Air	0.1	0.2	0.3	0.2	0.3	82%	183%	81%	184%
	Walk/cycle	1.6	1.8	2.1	1.8	2.1	18%	32%	18%	32%
	All	37.2	42.8	48.8	42.9	48.8	15%	31%	15%	31%
Slovenia	Car	10.0	12.0	15.7	12.0	15.7	19%	57%	19%	56%
	Bus/coach	2.2	1.4	1.3	1.4	1.3	-36%	-42%	-36%	-42%
	Train	0.7	1.0	1.2	1.0	1.3	41%	76%	43%	83%
	Air	0.2	0.3	0.5	0.3	0.5	91%	195%	91%	198%
	Walk/cycle	0.6	0.6	0.7	0.6	0.7	5%	18%	5%	18%
	All	13.7	15.3	19.4	15.3	19.4	12%	42%	12%	42%
Cyprus	Car	3.5	4.1	4.7	4.1	4.7	18%	36%	18%	36%
	Bus/coach	0.6	0.6	0.6	0.6	0.6	6%	9%	6%	9%
	Air	6.1	8.5	11.0	8.5	11.1	40%	82%	39%	82%
	Walk/cycle	0.03	0.03	0.03	0.03	0.03	7%	13%	7%	13%
	All	10.2	13.2	16.4	13.2	16.5	30%	62%	30%	62%
Malta	Car	2.2	2.4	2.6	2.4	2.6	11%	20%	11%	20%
	Bus/coach	0.017	0.018	0.019	0.018	0.019	8%	14%	8%	14%
	Air	2.0	2.8	3.8	2.8	3.8	42%	90%	42%	91%
	Walk/cycle	0.1	0.1	0.1	0.1	0.1	1%	12%	1%	12%
	All	4.3	5.4	6.5	5.4	6.6	25%	53%	25%	53%

Table 26: Passenger demand by Member State for Full and Extended scenarios

State	Mode	Ob-served	Full scenario		Extended scenario		Full: % change over period		Ext.: % change over period	
		2000	2010	2020	2010	2020	2000-2010	2000-2020	2000-2010	2000-2020
Austria	Car	70.9	84.3	96.6	83.8	90.8	19%	36%	18%	28%
	Bus/coach	13.1	13.6	14.2	13.7	14.7	4%	8%	4%	12%
	Train	11.0	13.4	14.2	13.2	15.0	22%	30%	21%	36%
	Air	4.6	6.3	9.4	6.5	8.4	37%	104%	41%	83%
	Walk/cycle	4.5	4.6	4.9	4.5	5.1	1%	9%	0%	13%
	All	104.0	122.2	139.3	121.8	133.9	17%	34%	17%	29%
Belgium	Car	107.3	124.3	138.9	123.9	125.1	16%	29%	15%	17%
	Bus/coach	13.2	13.3	12.7	13.4	13.0	1%	-4%	2%	-1%
	Train	8.6	9.4	10.0	9.3	10.7	10%	16%	9%	25%
	Air	6.5	8.3	12.2	8.6	10.2	27%	88%	32%	57%
	Walk/cycle	7.2	7.9	8.2	7.8	8.7	10%	14%	9%	21%
	All	142.8	163.3	182.0	163.0	167.9	14%	27%	14%	18%
Germany	Car	871.8	1013.5	1181.0	1018.7	1115.4	16%	35%	17%	28%
	Bus/coach	69.0	83.2	89.2	83.7	93.5	21%	29%	21%	35%
	Train	82.3	85.2	95.3	84.9	104.6	4%	16%	3%	27%
	Air	38.3	32.5	50.0	35.2	33.8	-15%	31%	-8%	-12%
	Walk/cycle	54.5	59.7	62.9	59.3	63.5	10%	15%	9%	17%
	All	1115.9	1274.2	1478.3	1281.8	1410.9	14%	32%	15%	26%
Denmark	Car	59.8	64.0	67.6	63.9	62.8	7%	13%	7%	5%
	Bus/coach	9.1	9.3	9.2	9.3	9.5	1%	0%	2%	4%
	Train	5.3	5.6	5.9	5.6	6.2	6%	11%	5%	17%
	Air	6.3	6.1	9.5	6.6	6.5	-3%	51%	5%	3%
	Walk/cycle	7.3	7.5	8.6	7.4	8.7	2%	18%	2%	19%
	All	87.9	92.5	100.9	92.8	93.7	5%	15%	6%	7%
Spain	Car	315.2	408.4	498.3	411.1	462.2	30%	58%	30%	47%
	Bus/coach	50.3	54.9	50.4	55.1	52.6	9%	0%	10%	5%
	Train	25.4	35.2	41.9	34.7	44.9	39%	65%	37%	77%
	Air	59.3	86.6	121.2	88.3	114.5	46%	104%	49%	93%
	Walk/cycle	15.5	19.2	19.6	19.0	21.2	24%	26%	22%	37%
	All	465.7	604.2	731.4	608.2	695.3	30%	57%	31%	49%
Finland	Car	56.6	63.9	75.1	63.8	68.6	13%	33%	13%	21%
	Bus/coach	7.7	7.6	7.3	7.6	7.7	-2%	-5%	-1%	-1%
	Train	3.9	4.3	4.6	4.2	4.8	11%	17%	8%	24%
	Air	5.7	7.6	10.6	7.7	10.0	33%	86%	36%	76%
	Walk/cycle	3.3	3.4	3.6	3.4	3.8	3%	10%	2%	14%
	All	77.2	86.8	101.3	86.7	94.9	12%	31%	12%	23%
France	Car	711.9	831.6	936.3	828.5	861.2	17%	32%	16%	21%
	Bus/coach	43.0	44.5	42.3	44.9	44.3	4%	-2%	4%	3%
	Train	80.0	99.0	107.8	97.9	117.3	24%	35%	22%	47%
	Air	27.2	29.8	44.9	31.5	33.8	9%	65%	16%	24%
	Walk/cycle	28.2	32.4	34.4	32.2	35.0	15%	22%	14%	24%
	All	890.3	1037.3	1165.6	1034.8	1091.5	17%	31%	16%	23%
Greece	Car	96.3	114.3	132.3	113.9	121.2	19%	37%	18%	26%
	Bus/coach	21.7	21.4	21.0	21.5	21.6	-1%	-3%	-1%	-1%
	Train	3.1	3.6	4.1	3.5	4.3	17%	35%	15%	41%
	Air	21.4	30.3	41.9	30.6	39.5	42%	96%	43%	85%
	Walk/cycle	4.9	5.9	6.1	5.8	6.6	20%	25%	18%	35%
	All	147.3	175.5	205.4	175.3	193.2	19%	39%	19%	31%

(continued)

(continuation of table)

State	Mode	Observed 2000	Full scenario 2010	Full scenario 2020	Extended scenario 2010	Extended scenario 2020	Full: % change over period 2000-2010	Full: % change over period 2000-2020	Ext.: % change over period 2000-2010	Ext.: % change over period 2000-2020
Ireland	Car	33.7	44.3	57.9	44.2	51.4	31%	72%	31%	52%
	Bus/coach	6.1	6.7	7.0	6.8	7.7	10%	15%	11%	25%
	Train	1.4	1.7	2.0	1.7	2.0	22%	40%	21%	41%
	Air	5.1	8.0	12.4	8.1	11.1	56%	143%	59%	118%
	Walk/cycle	2.1	2.2	2.4	2.2	2.4	5%	13%	5%	17%
	All	48.4	62.9	81.7	62.9	74.5	30%	69%	30%	54%
Italy	Car	793.5	855.9	908.3	854.1	783.3	8%	14%	8%	-1%
	Bus/coach	94.0	96.5	95.8	96.9	98.3	3%	2%	3%	5%
	Train	52.5	51.2	50.0	50.8	53.4	-2%	-5%	-3%	2%
	Air	27.2	35.6	47.3	36.3	44.8	31%	74%	33%	65%
	Walk/cycle	32.6	39.4	39.0	39.1	39.0	21%	20%	20%	20%
	All	999.8	1078.6	1140.4	1077.3	1018.8	8%	14%	8%	2%
Luxem-bourg	Car	5.1	6.0	6.7	6.0	6.2	17%	30%	17%	20%
	Bus/coach	0.9	1.0	1.0	1.0	1.1	6%	6%	8%	19%
	Train	0.3	0.3	0.3	0.3	0.4	-1%	-4%	-3%	12%
	Air	0.5	0.9	1.2	0.9	1.2	86%	144%	87%	144%
	Walk/cycle	0.2	0.2	0.3	0.2	0.3	16%	32%	14%	38%
	All	7.1	8.5	9.5	8.5	9.1	20%	33%	20%	29%
Netherlands	Car	142.1	167.4	194.7	167.0	183.2	18%	37%	17%	29%
	Bus/coach	7.5	7.4	6.7	7.5	7.4	-2%	-10%	0%	-1%
	Train	16.2	19.9	23.4	19.8	23.9	23%	44%	22%	48%
	Air	9.6	12.2	18.2	12.7	15.3	27%	90%	33%	59%
	Walk/cycle	19.5	18.8	19.2	18.7	19.2	-4%	-1%	-4%	-2%
	All	194.9	225.7	262.2	225.7	249.0	16%	35%	16%	28%
Portugal	Car	93.5	101.6	117.2	101.5	110.2	9%	25%	9%	18%
	Bus/coach	11.8	12.9	11.8	13.0	12.6	9%	0%	10%	7%
	Train	4.3	4.5	4.6	4.5	4.7	6%	9%	6%	11%
	Air	8.8	11.6	17.1	12.1	15.0	32%	94%	37%	71%
	Walk/cycle	3.8	4.2	4.6	4.2	4.7	10%	20%	10%	23%
	All	122.2	134.8	155.3	135.2	147.3	10%	27%	11%	20%
Sweden	Car	91.9	106.8	124.1	106.5	120.2	16%	35%	16%	31%
	Bus/coach	9.3	9.6	9.8	9.6	10.0	3%	6%	4%	8%
	Train	10.4	12.8	12.9	12.6	13.2	23%	25%	22%	28%
	Air	12.6	32.3	51.5	34.4	47.4	156%	309%	173%	276%
	Walk/cycle	5.8	6.1	6.7	6.0	6.6	5%	16%	4%	14%
	All	130.0	167.5	205.1	169.2	197.5	29%	58%	30%	52%
UK	Car	644.0	781.3	917.8	785.1	855.8	21%	43%	22%	33%
	Bus/coach	45.0	47.0	50.2	47.2	53.0	4%	12%	5%	18%
	Train	46.7	52.3	55.0	51.8	55.3	12%	18%	11%	18%
	Air	50.5	68.7	100.4	70.4	87.9	36%	99%	39%	74%
	Walk/cycle	25.7	29.8	31.8	29.6	32.5	16%	24%	15%	26%
	All	811.9	979.0	1155.1	984.1	1084.6	21%	42%	21%	34%
Czech R.	Car	63.9	91.5	116.8	92.0	106.8	43%	83%	44%	67%
	Bus/coach	9.4	8.8	8.4	8.9	9.0	-6%	-10%	-5%	-4%
	Train	15.4	15.3	16.0	15.1	16.5	-1%	4%	-2%	8%
	Air	2.2	3.5	5.8	3.6	5.5	63%	166%	65%	154%
	Walk/cycle	3.6	4.2	4.8	4.1	5.2	16%	35%	16%	44%
	All	94.4	123.3	151.8	123.7	143.0	31%	61%	31%	51%

(continued)

(continuation of table)

State	Mode	Observed 2000	Full scenario 2010	Full scenario 2020	Extended scenario 2010	Extended scenario 2020	Full: % change over period 2000-2010	Full: % change over period 2000-2020	Ext.: % change over period 2000-2010	Ext.: % change over period 2000-2020
Estonia	Car	4.3	6.0	7.9	6.0	7.4	39%	83%	39%	72%
	Bus/coach	2.6	2.5	2.3	2.5	2.3	-6%	-14%	-6%	-11%
	Train	0.3	0.2	0.3	0.2	0.3	-5%	-3%	-6%	4%
	Air	0.2	0.4	0.6	0.4	0.5	91%	194%	92%	187%
	Walk/cycle	0.1	0.1	0.2	0.1	0.2	15%	24%	15%	26%
	All	7.5	9.2	11.1	9.2	10.8	23%	48%	23%	43%
Hungary	Car	46.6	61.4	75.6	61.6	69.3	32%	62%	32%	49%
	Bus/coach	18.7	17.3	15.7	17.4	17.4	-8%	-16%	-7%	-7%
	Train	10.3	10.1	9.7	9.9	10.9	-2%	-6%	-3%	6%
	Air	1.6	3.3	5.5	3.3	5.1	106%	244%	107%	219%
	Walk/cycle	3.3	3.7	3.8	3.7	4.1	12%	15%	11%	22%
	All	80.5	95.8	110.3	96.0	106.7	19%	37%	19%	33%
Latvia	Car	6.6	9.9	13.3	10.0	12.5	50%	101%	50%	88%
	Bus/coach	2.3	2.1	2.0	2.1	2.1	-9%	-14%	-9%	-10%
	Train	1.3	1.2	1.2	1.2	1.2	-6%	-10%	-6%	-6%
	Air	0.2	0.2	0.2	0.2	0.2	23%	35%	24%	27%
	Walk/cycle	0.2	0.2	0.2	0.2	0.2	15%	24%	14%	26%
	All	10.6	13.7	16.9	13.7	16.3	29%	59%	29%	53%
Lithuania	Car	14.3	20.6	25.2	20.4	23.4	44%	76%	43%	64%
	Bus/coach	2.2	2.0	1.8	2.0	1.9	-7%	-15%	-6%	-11%
	Train	0.6	0.6	0.6	0.6	0.6	-2%	-5%	-3%	2%
	Air	0.2	0.3	0.3	0.3	0.3	25%	47%	26%	43%
	Walk/cycle	0.1	0.1	0.2	0.1	0.2	16%	26%	16%	29%
	All	17.4	23.6	28.0	23.4	26.4	36%	61%	35%	52%
Poland	Car	149.7	233.3	312.2	234.2	285.0	56%	109%	56%	90%
	Bus/coach	31.7	30.2	28.1	30.3	29.9	-5%	-11%	-4%	-6%
	Train	19.7	19.7	18.7	19.4	24.1	0%	-5%	-1%	22%
	Air	1.7	3.0	4.8	3.0	4.5	73%	180%	74%	164%
	Walk/cycle	9.4	11.5	12.2	11.4	12.9	23%	30%	22%	38%
	All	212.2	297.6	376.1	298.4	356.5	40%	77%	41%	68%
Slovak R.	Car	23.9	30.6	37.3	30.8	35.7	28%	56%	29%	49%
	Bus/coach	8.4	8.0	7.3	8.1	7.5	-5%	-13%	-4%	-11%
	Train	3.2	2.6	2.4	2.6	2.5	-18%	-24%	-19%	-21%
	Air	0.1	0.2	0.3	0.2	0.3	76%	178%	78%	169%
	Walk/cycle	1.6	1.8	2.0	1.8	2.1	17%	29%	16%	32%
	All	37.2	43.2	49.3	43.5	48.0	16%	33%	17%	29%
Slovenia	Car	10.0	12.1	15.8	12.1	14.9	20%	57%	21%	49%
	Bus/coach	2.2	1.4	1.3	1.4	1.5	-36%	-41%	-36%	-34%
	Train	0.7	1.0	1.3	1.0	1.5	43%	85%	41%	110%
	Air	0.2	0.3	0.5	0.3	0.4	80%	185%	82%	178%
	Walk/cycle	0.6	0.6	0.7	0.6	0.7	4%	17%	4%	23%
	All	13.7	15.4	19.5	15.4	19.0	12%	42%	13%	39%
Cyprus	Car	3.5	4.2	4.8	4.2	4.4	21%	38%	20%	26%
	Bus/coach	0.6	0.6	0.6	0.6	0.7	9%	13%	8%	16%
	Air	6.1	8.0	10.8	8.1	10.2	32%	78%	34%	67%
	Walk/cycle	0.03	0.03	0.03	0.03	0.03	5%	10%	3%	19%
	All	10.2	12.9	16.3	13.0	15.3	27%	60%	28%	50%
Malta	Car	2.2	2.4	2.6	2.4	2.4	12%	21%	12%	9%
	Bus/coach	0.017	0.018	0.020	0.018	0.020	10%	17%	10%	21%
	Air	2.0	2.8	3.8	2.8	3.8	42%	90%	42%	91%
	Walk/cycle	0.1	0.1	0.1	0.1	0.1	0%	10%	-1%	12%
	All	4.3	5.3	6.5	5.3	6.2	24%	52%	24%	44%