iTREN-2030

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List of Abbreviations

$€_{2005}$	Euro at the value of year 2005
€ct	Eurocent (100 €ct = 1 €)
APRS	Adaptive policy in Reference Scenario
ASPO	Association for the Study of Peak Oil
ASTRA	Assessment of Transport Strategies, iTREN-2030 model
BBL	Barrel of oil
BEV	Battery electric vehicles
CCS	Carbon capture and storage
CES	Constant elasticity of substitution
CNG	Compressed Natural Gas
CO	Carbon monoxide
CO_2	Carbon dioxide
D	Destination
EC	European Commission
eeccf	Equivalent energy content of conventional fuel per liter
EET	European Energy and Transport - Trends to 2030, report
ENV	Environment module of ASTRA
ETiF	EU Energy and Transport in Figures – Statistical pocketbook 2009
ETS	Emission Trading System, Emission trading scheme
EU	European Union
EU12	Member states that joined the European Union after 2003
EU15	Member states that joined the European Union before 2004
EU27	All member states of the European Union as of today (2008)
EU27+2	EU27 countries plus Norway and Switzerland
EU-ETS	European Emission Trading System
EWG	Energy Watch Group
FOT	Foreign trade module of ASTRA
GA	Generation-attraction
GDP	Gross domestic product
GHG	Greenhouse gases
GIEC	Gross Inland Consumption
GIS	Geographical Information System
GRP4	Emission reduction pathway scenario
HDV	Heavy duty vehicles
HFC	Hydrogen fuel cell vehicles
HGV, HDT	Heavy Goods Vehicle (>3.5 ton gross vehicle weight)
HST	High speed passenger trains

IEA	International Energy Agency
INF	Infrastructure module of ASTRA
INT	Integrated Scenario of iTREN-2030
INTRA-EU	EU27+2 European countries
IPCC	Intergovernmental Panel on Climate Change
IWW	Inland waterways
Km	Kilometer
LC	Local distances of passenger transport (<3.2km)
LDV, LDT	Light Duty Vehicles (<3.5 ton gross vehicle weight)
LG	Long distances of passenger transport (>160km)
LGD	Long distance band of freight transport (>700km)
LOC	Short distance band of freight transport (<50km)
LOS	Level-of-service data
LPG	Liquefied Petroleum Gas
LRRT	Low rolling resistance tires
LVL	Low viscosity lubricants
MAC	Macro-economic module of ASTRA
MD	Medium distances
MED	Medium-long distance band of freight transport (150 to 700km)
Mt, Mt CO_2	Mega-tons, million tons of CO_2 emissions
Mtoe, mtoe	Million ton of oil equivalent – energy unit
NAP	National Allocation Plan
NEC	National Emissions Ceilings
NH_3	Ammonia
NO_x	Nitrogen Oxide
NSTR	Nomenclature uniforme des marchandises pour les Statistiques de Transport, Revisée
NUTS	Nomenclature of Territorial Statistical Unit
O	Origin
OD, O/D	Origin-destination (OD-pair, OD-matrix)
OEM	Original equipment manufacturers
Pass-km, pkm	Passenger-kilometre,
	1 person transported over 1 km distance = 1 pkm
PM	Particulate Matter
PM_{10}	Soot particles of a diameter of less than 10 µm
POLES	Prospective Outlook on Long term Energy Systems, iTREN-2030 model
POP	Population module of ASTRA
PP	Policy Package

PPP	Public-private partnerships
R/P	Reserves-to-production
REF	Reference Scenario of iTREN-2030
REG	Medium-short distance band of freight transport (50 to 150km)
REM	Regional economic module of ASTRA
RES	Renewable energy systems
RoW	Rest-of-the-world region
SCENES	European transport network model
SIA	Sustainability impact assessment
SO_2	Sulphur dioxide
ST	Short distances of passenger transport (8 to 40km)
TEN-T	Transport projects belonging to the Trans European Transport Network
TiF, TiF-2007	Energy and Transport in figures 2007 (European Commission 2007)
TIPMAC	European research project 5FP
Tonnes-km, tkm	Tonnes-kilometre, 1 ton transported over 1 km distance = 1 tkm
TPMS	Tire pressure monitoring system
TRA	Transport module
TRANSTOOLS, TTv1	TOOLS for TRansport Forecasting ANd Scenario testing, iTREN-2030 model
TREMOVE	Vehicle fleet and emission model, iTREN-2030 model
TRIAS	European research project 6FP
TTv2	TRANSTOOLS model version developed in the TEN-Connect project
URR	Ultimate recoverable resources
VAT	Value-added tax
Veh-km, vkm	Vehicle-kilometre, 1 vehicle that drives a distance of 1 km = 1 vkm
VFT	Vehicle fleet module of ASTRA
VKT	Vehicle-kilometres-travelled
VOC	Volatile Organic Compound
VS	Very short distances of passenger transport (3.2 to 8 km)
WEM	Welfare Measurement module of ASTRA
WEO	World Energy Outlook
WP5	Work package 5
WTW	Well-to-wheel

0 Executive Summary

iTREN-2030 - Integrated TRansport and ENergy baseline until 2030 – is a research project conducted on behalf of the European Commission (EC) DG TREN funded by the EC 6th Research Framework Programme. The objective of iTREN-2030 is to design a powerful toolbox for European transport policy-making by creating an integrated model system of transport, economics, energy and the environment. As the energy and transport systems are becoming more closely interlinked, such a system would enable coherent scenario and policy analysis to be carried out at the European level for the coming decades.

Integrated Scenario (INT)

This deliverable describes the methodology and the results of the Integrated Scenario of iTREN-2030. The setting of the Integrated Scenario brings us into a world that is different from the past. The scenario includes (i) the economic and financial crisis of 2008/2009 as well as the economic recovery programmes implemented by the EU and the Member States and (ii) ambitious climate, energy and transport policies that are to be implemented between 2009 and 2025. Such policies include pricing, regulation, technology support and diffusion measures, as well as information measures and behavioural adaptations. The policies were selected in a stakeholder process in which the yardsticks relevance of policies, likeliness of implementation of policy until 2025 and ability to model the policy by the model system applied in iTREN-2030 were the decisive criteria.

The Integrated Scenario is an output of iTREN-2030 that can stand on its own as an alternative and feasible future scenario considering trend-breaks and plausible policy-making in the next two decades. It can also be compared with the Reference Scenario developed earlier in iTREN-2030, which excludes both the crisis and policies that are passed after 2008.

Economic and financial crisis 2008/2009

The Integrated Scenario incorporates the crisis of 2008/2009. The economic model (ASTRA model) was adapted to reproduce the drop in trade and GDP indicators in 2008/2009 and to incorporate the economic stimulus packages of the EU and the Member States. This generates new trajectories for economic development until 2030, which anticipates a growth path with an average annual growth rate of +1.5% that is significantly lower than for earlier studies, but still negates the option of a new economic crisis in the years to come, due to the remaining instability in the financial system and the growing debt of governments as a consequence of the public economic stimulus packages to solve the past crisis.

Energy sector

The rising demand from fast developing world regions and uncertainty about the future availability of cheap resources suggest that crude oil prices will not return to the low levels observed before 2007. It is therefore estimated that crude oil prices will rise from present price levels and remain at levels of around 80 $€_{2005}$/bbl in 2020 and almost 90 $€_{2005}$/bbl in 2030. The prices of CO_2 certificates also moderately increase from today's levels to about 27 $€_{2005}$/tCO_2 in 2020 and about 28 $€_{2005}$/tCO_2 in 2030. This implies that the CO_2 emissions cap follows the target of -20% until 2020 compared with 1990, but this is not made stricter after 2020. For non-ETS sectors it is assumed that a carbon value is applied that follows the CO_2 certificate price.

Major policy strategies in the energy sector in the Integrated Scenario include the application of a certificate trading system for ETS sectors and a carbon value for non-ETS sectors as explained above. Further, feed-in tariffs and other support policies are implemented to enable renewable energies to meet the target of 20% of renewables in energy production until 2020. Finally, the European energy efficiency action plan is implemented, improving energy efficiency by 1% annually. These strategies cause the average annual growth of EU energy consumption to drop from around +0.5% observed between 1996 and 2005 to levels between 0% and -0.2% for the next decades.

A more detailed look at energy demand from transport presented in Table 0-1 reveals an impressive break-in-trend where energy demand of total transport and all modes increased in the Reference Scenario, while in the Integrated Scenario the growth trend is reversed for total transport as well as for the major modes passenger car and freight truck and reveals negative average annual changes between 2005 and 2030. For total transport this means a change from average annual growth rates of +0.7% to average annual decline rates of -0.4%.

Table 0-1: Transport energy demand growth rates by mode between 2005 and 2030 (INT, REF)

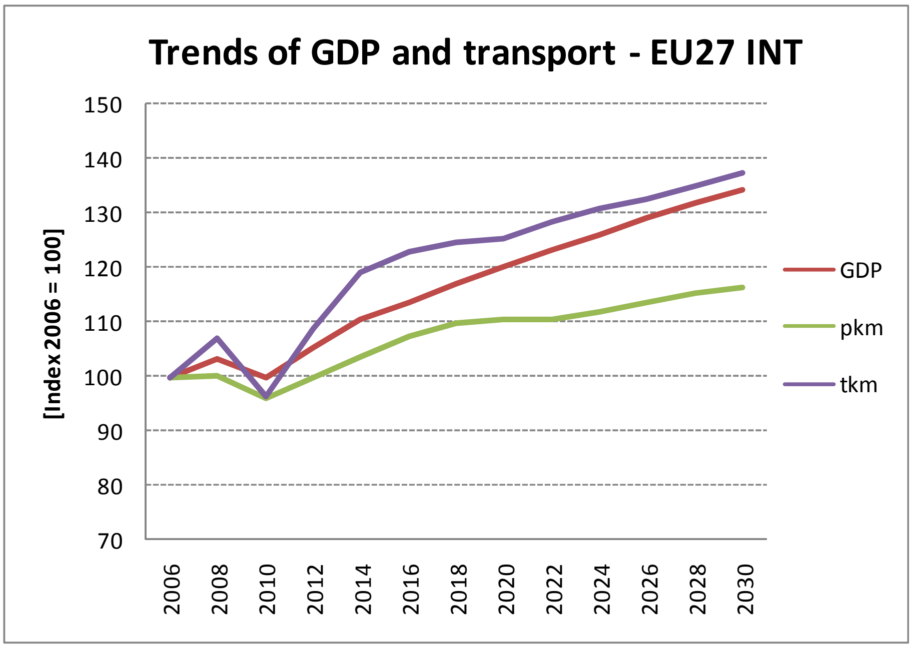
Average annual changes in final energy demand [%]	**Integrated Scenario**	**Reference Scenario**
Transport – all modes	**-0.4**	**0.7**
Road transport cars	-0.6	0.8
Road transport freight	-0.5	0.6
Rail	0.4	1.2
Aviation	0.4	0.8

Source: iTREN-2030

Transport sector

Transport demand indicators and vehicle fleet trends are also shaped by the impacts of the economic and financial crisis. In particular, freight transport responds to the crisis by reducing demand both in the short and in the long term, while passenger transport only responds with reduced demand in the short term but then returns to the demand levels estimated without the crisis in the medium and long term.

However, the overall growth of freight transport remains much stronger than that of passenger transport, as Figure 0-1 shows. Until 2030 freight transport increases by +39% compared with 2006 and passenger transport by +16%. This means the growth of freight transport is slightly faster than that of GDP, though comparison of the period 2010 to 2020 and 2020 to 2030 reveals that this only holds for the first decade, while in the second decade economic growth is slightly faster than freight demand growth. This seems to be a first sign of structural change and relative decoupling between freight and the economy. Relative decoupling occurs over the whole period for passenger transport, which is not surprising as the European population is stagnating and only the eastern European countries continue to increase their motorization significantly.



Source: iTREN-2030

Figure 0-1: Freight and passenger demand trend in the Integrated Scenario (intra-EU demand)

Vehicle fleets

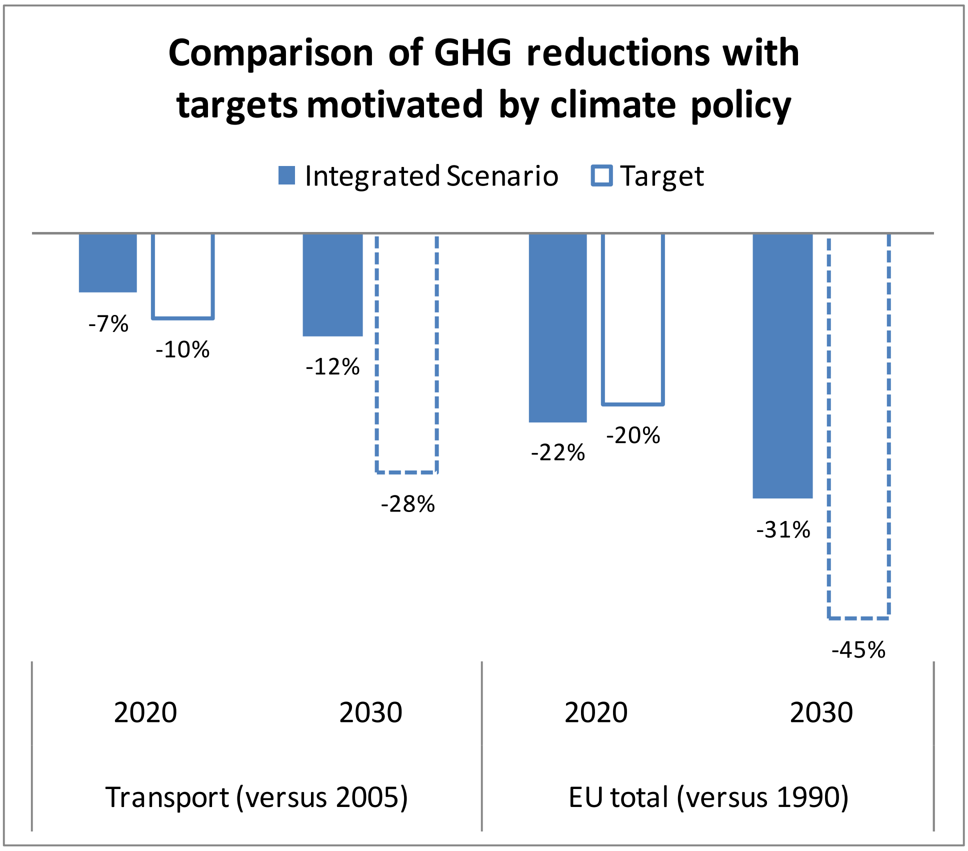
One of the most significant changes compared with the past concerns the structure of the vehicle fleets. The car fleet continues to grow, but at lower rates than in the past, reaching about 280 million cars in the EU27 in 2030, whereas stronger growth occurs in the EU12 countries compared with the EU15 countries. In 2010 more than 95% of the car market is dominated by conventional gasoline and diesel cars. This share is reduced to about 80% by 2030. The strongest alternatives would be small battery electric vehicles which attain a market share of 5% until 2020 and CNG with a share of 3%. Until 2030 the share of battery electric vehicles nearly doubles, while that of the CNG vehicles remains constant. Around 2025 it is expected that hydrogen fuel cell vehicles will also start to play a role, since the battery electric vehicles mainly satisfy the needs for clean, short distance urban transport, while hydrogen fuel cell vehicles also provide a potentially non-fossil alternative for longer distances.

While the level of the car fleet is nearly unchanged by the crisis in the long term, due to the fact that more efficient cars reduce costs and become more attractive in the medium to long run, the same does not hold for the freight fleets. The combined influence of the economic crisis and the policies to mitigate the climate impact of freight transport reduce the fleet of heavy duty trucks by about 800,000 until 2030, compared with the Reference Scenario and of light duty trucks by about 2 million. In growth terms, this means that the HDV fleet nearly stops growing, while the LDV fleet continues to grow at a moderate rate. Battery electric LDVs also start to diffuse into the market after 2015, so that in 2020 about 200,000 electric LDVs and in 2030 more than 1.3 million provide urban delivery services in the EU27.

Greenhouse gas emissions (GHG)

For the first time in the EU27 the development of GHGs shows a negative slope in the Integrated Scenario. This holds for both the aggregate GHGs from all sectors as well as for the GHGs from the transport sector. The trajectories of the Integrated Scenario can be compared with targets for the years 2020 and 2030. For 2020 the EU has defined different targets for the EU total and the transport sector. The EU total GHG emissions should be reduced by -20% compared with the base year 1990. The EU transport GHG emissions (as transport is a non-ETS sector) should be reduced by -10% compared with 2005, assuming that transport should contribute a share of reductions equal to the other non-ETS sectors. These two targets are fulfilled, or at least are close to being met, in the Integrated Scenario as can be seen in Figure 0-2. For 2020 the total reduction amounts to -22%, i.e. an over-fulfilment of 2%, though this could be easily ascribed to the economic downturn of 2008/2009. However, transport still underperfoms in terms of the reduction target as it achieves only -7% instead of the -10% target. This means that other sectors contribute more drastic reductions.

For 2030 no concrete GHG reduction targets have been defined in official European policy documents, yet. Hence, the objective to limit the global temperature increase by 2100 to 2° Celsius, which was agreed by the EU leaders, has to be considered when arriving at a benchmark for 2030. Such a benchmark can be adopted from the European ADAM project which developed a so-called 2-degree Scenario that succeeds in directing Europe onto a pathway towards -80% reduction of GHG emissions until 2050 [Schade/Jochem et al. 2009]. The benchmark of this pathway for 2030 would then mean a reduction of -45% for the EU total GHG emissions and a reduction of -28% for the transport sector. These benchmarks are indicated by dashed rectangles in Figure 0-2. Obviously, the Integrated Scenario falls short of achieving these benchmarks that would bring Europe onto a long-term path to limit temperature increases to 2° Celsius. This conclusion is not surprising, as major policies of the Integrated Scenario are only focused on 2020 (e.g. CO_2 emission limits for cars and LDVs, CO_2 emissions cap), but they are not made stricter after 2020 to promote the required reductions.



Source: iTREN-2030

Figure 0-2: Reductions of CO_2 emissions in comparison with reduction targets

Methodology and further use

iTREN-2030 applied a methodology to create consistent scenarios for the energy and transport systems until 2030 which combines development of an integrated model system with an intensive stakeholder approach to construct policy scenarios and validate the intermediate findings of these scenario results obtained via the model system. This methodology has proved particularly useful in developing consistent scenarios for the integrated energy and transport field, but it seems that as far as the analysis of single policies is concerned, a subset of the model system is usually sufficient for carrying out policy assessment.

The linkages between the models of the model system were implemented by soft links i.e. they require the manual exchange of files and individual input-output procedures for each model. This approach can be improved by using semi-automated linkages as developed in the European ADAM project [Schade/Jochem et al. 2009]. In ADAM a web-based application was developed that collected the outputs from all models, stored them in a database, provided the conversion of numbers (e.g. for differing units of measurements, auxiliary variables) and supplied each model with the inputs in their particular formats. This replaces the bilateral linkages between models by a central operating system that reduces the number of interactions and accelerates the process of consistency building and scenario construction of a linked model system.

However, sophisticated interaction and feedbacks between models even using such a system require short response times of involved models as well as a limitation of size and number of variables to be transferred. In the iTREN-2030 model suite this is not given for the TRANSTOOLS and TREMOVE models in particular, as both have longer response times and the amount of exchanged data from TRANSTOOLS to TREMOVE can hardly be stored within an MS Access database. Therefore it is proposed that leaner and/or faster versions of both models should be developed to be more easily integrated into a model system with energy and economic models like POLES and ASTRA. For TREMOVE this has already been initiated, with its conversion into a system dynamics model (like ASTRA, POLES), while for TRANSTOOLS the discussion is concentrated on developing a strategic and thus leaner version of the model.

The further use of the model system can be recommended for both approaches, though significantly longer time resources will be needed in the case of keeping the soft links and maintaining modelling approaches. In fact, having applied two different approaches for the Reference Scenario (including TRANSTOOLS) and the Integrated Scenario (excluding TRANSTOOLS), the iTREN-2030 project has developed a scenario approach with detailed network analysis capabilities and a strategic integrated energy and transport assessment approach without network analysis capability.

1 Introduction

iTREN-2030 - Integrated TRansport and ENergy baseline until 2030 – is a research project on behalf of EC DG TREN funded by the European Commission (EC) 6th Research Framework Programme.

The objective of iTREN-2030 is to design a powerful toolbox for European transport policy-making by creating an interface for transport, economics, energy and environment fields. To this end, it was planned that in iTREN-2030 a European model system should be developed, integrating four existing models and making them consistent, thus enabling coherent scenario and policy analysis. The capability to complement each other and the resulting synergies between the models would then benefit interdisciplinary transport policy-making at a European level.

For this purpose, the following four models - each with a specific focus of application - are linked with each other:

- TRANSTOOLS: the multi-modal tool for transport network analysis for the EU, with links to global transport flows.
- POLES: a multi-sectoral world energy system model integrating energy supply and demand and estimating energy prices.
- TREMOVE: an environmental and vehicle fleet model calculating emissions, fuel consumption and accidents from transport.
- ASTRA: a strategic transport-economy-environment assessment model providing an economic baseline and estimating economic impacts of policies, as well as incorporating transport demand and vehicle fleet projections.

The steps by which iTREN-2030 developed its activities included (1) implementation of a model-based Reference Scenario in a consistent manner and as a methodological step to link the four models, (2) communication with and consideration of comments of stakeholders concerning their user needs and their expectations of a scenario to 2030, and (3) development of transport policy packages that would constitute an Integrated Scenario for energy and transport, taking into account the requirements emerging from climate policy and the growing scarcity of fossil energy resources.

Before iTREN-2030, the four models applied had already been used to develop scenarios for different time horizons, i.e. some to 2020 and others as far as 2050. The added-value of iTREN-2030 is the enrichment of these scenario projections by testing the individual forecasts against the other models and by learning from each other, adapting the four models to come to a joint and better based scenario until 2030. Two such scenarios were developed in iTREN-2030:

- a **Reference Scenario (REF)**, which was described in iTREN-2030 deliverable D4 [Fiorello et al. 2009] and
- an **Integrated Scenario (INT)** that is driven by changing framework conditions until 2030 and by policies. The INT is explained in this deliverable D5.

Both scenarios are supplied with very detailed quantified indicators by Member States and EU regions for energy, transport, vehicle fleets, environment and economic development until 2030, as reported in the annex to this deliverable (see section 14).

The development of the scenarios was informed through inputs from the stakeholders obtained from a series of four workshops that were organized at appropriate stages of the project. Stakeholder guidance included the request for transparency of key assumptions, the strong suggestion to include the economic crisis in scenario development, as well as the clear expectation that significant breaks-in-trend will have to be faced within the energy and transport systems within the given time horizon of 2030.

For the **Reference Scenario**, the three other modelling tools were harmonized with TRANSTOOLS and made mutually consistent. This results in a coherent scenario for Europe until 2030 for technology, transport, energy, environment and economic development that can be compared with the results of previous studies. So the Reference Scenario has to be seen as a methodological step of iTREN-2030. The basic concept of the Reference Scenario is **Frozen Policy 2008**, i.e. the scenario considers only policies that were decided by the EU Council and/or EU parliament by mid 2008. After 2008 the policies are frozen, i.e. remain as they were decided and implemented and no further new policies are applied. This excludes the ambitious climate, energy and transport policies decided on or proposed in 2008/2009, as well as any other policies that would be developed under a new international climate policy agreement until 2030. The economic and financial crisis of the years 2008/2009 is excluded from the Reference Scenario as well.

The setting of the **Integrated Scenario** brings us into a completely **different world**. This scenario includes (i) the economic and financial crisis of 2008/2009 as well as the economic recovery programmes implemented by the EU and the Member States and (ii) ambitious climate, energy and transport policies that are implemented between 2009 and 2025. These policies include pricing measures, regulation, technology support and diffusion measures as well as information measures and behavioural adaptations. The impacts of the crisis in comparison with the Reference Scenario can be observed over the full scenario period until 2030 and its socio-economic effects are more substantial than the impact of the policies. Thus, although the Integrated Scenario builds on the Reference Scenario, the comparability between the two scenarios is limited. At least we must caution against ascribing the full differences between the scenarios to the impacts of the policies. For instance, when considering impacts on energy and environmental indicators, the impacts of policies are stronger than the impacts of the economic and financial crisis.

The development, the structure and the results of the Integrated Scenario are described in this deliverable, which explains the outcome of work package 5 (WP5) of iTREN-2030. The specific objectives of WP5 were:

- to select likely policies / policy packages for prototypical impact assessment
- to demonstrate the integrated impact assessment capabilities of the iTREN-2030 modeling suite and
- to develop a coherent Integrated Scenario incorporating the likely policies until 2030.

Likely policies have been proposed by the iTREN-2030 project. In discussions with stakeholders at workshops as well as by considering ongoing policy processes, the proposed policies have been reviewed and adapted to be finally implemented in the Integrated Scenario (see section 3). Further selected policies have been grouped to form policy packages that are analyzed with different set-ups of the iTREN-2030 modelling suite to demonstrate both the integrated assessment capability of the full suite as well as of its partial application. The final outcome of iTREN-2030 consists of both a narrative storyline describing the Integrated Scenario as well as a comprehensive set of very detailed quantified indicators from the energy-transport-environment-economy fields by Member State and EU region.

Deliverable D5 describes the Integrated Scenario in the following sequence of sections. After this introduction, the methodology is explained, consisting of the scenario structure, the model descriptions and the way the models are integrated. Then the description of the Integrated Scenario starts with the narrative storyline including the drivers of policy-making in the next two decades as well as an overview of the applied policies. This is completed by a description of the socio-economic drivers of the energy and transport systems. The subsequent five sections present the results of the Integrated Scenario divided into the separate fields energy system, vehicle fleets, passenger transport, freight transport and environment. These sections are completed by a section describing the results of three sub-groups of policies, so-called policy packages, of the Integrated Scenario and a section demonstrating the application of different assessment approaches using the iTREN-2030 modelling suite. This is followed by a section synthesizing the findings of the scenario, the policy packages and the assessment approaches, so that the added-value, advantages and potential shortcomings of the applied methodology can be explained. The final section presents the conclusions of this deliverable D5.

An annex lists the Integrated Scenario results in a structured format by indicators on the level of each Member State as well as on groupings of European countries i.e. EU27, EU15 and EU12.

2 Methodology

The methodology of iTREN-2030 consisted originally of four major steps (user needs analysis, model update, model integration to prepare baseline scenario, comparison with previous studies). During the course of the iTREN-2030 project the methodology was refined and improved, driven by requirements of the stakeholders and the client as well as by developments of the TRANS-TOOLS model occurring outside the frame of the project.

The refined methodology then comprised eight steps, of which three were included in the original approach:

1. To analyse and agree on the user needs of an EU energy-transport modelling suite.
2. To update the models involved, in particular TRANS-TOOLS and TREMOVE (e.g. so that they can run scenarios until 2030).
3. To (re-)define the structure and purpose of the scenarios:
   - Reference Scenario: methodological step to harmonize models, frozen policy.
   - Integrated Scenario: final result including trend-breaks and the economic crisis.
4. To discuss and agree on energy and transport policies which are both relevant and likely to be implemented until 2030.
5. To implement the Reference Scenario in all four models of iTREN-2030, making them coherent.
6. To consider and implement the impact of economic crisis and economic recovery programmes in three models of iTREN-2030 (i.e. ASTRA, POLES, TREMOVE).
7. To implement the Integrated Scenario in the three models by including the relevant and likely policies decided on in the models.
8. To describe and assess the impacts of the policies / policy packages.

The main elements of the methodology are described briefly in the following sections, starting with a description of the scenario process. Afterwards the single models are shortly explained and the integration of the models to run the Integrated Scenario is presented.

2.1 Defining the Integrated Scenario in iTREN-2030

The definition of the Integrated Scenario is based on three elements and resulted from a process that lasted more than one and a half years:

1. an intensive stakeholder process
2. inherent trends of the applied models
3. expertise of the iTREN-2030 project team.

2.1.1 Stakeholder process

The stakeholder process consisted of four workshops and a final conference. During the workshops the stakeholders were involved by giving presentations, joining group discussions or by participating in the plenary discussion. The presentations and summaries of the workshops can be obtained from the project website (http://isi.fraunhofer.de/isi-de/projects/itren-2030/index.php). The stakeholder process is also documented in deliverable D1 [Meijeren 2009].

The first major recommendation made by the stakeholders concerned the inclusion of trend-breaks into the scenarios, as they expected that trends like ambitious climate policy or continuous high oil prices in the next decades will shape the transport system in a different way than in the past. The second major recommendation appeared when the economic and financial crisis of 2008/2009 was fully visible, with the suggestion that the crisis should become an element of the Integrated Scenario. Further contributions were related to the recommendations on policies to be included as well as in the details of the policies. Stakeholders also provided advice on technological developments, e.g. the majority expected a break-through of electro-mobility in the years to come.

2.1.2 Inherent trends of applied models

All models applied in iTREN-2030 existed before the project started. This means that simulation with one of the models would from the beginning produce a scenario that reflects the results of a previous project/application of the model.

In iTREN-2030 all models were adapted, either due to required model improvements e.g. that TRANS-TOOLS and TREMOVE could forecast until 2030 [see Newton et al. 2009] or due to the approach of making the models consistent to produce a consistent Reference Scenario [see Fiorello et al. 2009]. Variables which are shared by different models were made consistent by adapting the underlying assumptions and values. Nevertheless, each model incorporates inherent trends for the other variables i.e.

trends that emerge from the specific implementation, parameterisation and rationale of the specific model. These trends are the result of combining previous scenarios of the models with the activities of the iTREN-2030 project. Inherent trends of the models are evaluated both by stakeholders, when they belong to the group of indicators presented at the workshops, and by the expertise of the iTREN-2030 modelling teams.

2.1.3 Expertise of iTREN-2030 project team

The project team of iTREN-2030 contributes its own expertise to the development of the Integrated Scenario. Firstly, the expertise comes from the interdisciplinary educational and research background of the involved staff, including transport planners, transport engineers, industrial engineers, economists and policy analysts. Second, the research staff as well as the institutes have been involved in many scenario and modelling activities in the past and contribute this experience to the scenario development.

A first group of project references concerns the development and quantification of scenarios by using a model suite including ASTRA and POLES. Examples of recent related projects carried out by the project team include the integrated assessment projects TRIAS on the sustainability impact assessment of integrated energy, transport, and technology scenarios [Schade/Fiorello/Köhler et al. 2008] and HOP! on the macroeconomic impacts of high oil prices as well as the impacts on energy and transport systems [Schade/Fiorello/Beckmann et al. 2008].

A second group of projects includes core transport scenario and forecasting projects. Examples here would be the TEN-STAC project on the development of the TEN-T infrastructure projects until 2020 and their transport demand implications [TEN-STAC 2003] and the WorldNet project on European and global freight demand forecast as well as on network analysis [NEA et al. 2009].

A third group of projects covers the energy side. Examples are the Weto-H2 project, providing a world energy and transport outlook until 2050 with focus on new technologies, like hydrogen fuel cells [EC DG RTD / EC DG JRC 2006], and the Employ-RES project analysing the economic impacts of the European renewable energies strategy until 2030 [Ragwitz et al. 2009]. Again, the POLES model was applied in the former and the ASTRA model in the latter project by members of the iTREN-2030 consortium.

Given the above expertise of the consortium, the iTREN-2030 project team was able to translate the results of the stakeholder process into a definition of the Integrated Scenario.

2.2 Models

After the analysis of user needs, the second major element of the iTREN-2030 project is the improvement, application and integration of the four applied models, TRANS-TOOLS, TREMOVE, POLES and ASTRA. An overview of the characteristics of the models is presented in Table 2-1. This comparison shows that spatial coverage and time horizon are similar across the models. However, they are implemented using different modelling approaches, i.e. equilibrium modelling, optimisation and simulation. The modelling approach is not decisive for the integration of the models, whereas the space and time dimensions need to be consistent and the purpose of each model should be clearly defined and distinct. Despite several overlaps in the model purposes, the models complement each other. The overlaps will be explained in more detail in section 2.3.

Table 2-1: Overview of the characteristics of the four iTREN-2030 models

Model	Purpose	Approach	Type / Scope	Cover-age	Time
TRANS-TOOLS	Detailed network-based analysis of transport. Corridor analysis.	Stochastic equilibrium	Transport bottom-up	EU31	Static, 2005, 2010, 2020, 2030
TREMOVE	Transport trend as input and vehicle fleets, energy and emissions as output.	Optimisation	Strategic, Fleet bottom-up	EU31	Dynamic, 1995 to 2030
POLES	Supply and demand of world energy system. Global energy emissions.	Simulation	Strategic, Energy bottom-up	Global, EU27	Dynamic, 2000 to 2030
ASTRA	Integrated assessment of economy, trade, transport, fleets, energy and emissions.	Simulation	Strategic, Integrated	EU27+2	Dynamic, 1990 to 2030

Source: iTREN-2030

The rationale of the four models is described in the following sections. For more details, please refer to the model documentation, which was prepared for earlier projects or in PhD publications.

2.2.1 The ASTRA model

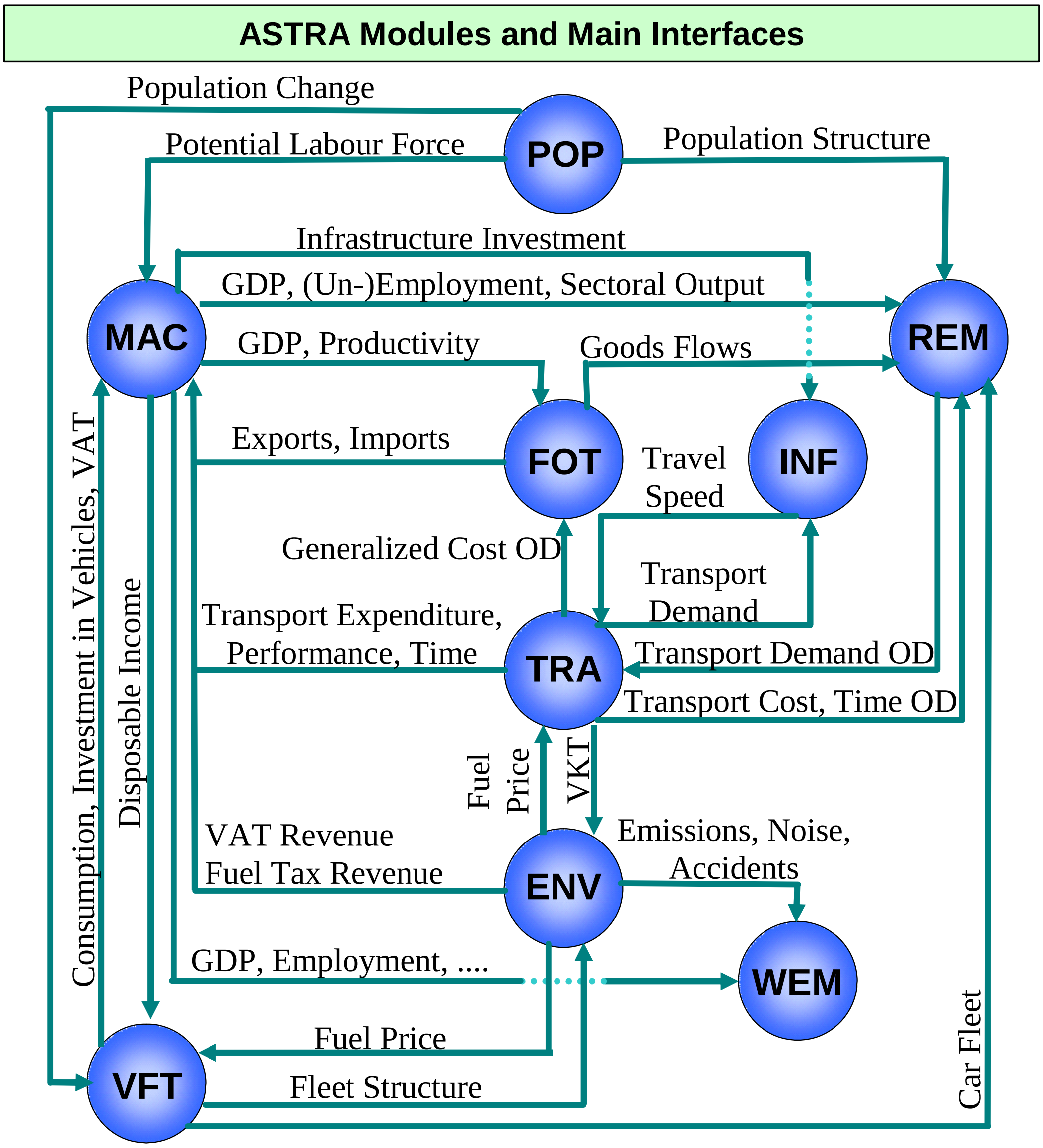
ASTRA (Assessment of Transport Strategies) is applied for the integrated assessment of policy strategies. The model is implemented as a system dynamics model. The ASTRA model has been developed and applied in a number of European research and consultancy projects for more than 10 years now by three institutions: Fraunhofer ISI, IWW and TRT. Applications included analysis of transport policy (e.g. TIPMAC, TRIAS), climate policy (e.g. ADAM project) or renewables policy (e.g. Employ-RES project). A comprehensive description of the model can be found in Schade [2005].

The ASTRA model consists of nine modules that are all implemented within one Vensim© system dynamics software file:

- Population module (POP)
- Macro-economic module (MAC)
- Regional economic module (REM)
- Foreign trade module (FOT)
- Infrastructure module (INF)
- Transport module (TRA)
- Environment module (ENV)
- Vehicle fleet module (VFT) and
- Welfare Measurement module (WEM).

An overview of the nine modules and their main interfaces is presented in Figure 2-1.

The Population module (POP) provides the population development for the 29 European countries with one-year age cohorts. The model depends on fertility rates, death rates and immigration of the EU27+2 countries. Based on the age structure, given by the one-year age cohorts, important information is provided for other modules, like the number of persons of working age or the number of persons in age classes who are permitted to acquire a driving licence. POP is calibrated to EUROSTAT and UN population predictions.



Abbreviations:

POP = Population Module
MAC = Macroeconomics Module
REM = Regional Economics Module
FOT = Foreign Trade Module
INF = Infrastructure Module
TRA = Transport Module
ENV = Environment Module
VFT = Vehicle Fleet Module
WEM = Welfare Measurement Module

Source: Schade/Fiorello/Beckmann et al. (2008)

Figure 2-1: Overview of the structure of the ASTRA modules

The MAC provides the national economic framework, which imbeds the other modules. The MAC could not be categorised explicitly into one economic category of models, for instance, a neo-classical model. Instead, it incorporates neo-classical elements like production functions. Keynesian elements are considered like the dependency of investments on consumption, which are extended by some further influences on investments, like exports or government debt. Further elements of endogenous growth theory are incorporated like the implementation of endogenous technical progress (e.g. depending on sectoral investment) as one important driver for overall economic development.

Six major elements constitute the functionality of the macroeconomics module. The first is the sectoral interchange model that reflects the economic interactions between 25 economic sectors of the national economies. Demand-supply interactions are considered by the second and third elements. The second element, the demand-side model, depicts the four major components of final demand: consumption, investments, exports-imports and government consumption. The supply-side model reflects influences of three production factors: capital stock, labour and natural resources as well as the influence of technological progress that is modelled as total factor productivity. Endogenised total factor productivity depends on investments, freight transport times and labour productivity changes. The fourth element of MAC is composed of the employment model that is based on value-added as output from input-output table calculations and labour productivity. Employment is differentiated into full-time equivalent employment and total employment, to be able to reflect the growing importance of part-time employment. Unemployment was estimated in combination with the population module. The fifth element of MAC describes government behaviour. As far as possible, government revenues and expenditures are differentiated into categories that can be modelled endogenously by ASTRA, and one category covering other revenues or other expenditures. Categories that are endogenised comprise VAT and fuel tax revenues, direct taxes, import taxes, social contributions and revenues of transport charges on the revenue side, as well as unemployment payments, transfers to retired persons and children, transport investments, interest payments for government debt and government consumption on the expenditure side. Sixth and final of the elements constituting the MAC are the micro-macro bridges. These link micro- and meso-level models, for instance, the transport module or the vehicle fleet module to components of the macroeconomics module. That means that expenditures for bus transport or rail transport of one origin-destination pair (OD) become part of final demand of the economic sector for inland transport within the sectoral interchange model. The macroeconomics module provides several important outputs to other modules. The most important one is surely gross domestic product (GDP). This is for instance required to calculate sectoral trade flows between the European countries. Other examples are employment and unemployment, representing two factors influencing passenger transport generation. Sectoral production value drives national freight transport generation. Disposable income exerts a major influence on car purchase, finally affecting the vehicle fleet module and even passenger transport emissions.

The Regional Economic module (REM) mainly calculates the generation and spatial distribution of freight transport volume and passenger trips. The number of passenger trips is driven by the employment situation, car-ownership development and number of people in different age classes. Trip generation is performed individually for each of the 76 zones of the ASTRA model. Distribution splits trips of each zone into three distance categories of trips within the zone and two distance categories crossing the zonal borders and generating OD-trip matrices with 76x76 elements for three trip purposes. Freight transport is driven by two mechanisms: firstly, national transport depends on sectoral production value of the 15 goods-producing sectors where the monetary output of the input-output table calculations are transferred into volume of tons by means of value-to-volume ratios. For freight distribution and the further calculations in the transport module the 15 goods sectors are aggregated into three goods categories. Secondly, international freight transport i.e. freight transport flows that cross national borders are generated from monetary Intra-European trade flows of the 15 goods-producing sectors. Again, transfer into volume of tons is performed by applying value-to-volume ratios that are different from the ones applied for national transport. In that sense the export model provides generation and distribution of international transport flows within one step on the basis of monetary flows.

The Foreign Trade module (FOT) is divided into two parts: trade between the EU27+2 European countries (INTRA-EU model) and trade between the EU27+2 European countries and the rest of the world (RoW) that is divided into nine regions (EU-RoW model with Oceania, China, East Asia, India, Japan, Latin America, North America, Turkey, Rest of the World). Both models are differentiated into bilateral relationships by country pair by sector. The INTRA-EU trade model depends on three endogenous and one exogenous factor. World GDP growth exerts an exogenous influence on trade. Endogenous influences are provided by GDP growth of the importing country of each country pair relation, by relative change of sectoral labour productivity between the countries and by averaged generalised cost of passenger and freight transport between the countries. The latter is chosen to represent an accessibility indicator for transport between the countries. The EU-RoW trade model is mainly driven by relative productivity between the European countries and the rest-of-the-world regions. Productivity changes together with GDP growth of the importing RoW country and world GDP growth drive the export-import relationships between the countries. Since transport cost and time are not modelled for transport relations outside EU27+2, transport is not considered in the EU-RoW model. The resulting sectoral export-import flows of the two trade models are fed back into the macroeconomics module as part of final demand

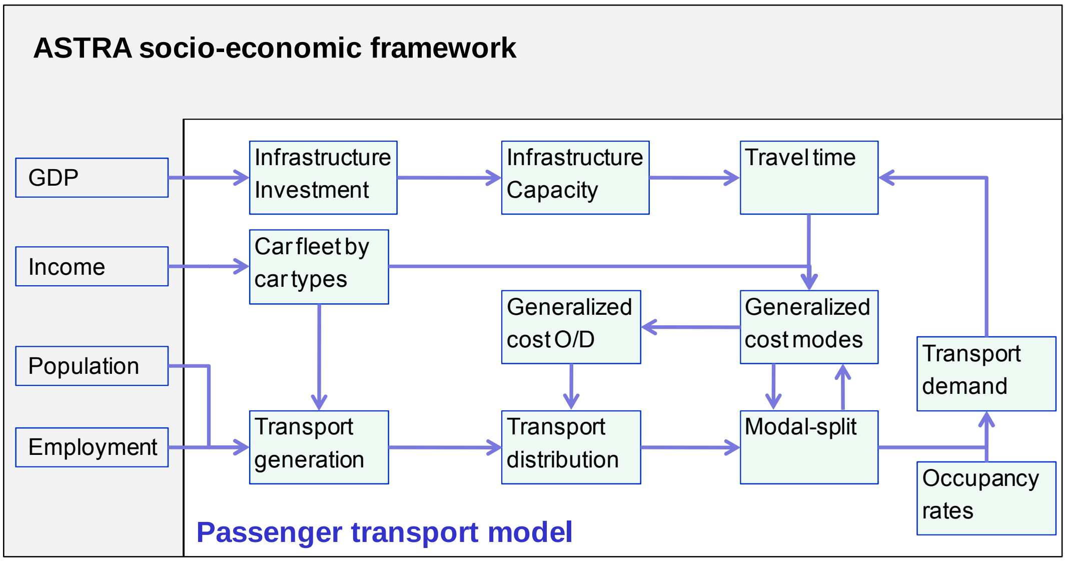
and national final use, respectively. Secondly, the INTRA-EU model provides the input for international freight generation and distribution within the REM module.

The Infrastructure module (INF) provides the network capacity for the different transport modes. Infrastructure investments derived both from the economic development provided by the MAC and from infrastructure investment policies alter the infrastructure capacity. Using speed flow curves for the different infrastructure types and aggregate transport demand, the changes of average travel speeds over time are estimated and transferred to the TRA where they affect the modal choice.

Figure 2-2 presents the major interdependencies of the passenger transport model. The main output of the model is the passenger transport performance by mode as well as the vehicle-kilometres-travelled (VKT) by mode. The core of the model is a classical four-stage transport model [see Ortuzar/Willumsen 2004] with a rather limited assignment component (4th stage). However, the first three stages act in an integrated and dynamic way, i.e. at none of these stages (generation, distribution, mode choice) are any assumptions made about structural stability. In the generation stage, e.g. changes in population, degree of (un-)employment or the car fleet may alter the number of generated trips. In the distribution stage, of course, changes may stem from generation, but more important is the **aggregated generalised transport cost** between any origin (O) and destination (D) in Europe. These aggregated costs consist of monetary costs and time costs and thus represent an accessibility measure for each European OD-relation described by the ASTRA functional zoning system.

Accessibility is influenced by the travel time (depending on infrastructure and network load) and the travel cost (depending, e.g. on tariffs, car prices, fuel prices, car taxes etc.) by mode. The same influences also affect the mode choice for each OD relation and each distance band (0-3.2 km, 3.2-8km, 8-40km, 40-160km, >160km distance). As a starting point for travel distances and travel times for each OD relation, the input from a European network model (in iTREN-2030 this input was updated from the SCENES model [ME&P 2000] to the TRANS-TOOLS model) is integrated into ASTRA. Distances and travel times change due to exogenous (e.g. growth of average distances within distance bands) and endogenous influences (e.g. investment in infrastructure, destination choice shifts to further away destination zones).

In the final step, passenger transport performances by mode are converted into vehicle kilometres using distance- and mode-specific occupancy rates. The occupancy rates are taken from national travel surveys (e.g. UK national travel survey) and decrease over time. The major outputs of the passenger transport model comprise the energy demand, emissions, transport expenditures, transport tax and toll revenues.

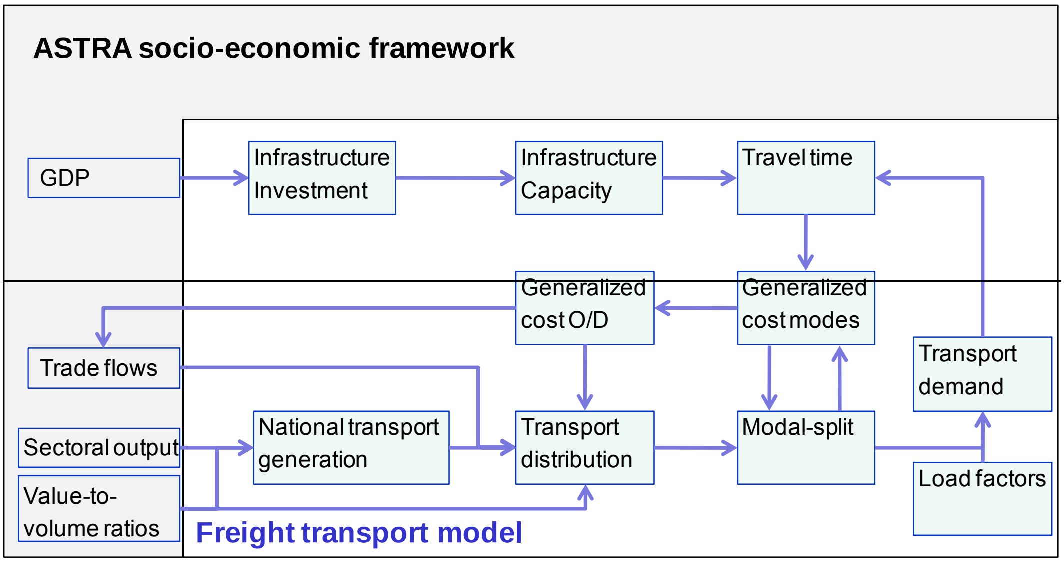


Source: Schade/Jochem et al. 2009

Figure 2-2: ASTRA passenger transport model

Figure 2-3 shows the major interdependencies of the freight transport model. The main outputs of the model are the freight transport performance by mode as well as the vehicle-kilometres-travelled (VKT) by mode. The basic structure of the freight transport model is similar to that of passenger transport; it is a classical four-stage transport model including only a limited 4th stage for assignment. A major difference concerns the distribution model of international freight transport, which derives the freight flows for the OD relations based on foreign trade flows. National transport flows are derived from the sectoral output of each goods-producing sector (15 sectors) in the 29 European countries.

In the final step, freight transport performances by mode are converted into vehicle kilometres using distance- and mode-specific load factors. The load factors are taken from the SCENES model and exogenously increase over time due to the assumption of improved logistics. Further, the load factors are endogenously altered by transport cost, e.g. to reflect organisational improvements in response to higher fuel prices or fuel taxes. Derived from such major outputs of the freight transport model are indicators like energy demand, emissions, investments in freight vehicle fleets, transport tax revenues and toll revenues.



Source: Schade/Jochem et al. 2009

Figure 2-3: ASTRA freight transport model

Major outputs of the TRA provided to the Environment Module (ENV) are the vehicle-km travelled (VKT) per mode and per distance band and traffic situation, respectively. Based on these traffic flows and the information from the vehicle fleet model on the national composition of the vehicle fleets and hence on the emission factors, the environmental module calculates the emissions from transport. Besides emissions, fuel consumption and, based on this, fuel tax revenues from transport are estimated by the ENV. Traffic flows and accident rates for each mode form the input to calculate the number of accidents in the European countries. Expenditures for fuel, revenues from fuel taxes and value-added tax (VAT) on fuel consumption are transferred to the macroeconomics module and provide input to the economic sectors producing fuel products and to the government model.

Another ASTRA module relevant for the iTREN-2030 project is the car fleet model, consisting of a stock model, a purchase model and a choice model for the selection of newly purchased cars. The car fleet model constitutes one of the most policy-sensitive model elements in ASTRA as it reacts to policies that support new technologies (e.g. subsidies or ‘feebates’, a novel combination of fees and rebates), to taxation policies (i.e. car and fuels) and to fuel price changes including changes of CO_2 taxes/certificates and energy tax changes. Other socio-economic drivers also affect the development of the car fleet, especially income, population and the existing level of car ownership.

The car fleet model starts with the purchase model, which determines changes in the absolute level of the car fleet. Depending on changes in income, population and fuel prices, the level of the car fleet is estimated for the next time period. Together with information on the scrappage of cars which mainly depends on the age structure of the fleet, the number of newly purchased cars is then calculated. Purchase of cars via the second-hand market in other countries is not considered, which is a simplification that played a role for the new Member States before they joined the EU.

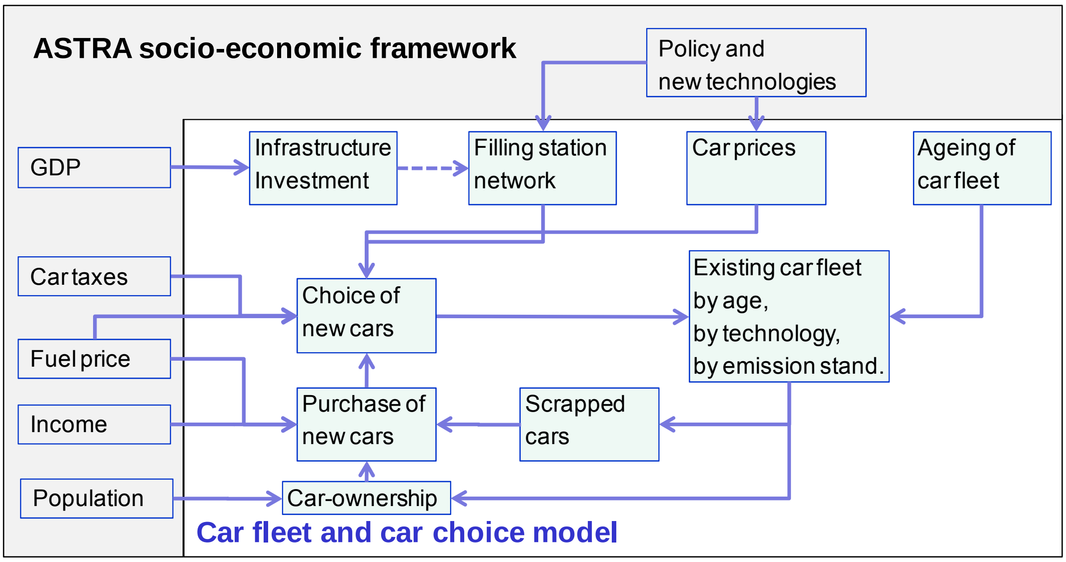
In the second step, the newly purchased cars are transmitted to the choice model, which determines the types of cars that are purchased. Car types include:

- gasoline cars: three types differentiated by cubic capacity (<1.4l, 1.4-2.0l, >2.0l),
- diesel cars: two types differentiated by cubic capacity (<2.0l, >2.0l),
- compressed natural gas (CNG) cars,
- liquefied petroleum gas (LPG) cars,
- bioethanol cars, i.e. cars that can run on 85 % bioethanol (E85) and more (incl. flex fuel),
- hybrid cars, meaning advanced hybrid cars depending on timing, i.e. plug-in hybrids with the ability to run for a significant distance on electricity,
- battery electric cars, i.e. smaller cars running in battery-only mode and
- hydrogen fuel cell vehicles (hydrogen internal combustion engine is not considered a reasonable option).

The choice of a new car depends on fuel prices (incl. taxes), car prices, taxation of car technologies, efficiency of cars, filling station network and, in the case of new technologies, on subsidies or feebates (combined fee and rebate system). In the case of electric vehicles, preferences are also altered by adapting the choice parameters in the model equations.

Emission standards are also considered in the car fleet model. The point of time when a new car is purchased determines to which emission standard it belongs and which emission factors have to be applied to model its emissions. ASTRA distinguishes nine emission standards (2 pre-euro standards, Euro 1 to Euro 7 standard). For example, if a car is purchased in 2005, it is assumed that it complies with the Euro 4 standard.

The third element is the stock model of the existing fleet. This model provides the number of cars and the age distribution in the fleet. Using age-specific scrappage functions and a cohort approach, the model simulates ageing of the individual cohorts of the fleet. Thus it is feasible to analyse the number of cars using a certain engine technology and belonging to a certain emission standard at any point of time.



Source: *Schade/Jochem et al. 2009*

Figure 2-4: ASTRA car fleet and car choice model

Finally, in the Welfare Measurement Module (WEM) major macro-economic, environmental and social indicators can be compared and analysed. Also, different assessment schemes that combine indicators into aggregated welfare indicators, for instance, an investment multiplier, are provided in the WEM. In some cases, e.g. to undertake a CBA, the functionality is implemented in separate tools.

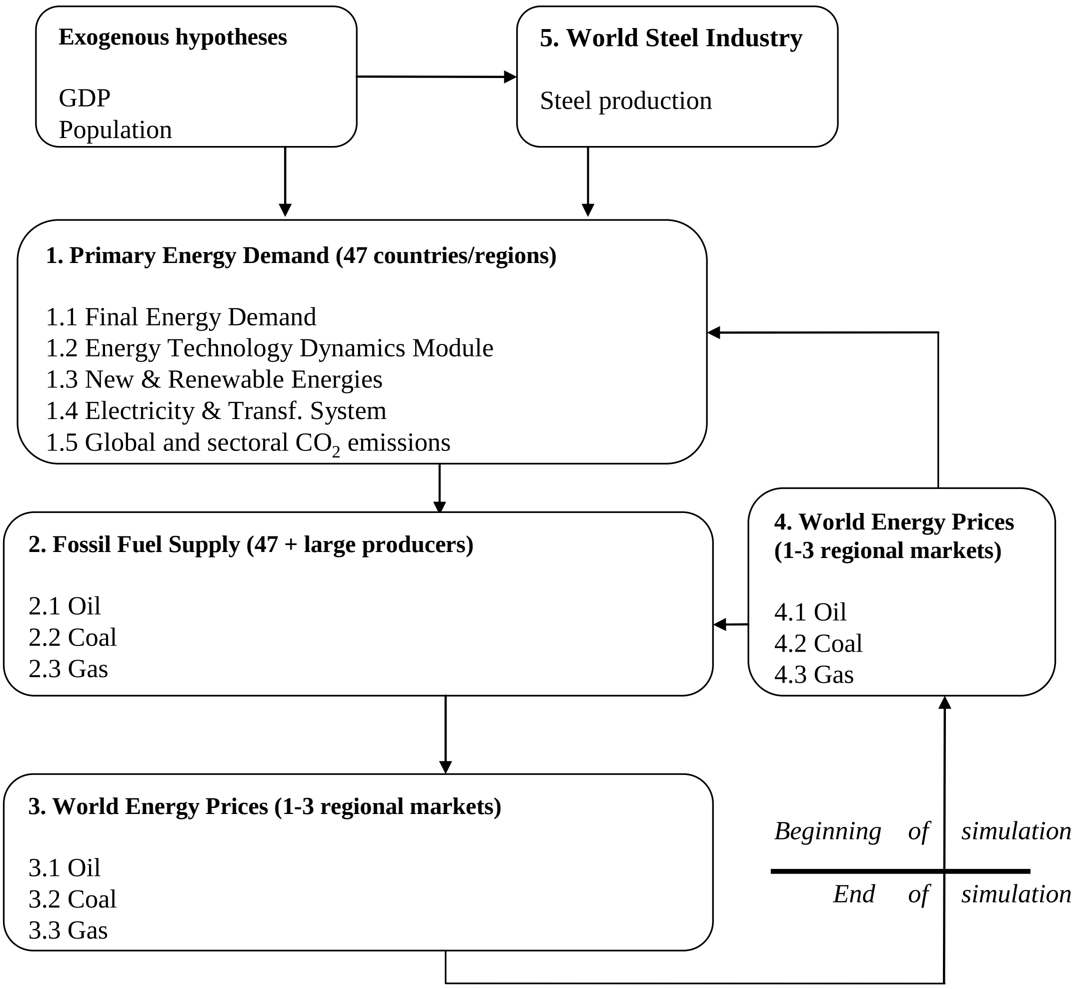
2.2.2 The POLES model

The POLES model is a simulation model to develop long-term (2050) energy supply and demand scenarios for the different regions of the world (Figure 2-5). POLES has been developed and applied in a variety of EU projects, e.g. the WETO, WETO-H2, TRIAS, HOP! and GRP projects.

The model structure corresponds to a hierarchical system of interconnected modules and articulates three level of analysis:

- international energy markets
- regional energy balances
- national energy demand, new technologies, electricity production, primary energy production systems and CO_2 sector emissions.

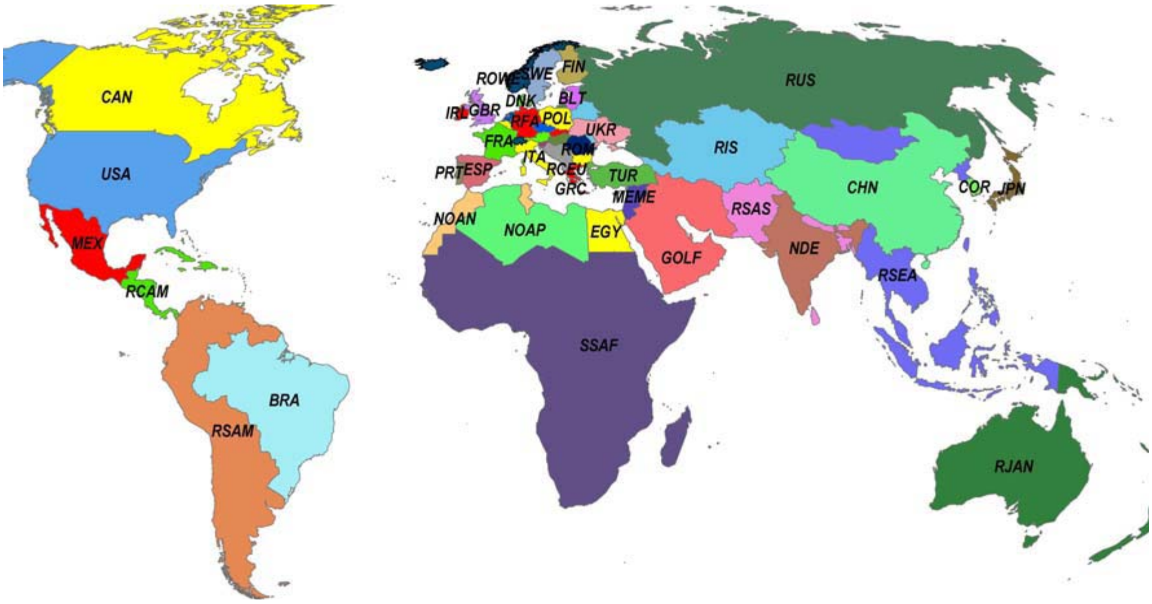
The main exogenous variables are the population and GDP (which in iTREN-2030 are derived iteratively with ASTRA), for each country/ region, the price of energy being endogenised in the international energy market modules. The dynamics of the model corresponds to a recursive simulation process, common to most applied models of the international energy markets, in which energy demand and supply in each national/ regional module respond with different lag structures to international prices variations in the preceding periods. In each module, behavioural equations take into account the combination of price effects and of techno-economic constraints, time lags or trends.



Source: Schade/Fiorello/Beckmann et al. (2008)

Figure 2-5: POLES modules and simulation process

In POLES, the world is divided into 47 zones (see Figure 2-6). In most of these regions the larger countries are identified and treated, with regard to energy demand, in a detailed model. In this version these countries are the G7 countries plus the countries of the rest of the European Union and five key developing countries: Mexico, Brazil, India, South Korea and China. The countries forming the rest of the 14 above mentioned regions are dealt with in more compact but homogeneous models.



Source: iTREN-2030

Figure 2-6: POLES country and region coverage

For each region, the model articulates four main modules dealing with:

- final energy demand by main sectors
- new and renewable energy technologies
- the electricity and conventional energy and transformation system
- the primary energy supply.

This structure allows for a complete energy balance for each region to be simulated, from which import demand / export capacities by region are estimated. At the same time, the horizontal integration is ensured in the energy markets module of which the main inputs are the import demands and export capacities of the different regions. Only one world market is considered for the oil market (the "one great pool" concept), while three regional markets (America, Europe, Asia) are distinguished for coal and gas, in order to take different cost, market and technical structures into account.

According to the principle of recursive simulation, the comparison of import and export capacities for each market allows the determination of the variation of the price for the following period of the model. Combined with the different lag structure of demand and supply in the regional modules, this feature of the model allows the simulation of under- or over-capacity situations, with the possibility of price shocks or counter-shocks similar to those that occurred on the oil market in the seventies and eighties.

In the final energy demand module, the consumption of energy is divided into 11 different sectors, which are homogeneous from the point of view of prices, activity variables, consumer behaviour and technological change. Each sector belongs to one of the three 'blocks': industry, transport and residential-tertiary-agriculture. In each sector, the energy consumption is calculated separately for substitutable technologies and for electricity, while taking account of specific energy consumption (electricity in electrical processes and coke for the other processes in the steel-making, feedstock in the chemical sector, electricity for heat and for specific uses in the residential and service sectors).

The POLES model calculates oil production for every key producing country or region, based on oil reserves. This is performed in three steps. Firstly, the model estimates the cumulative amount of oil discovered as a function of the ultimate recoverable resources (URR) and the cumulative drilling effort in each region. The amount of URR is not held constant, but is calculated by revising the value for the base year, based on a recovery ratio that improves over time and increases with the price of the resource. According to WETO-H2, while the recovery rate is differentiated across regions, the world average accounts for 35% today and, due to the price-driven technology improvements, increases to around 50% in 2050.

Secondly, the model calculates remaining reserves as equal to the difference between the cumulative discoveries and the cumulative production for the previous period. The calculation is described by the formula: $R_{t+1} = R_t + DIS_t - P_t$ (where R = reserves, DIS = discoveries, P = production, subscript t = year of account).

Finally, the model calculates the production, which differs among regions of the world. In the "price-taker" regions (i.e. non-OPEC) it results from an endogenous reserves-to-production (R/P) ratio that decreases over time and the calculated remaining reserves in the region; the production from "swing-producers"(i.e. OPEC) is assumed to be the amount needed to balance the world oil market (OPEC total oil production = total oil demand – non-OPEC total oil production). Thus, the model calculates a single world price, which depends in the short term on variations in the rate of utilisation of capacity in the OPEC Gulf countries and in the medium and long term on the world R/P ratio (including unconventional oil). The unconventional oil enters in the composition of the world oil supply when the oil international price makes it competitive against the conventional oil, that is, when the world oil price exceeds the cost of an unconventional source of oil.

The gas discoveries and reserves dynamics are modelled in a similar way to that used for oil; whereas the gas trade and production are simulated in a more complex process that accounts for the constraints introduced by gas transport routes to the different markets. The production of gas in each key producing country is derived from the combination of the demand forecast and of the projected supply infrastructures in each region (pipelines and LNG facilities). Three main regional markets are considered for gas price determination, but the gas trade flows are studied in more detail for 14 sub-regional markets, 18 key exporters and a set of smaller gas producers. The price of gas is calculated for each regional market; the price depends on the demand, domestic production and supply capacity in each market. There is some linkage to oil prices in the short term, but in the long term, the main price driver is the variation in the average reserve-to-production ratio of the core suppliers of each main regional market. As this ratio decreases for natural gas as well as for oil, gas prices follow an upward trend that is similar in the long term to that of oil.

A recent module developed in POLES is the biofuels model. It has improved the capability of POLES to deal with a potentially relevant alternative source of energy for the transport sector. The biofuels model is based on the production costs of biofuels and those of the fossil alternative they substitute, taking into account the biomass potential of each region. In addition, the model considers the 1st and 2nd generation of biofuels and as well the use of biomass for electricity and the direct use of biomass in the residential and industrial sectors.

With other modules, POLES simulates global transport demand. However, in iTREN-2030 European transport demand is provided to POLES by ASTRA, taking into account the TRANS-TOOLS transport demand from TTv2.

2.2.3 The TRANS-TOOLS model

The TRANS-TOOLS model is an IPR-free European-wide network-based transport planning tool. The model covers both passenger and freight transport with interactions to an economic model and impacts models. The aim of the TRANS-TOOLS model is to serve as a tool for strategic transport policy analysis at EU level. The TRANS-TOOLS model has been developed by a 6th Framework Research Project called TRANS-TOOLS [Burgess et al. 2006], which developed the so-called TRANS-TOOLS version 1 (TTv1). It has been updated by the TEN-Connect project [Rich 2008, Rich et al. 2009], which developed the so-called TRANS-TOOLS version 2 (TTv2). The model is continuously maintained by the European Commission DG JRC, IPTS in Seville and the most recent information on the TRANS-TOOLS model is provided via the official website:

http://energy.jrc.ec.europa.eu/transtools/

Transport policies which may be assessed by the TRANS-TOOLS model include, for instance:

- construction and improvement of the infrastructure e.g. trans-European networks to eliminate bottlenecks, promote mode shifts, improve quality of service etc.
- implementation of infrastructure charging systems
- change of transport costs due to policy interventions, increases in fuel prices etc.

The geographical scope of the model includes all European countries and the zoning system is based on NUTS3, consisting of 1,441 zones in the most recent version. Separate networks for road transport, rail passenger and freight transport, inland waterways transport, and passenger transport by air are modelled.

The TRANS-TOOLS model is similar to a traditional four-step model including freight and passenger modelling. The main sub-models are:

- freight demand model
- passenger demand model and
- assignment model

The TRANS-TOOLS model computes transport flows (passenger, vehicles and tonnes) at link level or zonal level, and transport performance (travel distance, cost, times, passenger-km, tonne-km etc). In addition to these main elements of the model system, the TRANS-TOOLS model also includes an economic model and impact models. The economic model CGEurope predicts future developments by the NSTR related sector of the economy of each region of the EU and assesses the feedback effect of transport policies on the sectors in monetary terms. The outputs of the impact models include calculation of energy consumption, emissions, external costs, and safety.

The different models are linked by applying a number of conversion routines. All model components are integrated into ArcGIS which allow the user to edit, operate and illustrate results from the same common GIS-based platform.

In its capacity as an integral sub-model of the TRANS-TOOLS freight model, the TTv2 trade model calculates a future freight demand per commodity per O/D relation, regard-less of the mode of transport. A two-stage method, predicting origin and destination totals first and applying the doubly constrained model next, is used in the trade model. In calculating origin and destination totals, money flows are converted into tonnes used in freight modelling. To reduce the uncertainty, a pivot-point procedure relative to the totals of the Worldnet 2005 base year matrix is used for all relevant regions within the core area of the TRANS-TOOLS model. The output of the trade model is a forecast O/D matrix for freight, including origin region, between transhipments and destination region, commodity group and tonnes.

In the modal split model the market shares of the different modes of transport are estimated for every O/D relation and commodity group from the trade model. The purpose of the mode split model is to relate changes in the relative costs of multi-modal paths into traffic shares: within the model there are four main modes of transport available (road, rail, inland waterway, sea). For each combination of origin and destination, the model calculates the level of service (i.e. cost) of each base year path and compares it with each scenario year path; this results in changes in the mode shares. Choice probabilities of the available modes per commodity group for every O/D relation are determined by using a multinomial logit model. Output of the TRANS-TOOLS modal split model is a freight matrix, which consists of a forecast O/D matrix including forecast modal split.

The working of the TRANS-TOOLS logistic module is based on SLAM, which is a module developed in the SCENES project. This module makes it possible to evaluate the impacts of changes in the logistic and transport systems within Europe on the spatial patterns of freight transport flows, through changes in the number and location of warehouses for the distribution of goods. The logistic module produces output that is to be used in the assignment model as well as in the economic model. For the assignment model the logistic module produces unimodal transport matrices (origin, destination, mode, tonnes, vehicles). The economic model needs generalized and monetary costs per origin, destination and commodity type. These costs can be computed from the assigning process. The monetary costs (payment to the public budget, e.g. toll, fuel taxes) can be separated out if input on these costs is available.

The passenger model, as developed in the TEN-Connect project, is based on the generation-attraction (GA) approach (the person that conducts the trip). This approach focuses on the person that conducts the trip and therefore ensures that the socio-economic drivers affect both outward and return trips. Generally, the approach for transforming matrices to GA is different for different trip purposes. The TRANS-TOOLS model uses four trip purposes: business, private, commuting and tourism.

- Business trips are based on GDP and work place in the zone of origin and destination respectively.
- Commuting is part of private trips in the TRANS-TOOLS model. Based on assumptions on trip lengths, commuting is separated from private trips, assuming commuting to be mainly short distance (yet several metropolitan regions in TRANS-TOOLS have 3-6 NUTS3 zones, and therefore commuting between NUTS3). The separated OD is transformed to GA based on population, work places and GDP.
- The remaining private trips are transferred from OD to GS based on GDP and population in the zone of origin and destination respectively.
- Tourism is based on population, GDP and a tourist attractiveness measure in the zone of origin and destination.

Travel costs, travel time and information about the trip itself, like frequencies and number of transfers, are used to split the trips between the modes. Subsequently, for each origin-destination pair the modal split model calculates the probability of selecting a modal alternative out of a set of available modes. A non-linear logit function is used in order to calculate the choice probability. The explanatory variables represent the transport service level between two zones, e.g. in the dimensions travel costs and travel time. Output of TRANS-TOOLS passenger demand model to assignment model are unimodal passenger O/D transport matrices at NUTS3 level in number of passengers per mode (rail, road, air) and trip purpose as well as unimodal passenger O/D transport matrices at NUTS3 level in the number of vehicles for road relations per trip purpose.

The network assignment module produces the direct output from the TRANS-TOOLS model. However, the models also generate level-of-service data (LOS) as input to passenger, freight, and logistic models in a feedback loop. Four independent assignment models are developed within the TRANS-TOOLS model:

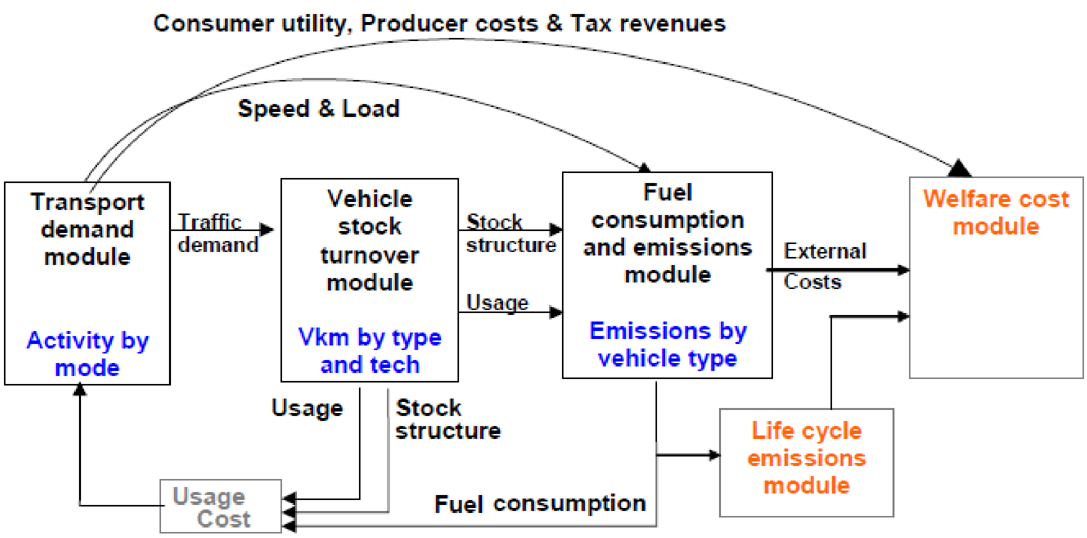
- road network (passenger and freight)
- rail network (passenger and freight)
- inland waterway (freight)
- air network (passenger).

Passengers by rail and air and freight by rail and inland waterways are assigned based on an average day, since congestion is not considered and information on service data differentiated by time and day is not available. LOS in the road assignment is calculated by time period. In TRANS-TOOLS, a stochastic assignment procedure is applied, based on probit-based models.

2.2.4 The TREMOVE model

TREMOVE is a policy assessment model developed to study the effects of different transport and environment policies on the emissions of the transport sector. It is an integrated simulation model developed for the strategic analysis of the costs and effects of a wide range of policy instruments and measures applicable to local, regional and European transport markets. The model was developed by the Catholic University of Leuven and Transport & Mobility Leuven.

TREMOVE models both passenger and freight transport in 31 countries (EU27 plus CH, NOR, HR, TR), and covers the period 1995-2030, providing yearly results. The TREMOVE model consists of separate country models. While the numeric values of the model differ from country to country, the model code is identical across countries. Figure 2.4 maps the modular structure of TREMOVE. Each country model describes transport flows and emissions in three model regions: one metropolitan area, an aggregate of all other urban areas and an aggregate of all non-urban areas. Trips in the non-urban areas are further separated in short (- 500 km) and long (+ 500 km) distance trips. The model explicitly takes into account that the relevant modes and network types differ, depending on the area considered.



Source: iTREN-2030

Figure 2-7: Modular structure of TREMOVE

The transport demand module represents, for a given year and transport mode, the number of passenger-kilometres or ton-kilometres that will be performed in each "model region" of the country considered. Three freight categories are distinguished (bulk, unitised and general cargo) as well as three passenger trip purposes (non-work, commuting and business). Also, transport flows are allocated to peak and off-peak periods. With this demand module, the impact of policy measures on the transport quantity of all transport modes is calculated. Transport modes for passenger trips include slow modes, mopeds, motorcycles, cars, vans, bus, metro/tram, train and plane. Freight modes are inland waterways, freight trains, light duty trucks and heavy duty trucks (disaggregated into four weight classes). Four road types are distinguished. TREMOVE models the transport activities within these areas without explicit network disaggregation. This simplification allows a simple but complete policy simulation model to be calibrated, starting from an exogenous baseline transport forecast. Since the iTREN-2030 project, the exogenous baseline is taken from TRANS-TOOLS.

The demand for private transport (non-work and commuting passenger trips) is the result of the decision processes of all households in a country, assuming that, within the constraints of their available budget, households choose the combination of goods that maximizes their utility. The decision processes of households are modelled using nested constant elasticity of substitution (CES) utility functions. Knowing the substitution elasticities between the different transport options, it is possible to model the change in consumed quantities in policy simulations.

The demand for business transport (freight transport and business passenger trips) is modelled as a result of the decision processes within firms. Business transport demand is determined by generalized prices, desired production quantities and substitution possibilities with other production factors. For a given production level, profit maximization then is equivalent to cost minimization. The cost-minimizing substitution processes are represented again by a nested CES production function.

The demand module produces aggregate transport quantities by mode. The vehicle stock module disaggregates these into detailed vehicle-km figures by vehicle type, vehicle technology and vehicle age. This requires a detailed modelling and forecasting of the vehicle fleet structures for each mode. Road and rail vehicle fleet evolution is modelled using a classic scrap-and-sales approach. Each year scrap rates are applied to estimate the number of scrapped vehicles. Total vehicle sales by mode then can be derived by comparing remaining vehicle stock to the stock needed to fulfil transport demands. The following step then is to disaggregate total sales by mode into sales by vehicle type and technology. For cars, motorcycles, vans, light duty trucks and buses the disaggregation by vehicle type is performed using a discrete choice (multinomial) logit model. For road vehicles, the vehicle types are further split up according to their technology. The technologies modelled in the baseline correspond with the EU emission standards. They are directly linked to the vintage of the vehicle.

In the fuel consumption and emissions module, fuel consumption and exhaust and evaporative emissions are calculated for all modes. Emission factors have been derived consistently from EU sources, thus may deviate from national estimates. For road vehicles, TREMOVE emission factors are based upon (a preliminary version of) the COPERT IV emission calculation methodology, to which following additions have been made:

- disaggregation of COPERT diesel car fuel consumption factor into three factors according to engine displacement, based upon EU CO_2 monitoring data;
- Upward scaling of COPERT fuel consumption factors for 2002 cars, based upon EU test-cycle monitoring data and information on the difference between test-cycle and real-world fuel consumption [Van den Brink and Van Wee, 2001 and TNO 2006];
- Introduction of fuel efficiency improvement factors up to 2009. For cars, these are based upon the voluntary agreements between the EU and the car industry. For other road vehicles predictions are derived from the Auto Oil II Programme;
- Update of moped and motorcycle emission factors based on recent information [Ntziachristos et al. 2004];
- Emission factors for CNG vehicles.

Fuel consumption and emission factors for diesel trains and aircraft (by distance class) have been derived from the TRENDS database. For electric trains, trams and metros only total energy consumption (kWh) is calculated in this module. The fuel consumption and emission factors for inland waterway vessels have been calculated following the first version of the approach developed within the ARTEMIS [Georgakaki 2003] project. Factors have been estimated using data on vessel characteristics for the 21 types included in TREMOVE and using estimates on waterway characteristics.

A welfare assessment module has been constructed to evaluate policies in TREMOVE. Differences in welfare between the baseline and the simulated policy scenarios are calculated. Based on the utility functions for private transport demand, the aggregate utility level of households is quantified. The modelling of business decisions leads to an aggregate measure for the change in production costs of firms. Additionally, welfare changes stemming from changes in tax revenues are incorporated by using the marginal cost of public funds. This latter approach accounts for the options of the government to beneficially use additional tax revenues from the transportation sector to lower taxes in other sectors. Emissions to air are calculated in detail. The external costs of these emissions are also incorporated in the welfare evaluation of policy measures.

2.3 Model integration

The Integrated Scenario was based on the four models prepared for the Reference Scenario [Fiorello et al. 2009]. This means the starting point was the transport demand scenario of the TRANS-TOOLS model from TEN-Connect project (TTv2), but incorporating the improvements developed by iTREN-2030 concerning e.g. rail passenger demand [see Newton et al 2009].

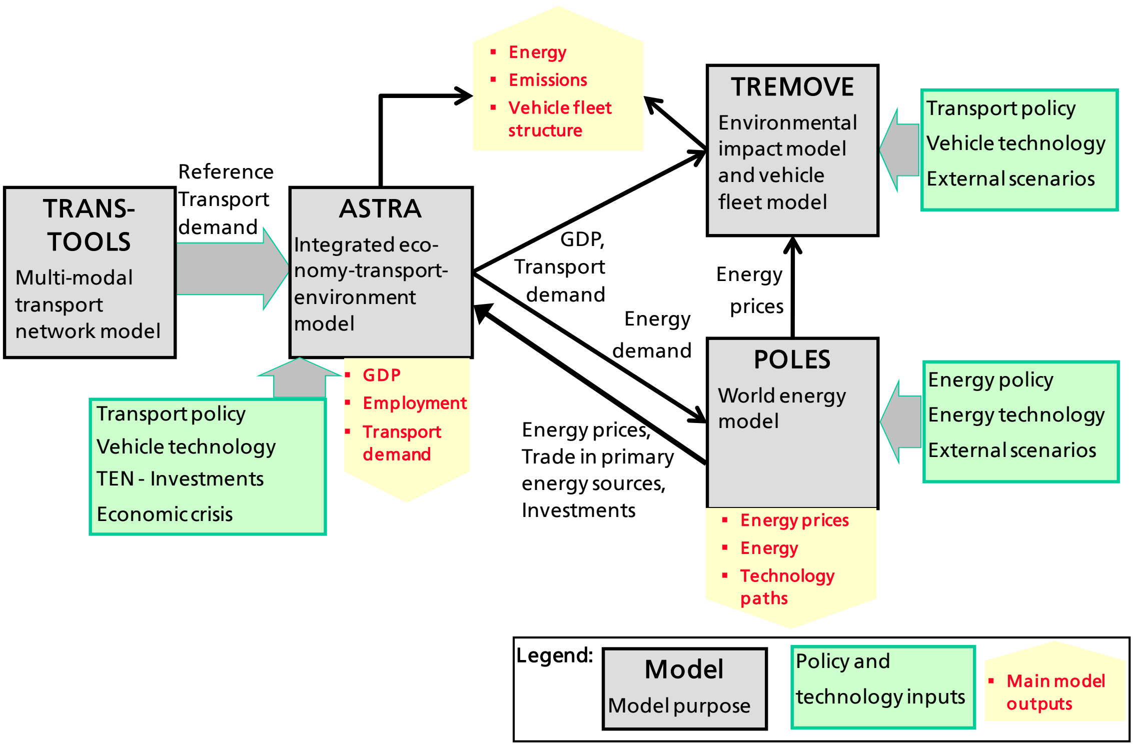
The first point for adaptations of the models concerned the inclusion of the economic crisis, which is part of the Integrated Scenario (INT), but was not included in Reference Scenario (REF). The economic crisis was implemented in the economic module of ASTRA, which is the only one of the four models that contains a full macro-economic component, enabling it to describe the impacts of the crisis. This resulted in new trends of GDP by country from 2008 until 2030. These trends were then forwarded from ASTRA to the other models. However, the forecast economic changes resulting from ASTRA were not fed back to TRANS-TOOLS. This was not feasible because of the limited access to the updates of the TTv2 model from TEN-Connect during the iTREN-2030 project. Therefore, only the three models ASTRA, POLES and TREMOVE were applied in the further analysis of the Integrated Scenario (see Figure 2-8).

Instead of using the TTv2 results for transport demand from TEN-Connect, ASTRA generated its own estimates of transport demand (TTv2 plus crisis) for the Integrated Scenario. It was particularly important for the consistent application of ASTRA and TREMOVE that this revised transport demand reflecting TTv2 plus crisis was provided from ASTRA to TREMOVE, which implemented the new transport demand.

After this step, all three models implemented the policies foreseen for the Integrated Scenario. Again at this stage the linkage between ASTRA and POLES was implemented as an iterative process in which both models implemented the policies and then new results were generated by ASTRA and transferred to POLES, which generated new fuel prices, trade in energy and energy investments that were fed back to ASTRA, which then repeated its simulation considering these new inputs [for details see HOP! D3, Schade/Fiorello et al. 2008]. Then new ASTRA results were transferred to TREMOVE. Such an iterative process ended when the change of GDP between two iterations was negligible. After checking for broad consistency of reactions to the policy, the final results of ASTRA and POLES (GDP, fuel prices) were transferred to TREMOVE to make a final simulation in TREMOVE, so that GDP, fuel prices and applied policies were consistent in all three models.

As Figure 2-8 reveals, the different output indicators that describe and quantify the trends in the Integrated Scenario are then provided by the most appropriate model.

This means, GDP, employment and transport demand come from ASTRA with some complents to transport demand from TREMOVE. Energy prices, aggregate energy demand and technology paths are described by POLES. Vehicle fleets, emissions and disaggregate transport fuels demand is provided by ASTRA and TREMOVE models.



Source: iTREN-2030

Figure 2-8: Integration of the four models of iTREN-2030 in Integrated Scenario

The following provides a brief summary of steps to model the Integrated Scenario, starting from the Reference Scenario that was rendered consistent for all four models:

1. Implement economic crisis in ASTRA:
   - Feed GDP and transport demand from ASTRA to TREMOVE.
   - Feed GDP and transport energy demand from ASTRA to POLES.
   - Consolidate in all three models a preliminary Integrated Scenario including the crisis, but without policies.
2. Implement energy and transport policies of Integrated Scenario in ASTRA, POLES and TREMOVE models.

3. Iterate transport energy demand, fuel prices and GDP between ASTRA and POLES.
4. Feed final GDP and fuel prices from ASTRA-POLES to TREMOVE, resulting in three models that run with consistent GDP, fuel prices, energy and transport policy package, but differ slightly in their reactions to the policies.

2.4 Detailed description of modelling approaches

This chapter aims at providing in-depth knowledge about the modelling approaches applied for simulating transport demand, vehicle fleet composition and transport-related emissions in the INT scenario of iTREN-2030. These indicators are quantified with the harmonized ASTRA and TREMOVE models, so that the following model descriptions refer to these models, in particular to ASTRA.

Most transport demand indicators are computed by ASTRA, supported by TREMOVE, which provides the demand for navigation on inland waterways. Trends in vehicle fleet development and the technological composition are also a conjoint output of ASTRA and TREMOVE. TREMOVE simulates the heavy duty vehicle and bus fleet development while ASTRA computes the light duty vehicle fleet. For passenger car fleets ASTRA and TREMOVE results are combined. TREMOVE provides the total motorisation trends and simulates the probable pathways for the conventional technologies gasoline and diesel. Alternative fuel car diffusion is calculated in the ASTRA car fleet model. Projections on transport-related emissions are coming from both models taking into account the model usage for fleet computations.

2.4.1 Modelling transport demand

Transport demand is simulated in a slightly different way in ASTRA and TREMOVE. ASTRA is able to provide its own transport demand projection based on classical 4-stage transport modelling with population, trade and economic activity as major drivers. TREMOVE takes such a transport demand projection as an input and on top of that implements the transport policies that should be subject to a policy analysis. The same holds for ASTRA that is also able to implement transport policies on top of its baseline transport demand projections.

As most transport indicators are provided by the harmonised ASTRA, the following description concentrates on the ASTRA approach. ASTRA applies an adjusted version of the classical four-stage transport modelling approach [Ortuzár/Willumsen 2004]. The classical four-stage model consists of four sub-models in a sequence: trip or volume generation, distribution, modal split and assignment. The stages of generation and distribution, both for passenger and freight transport, are implemented in the ASTRA regional economics (REM) module. In the following, the structure of both model stages as well as their major outputs are described. As these stages are managed in quite different ways for passengers and freight, they are examined separately. Finally, the modal split stage is presented in a generic way as the modelling procedure is similar for freight and passenger transport.

2.4.1.1 Passenger trip generation

Originally, the passenger trip generation of state-of-the-art four-stage models can be differentiated into two parts: trip production and trip attraction. Trip production comprises the computation of the total number of trips per year for three trip purposes originating in each functional zone in EU27+2 countries, while trip attraction simulates the number of trips per year and trip purpose that have their destination in a certain functional zone. In brief, each of the EU27+2 countries is subdivided into one, two or four functional zones according to settlement patterns and level of GDP per capita. The resulting trip vectors provide the required input for the distribution stage that is performed by a gravity function. Originated and attracted trips represent the attracting masses in this gravity function. The number of trips from origin zone to destination zone per trip purpose without differentiation into transport modes is the output of the distribution stage.

As opposed to the described distribution approach, an alternative approach was chosen for the ASTRA REM module. The original approach using a gravity function in the distribution stage could not be implemented because of the necessary adjustment processes. Balancing factors have to be computed in a FURNESS (1965) iteration approach in order to control the multiplication of originating and attracted trips. Four-stage transport models are usually applied in static approaches, while ASTRA calculates results in every single integration time step between 1990 and 2030. Therefore, the Furness iteration process adjusting the trip matrix for each trip purpose at each time step would require large computational resources. In fact, the ASTRA model is simulated on personal computers or servers with high-grade equipment but running a simulation with ASTRA should not last longer than a few minutes, which is not feasible applying Furness iteration. Thus the ASTRA model contains a distribution approach that requires only the assessment of originating trips in the trip generation stage.

In ASTRA, the trip generation is performed by multiplying average yearly trip rates per person with the number of persons of four person segments that live in a functional zone. The following equation describes the computation of originating trips:

$$OT_{i,z,tp,ps,ca}(t) = POP_{i,z,ps,ca}(t) * TR_{i,tp,ps,ca}(t) \qquad \text{(eq. 2-1)}$$

where: *OT =* *number of trips per country i, functional zone z, trip purpose tp, population segment ps and car availability ca*
POP= *persons per country i, functional zone z, population segment ps and car availability ca*
TR = *trip rate per country i, trip purpose tp, population segment ps and car availability ca*
i = *index for EU27+2 countries*
z = *index for functional zone*
tp = *index for three trip purposes*
ps = *index for population segment*
ca = *index for car availability status*

Trip rates reflect the specific propensity of persons with certain characteristics and thus are differentiated into representative combinations of person attributes. Basic ASTRA trip rates were derived from the SCENES (ME&P 2000) model for all EU15 countries. They are differentiated into three trip purposes (business, private and tourism), four population segments (children younger than 16 years, employed persons between 16 and 64 years, unemployed persons between 16 and 64 years and retired persons older than 64 years) and three car-availability categories (full access to car, shared car and no car available). According to the predefined combination of attributes in SCENES trip rates, the population is assigned to the different attribute combinations. Demographic structures are provided by the POP module, employment status by the MAC module and car-availability by the Vehicle Fleet (VFT) module.

Most western European countries and members of EU15 frequently performed mobility or travel surveys among the population helping to identify mobility patterns of specific population clusters, for example, the German Mobility Panel and the Dutch National Travel Survey or the British National Travel Survey. Analysing and comparing these mobility surveys led to the insight that mobility patterns and average numbers of trips per person in these countries resemble one another. Unlike Western Europe, no surveys were available for the eastern European members of the EU. This lack of information and data required the development of an appropriate methodology to estimate the passenger trip rates in the new Member States. This approximation was based on available data on transport performance and socio-economic indicators like GDP per capita (KRAIL 2009).

2.4.1.2 Freight demand generation

Generation of freight demand is mainly driven by the production of physical goods. As the result of industrial activity is generally consumed far from the production location, the larger the amount of products, the higher the freight traffic is.

Hence, the starting input is represented by the value of production of physical goods provided for each sector by the ASTRA MAC and FOT modules. National and international transport are treated differently, since the former depends on domestic output per sector, while the latter depends on country-wise export flows that already incorporate a distribution. In both cases the monetary aggregates are put into volumes of generated freight demand by dividing them by the average unitary values of production in each sector:

$$V_{i,s}(t) = \frac{O_{i,s}(t)}{VVR_s(t)} \qquad \text{(eq. 2-2)}$$

where: *V =* *Volume of goods generated by sector s in country i*
O = *Value of production of sector s in country i*
VVR = *value-to-volume ratio of sector s*
i = *index for EU27+2 countries*
s = *index for 25 economic sectors*

The unitary values of production, expressed in €/ton were estimated from available statistics. The unitary values are assumed to decrease slightly in the future, i.e. the same monetary flow will generate less tons of transport due to an expected trend towards higher value goods. As for passengers, where three trip purposes are considered, three different handling categories are defined: bulk (e.g. oil, sand, cereals), general cargo (e.g. machinery, building materials) and unitised (e.g. containers, swap bodies).

2.4.1.3 Passenger and freight distribution

The main objective of passenger trip distribution consists in the assignment of generated trips among all possible destinations. Passenger trip distribution among all available destinations is estimated by a discrete choice function:

$$p_{od} = \frac{e^{-\lambda * u_{od}}}{\sum_d e^{-\lambda * u_{od}}} \qquad \text{(eq. 2-3)}$$

where: λ= *spread parameter*
p = *probability that demand generated in origin o choose destination d*
u = *disutility of the trip from origin o to destination d*

The implemented utility function consists of a term that accounts averaged generalised times per trip from origin to destination per trip purpose with a specific disutility or resistance for this origin-destination link. Generalised times per origin-destination link per trip purpose per passenger mode are provided by the Transport (TRA) module. Weighted by the simulated traffic volume per passenger mode on the specific origin-destination links, average generalised times were calculated. For freight, average generalised cost is used instead. Generalised time is calculated as travel time plus the equivalent, in time terms, of the costs of the trip. The translation of cost into time is based on value-of-time differentiated by trip purpose and by handling category. The computation of average generalised cost for freight requires similar elements, but the translation concerns time into monetary units. Value of time represents the monetary value of a unit of time. It strongly depends on the trip purpose, respectively goods category.

As in real transport systems, passenger and freight transport modes are not available for all distances, trips and freight demand are assigned to predefined distance bands. Five passenger distance bands are implemented: local (LC, distances below 3.2 km), very short (VS, distances => 3.2 and < 8 km), short (ST, distances => 8 and < 40 km), medium (MD, distances => 40 and 160 km) and long (LG, distances > 160 km) distances. Freight transport is differentiated into four distance bands: short (LOC, distances < 50 km), medium-short (REG, distances => 50 and < 150 km), medium-long (MED, distances => 150 and 700 km) and long (LGD, distances > 700 km) distances. Distance bands were assigned to each possible origin-destination pair according to the average distance of road freight modes and passenger car mode.

2.4.1.4 Freight and passenger modal split

Modal split constitutes the third stage of the classical four-stage transport model. For passenger modal split, the model simulates the probability of a person's decision to use one out of all available transport modes for a trip from origin to destination zone for a certain trip purpose. The modal split is performed with a discrete choice function that is based on random utility theory (DOMENICH/MCFADDEN 1975). Basic assumptions are that persons act rationally and possess perfect information, a set of alternative modes exists and each alternative associates a net utility. Among the existing different specifications of discrete choice models, the selected modal split modelling approach can be assigned to the group of multinomial probit models (ORTÚZAR/WILLUMSEN 2004). The following equation illustrates the calculation of the mode-specific probability for passenger transport. The only difference between passenger and freight transport logit equations is that freight modal split is estimated for three goods categories instead of trip purposes.

$$P_{o,d,tp,pm}(t) = \frac{e^{-\eta * U_{o,d,tp,pm}(t)}}{\sum_{pm} e^{-\eta * U_{o,d,tp,pm}(t)}} \qquad \text{(eq. 2-4)}$$

where: η= *spread parameter*
P = *probability of using mode pm for the trip from origin o to destination d*
U = *disutility of using mode pm for the trip from origin o to destination d*
o = *index for origin functional zone*
d = *index for destination functional zone*
tp = *index for trip purpose respectively goods category*
pm = *index for passenger respectively freight transport mode*

The logit function contains a disutility function for each origin-destination pair, trip purpose respectively goods category and transport mode that is composed out of generalised costs and a constant, the so-called residual disutility.

$$U_{o,d,tp,pm}(t) = GC_{o,d,tp,pm}(t) + RD_{o,d,tp,pm}(t) \qquad \text{(eq. 2-5)}$$

where: U = *disutility of using mode pm for the trip from origin o to destination d and trip purpose tp*
GC = *generalised cost of using mode pm for the trip from origin o to destination d and trip purpose tp*
RD = *residual disutility - constant specific of trip purpose tp mode pm*
o = *index for origin functional zone*
d = *index for destination functional zone*
tp = *index for trip purpose respectively goods category*
pm = *index for passenger respectively freight transport mode*

In order to compute the transport flow matrices for each available transport mode, the resulting mode-specific probabilities are multiplied with the demand for passenger and freight transport that is provided by the REM in form of origin-destination (O/D) matrices per trip purpose, respectively goods categories. Based on the classification of trips into five passenger and four freight distance bands, the modal split is performed for each distance band with different sets of available transport modes. In the passenger modal split model, the shortest distance band (LC) allows the decision between slow modes (walking or cycling), car and bus while the long distance band (LG) covers car, bus, train and air mode.

Initial traffic flows for the year 1990 were derived from information from SCENES (ME&P 2000) and ETIS (NEA et al. 2005) matrix for the year 2000. Based on observed trends between 1990 and 2000, these matrices were transformed into 1990 values and implemented as initial values for each distance band.

2.4.2 Modelling vehicle fleets

The development of motorisation, the technological composition of vehicle fleets and the diffusion of emission standards in the fleets are additional relevant inputs required for a comprehensive modelling of transport emissions. The approach for modelling vehicle fleets in ASTRA and TREMOVE is similar, despite some minor differences. Both models consider each road mode in single models so that the development of vehicle fleets for passenger cars, buses, light duty vehicles (LDV) and heavy duty vehicles (HDV) in EU27+2 can be simulated. Passenger car fleets cover all passenger cars lighter than 3.5 tons, LDV all vans respectively trucks from 3.5 to 7.5 tons and HDV all trucks heavier than 7.5 tons. One of the differences between ASTRA and TREMOVE concerns the coverage of fuel technologies for passenger cars. ASTRA covers besides the conventional technologies (gasoline and diesel) also the most important alternative technologies. Another difference is that ASTRA derives the development of new passenger car registrations from socio-economic drivers like income, population, fuel prices or purchase costs. TREMOVE simulates the demand for new passenger car registrations via road passenger transport and average yearly mileages. New registrations of buses, LDV and HDV are driven by replacement of scrapped cars together with the demand for new vehicles derived from vehicle-kilometre-travelled for each mode. Based on average mileages per vehicle category, both models deduce the registration of new vehicles. The core element of all vehicle fleet models is similar in ASTRA and TREMOVE, as all models simulate the vehicle fleet stock via level variables that are increased by new registrations and decreased by scrapping. As all three level variables store and differentiate vehicle stocks by age, the model is able to compute scrapping depending on the age of the vehicle. In the ASTRA calibration process, the parameters for scrapping cars that reached a certain age are optimised. The following equation 2-6 describes the applied cohort model. The LDV model differentiates between vehicles with in each case one diesel and one gasoline engine category. HDV are usually equipped with diesel engines, so that this model distinguishes only between different loaded weight categories. Additionally, all new registered vehicles are assigned to emission standard categories according to the registration year. In the following, the

ASTRA passenger car fleet modelling approach is described in detail, focussing on the technology choice module which differs from other fleet models.

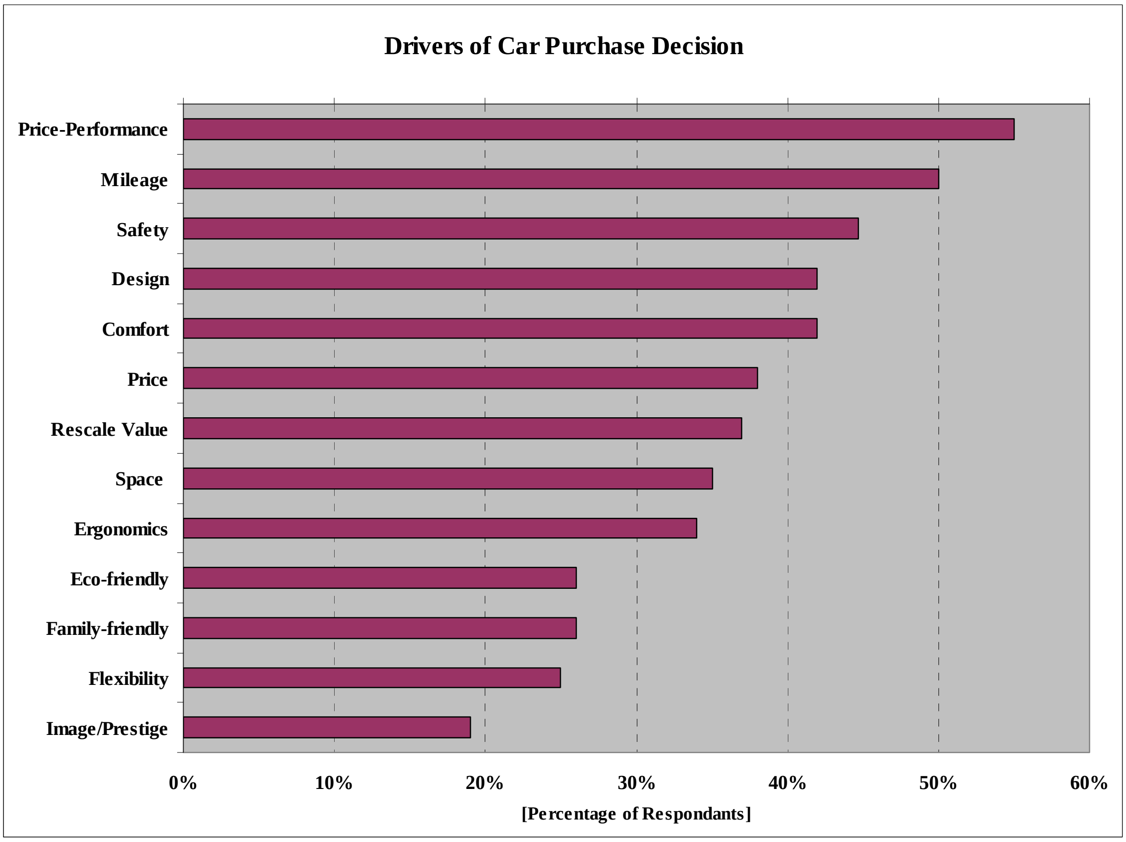
$$V_{i,c}(t) = \begin{cases} NRV_{i,c}(t) - V_{i,c}(t-dt) \rightarrow c = 0 \\ V_{i,cp}(t-dt) * (1 - SP_{i,c-1}) - V_{i,c}(t-dt) \rightarrow c \in [1,24] \end{cases} \quad \text{(eq. 2-6)}$$

where: *V =* *number of vehicles in country i and age cohort c*
NRV = *new registered vehicles*
SP = *scrapping probability of car in age cohort c*
dt = *integration time step to previous point of time*
i = *index for EU27+2 countries*
c = *index for cohorts 0 to 24*

After computing the new car registrations in ASTRA, the cars need to be assigned to available fuel technologies. This assignment is carried out by estimating the probabilities for each alternative to be chosen by potential purchasers. The so-called car technology choice model covers the following fuel technologies:

- gasoline cars differentiated by three cubic capacity types (<1.4l, 1.4-2.0l, >2.0l),
- diesel cars differentiated by two cubic capacity types (<2.0l, >2.0l),
- compressed natural gas (CNG) cars,
- liquefied petroleum gas (LPG) cars,
- bioethanol cars covering also flexi-fuel cars,
- hybrid cars representing advanced hybrid systems depending on timing,
- battery electric cars and
- hydrogen fuel cell vehicles.

In order to integrate the new alternative car technologies, major factors that influence the decision of purchasers are identified. Several US studies and the most recent ARAL [2005] study elaborated via costumer surveys potential factors influencing the decision of a car purchaser for a certain car, respectively car technology. In the following, the European study from Aral is taken, as the new purchase decision model simulates the EU27+2 markets. Figure 2-9 provides a detailed overview of the survey. According to this study, customers set a high value on economic efficiency for new cars. Price in combination with the performance of a car is the most significant factor with 55 %, followed by the mileage of the car. Compared with older surveys, the factor safety lost significance but, nevertheless, safety still plays an important role for 47 % of all interviewed customers. The low importance of factors like the environment-friendliness of a new car indicates that alternative fuel cars can only diffuse successfully into the European markets when they can be purchased and operated for a reasonable price. Based on the insights from this survey and the feasibility of quantifying drivers in a system dynamics model, the modified car fleet model concentrates on economic efficiency as a major impact for the purchase decision.



Source: ARAL (2005)

Figure 2-9: Drivers of car purchase decision

Due to the characteristics of the purchase as a discrete choice for one out of eleven car categories, respectively technologies, a logit-model is supposed to be the most sophisticated approach to simulating this decision. The implemented logit-function requires specific user benefits of all eleven car technologies that can be chosen. Similar to the application of logit-functions in the modal-split transport modelling stage, this model does not compute benefits but costs that can be put into the logit-function as negative benefits according to the following equation.

$$P_{cc,i} = \frac{\exp(-\lambda_i * pC_{cc,i} + LC_{cc,i})}{\sum_{cc} \exp(-\lambda_i * pC_{cc,i} + LC_{cc,i})} \quad \text{(eq. 2-7)}$$

where: *P =* *share of purchased cars per car category cc and country i*
pC = *perceived total costs per vehicle-km per car category cc and country i*
λ = *multiplier lambda per country i*
LC = *logit const per car category cc and country i representing the disutility*
cc = *index for eleven car categories/technologies*
i = *index for EU27 countries plus Norway and Switzerland*

The modified car fleet model calculates the required average costs per vehicle-km for each car category in a bottom-up approach. First, the model computes variable costs per vehicle-km based on average fuel consumption factors for each technology and country-specific fuel prices provided by the POLES model described in KRAIL ET AL [2007]. Fuel consumption factors for conventional cars are derived from HBEFA [2004]. Available sales figures for specific car types for each alternative car category and general information from original equipment manufacturers (OEM) are used to generate average fuel consumption factors for the six new car categories.

Besides variable costs, the model also considers fixed costs for each car category. Fixed costs per car category and country are determined by car-ownership taxation, registration fees and purchase costs per country and car category as well as country-specific average maintenance costs. All elements of fixed costs are transformed into costs per vehicle-km by the division of average yearly mileages per car category and country. As the conversion of purchase costs into costs per vehicle-km requires information on average lifetime per car category, this is derived from the car stock cohort model via feedback loop. Similar to the approach for computing the average fuel consumption factors for alternative fuel cars, average purchase costs for alternative fuel cars consider sales figures from the last years.

Assuming completely rational purchase decision behaviour based on all variable and fixed costs would disregard other important drivers, like the distribution grid of filling stations selling the required type of fuel. The distribution grid for conventional fuel types like gasoline and diesel is of high quality in all EU27+2 countries. At present, owners or prospective customers of alternative fuel cars have to cope with the burden of procuring alternative fuels requires significantly longer additional trips or is even not feasible due to lack of filling stations. JANSSEN (2004) concluded in his paper on CNG market penetration that successful diffusion of new car technologies depends on a uniform development of technology and filling station infrastructure. Taking into account these significant impacts due to fuel supply differences, the model has to consider the quality of filing station grids as well. Hence, the four mentioned cost categories have to be completed by so-called fuel procurement costs.

In order to generate these costs per vehicle-km for each car category and country, the model requires input in terms of filling station numbers for each fuel category diesel, gasoline, LPG, CNG, electric current, E85 and hydrogen. Conventional filling stations are derived from national statistics offices and automobile associations. Alternative fuel filling station numbers were taken from European Natural Gas Vehicle Association[1] and other databases[2]. Due to the lack of information about the spatial distribution of filling stations, the modified model assumes a homogenous distribution. This leads to an average surface area for each fuel category that has to be served per filling station. The model considers the optimisation efforts of mineral oil groups in locating new filling stations efficiently by assuming a central location in a unit circle representing the average surface area. Based on this assumption, average distances to be driven for refuelling a car are estimated. Finally, the model simulates the fuel procurement costs by multiplying the yearly kilometres with fixed and variable costs per vehicle-km and adding the opportunity costs generated via value of time and required time for the procurement trips extracted from the passenger transport demand. The following equation describes the simulation of perceived total car costs per vehicle-km that are composed of variable/fuel, purchase, taxation, maintenance and fuel procurement costs. Furthermore, the model considers the importance of the purchase costs level for the calculation of perceived costs by setting a car-category- and country-specific weighting factor.

1 European Natural Gas Vehicle Association (ENGVA): http://engva.org.

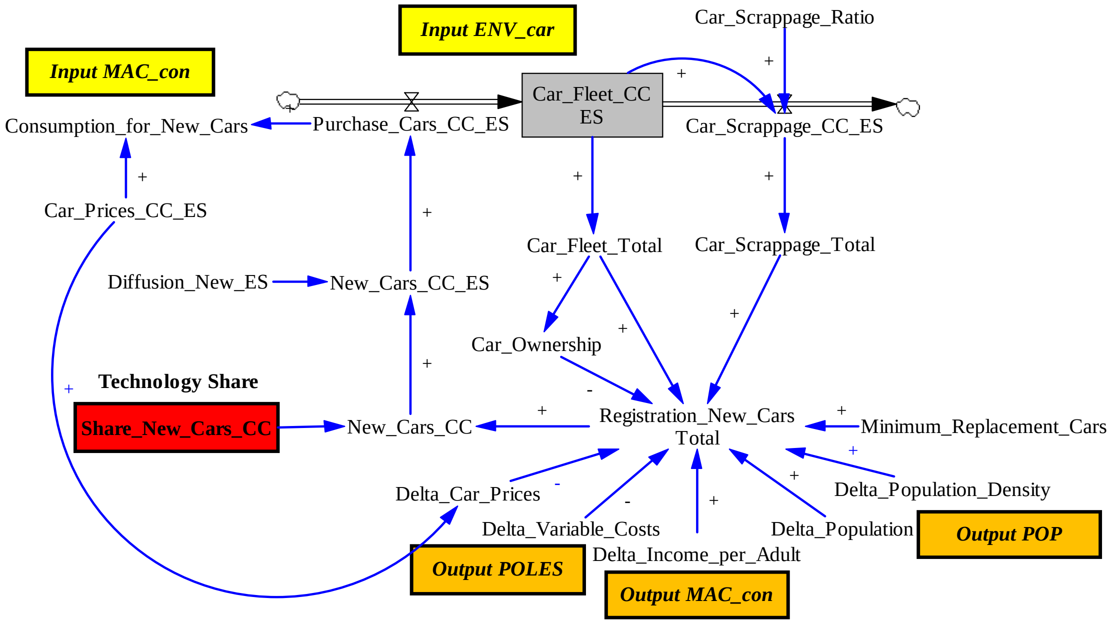
2 Data taken from: http://www.gas-tankstellen.de, http://www.erdgasfahrzeug-forum.de and http://www.h2stations.org.

$$C_{cc,i} = \alpha_{cc,i} * pC_{cc,i} + taxC_{cc,i} + mC_i + vC_{cc,i} + procC_{cc,i} \quad \text{(eq. 2-8)}$$

where: *C =* *perceived car cost per vehicle-km per car category cc and country i*
pC = *purchase cost per vehicle-km per car category cc and country i*
taxC = *taxation/registration cost per vehicle-km per car category cc and country i*
mC = *maintenance cost per vehicle-km per country i*
vC = *variable/fuel cost per vehicle-km per car category cc and country i*
procC = *fuel procurement cost per vehicle-km per car category cc and country i*
α = *weighting factor representing the significance of purchasing costs*
cc = *index for eleven car categories/technologies*
i = *index for EU27 countries plus Norway and Switzerland*

Finally, the logit function simulates the probability of cars purchased for each of the eleven technologies based on the simulated perceived car costs. An optimal set of parameters could be identified for the weighting factor α, logit parameter λ and the logit const *LC* in the process of calibration. All parameters are calibrated with the Vensim® internal optimisation tool. Time series data for car registration per country disaggregated into car categories are taken from EUROSTAT online database. Several lacking datasets, especially for alternative fuel car registrations, required further data sources like data from ACEA and others. Parameters of the discrete choice function for technologies that were not present on the European vehicle markets until 2008 are assumed to be at an average level of the existing vehicle technologies. Hence, the purchase decision for technologies like battery electric or fuel cell cars do not differ in their basic character from the decision for other existing technologies.

After simulating the share of new cars per car category with the new car purchase model, this share is multiplied with the total number of new cars registered per country. Figure 2-10 demonstrates the implemented feedback loop in the car fleet model. Starting with an initial share of cars per car category, emission standard, country and age for each simulation period, the new purchased cars are added while all scrapped cars in the different age cohorts are subtracted by the model. The number of scrapped cars is one of the drivers of total new registered cars per year, as the model assumes that a certain share of all scrapped cars is replaced by new ones. Furthermore, new registrations per year are assumed to depend on the development of variable costs for operating a car, population, population density, average car prices, the level of motorisation and the average income per adult. Population density as a representative for urbanisation, car price, fuel prices and the level of motorisation curb new registrations while income per adult and population foster new registrations.



Source: Krail (2009)

Figure 2-10: Overview of ASTRA car fleet model

2.4.3 Modelling transport emissions

ASTRA estimates all transport-related environmental burdens in each functional zone, respectively EU27+2 country. Additionally, all necessary data for assessing impacts of these burdens on economies are provided by the ENV module. Environmental impacts covered by the ENV module can be allocated into two categories according to their effects: global impacts and impacts on human beings. The growing awareness of climate change as an unchangeable matter of fact demonstrated the global impacts of the greenhouse effect. Carbon dioxide (CO_2) emissions contribute up to 26% to the effect and, accordingly, can be considered the most important greenhouse gas. Environmental impacts of transport activities on the health of human beings can be direct effects, such as the risk of traffic accidents but also indirect effects caused by emissions of nitrogen oxides (NO_x), carbon monoxide (CO), volatile compounds (VOC) and soot particles (PM_{10}).

The main input for the ENV module is provided by the TRA module in terms of vehicle-kilometres-travelled and traffic volume per transport mode. Based on this information, CO_2, NO_x, CO, VOC and soot particles emission quantities are simulated for each EU27+2 country and all transport modes. As the ENV module derives complete life-cycle emissions caused by transport-related activities, four distinct sources of emissions are considered: hot emissions which occur during the driving activity, cold start emissions that are emitted during the warm-up phase of vehicles starting with cold engines, fuel production emissions that escape during filling and production processes of consumed fuel, and vehicle production emissions which occur during the manufacturing process of new vehicles. Apart from relevant information on transport performance, the composition of vehicle fleets is the second important input that is transferred by the VFT module. Based on the chosen differentiation of car categories and emission standards, average emission factors were integrated, reflecting the transport activity and fuel and vehicle transformation related effects. For hot and cold start emissions, specific average emission factors per vehicle category and emission standard were derived from the Handbook Emission Factors for Road Transport [HBEFA 2004]. The following equations demonstrate the calculation of hot emissions in the ASTRA model:

$$HE_{po,i,fz,m,db,cc,est} = hEFAC_{po,i,m,db,cc,est} * shV_{i,m,cc,est} * VKT_{i,fz,m,db} \qquad \text{(eq. 2-9)}$$

where:	
HE =	*hot emissions during driving activity in tons per year*
hEFAC =	*hot emission factors in tons per vehicle-km*
shV =	*share of vehicles per technology and emission standard in stock*
VKT =	*vehicle-km travelled per mode and year*
po =	*index for five pollutants covered in ASTRA*
fz =	*index for four functional zone types*
m =	*index for four passenger and three freight transport modes*
db =	*index for five passenger and four freight distance bands*
est =	*index for emission standards (pre-Euro to Euro 7)*
cc =	*index for eleven car categories/technologies*
i =	*index for EU27 countries plus Norway and Switzerland*

The number of originating trips provides the necessary information for cold start emission calculation. Fuel production emission factors representing CO_2, NO_x, CO and VOC emissions caused by the extraction of crude oil from the ground, the transport of crude oil to refineries, the refining process and the transportation of fuel to the end-user are considered, as well as vehicle production emissions of average vehicles per car category.

Emissions of other transport modes are modelled similarly. For example, rail transport performance is split into diesel and electrical traction and based on emission factors of power stations representing the national electricity mix CO_2, NO_x, CO and VOC emissions are computed. Air transport emissions could be simulated by considering average emissions of short and long distance flights of two representative aircraft types (Boeing 737 and Airbus A310).

3 Storyline of the Integrated Scenario

The Integrated Scenario brings us into a **new world** compared with the Reference Scenario. Here are a few examples of what we mean by a new world. In this new world electric vehicles exist and are becoming an important element of the vehicle fleet, while they are not contained in the Reference Scenario. Climate policy becomes an overarching policy goal, so that every policy is checked against the criteria of how it contributes towards reducing the climate impact of energy and transport. Policies that contradict climate mitigation would not be implemented. Awareness on the part of industry and households of the need for climate mitigation actions and of the future continuous growth of fossil energy prices is increasing and supports behavioural change to increase climate efficiency and energy efficiency.

Obviously, these examples differ from what we observe today in the energy and transport field. But we assume that such changes can be reasonably expected for the next two decades.

3.1 Changing framework conditions of future scenarios

Looking back 20 years from today, it seems that the energy and transport systems in Europe did not face any major break in trends. The energy system was always solidly based on a combination of cheap fossil fuels and nuclear energy, to satisfy a continuously growing demand. In particular, demand for electricity was fast and steadily rising. The transport system always relied on internal combustion engines using fossil fuels, as well as assuming that transport demand continuously increased though with different speeds for the individual modes, showing the strongest growth for air, maritime and truck transport. Energy and fuel efficiency moderately improved, but could only slow down energy demand growth, not break the trend to reduce energy demand in the final energy sectors, including the transport sector. A few changes occurred, concerning the diffusion of renewable energy in some EU countries and the high oil prices of 2008.

However, some important changes also took place during these decades. For instance, the World Wide Web emerged and communication started to be mobile telephone and e-mail-based. In fact, the first private e-mail communication in Europe started in 1990 and since then has revolutionized private communication and communication at work. The discussion with the iTREN-2030 stakeholders resulted in their strong recommendation for the next 20 years to expect break-in-trends for the energy and transport systems as well as for their framework conditions. Examples that were mentioned include scarcity of fossil fuels, the implementation of ambitious climate policies and the emergence and breakthrough of new technologies like battery electric vehicles [Schade 2007, Schade 2008].

The iTREN-2030 project team also pointed to the fact that for future decades economic growth rates would be lower than in the past, due to fundamental reasons like ageing societies. Additionally, the project team highlighted the risk of economic crises due to the US sub-prime crisis and the imbalances in the financial markets [Schade et al. 2008]. The stakeholders disagreed with this proposal of a risk that would slow down economic development. Half a year later the Lehmann Brothers' bankruptcy confirmed that the risk pointed out by iTREN-2030 was quite realistic, when it kicked off the global financial crisis of 2008/2009. This crisis constituted another changing framework condition for our Integrated Scenario as mitigating the impacts of the crisis forced the European governments to increase public spending, which drove the growth of public debt to levels above the criteria of the Maastricht Treaty in most EU Member States. In a joint effort, the EU set up a European Economic Recovery Plan [EC 2008b] that together with national strategies until now has stabilized the economic development of the Union. However, in the years to come the accumulated public debts will have to be repaid, thus reducing the leeway for pro-active policy-making in the fields of energy and transport. Nevertheless, the EU Recovery Plan as well as some plans of the Member States included elements that will also positively affect trends in energy and transport like the support for R&D and market introduction of electro-mobility, implemented via the Green Cars Initiative.

Finally, a trend that is certain and has already started is the ageing of the European population. The recent EU ageing report established that from 2008 onwards until 2060 the labour force in the EU will decline and the share of persons above 65 years of age will continuously grow [European Commission DG ECFIN 2009]. Since mobility patterns are also age dependent as well as being shaped by the employment status, this will have implications for the transport system.

3.2 Changing patterns of transport policy

Core transport policy focuses on increasing the efficiency of transport, reducing congestion and improving accessibility. This was the line of action defined by the last Transport White Paper of 2001 [European Commission 2001], which defined four action priorities that should be implemented via 76 measures:

- shifting the balance between modes of transport
- eliminating bottlenecks
- placing users at the heart of transport policy and
- managing the globalisation of transport.

The mid-term assessment of the White Paper confirmed progress in many of the 76 measures, stating that lack of progress in particular was observed for the implementation of pricing measures. It then adapted the focus from shifting demand towards environmental modes to the concept of co-modality and the objective of strengthening the performance and efficiency of the major modes [De Ceuster et al. (2005), European Commission 2006].

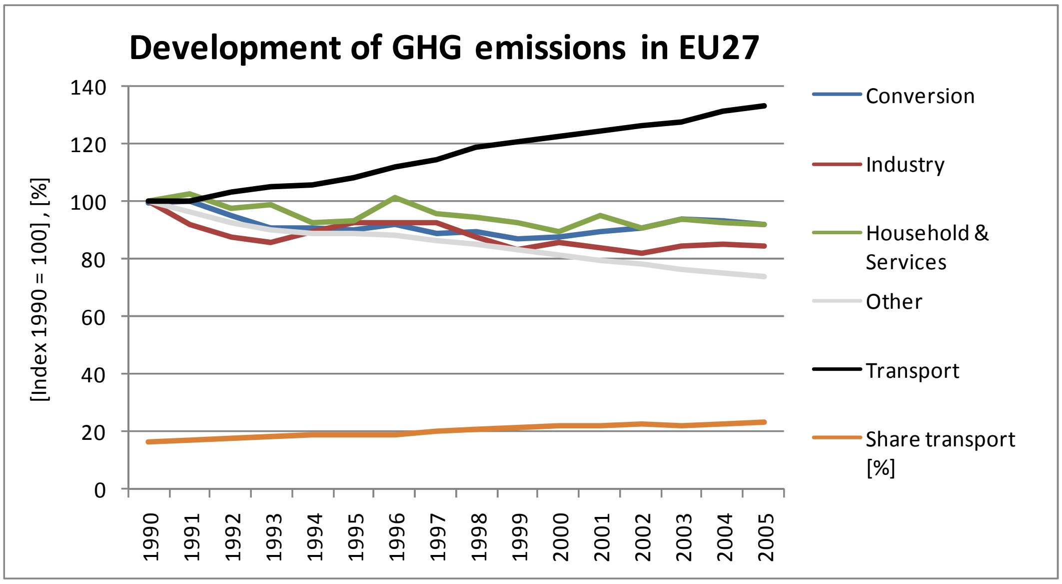
In the years after the mid-term review of the White Paper the close connection between energy policy and transport policy became rather obvious and more important, e.g. due to the high oil prices of 2007/2008. Linking transport policy with energy policy widens the scope to such issues as the security of energy supply for transport (as well as competing energy uses). Another important link between transport and energy policy exists at the technological level: the use of specific propulsion technologies determines the energy demand and the type of primary energy sources that are required for transport, e.g. replacing fossil fuel by potentially renewable-based electric energy. And finally, the choice of energy sources as well as the energy efficiency of transport and of its energy use determines the environmental impacts of transport, the most relevant of which will be the climate impact, in the long run. Given this framework, the three most important drivers of an integrated energy and transport scenario are:

- climate policy (and growing signals of climate change)
- fossil fuel scarcity and
- new technologies coping with the challenges posed by the first two drivers.

The following three sections briefly highlight these three drivers as they are important elements of the Integrated Scenario defined by iTREN-2030.

3.3 Driver 1: Climate policy

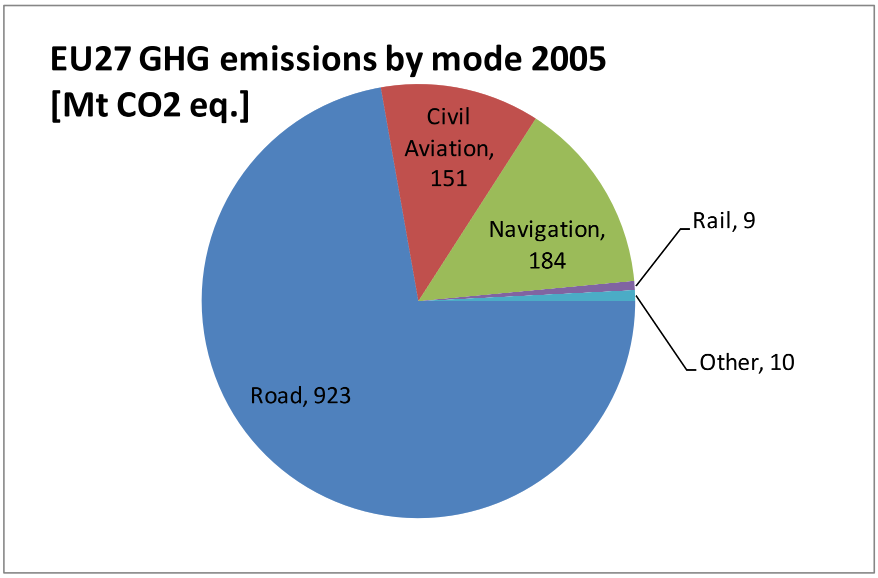
The transport sector in Europe contributed more than 23% of the EU27 greenhouse gas (GHG) emissions in 2005 (1,277 Mt CO_2 eq.). Due to the high share of fossil fuel use, the share of CO_2 emissions is even higher, amounting to more than 27% of the EU27 CO_2 emissions in 2005 (1,247 Mt CO_2). As Figure 3-1 reveals, the transport sector is the only major sector in the EU27 in which GHG emissions have risen compared with 1990. The same holds for the CO_2 emissions of transport [European Commission 2007a]. Despite this growth trend, the European Commission has agreed on a target of a -10% reduction of GHG emissions by 2020 compared with the year 2005 for the non-ETS sectors, which includes the transport sector [European Commission 2008a].



Source: European Commission, 2007a

Figure 3-1: Development of GHG emissions of transport compared with other sectors in the EU27 (1990 to 2005)

The split of GHG emissions across the major modes of transport is presented in Figure 3-2. With more than 70%, road generates by far the largest quantity of GHG emissions. Navigation and civil aviation, both including international bunkers, generated about 14% and 12% in 2005, respectively.



Source: European Commission, 2007a

Figure 3-2: EU27 GHG emissions of transport by major mode in 2005

The EU has developed its position on climate change and climate policy through a number of communications, which all emphasize the target to stabilize temperature increase at 2-degree Celsius compared with pre-industrial levels [EC 2007b, EC 2009]. For 2020 this would imply that the EU reduces its GHG emissions by -20% by 2020 compared with 1990, if the rest of the world does not agree on reductions. However, if a joint global agreement similar to the Kyoto Protocol is achieved for the post-Kyoto period after 2012, the EU would accept a reduction target of as much as -30% by 2020. At the global level, the EU formulated the target of a reduction of -50% GHG emissions by 2050 compared with 1990, which according to the Intergovernmental Panel on Climate Change (IPCC) means a reduction of -80 to -95% by the industrialised countries by 2050. In other words: in 2050 the EU must emit less than 20% of the greenhouse gases emitted today. ??? This means that a transport sector that today already emits more than 23% of EU GHGs, i.e. more than it will be allowed in total for the EU in 2050, has to deliver significant reductions of GHGs over the next four decades. Thus climate policy can be seen already today as the strongest driver shaping transport policy.

A few analyses of what such a 2-degree scenario would imply for transport exist. The European ADAM project developed a 400 ppm $CO2_{eq.}$ concentration scenario achieving the 2-degree world with a 70% likelihood. In this scenario the EU would reduce its GHG emissions by -80% until 2050 compared to 1990. Compared with the level of 2010, the transport sector would reduce its GHG emissions by -62% by 2050, while housing and energy conversion decarbonize more drastically at close to -90% [Schade/Jochem et al. 2009]. The IEA developed scenarios in which European OECD countries would reduce their GHG emissions from transport until 2050 by about -70% compared with 2005 [Blue Map / Shift scenario in IEA 2009].

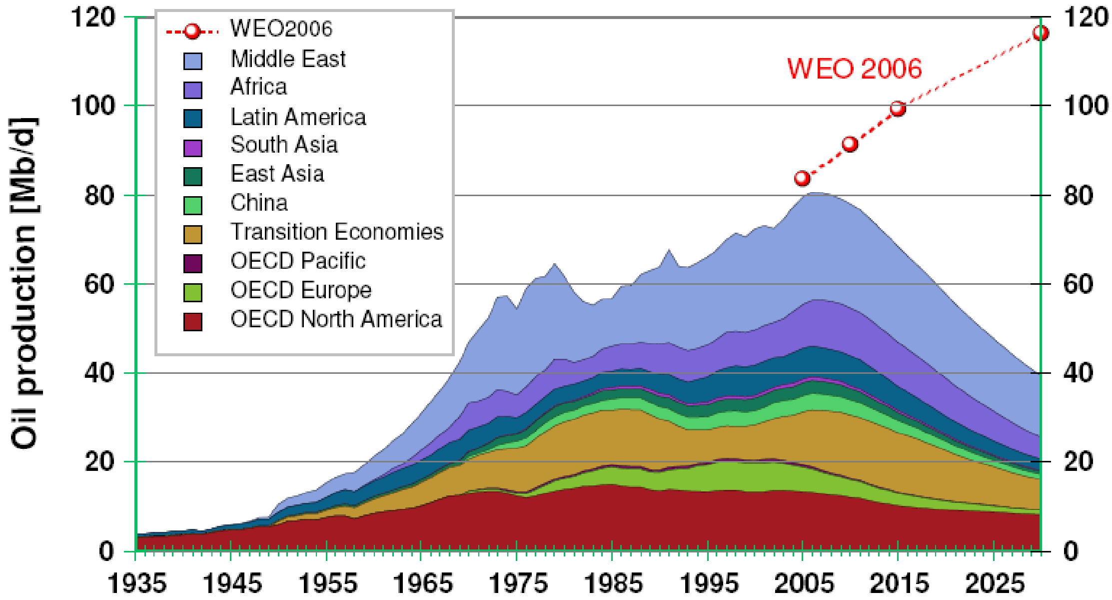
3.4 Driver 2: Fossil fuel scarcity

In 2008 the price of crude oil peaked at about 150 $/bbl increasing from about 20 $/bbl a few years ago. The economic crisis made it drop to about 55 $/bbl again. However, the fundamentals of crude oil supply and demand clearly suggest that crude oil prices on average will increase in the near future. At the beginning of 2010 the oil price increased again to levels above 80 $/bbl.

On the demand side, new players like China and India will increase world crude oil demand to fuel their economic growth, in particular due to their growth in transport demand. It seems that only economic turbulence, as happened during the economic crisis of 2008/2009, or a large-scale shift to non-fossil energy sources could slow down or even stop this growth in demand. The latter shift would need a considerable period for implementation.

On the supply side, there is a more controversial discussion. However, consider (1) that the largest numbers of new oil-wells discovered was during the last century in the 1960s to 1970s, and (2) that geophysical laws shape a typical time-path of extraction of oil from each well with growing extraction over a period of 10 to 30 years and after the production peak extraction declines at annual decline rates of about -3 to -10%. The IEA estimates that from worldwide observation the average decline rate of such post-peak fields is -6.7% annually. The natural decline rate, i.e. the rate without any post-peak investment in declining oil fields, would even be close to -10% [IEA 2008]. This means, after only a few decades of such an oil production regime only the maintenance of oil extraction levels requires new discoveries of more than 6% annually. The same holds for new production to come on stream i.e. each year new wells amounting to a capacity of 6% of current extraction have to go on stream just to maintain the current production levels.

The Association for the Study of Peak Oil (ASPO) and others point to this fundamental time-sensitive structure of oil extraction and supply [e.g. Aleklett 2007]. Figure 3-3 is estimated on behalf of the Energy Watch Group (EWG) and concludes that today we are at the peak of oil production [EWG 2007], while the World Energy Outlook (WEO 2006) of the International Energy Agency (IEA) in 2006 expected a continuous growth of oil supply to reach 116 Mb/day until 2030 [IEA 2006]. Recently, the IEA revised their expectation for 2030 downwards, such that oil production would reach 106 Mb/day growing from the 83 Mb/day of today. However, the IEA also identified the possibility of a supply crunch in 2013, if investments in new extractions do not increase substantially while demand growth in particular from Asian countries like China and India continues [IEA 2008].



Source: Energy Watch Group, 2007

Figure 3-3: Optimistic and pessimistic scenarios of oil production

The iTREN-2030 project expects a plateau (or even a slow decline) of oil production rather than an increase for the next decades. Given the growth in demand, this would lead to a continuous increase of oil prices as crude oil becomes increasingly scarce due to the widening gap between supply and demand.

In addition, not only the market interactions on the oil market itself affect transport systems, but also the expectations of the trend of crude oil prices. It seems that the high oil prices of 2007/2008 as well as the fast growth of oil prices in 2008 altered the “common wisdom” in a way that the general public, which includes the transport users, expects fuel prices to rise. This then has implications for transport choices, e.g. that fuel efficiency in purchase decisions of new cars will play a significantly larger role than in the past.

To conclude, the probable relative scarcity of fossil fuels as well as the growing expectation and awareness of such scarcity should be treated as one important driver changing the transport system in the next two decades.

3.5 Driver 3: New technologies

For almost the last 100 years, fossil fuel combustion engines have dominated the propulsion of the majority of transport modes. However, fossil fuel combustion engines are in conflict with the two previously described drivers, as they cause greenhouse gas emissions that will have to be reduced and as they require availability of fossil fuel resources that are probably declining. In view of these fundamentals, it seems that new transport technologies, in particular low or no carbon propulsion technologies, will have to emerge in the next decades.

Examples of such technologies are manifold, so that it can be expected that technologies that could contribute to solving both problems will be successful compared with technologies that solve one of the drivers but sacrifice the other one (e.g. like substituting crude oil by coal-to-liquid oil, which reduces crude-oil-based fuel demand but increases greenhouse gas emissions).

Promising new technologies seem to incorporate or at least contribute to two main characteristics: first, the new technologies **increase energy efficiency** and thus reduce absolute energy demand, and second, they **increase** the **climate efficiency** of transport and thus reduce absolute greenhouse gas emissions.

Examples of technologies compatible with climate policy and fossil fuel scarcity include first of all any kind of **electrification** of road transport, be it plug-in hybrid vehicles, battery electric vehicles or hydrogen fuel cell vehicles. In particular, these technologies would be compatible with the two drivers if the electricity required comes from renewable energy sources. When considering national as well as Europe-wide energy scenarios, this expectation could be feasible and foreseeable, as by 2030 renewable electricity can reach market shares in Europe of more than 40%, even 50%, and until 2050 of close to 80% [Nitsch 2008, Schade/Jochem et al. 2009].

The second option might be called **biomassification** i.e. the increased use of biomass, although this requires that the biomass is grown in a sustainable manner and does not compete with food. Also, it must be ensured that the life cycle assessment of greenhouse gases reveals a reduction of GHGs. Such examples would be 2nd generation biofuels (e.g. Fischer-Tropsch fuels from full energy plants or plant residues) or 3rd generation biofuels (e.g. algae).

The third technological option could be called the **efficiency revolution**, which would involve light-weight solutions for vehicles and/or down-sizing of vehicles such that “1 or 2 liter cars” like the Loremo prototype become feasible [Loremo 2009].

Such technology breakthroughs cannot be anticipated analysing fundamentals that are as similarly obvious and predictable as in the first two drivers. However, the emergence of new technologies is the third important driver of the Integrated Scenario of iTREN-2030. From the study of comprehensive publications covering similar long-term transport technology scenarios as iTREN-2030 it transpires they also expect the emergence of a large variety of new technologies to reduce energy demand and GHG emissions from transport [e.g. IEA 2009].

3.6 Effects of the drivers: Behavioural change

The above described three drivers enter the Integrated Scenario e.g. via changes in fuel prices driven by crude oil price increases, or by implemented policies like climate policies that would change the cost of transport. Such changes would affect the choice models in ASTRA, POLES or TREMOVE and would lead to endogenous changes of behaviour, thus modifying the demand trend expected in the Reference Scenario [Fiorello et al. 2009], where higher motorization, more use of cars and planes, faster and longer travel would continue as in the past. This level of behavioural change in response to changes of the framework conditions and the policies of the scenario is covered by the applied models, e.g. favouring the choice of other modes than cars or the choice of more efficient cars.

Instead, more drastic behavioural changes that might have needed modifications of the model parameters have not been included in the scenario and have thus not been implemented in the models. Options for such drastic change would be the emergence of new mobility concepts, like car-sharing or bike-sharing, that become well integrated with public transport and easily accessible via new communication means. An example of a drastic change would be the EU-wide implementation of a car2go car-sharing concept as implemented in 2009 in the cities of Ulm (Germany) and San Antonio (Texas, US) [Car2Go 2009]. The advantage of such a concept is the one-way capability of the system, i.e. a user can pick up a car at any location in the city, make his or her trip and leave the car also at any location in the city. The concept works very successfully in Ulm. The implications in modelling terms would be that the car fleet stock can be reduced, while the life-time of a single car is reduced and the renewal of the fleet is speeded up. Such drastic behavioural changes that would probably require adaptation of the model structures have not been addressed and thus are not included as part of the Integrated Scenario.

3.7 Policies in the Integrated Scenario

The policies for the Integrated Scenario were discussed at the 3rd and 4th iTREN-2020 stakeholder workshops. Commencing from the recommendation that the Integrated Scenario should include the **major policies likely to be implemented until 2030,** two criteria were defined to select policies for inclusion in iTREN-2030:

- **relevance** criteria: policies that really make a difference

- **likeliness** criteria: policies that bear a high probability of being implemented between now and 2025. The date 2025 was chosen, as the impact of policies often appears only after some time lags, and by commencing at the latest in 2025 all policies should have had some time to take effect until 2030.

This means that the Integrated Scenario is not expected to include all detailed policies that might be decided on and implemented by 2030, but it concentrates on those policies that are identified as being both relevant and likely to be implemented. Of course, both qualifications do not constitute exact criteria and thus the policies for the Integrated Scenario were subject to discussions with the stakeholders, including the European Commission.

Also, the selection of policies was driven by a pragmatic approach, since the models have to be capable of implementing the policies. This becomes even more challenging when a policy has to be implemented in more than one of the models to ensure consistency of the modelling results. In this sense, a further criterion **model applicability** is also relevant for selecting policies.

The discussions about the policies cannot end with the decision on their inclusion in or exclusion from the Integrated Scenario, but for many policies inclusion in the three iTREN-2030 models implies a quantification of the policy. As an example, a road user charge for trucks could be conceived. In this case, the charging level has to be specified by country to implement the policy in the models.

The following sections explain the types of policy measures that were considered as elements of the Integrated Scenario, followed by a list and explanation of implemented policies. The final sections describe trends of major demographic and economic variables as well as the infrastructure scenario.

3.7.1 Types of policies

There are a number of different policy types that could be entered as components in a scenario definition. iTREN-2030 applies a concept of policies in a wide sense. This section briefly clarifies the understanding of “policies” in iTREN-2030. The subsequent sections then apply the categorization of policies as follows:

- policy (P)
- adaptive policy in Reference Scenario (APRS)
- objective only (O)
- trend adaptation (TA).

Obviously, objectives and trend adaptations do not constitute concrete policies but are considered as "policies in a wider sense" that may influence the Integrated Scenario.

3.7.1.1 Policy (P)

A policy would be something that is concluded in legal directives, is binding in nature and usually includes rules for enforcement of the policy. Policies could be decided and implemented either by the legislative bodies of the European Union (i.e. EU council, EU parliament) or by the Member States.

Policies decided on by mid 2008 belong to the Reference Scenario and would not change anymore, while future policies not yet decided on would belong to the Integrated Scenario, assuming they fulfil the selection criteria of relevance and likeliness.

3.7.1.2 Adaptive policy in Reference Scenario (APRS)

There are a number of policies that have been passed and implemented until 2008, in which changes over time until 2030 are foreseen. We would call such a policy an **adaptive policy in Reference Scenario** (APRS). An example of such a policy would be the transport network infrastructure, for which the current decisions on the TEN networks foresee an implementation plan stretching over the next 20 years (see section 3.9). Such policies are **the same** in the Reference Scenario and Integrated Scenario, though they will develop after 2008, i.e. their implementation is **neither** frozen in the Reference Scenario nor in the Integrated Scenario.

3.7.1.3 Objective only (O)

For some policy fields, the policy-makers have decided on objectives e.g. the 20-20-20 target for energy demand and renewable energies. Despite the fact that policies have not been developed and implemented for all objectives decided on, the important objectives are listed in the policy tables below, and in the models policies or trend adaptations are assumed and implemented that lead to fulfilment of these objectives. The rationale is that such objectives will be the starting point for future policy decisions that would become part of the Integrated Scenario at a later point in time.

Further, policies that are not of a binding nature or have no enforcement belong to the objectives. Voluntary agreements would be one example of such an objective.

3.7.1.4 Trend adaptations (TA)

In addition to policies, trend adaptations that are not mandated by policies also play a role in the differences between the Reference Scenario and the Integrated Scenario.

Thus trend adaptations should be listed in the policies tables below. These concern only trend adaptations that are **not** included in the Reference Scenario, but **should be included** in the Integrated Scenario. Such trend adaptations could be caused by external factors that appear only after 2008 and before 2030. As an example, the emergence of electric vehicles due to technical progress in battery technology can be mentioned.

3.7.2 Transport pricing measures

Pricing measures are a significant element of the Integrated Scenario due to their potentials to set behaviour-changing incentives towards more energy-efficient and climate-efficient choices. Pricing policies focus on policy measures that are in the implementation pipeline, e.g. due to the fact that strategic policy papers foresee their implementation. Further, they consider that the economic crisis, as well as the reduced use of fossil fuels both require adapted funding and revenue mechanisms from transport. Thus policies include the extended implementation of user charges and city tolls as well as adaptation of fuel taxes.

Further, the EU decided to include air transport in the EU Emissions Trading System (EU-ETS) [European Commission 2008c]. Given that most rail transport, i.e. electric rail transport, is also included in the EU-ETS, in order to complete the ETS system and arrive at a situation in which the entire EU GHG emissions are subject to the emissions cap defined by international agreements, road transport will also be included in the EU-ETS from 2020 onwards. The system would be an upstream-approach on fuels, which can be handled in the models in the same way as a fuel tax, i.e. increasing the total fuel cost. Table 3-1 summarizes the resulting list of transport pricing measures.

Table 3-1: List of transport pricing measures

Measure	Type	Start year	Description
Road user charge trucks	P	2020	Implementation of Greening Transport Package using the cost values identified by the IMPACT Handbook on external cost of transport (about 7 to 10 €ct/vhc-km)
Road user charge cars	P	2025	Implementation of Greening Transport Package transferring the cost values identified by the IMPACT Handbook to car transport (about 2.5 €ct/vhc-km)
City tolls	P	2025	Implementation for metropolitan areas in EU27 only at the level of about 35.7 €ct/vhc-km during peak-period
Fuel tax harmonisa-tion	P	2020	Following EC directive 2003/96/EC tax levels of 35.9 €ct/l gasoline and 41 €ct/l diesel introduced
Air transport into EU-ETS	P	2012	Inclusion of all air transport within or leaving the EU27 into EU-ETS with reduction targets of -3% in 2012 and -5% after 2012 compared to aver-age of 2004 to 2006
Road transport into EU-ETS (upstream)	P	2020	Inclusion of road transport into EU-ETS by an upstream approach. The certificate price in 2020 is about 28 €$_{2005}$ per tonne of CO_2

Source: iTREN-2030. P = policy, O = objective without specifying implementation, TA = trend adaptation

It is relevant to mention that transport-related climate policies at the level of Member States include further policies that were not considered for the Integrated Scenario as they did not fulfil the criteria of relevance, likeliness or model applicability. Examples from the UK or German strategies include a CO_2-based taxation of cars, a CO_2-based tax deductibility of business cars favouring cars with less than the 130 g CO_2/km limit and penalizing cars with higher CO_2-emissions, kerosene tax, value-added tax or ticket charge for air transport, as well as the increase and adaptation of fuel taxes so that tax levels consider the carbon content of fuels and set incentives to increase energy and carbon efficiency [e.g. Matthes et al. 2009].

3.7.2.1 Quantification of user charges for trucks

The proposal for a Directive of the European Parliament and of the Council amending Directive 1999/62/EC on charging heavy goods vehicles for the use of certain infra-structures [European Commission 2008e, COM(2008)436], which is part of the Green-ing Transport Package, reports the recommended amount of charges for heavy goods vehicles in the EU. The source of the Greening Transport Package is the handbook developed in the IMPACT project [Maibach et al. 2008]. Three categories of costs are included: air pollution (as far as particulate matters and ozone precursors are concerned), noise and congestion. Actually, the document reports formulae to be adopted to estimate marginal costs according to elements like the type of vehicle, the type of road, etc. However, maximum values are also reported. The recommendations of the Greening Transport Package are used to define truck charges for the iTREN-2030 Integrated Scenario, taking into account the following general assumptions:

- All three cost items are considered.
- Maximum values are considered, since the applications of formulas to local conditions is beyond the level of detail of iTREN-2030.
- Only 75% of maximum values are used, assuming that in some specific conditions formulas would lead to lower values.
- Whenever maximum costs are different for suburban roads and other interurban roads, the values for the latter are used, since distinguishing between the two is too detailed for iTREN-2030 and it can be assumed that suburban roads are quite a small share of the whole interurban network.
- Whenever maximum costs depend on the Euro standard of the vehicle, a weighted average is estimated for each country based on the extrapolation of vehicle fleet composition in the year 2020 according to TREMOVE.
- Year 2020 is the first year when charging is adopted. For the year 2030 revised charges should be adopted according to the new composition of the fleet. When TREMOVE forecasts for the year 2030 will be available, updated charges will be estimated.
- Congestion charges are intended for congested links only, i.e. to be applied as link charge in the TRANS-TOOLS model for those links where load/capacity ratio exceeds a given threshold, to be defined. For the other models they are included proportionally into the average charge.
- For countries not included in TREMOVE, the pollution costs have been estimated using the ratio between the marginal costs of those countries and the average marginal cost of remaining countries as in the ASSESS project.

Table 3-2: Quantification of user charges for trucks

Country	Pollution	Noise	Congestion	Total
Austria	3.6	0.13	4.5	*8.2*
Belgium	3.1	0.13	4.5	*7.8*
Bulgaria	5.9	0.13	4.5	*10.6*
Cyprus	4.7	0.13	4.5	*9.4*
Czech Republic	4.5	0.13	4.5	*9.1*
Germany	3.4	0.13	4.5	*8.1*
Denmark	2.5	0.13	4.5	*7.1*
Estonia	4.7	0.13	4.5	*9.4*
Greece	4.3	0.13	4.5	*8.9*
Spain	3.7	0.13	4.5	*8.3*
Finland	3.4	0.13	4.5	*8.1*
France	3.3	0.13	4.5	*8.0*
Hungary	5.2	0.13	4.5	*9.9*
Ireland	4.1	0.13	4.5	*8.8*
Italy	3.4	0.13	4.5	*8.0*
Lithuania	4.7	0.13	4.5	*9.4*
Luxemburg	2.8	0.13	4.5	*7.4*
Latvia	4.9	0.13	4.5	*9.5*
Malta	4.7	0.13	4.5	*9.3*
Netherlands	2.0	0.13	4.5	*6.6*
Poland	5.1	0.13	4.5	*9.7*
Portugal	4.5	0.13	4.5	*9.1*
Romania	5.9	0.13	4.5	*10.6*
Sweden	3.2	0.13	4.5	*7.9*
Slowenia	4.8	0.13	4.5	*9.4*
Slovakia	4.0	0.13	4.5	*8.6*
United Kingdom	2.7	0.13	4.5	*7.4*

Source: iTREN-2030. Own calculation based on Greening Transport Package and de Ceuster et al. 2005

3.7.2.2 Quantification of user charges for cars

The above mentioned proposal for a Directive on charging heavy goods vehicles does not mention cars. However, the relevance (if not the likelihood) of road charging policy for cars is such that its implementation is part of the iTREN-2030 Integrated Scenario. Since no costs are recommended in the Greening Transport Package, costs proposed in the IMPACT handbook based on German data have been used[3] [Maibach et al. 2008]. Such data depends on the composition of the car fleet in terms of Euro category as well as cubic capacity and fuel type, so again car fleet forecasts from TREMOVE for the year 2020 have been considered to compute average country values. For those countries for which TREMOVE does not provide the fleet composition, pollution costs have been estimated using the ratio between the marginal costs of those countries and the average marginal cost of remaining countries as in the ASSESS project. The introduction is foreseen in 2025, which should be the latest point of time after which significant changes can be observed until the final time horizon 2030.

Table 3-3 reports the estimated costs for each item and the total charge by country. As for trucks, the congestion charge is intended for peak time and for congested links only, but needs to be averaged for the ASTRA and TREMOVE models.

3 Data in table 15 page 57 of the Handbook (see reference in note 1).

Table 3-3: Quantification of user charges for cars

Country	Pollution	Noise	Congestion	Total
Austria	0.35	0.07	2.3	*2.7*
Belgium	0.35	0.07	2.3	*2.7*
Bulgaria	0.31	0.07	2.3	*2.7*
Cyprus	0.24	0.07	2.3	*2.6*
Czech Republic	0.23	0.07	2.3	*2.6*
Germany	0.23	0.07	2.3	*2.6*
Denmark	0.15	0.07	2.3	*2.5*
Estonia	0.24	0.07	2.3	*2.6*
Greece	0.32	0.07	2.3	*2.7*
Spain	0.31	0.07	2.3	*2.7*
Finland	0.01	0.07	2.3	*2.4*
France	0.26	0.07	2.3	*2.6*
Hungary	0.17	0.07	2.3	*2.5*
Ireland	0.20	0.07	2.3	*2.6*
Italy	0.28	0.07	2.3	*2.6*
Lithuania	0.24	0.07	2.3	*2.6*
Luxemburg	0.30	0.07	2.3	*2.7*
Latvia	0.25	0.07	2.3	*2.6*
Malta	0.24	0.07	2.3	*2.6*
Netherlands	0.20	0.07	2.3	*2.6*
Poland	0.17	0.07	2.3	*2.5*
Portugal	0.29	0.07	2.3	*2.7*
Romania	0.31	0.07	2.3	*2.7*
Sweden	0.14	0.07	2.3	*2.5*
Slowenia	0.16	0.07	2.3	*2.5*
Slovakia	0.20	0.07	2.3	*2.6*
United Kingdom	0.14	0.07	2.3	*2.5*

Source: iTREN-2030. Own calculation based on Greening Transport Package, TREMOVE model and de Ceuster et al. 2005

3.7.3 Regulation and technological measures and trends

This group of measures includes a number of policies to improve the efficiency of conventional engine technologies, to develop the diffusion of alternative/ future engine technologies, general regulation policies and the implementation of soft measures.

Table 3-4 presents the measures related to efficiency measures. This includes the implementation of the 3rd railway package to increase railway efficiency that is expected to reduce the railway transport cost by -2% in the models after 2010. Further, the regulation setting pathways for CO_2 emission limits of cars [European Commission 2009] and light duty trucks belong in this category. Though it can be expected that after 2020 the emission limits will be strengthened to take account of technical progress, the Integrated Scenario did not implement such an extension of the measures, due to the uncertainty of progress. Climate policy at the Member States level foresees a target of 80 g CO_2/km for cars in 2030 [e.g. for Germany, see Matthes et al. 2009].

Finally, it is assumed that legislation would be implemented for the binding use of low resistance tires for heavy duty trucks. It is expected that such tires could reduce energy demand and emission of trucks by -7%, but part of these potentials is already captured in the Reference Scenario, so that the savings in the Integrated Scenario would amount to -3.5% compared with the Reference Scenario.

Table 3-4: List of regulation and (engine) efficiency measures

Measure	Type	Start year	Description
Railway liberalisation	P	2010	Implementation of 3rd railway package reducing passenger rail cost by -2%
CO_2 limits cars	P	2015, 2020	Regulation setting CO_2 limits for average new car fleet with a limit value of 130 g CO_2/km in 2015 and 105 g CO_2/km in 2020
CO_2 limits LDVs	P	2015, 2020	Regulation setting CO_2 limits for average new LDV fleet with a limit value of 175 g CO_2/km in 2016 and 135 g CO_2/km in 2020
Binding use of low resistance tyres HDV	P	2012	The binding use of low resistance tyres for trucks will reduce energy consumption by -3.5%

Source: iTREN-2030. P = policy, O = objective without specifying implementation, TA = trend adaptation

Table 3-5 presents the policies related to alternative engine technologies and soft measures. The most important policies in this field consist of trend adaptations that are fostered by technology breakthroughs (e.g. for lithium-ion batteries and the linkage between the energy and transport system connecting electro-mobility and renewable energies) and changes of market structures (e.g. for CNG vehicles).

Limited battery storage capacity and high weight have been a barrier for electric vehicles in the past. Since 2007, technical progress with Lithium-Ion batteries has enabled the development of battery electric vehicles (BEV) that enter the market in 2010, according to the plans of car manufacturers like Mitsubishi, Renault and Daimler. We expect that significant numbers of battery electric vehicles will only become available from 2012 onwards, when further car manufacturers plan to introduce electric vehicles. For example, board members of Daimler announced production and sales plans of more than 10,000 electric cars (Smart and A Class) for 2012 at the CAR-Symposium in January 2010. This type of car would rather implement the concept of city cars equipped for daily travel distances of maximum 100 to 150 km; it is unlikely that they will be used as long distance cars. For light duty trucks it is expected that from 2015 onwards battery electric LDVs will take a share in urban delivery.

Both Toyota and Daimler announced that hydrogen fuel cell vehicles (HFC) will enter the market in 2015. iTREN-2030 expects that the full market introduction of BEVs will occur first, before a further new technology like hydrogen is implemented by the industry on large scale. Thus we expected the market introduction of HFCs by 2025 only.

Table 3-5: List of new engine technology and soft measures

Measure	Type	Start year	Description
Battery electric cars	TA	2012	Breakthrough of battery technology and market diffusion of electric city cars after 2012
Battery electric LDVs	TA	2015	Breakthrough of battery technology and market diffusion of electric LDVs for urban deliveries after 2015
Hydrogen fuel cell cars	TA	2025	R&D support and support for market introduction will lead to market diffusion after 2025
Car efficiency labelling	P	2009	Effective labelling of cars according to their energy/CO_2 efficiency affecting choices of car buyers to reduce CO_2 emissions by -3.5%
Driver education for drivers of HDV	TA	2010	Driver education can reduce energy demand by -20%. It is assumed that due to changing framework conditions -10% is achieved by more ambitious education programmes of companies
Increased implementation of CNG fuelling stations	TA	2010	The requirements of climate policy and price differentials increase attractiveness of CNG generating incentives to implement more CNG fuelling stations

Source: iTREN-2030. P = policy, O = objective without specifying implementation, TA = trend adaptation

The soft measures listed in Table 3-5 consider efficiency labelling for cars, for which we expect an effect of -3.5% reduction of energy demand and CO_2 emissions (studies indicate potentials of up to 5% [E.V.A. et al. 1999, Jochem et al. 2009]). For HDV, educating drivers holds significant potentials of energy and GHG savings: studies indicate potentials of up to -20% reductions. Since energy cost also plays a role in the Reference Scenario as driver education takes place there as well, we assume an additional reduction in the Integrated Scenario of -10%.

3.7.4 Energy sector policies

Policies have been defined and implemented at a rather strategic level for the energy sector (see Table 3-6). This includes policies like agreeing on GHG reduction targets for the EU27 of -20% for 2020, which is largely implemented via setting-up the EU-ETS system, plus some sector-specific measures in non-ETS sectors. Further, targets have been defined for the diffusion of renewable energies into the energy supply, so that by 2020 about 20% of final energy is produced by renewables. This target is achieved by the introduction of support premiums across the EU.

The implementation of the Energy Efficiency Action Plan is expected to foster an annual efficiency improvement of 1% of final energy use. Finally, R&D for the development and implementation of first demonstration sites for carbon capture and storage (CCS) is supported so that by around 2030 the first large-scale plants are expected to be built.

Table 3-6: List of energy policies

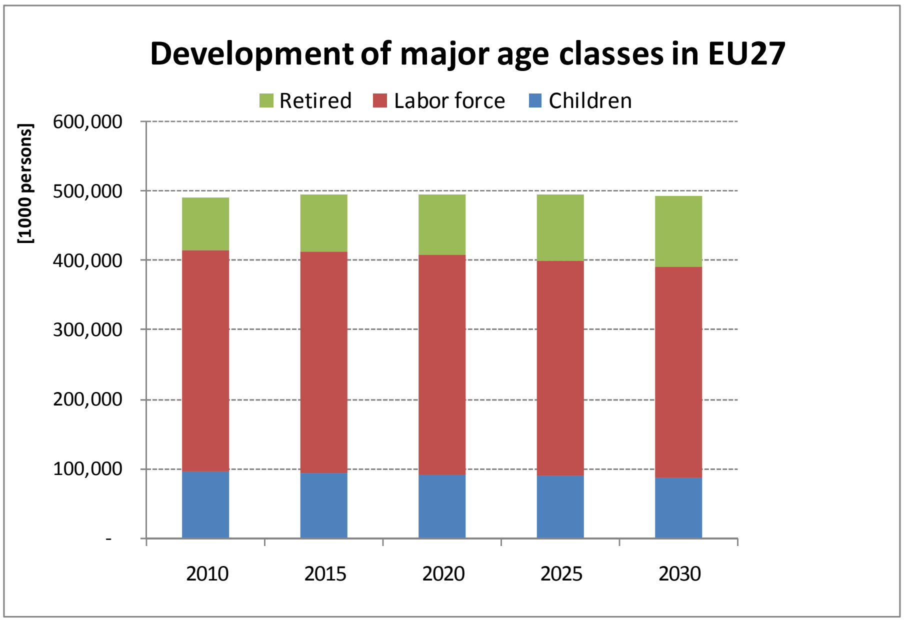
Measure	**Type**	**Start year**	**Description**
GHG reduction target for the EU for 2020	P	2012	Agreement of a binding reduction target of GHG emissions of EU27 of -20% until 2020 against 1990 and extension of EU-ETS with certificate price of 28 €$_{2005}$ per tonne of CO_2 in 2020
Renewable energy target	O	2008	Harmonized renewable energy support premiums across the EU to reach 20% renewable energy by 2020
Energy efficiency action plan	P	2008	Increase of energy efficiency by 1% annually
Support for carbon capture and sequestration (CCS)	P	2010	Support of R&D and demonstration sites for CCS such that around 2030 first large-scale plants can be built

Source: iTREN-2030. P = policy, O = objective without specifying implementation, TA = trend adaptation

3.8 Major socio-economic trends in the Integrated Scenario

This section describes a few important socio-economic trends that influence more than one of the areas explained in sections 4 to 9 of this deliverable (i.e. economics, energy demand, fleets, passenger transport, freight transport and emissions). This includes population development, oil price and price of CO_2 certificates.

The demographic development in iTREN-2030 is still derived from the Eurostat population projections from 2006 (EUROPOP 2006), which were implemented in the ASTRA model as part of the ADAM project [Schade/Jochem et al. 2009]. Until 2030, projections reveal a flat development of the EU27 population at a level of about 495 million persons. However, the structure of the population is changing drastically, as between 2010 and 2030 the number of children declines by -9% and the potential labour force by -5%, while the number of persons above 65 years of age (retired) increases by +32%. In the most recent population projections (EUROPOP 2008[4]), the EU expects significantly higher inward migration, so that for the EU27 until 2035 a continuous growth of population is expected, with the population reaching about 520 million persons [European Commission DG ECFIN, 2009], which means that this projection is more than 4% higher than the iTREN-2030 demographic development.

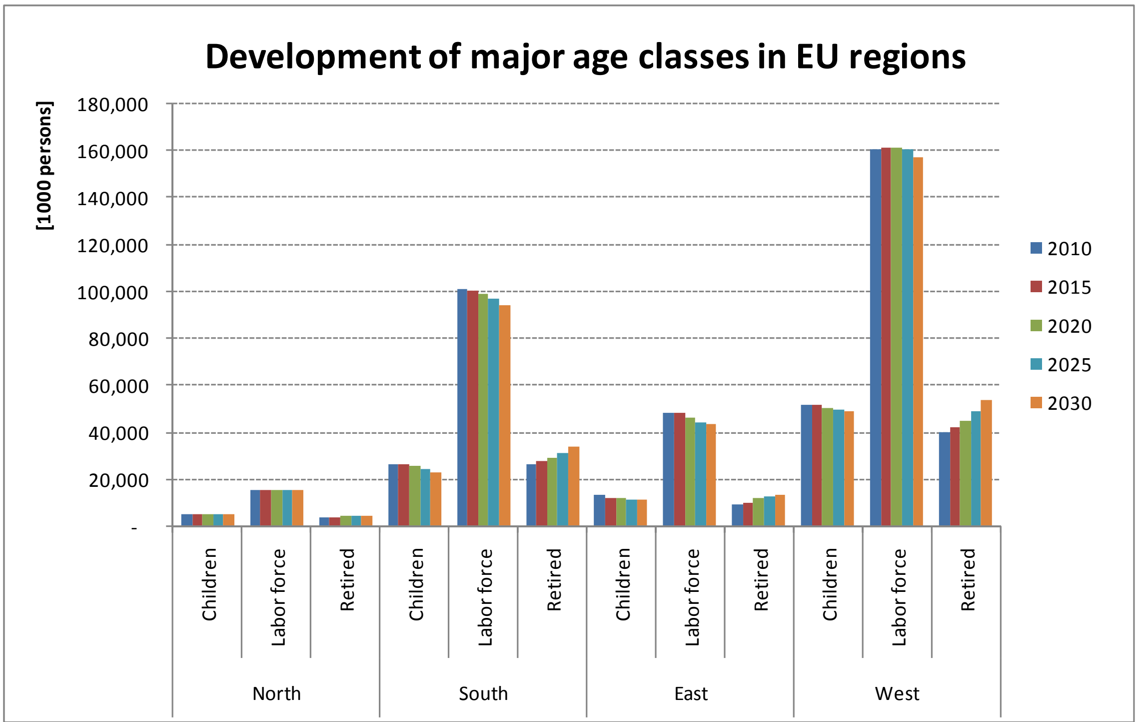


Source: iTREN-2030, ASTRA model

Figure 3-4: Development of population in EU27 by major age classes

4 See http://epp.eurostat.ec.europa.eu/portal/page/portal/population/data/database.

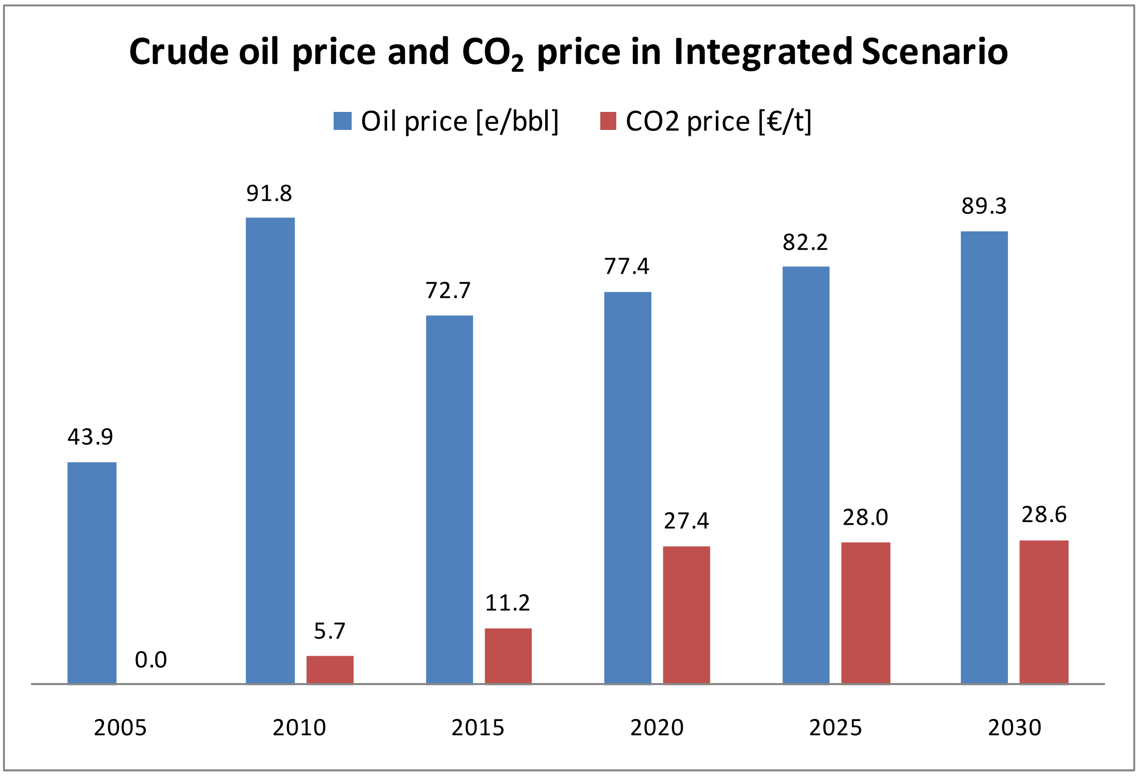
However, the demographic development differs significantly between the EU regions (see Figure 3-5). The most balanced situation can be observed for the northern countries that nearly have a stable development of children and labour force and an increase of retired persons by about +30%. The most unbalanced situation is identified for the eastern countries with a reduction of children by -17% and of labour force by -10%, while the number of retired increases by +42%. Southern countries are slightly better off as their retired population increases by “only” +27%, while they are also having -14% less children and -7% lower labour force. The western countries moderately lower their younger population with -5% children and -2% labour force, also increasing the number of retired by +34% until 2030 compared with 2010.



Source: iTREN-2030, ASTRA model

Figure 3-5: Development of population in EU27 by major age classes

Two key economic indicators are related to the energy sector: oil price and CO_2 price. The oil price is expected to moderately increase, reaching levels close to 80 €$_{2005}$/bbl in 2020 and almost 90 €$_{2005}$/bbl in 2030. The price of CO_2 is expected also to grow moderately and would reach a certificate price of about 28 €$_{2005}$ per tonne of CO_2 in 2020 and about 29 €$_{2005}$ per tonne of CO_2 in 2030 (see Figure 3-6). The stable level of the CO_2 price after 2020 indicates that no tightening of the cap was assumed until 2030 in the Integrated Scenario. Given the fact that the EU is willing to reduce its GHG emissions by -30% until 2020, if other countries also agree on ambitious targets, this would be a rather conservative assumption for a point in time which is even ten years later than 2020.



Source: iTREN-2030, POLES model

Figure 3-6: Oil price and CO_2-certificate price until 2030 (in $€_{2005}$ values)

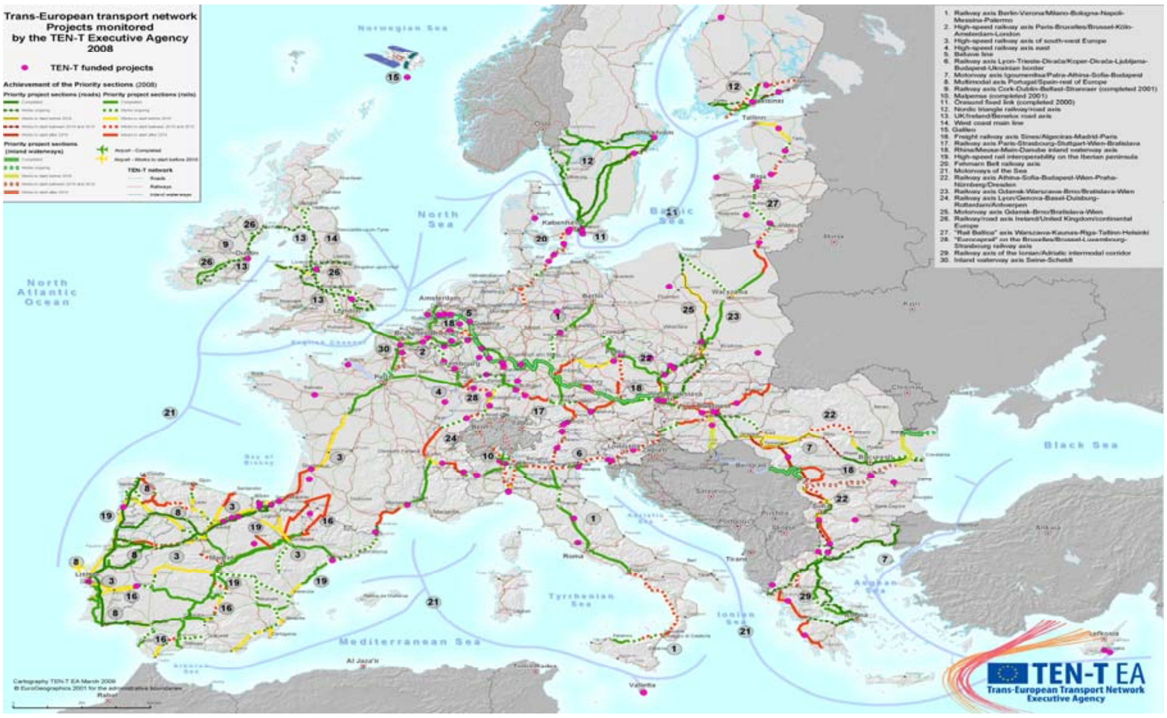
3.9 Transport infrastructure scenario

A joint transport infrastructure scenario has been developed for the iTREN-2030 Reference Scenario and the Integrated Scenario. The infrastructure scenario of TRANS-TOOLS v2 / TEN-CONNECT (baseline scenario 2030) required further processing, but was taken as the basis for developing the iTREN-2030 infrastructure scenario. The main focus was centred on EU priority projects, while infrastructure measures at the national level have only partly been considered.

Table 3-7: Implementation of the TEN-T Priority Projects

Priority axis	MSs involved	End of works confirmed by MS	Total cost in M EUR	Total investment before 2007 in M EUR	Total 2007-2013 in M EUR	Remaining investment in M EUR
PP1 Railway axis Berlin-Verona/Milan-Bologna-Napels-Messina-Palermo	AT, IT, DE	2024	47.054,61	22.370,53	14.285,63	10.398,45
PP2 High-speed railway axis Paris-Brussels/Brussels-Cologne-Amsterdam-London	BE, DE, NL, UK	2015	18.848,01	16.954,61	1.857,07	36,33
PP3 High-speed railway axis of south-west Europe	ES, FR, PT	2020	50.656,68	10.556,20	26.782,65	13.317,83
PP4 High-speed railway axis east	FR, DE	2013	5.255,00	4.521,60	590,60	142,80
PP5 Betuwe Line	NL	2008	4.776,40	4.361,00	415,40	0,00
PP6 Railway axis Lyon-Trieste-Divaca/Koper/Divaca-Ljubljana-Budapest-Ukrainian border	FR, HU, IT, SL	2025	60.741,96	7.827,03	10.427,94	42.486,98
PP7 Motorway axis Igoumenitsa/Patra-Athina-Sofia-Budapest	BG, GR, RO	2020	14.928,70	10.051,10	4.727,60	150,00
PP8 Multimodal axis Portugal/Spain-rest of Europe	ES, PT	2017	15.324,54	8.882,71	4.752,97	1.688,86
PP9 Railway axis Cork-Dublin-Belfast-Stranraer (COMPLETED)	IRL, UK	2001	357,00	357,00	0,00	0,00
PP10 Malpensa Airport (Milan) (COMPLETED)	IT	2001	1.344,00	1.344,00	0,00	0,00
PP11 Öresund fixed link (COMPLETED)	DK, S	2001	4.158,00	4.158,00	0,00	0,00
PP12 Nordic triangle railway-road axis	FIN, S	2016	11.746,37	4.364,40	5.705,37	1.676,60
PP13 UK-Ireland/Benelux road axis	IRL, UK	2015	7.526,44	3.285,65	4.057,80	182,99
PP14 West Coast Main Line	UK	2009	12.629,24	10.896,37	1.732,87	0,00
PP16 Freight railway axis Sines/Algeciras-Madrid-Paris	ES, PT	2020	8.899,04	48,80	1.100,34	7.749,90
PP17 Railway axis Paris-Strasbourg-Stuttgart-Vienna-Bratislava	AT, FR, DE, SK	2020	13.563,29	3.528,68	6.779,99	3.254,62
PP18 Rhine/Meuse-Main-Danube inland waterway axis	AT, BE, BG, DE, HU, NL, RO	2016	2.103,28	45,29	1.075,55	982,44
PP19 High-speed rail interoperability on the Iberian peninsula	ES, PT	2020	41.770,45	5.236,30	33.194,37	3.339,78
PP20 Fehmarn Belt railway axis	DE, DK	2018	7.930,70	36,72	2.680,50	5.213,48
PP22 Railway axis Athina-Sofia-Budapest-Vienna-Prague-Nürnberg/Dresden	AT, BG, CZ, DE, GR, HU, RO	2020	12.641,80	465,36	5.618,52	6.557,92
PP23 Railway axis Gdansk-Warsaw-Brno/Bratislava-Vienna	CZ, PL, SK	2017	6.159,17	1.384,42	3.296,22	1.478,53
PP24 Railway axis Lyon/Genoa-Basel-Duisburg-Rotterdam/Antwerp	BE, DE, FR, IT, NL	2020	22.647,29	2.103,69	5.421,19	15.122,41
PP25 Motorway axis Gdansk-Brno/Bratislava-Vienna	AT, CZ, PL, SK	2017	6.845,96	1.063,50	5.782,46	0,00
PP26 Railway-road axis Ireland/United Kingdom/continental Europe	IRL, UK	2020	6.242,82	2.356,39	2.473,43	1.413,01
PP27 Rail Baltica axis Warsaw-Kaunas-Riga-Tallinn-Helsinki	EE, LT, LV, PL	2020	3.198,19	50,00	1.556,19	1.592,00
PP28 Eurocaprail on the Brussels-Luxembourg-Strasbourg railway axis	BE, LUX	2013	1.183,19	18,76	1.083,23	81,20
PP29 Railway axis if the Ionian/Adriatic intermodal corridor	GR	2019	4.308,00	81,00	1.074,00	3.153,00
PP30 Inland waterway Seine-Scheldt	BE, FR	2016	4.422,41	21,31	4.097,70	303,40
Total			**397.262,54**	**126.370,42**	**150.569,57**	**120.322,55**

Source: European Commission [2008d]



Source: TEN-TEA, http://tentea.ec.europa.eu/en/ten-t_projects/30_priority_projects/

Figure 3-7: Overview of the TEN-T Priority Projects

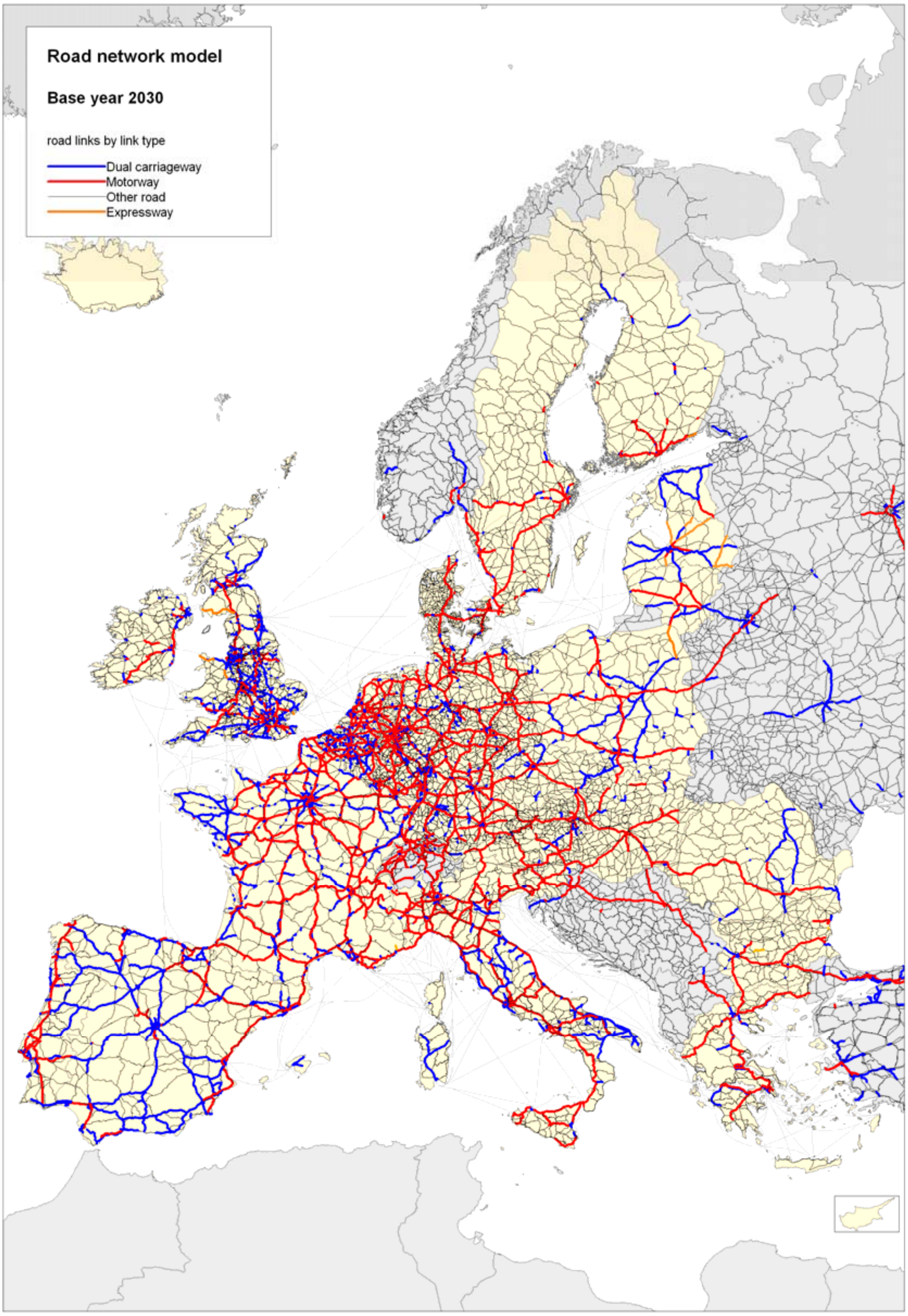
Following the most recent EU publication on the development of the TEN-T Priority Projects [European Commission 2008d], all infrastructure measures in this investment package will have been finalised by the year 2025. Therefore, when the infrastructure assumptions for the iTREN-2030 scenarios referring to the year 2030 were being defined, the assumption has been made that all rail/ road TEN-T Priority Projects have already been implemented.

The scope of the TEN-T Priority Projects and the planned completion schedule of each project, as well as the remaining investment amount, is summarised in Table 3-7. The numbers are presented in million € of 2007. Figure 3-7 gives a geographical overview of the locations of the investments.

Based on the year 2005 network models by TRANS-TOOLS v2/ TEN-CONNECT, the TEN-T Priority Projects have been integrated into the forecast networks, as well as a limited number of national infrastructure projects. However, a complete survey of national investment programmes was not within the scope of the iTREN-2030 project.

Source: iTREN-2030

Figure 3-8: Rail infrastructure scenario



Source: iTREN-2030

Figure 3-9: Road infrastructure scenario

The resulting rail and road network models for the iTREN-2030 scenarios are displayed in Figure 3-8 and Figure 3-9. The rail links are differentiated by new lines/ high-speed lines, upgraded lines, and conventional lines, while the road network model displays motorways, dual carriageway roads, expressways and other road links.

To sum up, the iTREN-2030 infrastructure scenario can be characterised as follows: the dimension of rail infrastructure projects outweighs the dimension of road infrastructure projects, although the assumptions are not unbalanced in favour of rail: in fact, EU priority projects clearly favour rail, while projects at national level – particularly in the new Member States – tend to place more weight on road investments. The infrastructure scenario is rather ambitious as regards the assumptions on the TEN-T Priority Projects, but is in line with the planning by the EU and the Member States. As far as the scope of infrastructure investments at the national level is concerned, the assumptions underlying the iTREN-2030 infrastructure scenario are rather moderate.

3.10 Integrated Scenario in brief

The Integrated Scenario of iTREN-2030 describes a world shaped by the economic crisis of 2008/2009, but which is also gradually and undisturbed escaping from this economic crisis in the years to come. Transport policy is leaving its traditional territories and instead is becoming driven by newly emerging issues, i.e. climate policy and strong GHG mitigation requirements for the transport sector, demand- and supply-driven growing fossil fuel scarcity and new propulsion technologies leading to the application of a diversity of fuels and engine technologies in the transport sector. However, behavioural change remains limited to adopting new engine technologies, without changing settlement structures, travelling behaviour or mobility concepts.

4 Economic development in the Integrated Scenario

The economic trends of the INT Scenario were strongly influenced by the financial crisis of 2008/2009, which is taken into account only in the INT Scenario and not in the REF Scenario. As the impact of the financial crisis only became obvious during the course of the iTREN-2030 project, the REF Scenario could not also be adapted to take the crisis into account. Therefore, this chapter focuses on the assumptions for implementing the financial crisis in the ASTRA model for the INT Scenario. The economic results of ASTRA are then transferred to POLES and TREMOVE so that via this transfer of ASTRA outputs, these other two models also consider the effects of the financial crisis for the energy and transport systems. In a second section, the results on macroeconomic indicators and transport economic indicators are presented in this chapter.

4.1 Modelling the financial crisis 2008/2009

4.1.1 Basic assumptions to model the crisis

The following assumptions provide the framework for considering the impacts of the financial and economic crisis of 2008/2009 in the ASTRA model for the INT Scenario. The assumptions emerged from a discussion on crisis impacts at the German Ministry of Transport [Rothengatter et al. 2010] and have been modified where appropriate for iTREN-2030:

- The period from 2002 to 2007 shall be deemed to be a "globalisation bubble". The strong dynamics of trade with the countries of central and eastern Europe after the political change in 1990 are regarded as a special phenomenon of the last 15 years. The disproportionately high growth rates in the field of trade and commercial transport in this period should therefore not continue.
- The expansion dynamics favoured by the liberalisation of the transport markets – hand-in-hand with extensive cost reductions – is approaching saturation point.
- After the crisis, the economic rebound is characterised of necessity by the consolidation of government budgets and monetary policy. This limits government spending policy and will reduce the potential allocation of credit by banks (higher bank interest rates despite possible lower prime rate of the central bank).
- After the crisis, the termination of short-time working measures increases the risk of growing unemployment. This impacts private household consumption, which is expected to drop.
- A trend-setting structural development, that means no impulses for strong structural change through a revival of the innovation activities. This conserving of structures was not assumed for iTREN-2030 as the measures of the INT Scenario are in fact driving structural change towards an economy with lower carbon emissions.

ASTRA is designed as a systems dynamics model. As opposed to computed general equilibrium models, imbalanced economic situations are supposed to be the common state and can be modelled in such a way that it is possible to simulate a recession followed by an economic rebound. The basic adaptations to model the economic and financial crisis include:

- a pessimistic development of investment
- downturn of the GDP in countries outside the EU as well
- increasing private saving rates in the years of depression
- implementation of the actions of national economic stimulus package(s)
- growth of short-time work and lower utilisation of manufacturing capacities, and
- reduction of business and tourism trip rates.

With these changes, the statistical development in 2008 and at the beginning of 2009 can be simulated with the ASTRA model for major countries like Germany. Since the "lag structures" of ASTRA are not changed (that means time-delayed responses to economic impulses, for example with investment or in the labour market), reactions which took place in 2009 in reality occur six to twelve months later in the model, i.e. some are simulated for 2010. In principle, a fine-tuning for the years 2009/2010 could depict the annual values realistically, but the fine-tuning would affect the middle- and long-term feedback mechanisms. As these mechanisms were more relevant for the scenario simulations until 2030, this fine-tuning was not carried out, instead the short-term shifts of reactions by a few months were accepted.

4.1.2 Economic stimulus package

Many countries reacted with national economic stimulus packages to the world economic crisis and at the end of 2008 the EU also agreed on an economic recovery plan [European Commission 2008b]. The implementation of the INT Scenario attempts to take all measures agreed by the second quarter of 2009 into consideration. Expected trend adaptations in the field of macroeconomic, technological and transport developments are included, partly by considering the observed trends during the crisis and until the end of the first quarter of 2009.

For the INT Scenario it was anticipated that the structure of national economic stimulus packages are similar in all EU countries, taking in particular the German stimulus package and the European recovery plan as a blueprint and adapting the size of the actions to the country specifics of the EU27 countries, plus Norway and Switzerland.

The following actions are modelled to reflect the economic stimulus package in the EU27+2 countries for the INT Scenario in the ASTRA model. All government expenditures related to the costs of the measures were included in the government accounts and therefore they become part of the calculation of the public debt.

- Reduction of private households' tax burdens and increase of transfers:
  - averaged reduction of income tax for 2009 and 2010
  - reduction of contributions for health insurance funds implemented as decrement of the averaged social insurance contribution in 2009
  - one-time increase of child benefit.
- Labour market:
  - increase of public support for qualification activities
  - extended contribution to wages of short-time workers
  - loan guarantee for companies (banks)
  - consideration of a risk of default (denoted with ca. 5 %) on loan guarantees for banks and companies as additive public spending.
- Investment:
  - allocation of increased public investments in education, infrastructure, research and development to the 25 economic sectors of the ASTRA models for the years 2009 and 2010.
- Assignment of the actions according to the relation of public spending by a country to the rest of the countries of the EU.
- Integration of the essential consolidation of the national finances after 2012, planning for a consolidation period of 10 years.

4.1.3 Implications for developments of major economic and transport indicators

4.1.3.1 Gross Domestic Product

As in the REF Scenario, the calculation of GDP is driven by the endogenous changes of the demand and supply side, on top of which exogenous elements are added as described above to model the impacts of the crisis, as well as the actions taken as part of the economic stimulus packages. Further, the following parameter adjustments have been implemented in ASTRA in contrast with the REF Scenario:

- ASTRA assumes both demand- and supply-driven GDP development. This was adapted towards more demand-driven GDP in the years 2009 to 2011 compared to the REF Scenario, as the demand side in ASTRA is more responsive than the supply side, which was important, given the speed with which the crisis' impacts unfolded.

- Adaptations of the supply side in terms of potential output like:
  - reduced capacity utilisation of production plants (-15% in 2009; -8% in 2010)
  - short-time work and thus reduction of average hours worked per week
  - integration of the assumption of a stronger rise of technical progress and thus total factor productivity from 2010 to 2014.
- Exogenous amplification of the impacts of these adaptations on GDP during 2009/2010.

4.1.3.2 Investment

Some drivers of investment changes during a crisis are not represented in ASTRA. For example, the implications of the financial markets' collapse on company and households' money supply could not be considered. Therefore, the investment decisions require exogenous drivers to model the crisis since the last quarter of 2008. In general, the model showed the right direction of reactions, but the reactions needed to be amplified to the degree observed during the crisis. The following assumptions were implemented by amplifying reactions in ASTRA:

- Reduction of investments of companies in transport vehicle fleets:
  - business cars: about -40% in 2009
  - other commercial vehicles: about -60% truck and about -12% busses
  - ships and trains: about -65%.
- Investments of governments in transport infrastructure as part of the economic stimulus packages.
- Exogenous reductions of the endogenous investments in other sectors:
  - reductions in industry (because of high reliance on the export sector);
  - reductions in the service sector.

4.1.3.3 Labour market

The development of work per economic sector is simulated in ASTRA, endogenously driven via sectoral labour productivity and the development of gross value-added by sector. Short-time work is integrated in this approach in terms of reduced averaged working hours and reduced labour productivity.

4.1.3.4 Exports and imports

The foreign trade models in ASTRA endogenous and exogenous influences at their disposal. Amongst the latter are the GDP development of nine world regions and a global GDP trend. The decrease of foreign trade in the last quarter of 2008 and in the first quarter of 2009 is simulated by the following adaptation of assumptions:

- Exogenous adaptation of GDP in 9 regions in the rest of the world for the years 2009 to 2011:
  - consideration of revised OECD forecasts during the crisis [OECD 2009]
  - amplification of influence of world-GDP on trade.
- Exogenous adaptation of sectoral exports and imports because of sector-specific strong export invasion.

4.1.3.5 Passenger transport

The decline of business and touristic trips, especially by plane, in 2008 and 2009 could only be considered exogenously, as trip rates mainly depend on the dynamics in social groups and age classes, but do not depend on income or general economic development in ASTRA, which were the drivers of the drastic changes in travel rates during the crisis. The following assumptions have thus been implemented:

- reduction of business trips by about -10% in 2009 and -5% in 2010 because of cutbacks in company trips
- reduction of tourism trips by about -5% in 2009 and 2010 and -3% in 2011 because of income loss and uncertainties about future development of households.

4.1.3.6 Freight transport

The observed slump in freight transport during the economic crisis is modelled via the influence of reduced trade activities in ASTRA. Furthermore, two other trends are integrated in the INT Scenario:

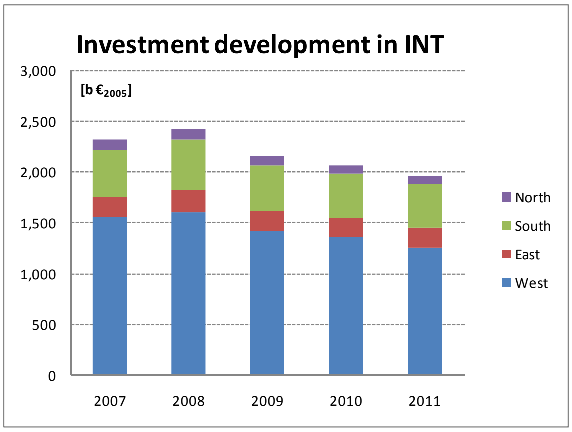
- reductions of average load factors because of free truck capacities during the last quarter 2008 to 2010
- reduction of load factors for long distances until 2010 and a subsequent rise of +2% to 2020 due to restructuring of transport operations in response to the crisis.

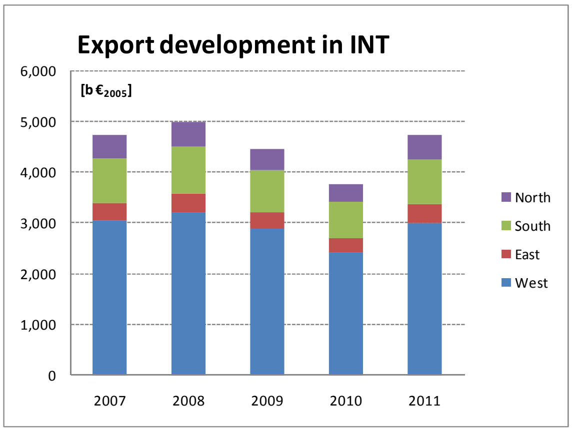
4.1.3.7 Vehicle fleet

The incentive system for replacing old automobiles by new ones in Germany (scrappage subsidy) was stimulated by raising the scrappage ratio temporarily for cars older than 9 years. In doing so, the subsidy of € 5 billion is transferred to the consumer supporting the scrappage of 2 million old automobiles in Germany. Even though some EU countries followed Germany's example,, this action could only be implemented for Germany.

4.1.4 Short-term development of model indicators during crisis

The mentioned delayed reaction of the ASTRA model due to the inherent lag structures between major model variables can be identified in the following Figure 4-1. Investment and exports should in fact be lower already in 2008, and at least for exports, the lowest value should occur in 2009 and not in 2010. Nevertheless, exports return to significant growth in 2011, while investment remains at the lower levels of the crisis year 2009. Our conclusion is that the model depicts a development that is delayed by 6 to 12 months, compared to what we can observe now. This would be significant for a short-term forecasting model, but not for a strategic model that runs scenarios until 2030.

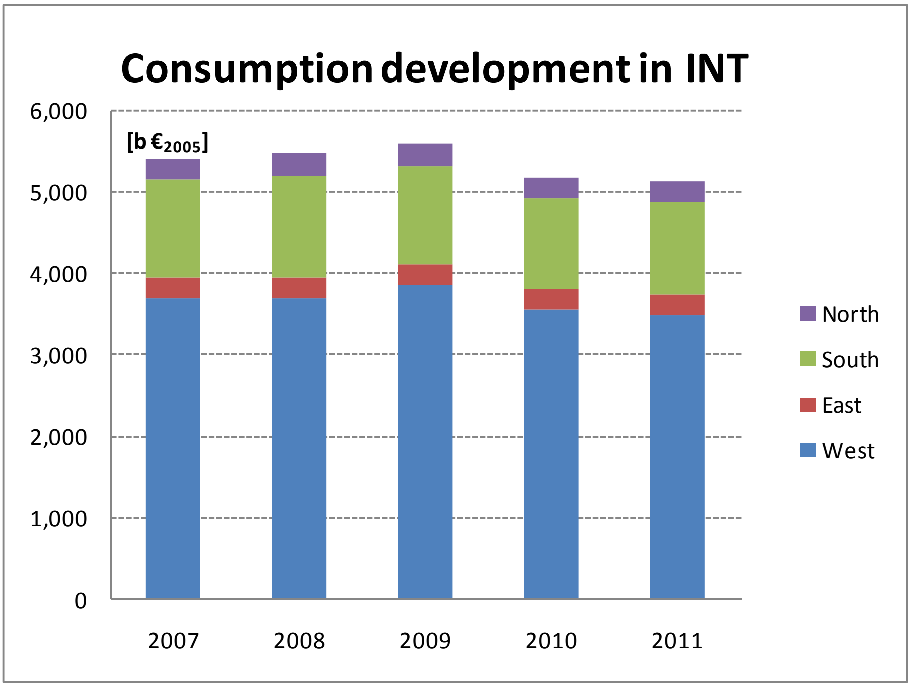




Source: iTREN-2030, ASTRA model

Figure 4-1: Investment and export development during the economic crisis

Figure 4-2 presents the development of consumption for the EU regions. The delayed reaction is also observed for household consumption, though in some countries like Germany the consumption remained nearly stable in 2009. However, the model, as well as some economic analysts, expects a cutback in consumption in the next few years. This, of course, also depends on the unemployment levels. The more strongly these increase, the more drastic the reduction of consumption should be, as unemployed persons are facing reduced incomes.



Source: iTREN-2030, ASTRA model.

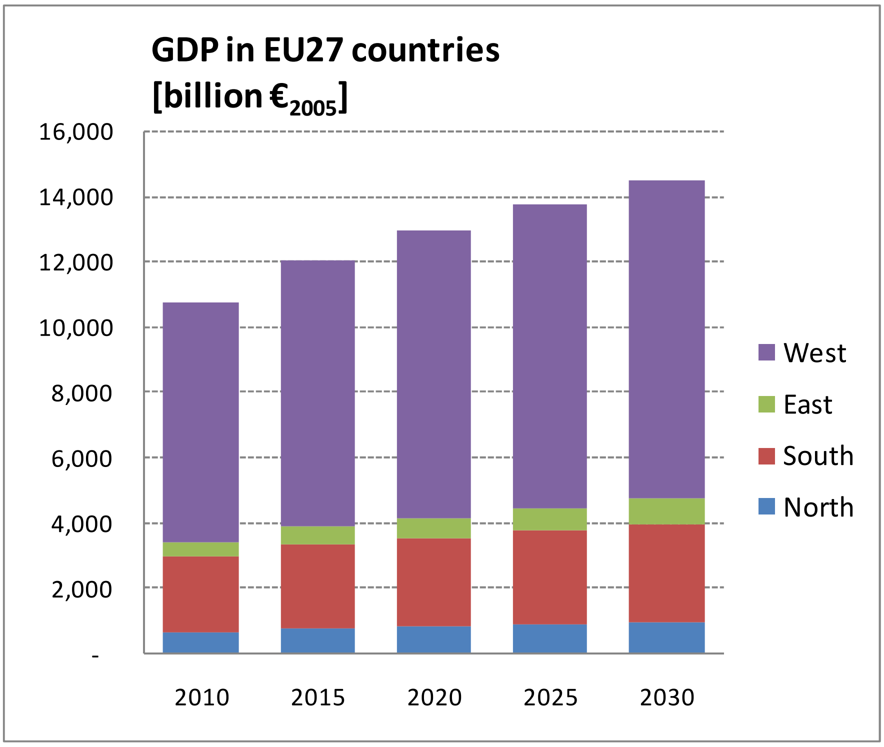
Figure 4-2: Consumption development during the economic crisis

4.2 Long-term economic development until 2030

The previous section described the consideration and the impacts of the economic crisis in the iTREN-2030 modelling suite, in particular with reference to the implementation of the crisis in the ASTRA model. This section explains the economic development from 2010 until 2030. The reason for this separation is that, during the crisis the economic indicators developed and changed on a shorter time scale (i.e. within months or quarters of a year), while after 2010 the scenario does not incorporate any sudden economic changes, so that we look at the economic indicators on a longer time scale (i.e. in bi-annual or five-yearly periods).

The iTREN-2030 Integrated Scenario after 2010 reflects a return to the smooth growth path of the last decades. The project team is aware that the financial system still bears risks (e.g. a speculative bubble because of too much cheap money provided by the central banks, the high government debt in some major countries, the imbalance between the US and Chinese trade flows and currency values), which could cause the next financial and economic crisis within the coming decade. However, it was not the purpose of the project to provide an economic analysis or scenario on the impacts of potential future economic crises.

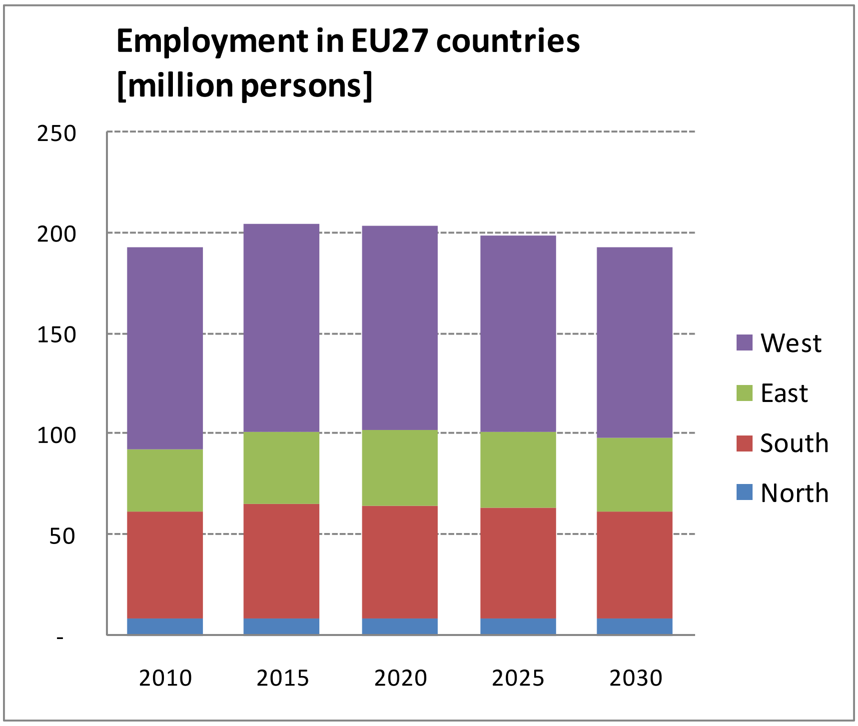
Even with the model outcome that economic development over the next two decades returns to a smooth growth path, some longer term influences of the economic crisis from 2008/2009 can still be observed (see Figure 4-3 and Table 4-1). First, from 2010 onwards, the first five-year period reveals the highest average annual growth of +2.3% in the EU27. Such high growth rates reflect the economic recovery after the crisis. For the subsequent five-year periods, growth rates decline in each period, so that in the period between 2025 and 2030, the average annual growth rate is down to +1%. This happens because in the longer run the dampening effects of high public debt and ageing with the resulting reduced labour force are enforced, while the stimulating effects of the global and European economic recovery disappear. Over the whole next two decades the average annual EU GDP growth rate is expected to be at +1.5%.



Source: iTREN-2030, ASTRA model

Figure 4-3: Development of GDP in the Integrated Scenario

GDP development strongly determines the trends for employment, so that over the first five years, employment significantly increases by 12 million persons, then stabilizes towards 2020 and falls, to return to the level of 2010 by 2030. Such a development can also be accounted for by the basic interrelationship between GDP, employment and productivity, which states that the long-term average annual labour productivity growth would be around 1.5%. This means that in periods when GDP growth is higher than productivity growth (i.e. higher than 1.5%), new employment is generated and when it is lower than productivity growth, employment shrinks. This fits the estimated rates for the next periods in which first the GDP growth rate between 2010 and 2015 is +2.3% and thus higher than the 1.5%, which leads to growth in employment. However, after 2020 the rate is significantly lower (1.2% and 1%), so that employment dwindles. Two issues should be taken into account: (1) in 2010 we are starting from a low level of employment at the end of the crisis, so that part of the employment increase is due to economic recovery, and (2) the decline of employment after 2020 should not have serious consequences for unemployment, since in parallel the labour force is also decreasing (though this assumes that the retirement age is not postponed compared with today).



Source: iTREN-2030, ASTRA model

Figure 4-4: Development of employment in the Integrated Scenario

Table 4-1 presents the average growth rates for the next four quinquennial periods for GDP and employment, providing the numbers for four EU regions as well as for the EU27. It can be observed that the catching-up process of eastern EU countries is expected to continue, and northern countries develop better than western and southern countries.

Table 4-1: Growth rates of GDP and employment by major region

	GDP growth average annual [%]				**Employment growth average annual [%]**			
Region	**'15 to '10**	**'20 to '15**	**'25 to '20**	**'30 to '25**	**'15 to '10**	**'20 to '15**	**'25 to '20**	**'30 to '25**
North	2.9%	1.5%	1.4%	1.3%	0.65%	-0.13%	-0.27%	-0.20%
South	2.0%	1.1%	1.0%	0.8%	0.55%	-0.11%	-0.16%	-0.30%
East	4.7%	2.9%	2.6%	2.8%	1.52%	0.33%	0.01%	-0.09%
West	2.2%	1.4%	1.1%	0.9%	0.31%	-0.20%	-0.36%	-0.41%
EU27	**2.3%**	**1.4%**	**1.2%**	**1.0%**	**0.60%**	**-0.08%**	**-0.23%**	**-0.31%**

Source: iTREN-2030, ASTRA model

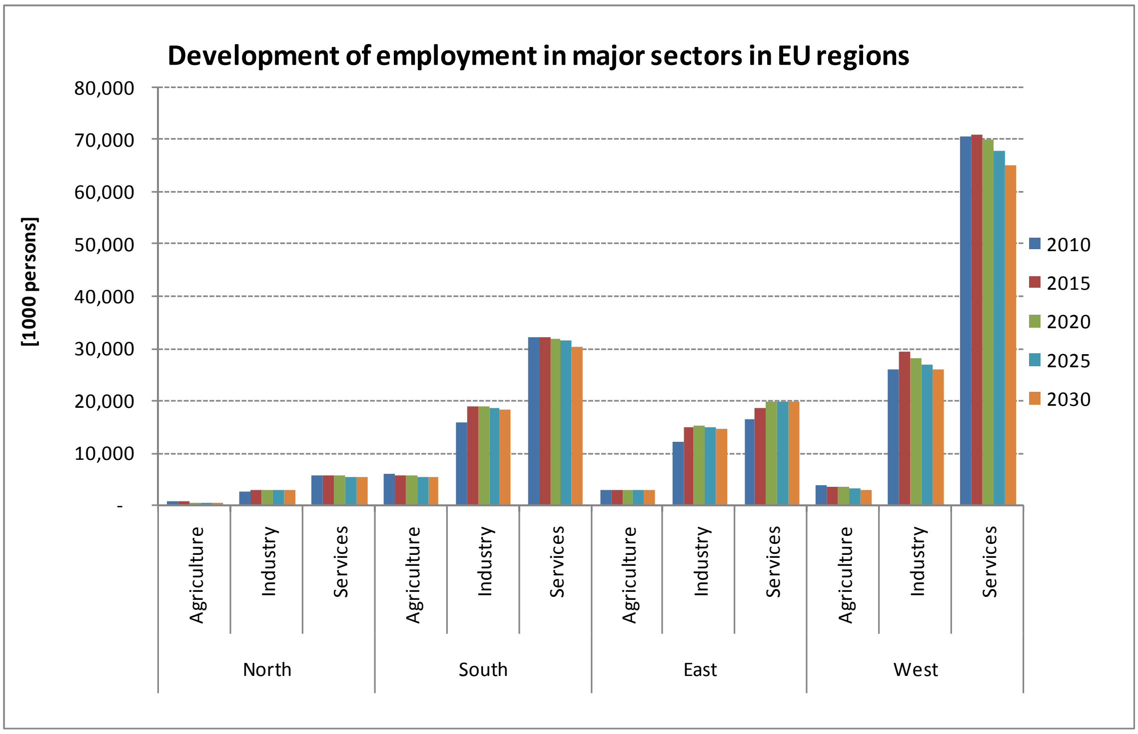
Table 4-2 shows the development of GDP at the level of countries or country groupings for the smaller countries. The EU27 reveal a total growth of 34% between 2010 and 2030. The majority of EU15 countries develops around the same growth number, while the new Member States in general perform significantly better. Positive examples would be Poland, Denmark or Slovenia, while negative examples include Greece, France and Italy.

Table 4-2: GDP development in EU countries

Country / country group [b€ $_{2005}$]	**2010**	**2015**	**2020**	**2025**	**2030**
Austria	275	309	332	353	372
Baltic States	28	34	38	43	49
Belgium/Lux.	333	371	384	397	409
Bulgaria	16	18	20	22	24
Czech Republic	67	78	86	95	105
Denmark	190	232	251	268	284
Finland	180	203	219	235	252
France	1,893	1,985	2,072	2,133	2,160
Germany	2,813	3,206	3,462	3,670	3,847
Greece	149	157	160	164	171
Hungary	57	71	77	83	90
Ireland	97	120	128	133	140
Italy	1,240	1,357	1,421	1,475	1,509
Malta/Cyprus	17	19	20	22	23
Netherlands	510	573	619	665	710
Norway	202	250	283	312	344
Poland	209	273	327	383	453
Portugal	143	165	181	197	210
Romania	34	40	45	51	57
Slovakia	26	32	36	41	46
Slovenia	33	42	47	52	58
Spain	727	817	874	935	986
Sweden	312	352	379	406	434
Switzerland	348	407	442	474	497
United Kingdom	1,409	1,599	1,748	1,902	2,058
EU27	10,757	12,056	12,926	13,724	14,445

Source: iTREN-2030, ASTRA model

The sectoral structure of changes in employment in Figure 4-5 reflects the differences in specialisation of sectoral employment and trends in the different EU regions. The western countries have the lowest shares of employment in agriculture with about 3%, while in the eastern countries this share rises to 10%. The highest share of employment in industry is observed for the eastern countries (about 40%), while in the other regions it provides less than one third of employment. This reflects the later starting point of the eastern countries in transforming from secondary-sector-based countries to tertiary-sector-based countries. The largest share of employment in services is observed for the western countries, with close to 70% while this share is just above half of employment in the eastern countries.



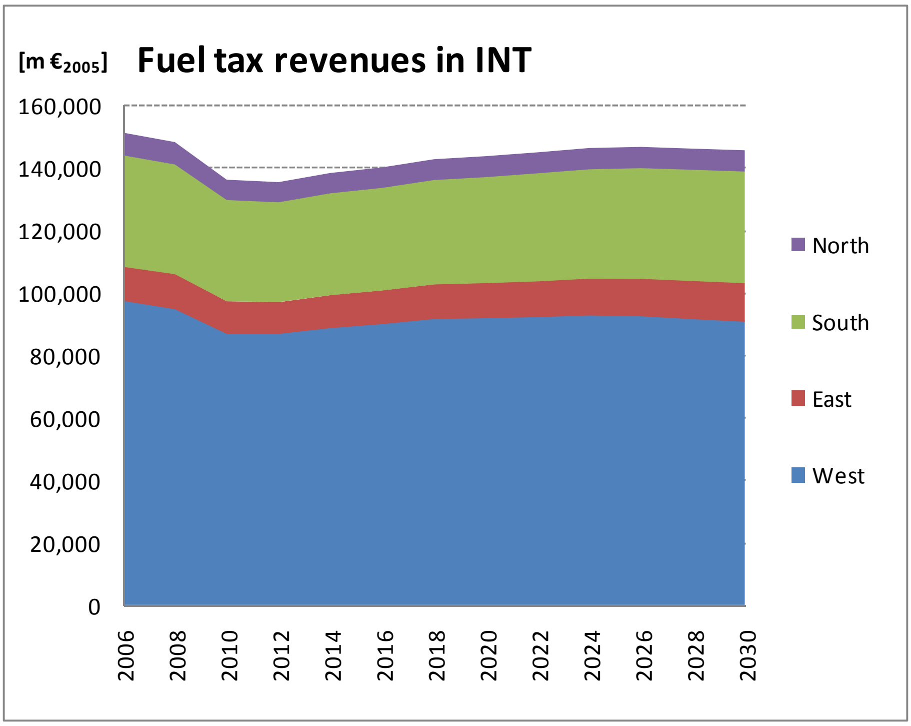
Source: iTREN-2030, ASTRA model

Figure 4-5: Development of employment by major sector and region

Employment in the transport sectors behaves differently. Over the first decade, the transport equipment sector significantly increases its employment due to new technologies entering the market, which require both more R&D and increased engineering value-added per vehicle. Since in iTREN-2030 no change of the external trade structure was assumed (i.e. new vehicle technologies are largely supplied by manufacturers within Europe), there is a direct link between these two positive trends and employment in the transport equipment sector. Also air and ship transport increase employment by 50% until 2030, due to a set of drivers, e.g. growth in international trade, and policy measures that favour these modes instead of road mode. Employment in land transport, logistics and travel services grow only moderately, by less than 10% until 2030.

A further relevant issue concerns the development of government revenues from the transport sector, as for many governments the transport sector generates a substantial share of their gross revenues. For this analysis, the next paragraphs present three different sources of funding: fuel taxes, road pricing and CO_2 pricing, which is implemented via the EU-ETS, but could also be implemented via a carbon tax with the corresponding tax rates at the price of the CO_2 certificates.

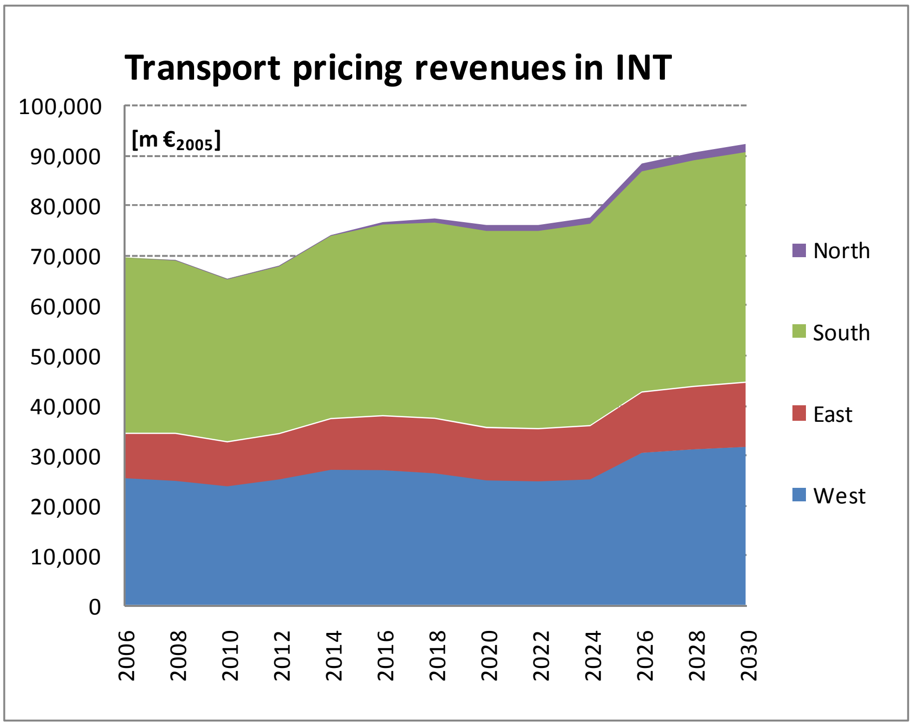
Figure 4-6 presents the fuel tax revenues in the four European regions. Obviously, the financial crisis of 2008/2009 caused a drastic fall in these revenues. In the course of the crisis, fuel tax revenues dropped by about -10%, which was a combined result of the crisis and the high oil prices in 2007/2008. After the crisis, the revenues stabilised, but did not continue to grow, so that they always remained below pre-crisis levels. This is mainly the effect of increased fuel efficiency reducing fuel demand, plus the shift towards alternative fuels that have a lower tax burden (e.g. CNG, biofuels, electricity). It should be borne in mind that the fuel tax revenues in the Reference Scenario were about € 23 billion higher than in the Integrated Scenario in 2030.



Source: iTREN-2030, ASTRA model

Figure 4-6: Development of fuel tax revenues by region

Transport pricing today generates less than one third of transport revenues in the EU27. However, these revenues remain linked to growing transport performance, so that after the dip of the economic crisis, these revenues will continuously increase. It can be observed that the introduction of the road user charge for cars in 2025 causes a surge in revenues from transport pricing. Nevertheless, with the given charging levels (see chapter 3), the generated revenues remain significantly lower than from fuel taxes. Further, part of these revenues is refunded to the tax payers via a reduction of the direct taxation.

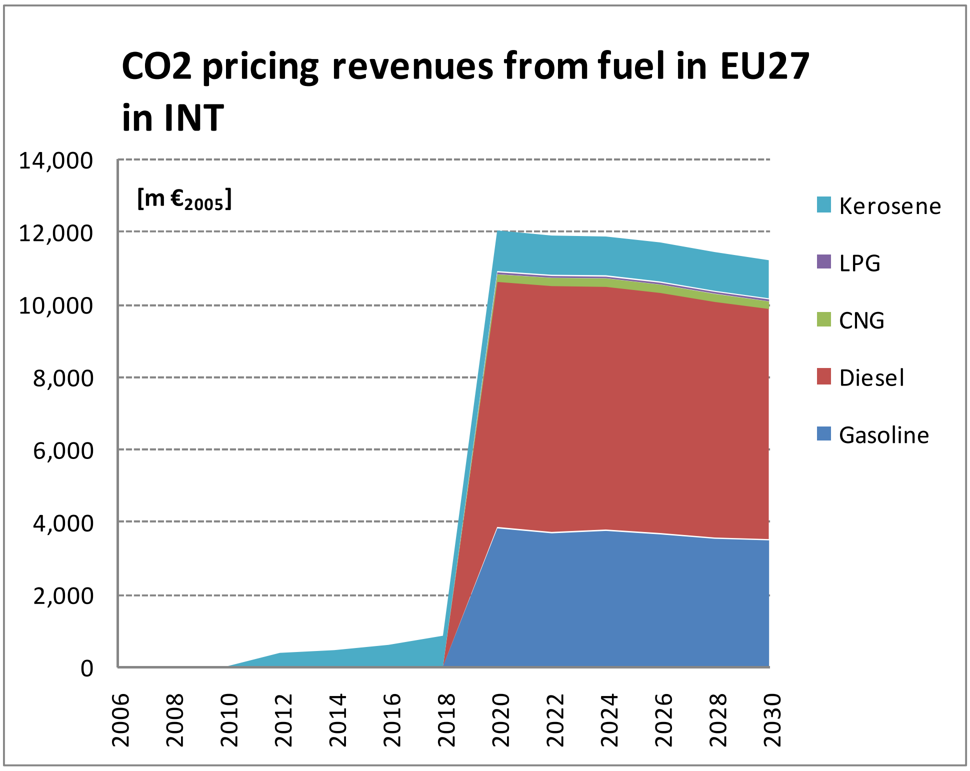


Source: iTREN-2030, ASTRA model

Figure 4-7: Development of revenues of road charges by region

The revenues from CO_2 pricing for fuel in the first years include only the revenues from intra-European air transport, which remain below the one billion € mark before 2020. In 2020 also all road fuels become subject to CO_2 pricing, which increases the revenues to about € 12 billion in 2020, the largest share coming from diesel fuel. The revenues from certificates for fossil electricity production have not been considered in this transport-related analysis.

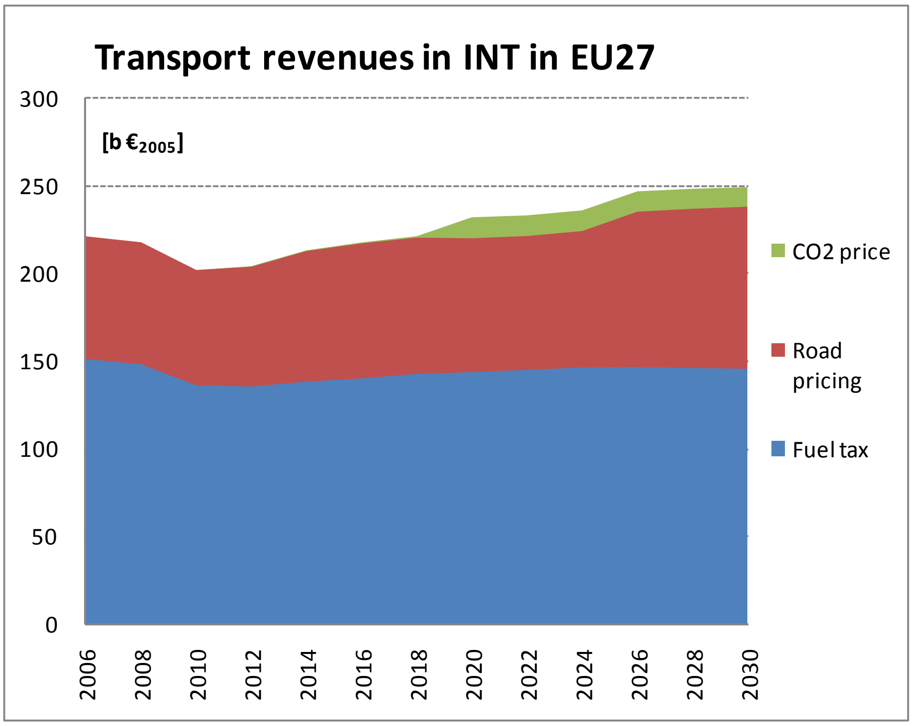
Comparing these revenues with the revenues from fuel taxes, it can again be noted that the fuel tax revenues are one order of magnitude larger. Translating the CO_2 price of around 27-28 €/tCO_2, which is estimated for the period 2020 to 2030, into an increase of fuel prices, this would be equivalent to about 3.5 €ct/l price increase of liquid fossil fuels. Obviously, this measure will have a limited impact on transport demand at such levels of CO_2 prices. Nevertheless, it seems a useful measure to complete the regime of the CO_2 cap-and-trade system by including transport as another important sector within the cap.



Source: iTREN-2030, ASTRA model

Figure 4-8: Development of CO_2 pricing revenues from transport by region

Finally, Figure 4-9 summarizes the development of major government revenues from the transport sector. Starting with about 70% of revenues in 2006 stemming from fuel taxes, and the rest from road transport charges, the system slightly adapts towards 2030 when about three fifth will come from fuel taxes, 37% from road charges and about 5% from CO_2 pricing. Again the figure presents the total revenues neglecting that part of the pricing revenues is refunded via reduction of direct taxes.



Source: iTREN-2030, ASTRA model

Figure 4-9: Development of total transport revenues in the EU27

5 Energy system in the Integrated Scenario

5.1 Policies and measures considered

Policies implemented in the iTREN-2030 Integrated Scenario have been mentioned in section 3.

Hence, the Integrated Scenario incorporates an ambitious energy and climate policy while at the same time it takes into account the economic downturn. In more details, the following elements are incorporated in the scenario:

- It incorporates the effects of the economic crisis: the GDP forecasts and associated value added of the various economic sectors reflect the recent economic downturn. This lowers energy demand and tends to lower energy-related CO_2 emissions.
- It endorses an ambitious climate change policy: it is assumed that the binding unilateral European greenhouse gas reduction target for 2020 (i.e. -20% below 2020 levels) is reached. The scenario results show that the target will even be over-fulfilled. In the model, these targets are achieved through a sector- and time-dependent carbon price, following the example of the emission trading scheme (ETS). We assume an imperfect carbon market across sectors and countries, resulting in different abatement and thus different carbon costs. With respect to trading sectors, we assume that a carbon market is created for energy-intensive industrial use (including the power sector), with other sectors joining later. The transport and residential sectors belong to the non-trading sectors. In these sectors the implementation of emission reduction policies is simulated by introducing a specific carbon value in 2013. In the Integrated Scenario these policies should establish an incentive similar to that of the carbon price in the industrial sectors by 2018. The carbon price would rise from 6 $€_{2005}$ per tonne of CO_2 in 2005 to 27 $€_{2005}/t_{CO2}$ in 2020 and 28 $€_{2005}/t_{CO2}$ in 2030.
- It takes an active renewable energy policy for granted: the Integrated Scenario will meet the European target of a 20% share of renewables in final energy demand. For model-related reasons, the target share of renewable energies in final energy consumption was set at around 18.7% instead of 20%, as the POLES model in its current version does not consider some emerging technology options[5]. The renewable energy policy has been approximated by assuming harmonised technology-specific renewable energy support premiums across the EU, which are based on information from the Green-X model [Resch et al., 2009].

5 In a comparison between renewable energy scenarios done with the POLES and the GreenX models, it was found that these missing categories account for 1.2-1.3% of renewables in final demand by 2020 [Resch et al., 2009].

- Energy efficiency policies: following the energy efficiency action plan, important improvements in energy efficiencies are assumed, which lead to an increase of energy efficiency by 1% annually.
- Support for carbon capture and sequestration (CCS): support of R&D and demonstration sites for CCS so that first large-scale plants can be built around 2030.
- Increased fossil fuel prices: even though fossil fuel prices have been decreasing since their peak at about 150$/bbl in 2008, supported by the global economic downturn, rising demand from fast developing regions and uncertainty about the future availability of cheap resources are suggesting that crude oil prices will not fall back to the low levels observed before 2007. It is therefore assumed that they rise from present prices and then remain at high levels at around 80 $€_{2005}$/bbl in 2020 and almost 90 $€_{2005}$/bbl in 2030.

Even though the focus of the present analysis lies on the development of the European power sector, global developments cannot be ignored due to their interactions via fuel prices or technological learning that is triggered by global capacities etc. In line with the trends assumed for the EU, it has been assumed that an active renewable energy and climate change policy will be implemented also in many other world regions. Assumptions for non-European macro-economic trends and the related CO_2 values build on the global emission reduction pathway scenario (GRP4) that was developed with the POLES model and is documented in Russ et al. [2009].

5.1.1 Energy prices

After more than a decade of cheap oil at around 20 US$/barrel, prices have steeply risen to peak at about 150$/bbl in 2008. After 2008, fossil fuel prices decreased, supported by the global economic downturn, to less than 50$/bbl. Currently they are rising again to 80$/bbl based on better economic outlooks and expected oil demand.

There is a general consensus among the experts that the rise of energy prices should be regarded as a structural condition due to the foreseeable trend of demand and supply. The rising demand from fast developing regions and uncertainty about the future availability of cheap resources suggest that crude oil prices will not fall back to the low levels observed before 2007. It is therefore assumed that they rise from present prices and then remain at high levels at around 80 $€_{2005}$/bbl in 2020 and almost 90 $€_{2005}$/bbl in 2030. The oil price in the INT Scenario follows the trend in the IEA World Energy Outlook (WEO). The WEO projects an oil price of around 74 $€_{2005}$/bbl in 2020 and 85 $€_{2005}$/bbl in 2030 [IEA, WEO 2009][6].

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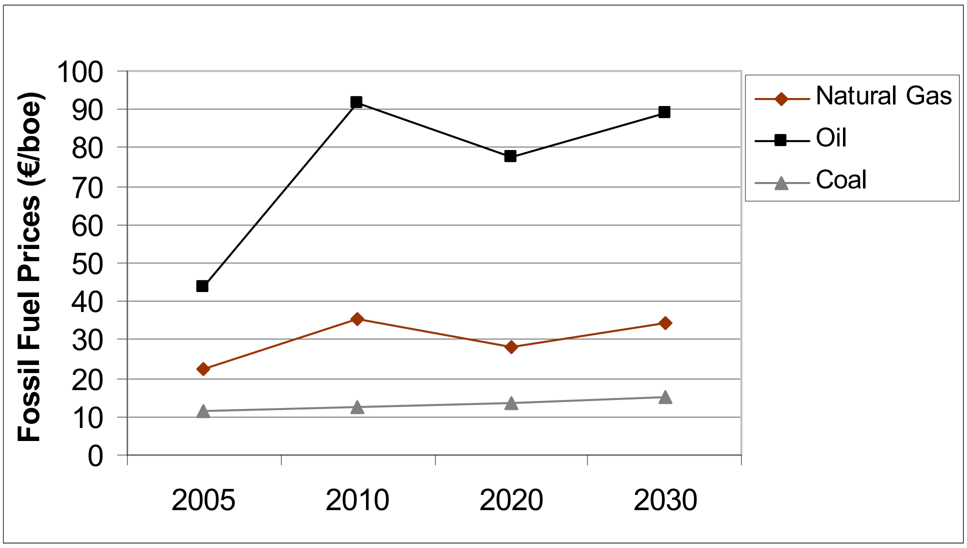
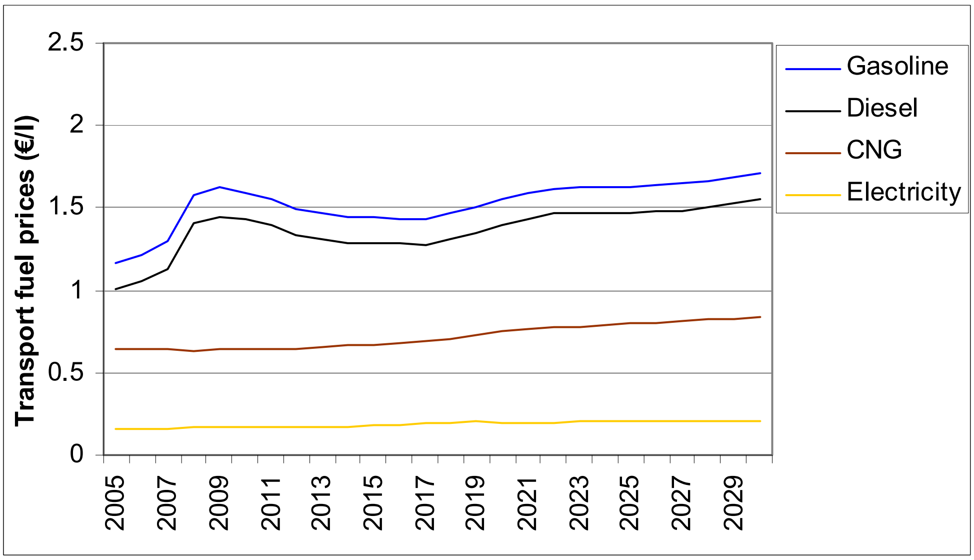
6 The original values from IEA are expressed in $ of 2008. They were 100 $\$_{2008}$/bbl respectively 115 $\$_{2008}$/bbl in 2020 and in 2030 [IEA, WEO 2009].



Source: iTREN-2030 – POLES model

Figure 5-1: Fossil fuel prices [in $€_{2005}$]

Gas prices are assumed to increase in a similar pattern but at a lower pace, reflecting the dynamics of the inter-fuel competition and the rising supply costs. Over the whole time period, gas prices are expected to increase by 56%. Coal prices increase by only 33% due to the ample reserves.



Source: iTREN-2030 – POLES model

Figure 5-2: Transport fuel prices [in $€_{2005}$]

In addition to the high prices for oil and gas we have to consider the development of fuel taxes. The rising carbon value and the harmonization of fuel taxes lead to a further increase of transport fuel prices (see Figure 5-2). It is expected that the gasoline and diesel prices reach the levels of the peak year 2008 by 2020 and increases slightly further thereafter. Gas prices are following this trend at a lower price level while electricity prices remain quite stable[7].

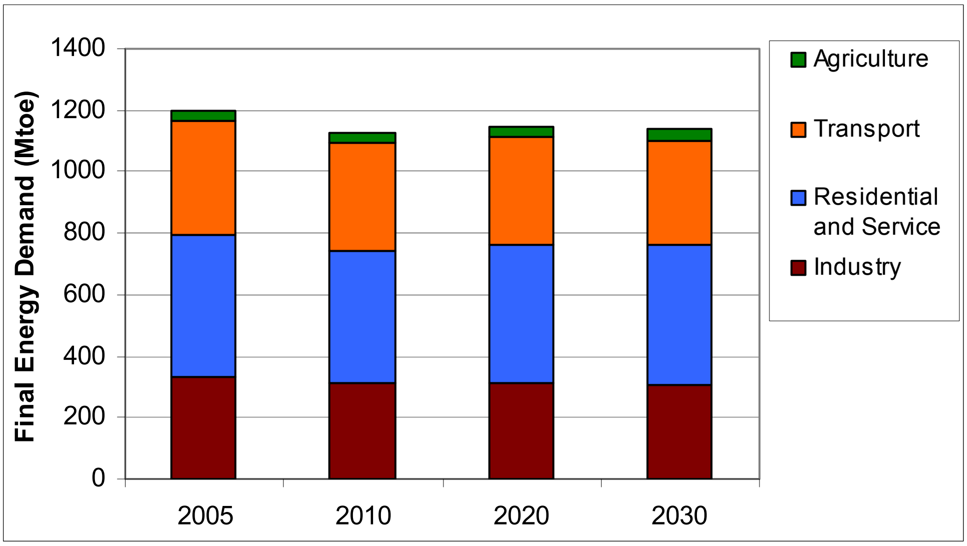
5.1.2 Energy demand

The above assumptions have a dampening effect on the total European energy demand. Unlike the steadily rising energy consumption observed over the past decades, the INT Scenario will remain close to 2005 levels by 2030. The stabilization of energy consumption is largely achieved by a break in the historic trend of a continuously growing transport energy demand in the INT Scenario, transport energy consumption may even experience some slight reductions after 2010 due to lower transport activities and the introduction of new technologies. The economic crisis also largely affects industrial activities and so lowers the final energy demand of industry, while the residential and service sectors are expected to further increase their energy consumption (see Figure 5-3).

Overall, the policies introduced in the Integrated Scenario would manage to achieve a trend break in most sectors and consequently limit the overall consumption of energy in the EU (see Figure 5-4). In the integrated scenario the average annual growth rate in total energy consumption dropped from around 0.5% observed between 1996 and 2005 to levels between 0% and -0.2%.

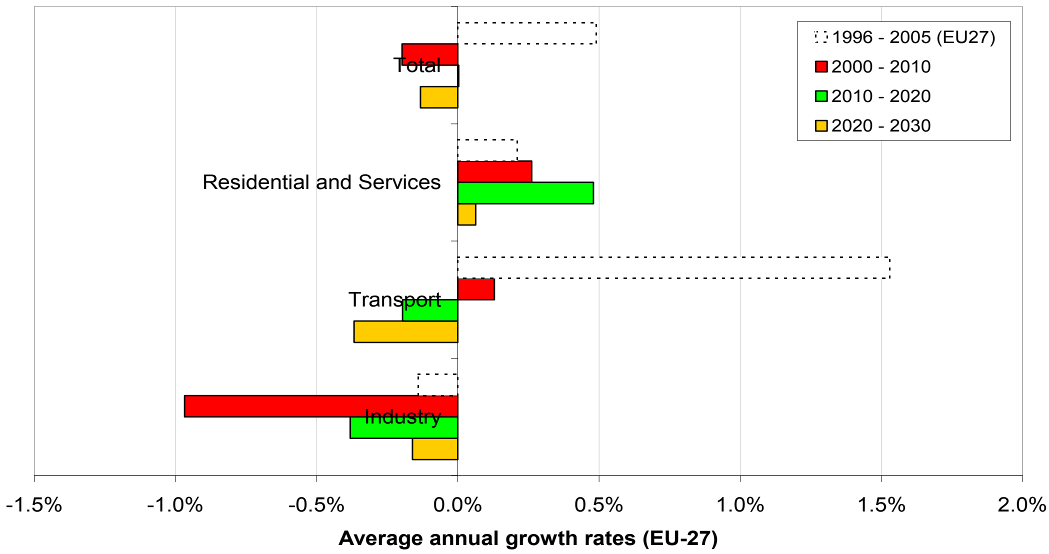
The biggest change can be identified for the transport sector, where high growth rates (+1.8% p.a. between 1996 and 2005) turned into slightly negative ones. This effect becomes even more pronounced towards the end of the time horizon because of delays related to the vehicle fleet. In the industrial sector the small decline in energy demand is expected to continue, only coming a bit later in the decade 2000 to 2010 due to the impacts of the economic downturn. After 2010 it seems that the economic recovery offsets the increase of higher carbon values and higher production costs due to higher renewable shares.

7 Gas and electricity prices are expressed in terms of energy content.



Source: iTREN-2030 – POLES

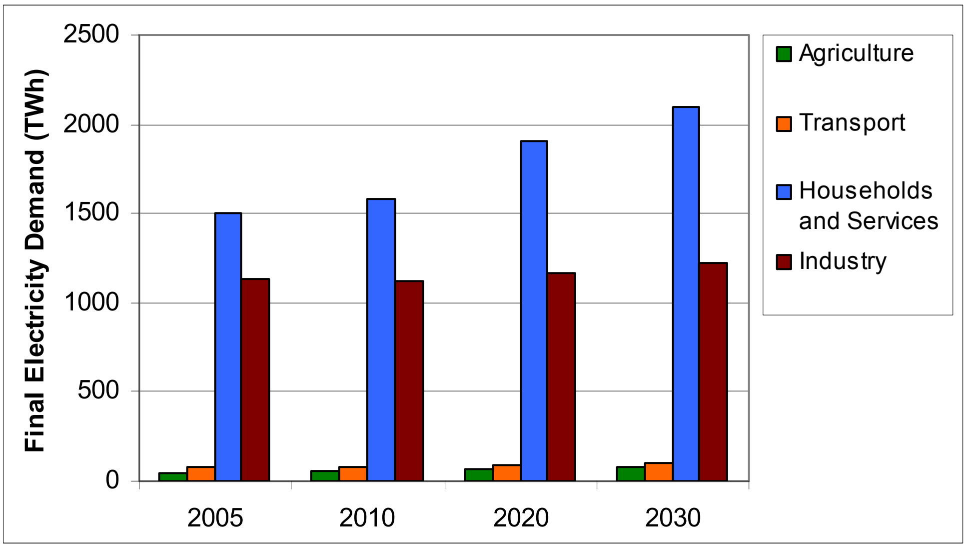
Figure 5-3: Trends in final energy demand in the INT Scenario (EU27)



Source: iTREN-2030 – POLES, Eurostat

Figure 5-4: Average annual growth rates of energy demand of economic sectors

Unlike final energy consumption, the demand for electricity will continue to rise throughout all sectors, following the development in the past years. The fastest growth is expected for the household and services sector, given the trend towards more and bigger appliances in private households and the rising economic importance of the tertiary sector.



Source: iTREN-2030 – POLES

Figure 5-5: Trends in final electricity demand in the INT Scenario (EU27)

Looking at the energy consumption of the transport sector in more detail reveals that the decrease largely stems from lower energy demand in road passenger transport and road freight transport (see Table 5-1). Road mode energy consumption decreases by around -14% for freight and passenger transport. Air transport experiences a significant drop until 2010 due to the economic crisis, but recovers and finally increases by +10% over the whole time period from 2005 to 2030.

Table 5-1: Final energy demand per transport mode

Final energy demand [mtoe]	**2005**	**2010**	**2020**	**2030**
Transport – all modes	375	356	350	339
Road transport cars	201	194	180	172
Road transport freight	108	106	105	95
Rail	9	9	10	10
Aviation	51	41	50	56
Other transport	6	5	5	5

Source: iTREN-2030 – POLES model

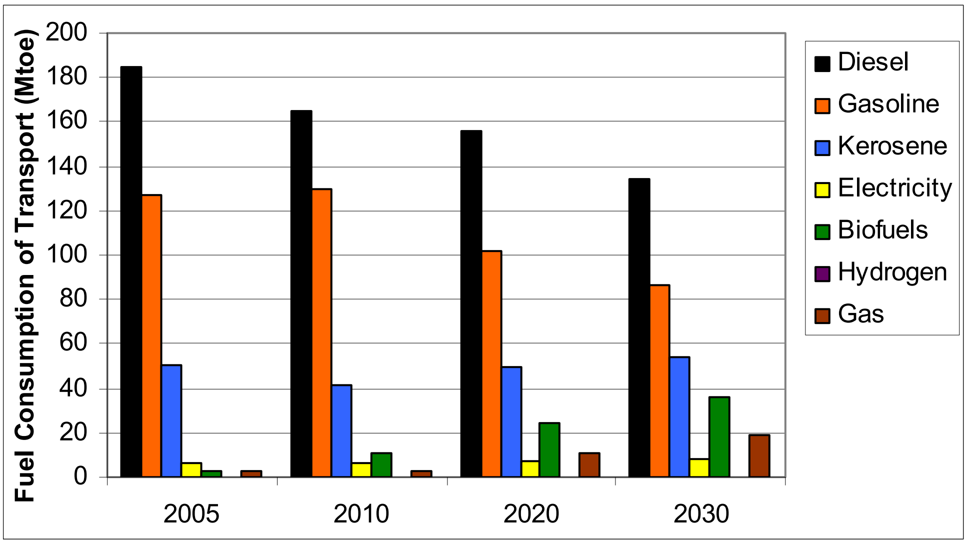
Also regarding final energy demand, the Reference and the Integrated Scenario differ most in the transport sector (see Table 5-2). Overall, the annual growth of 0.7% in the Reference Scenario turns into a negative growth of -0.4% in the Integrated Scenario. This reduction is largely caused by the changes in road transport and to a minor extent from the changes in air transport. Both types of road transport are expected to decrease, with an annual growth rate of about -0.5%, while they experienced an increase in the Reference Scenario.

Table 5-2: Final energy demand growth rates between 2005 and 2030

Average annual changes in final energy demand [%]	**Integrated Scenario**	**Reference Scenario**
Transport – all modes	**-0.4**	**0.7**
Road transport cars	-0.6	0.8
Road transport freight	-0.5	0.6
Rail	0.4	1.2
Aviation	0.4	0.8
Other transport	-0.7	-0.7

Source: iTREN-2030 POLES model

The development of fuel consumption in transport reflects the overall decrease of energy demand and the trends of the vehicle fleet (see chapter 6). Gasoline and diesel consumption is decreasing, while kerosene experiences a slight increase due to the continued growth of air transport (see Figure 5-6).



Source: iTREN-2030 – POLES model

Figure 5-6: Fuel consumption in transport

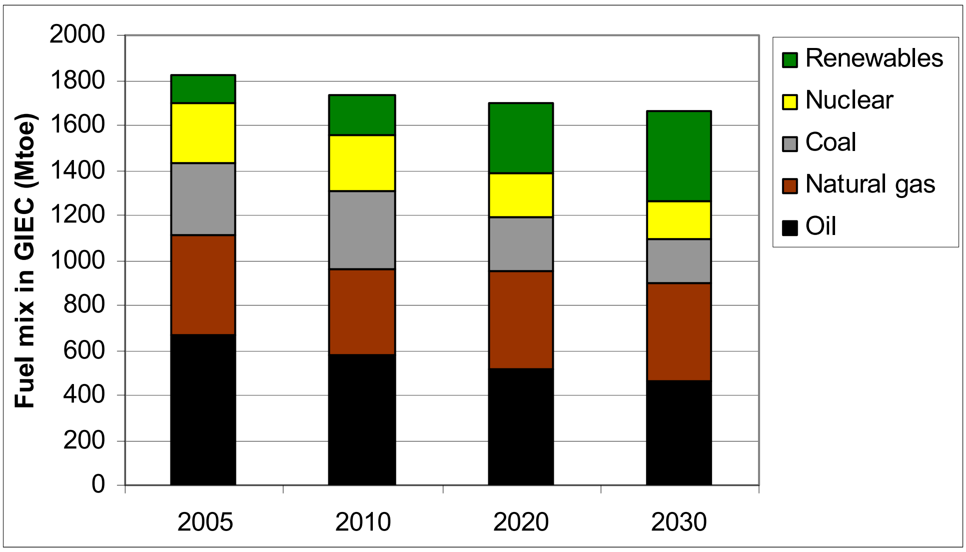
Alternative transport fuels like biofuels, gas and electricity will play a more important role. Among alternative fuels, biofuels will experience the strongest growth, in particular in the

Integrated Scenario. Despite their uptake, the biofuels share will be around 3.4% by 2010, thus falling short of the 5.75% target of the Biofuels Directive. Thereafter, however, the favourable conditions of the Integrated Scenario imply a further increase in the share of biofuels to gasoline and diesel consumption, to reach 9.8% by 2020 and around 15% by 2030. The increase of biofuels consumption is supported by the high oil prices, on the one hand, and a decrease of the production cost of biofuels with the entry of more advanced technologies, on the other.

Gas demand for transport experiences substantial growth as well. The trend towards gas can be explained by the development of gas and gasoline/diesel prices (see Figure 5-2). Although the number of hybrid and electric vehicles reaches 30 million vehicles, the electricity consumption of transport remains quite low as the fuel efficiency is quite high with respect to electricity of electric and hybrid vehicles.

5.1.3 Energy supply

On the supply side, the energy sector in general, and the power sector in particular, strongly reacts to the rising carbon dioxide price and the renewable energy policy by substituting carbon-intensive fuels with low-carbon alternatives (see Figure 5-7).



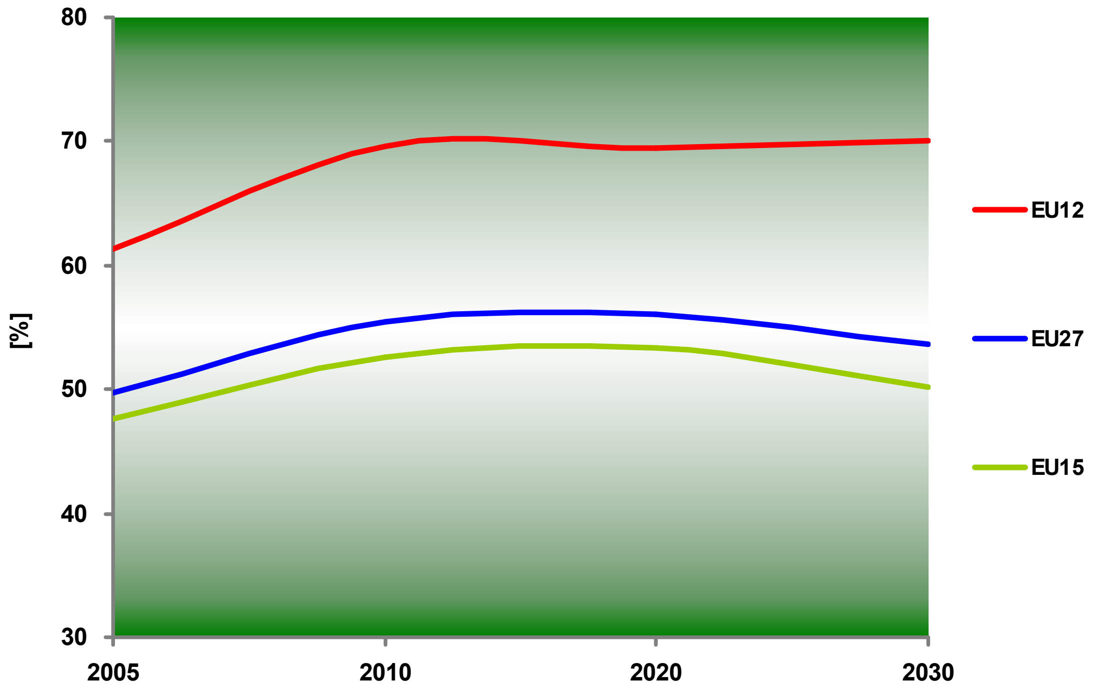
Source: iTREN-2030 – POLES model

Figure 5-7: Fuel mix in Gross Inland Consumption (GIEC) in mtoe

Among the fossil fuels, a shift from oil and coal towards gas can be observed: oil and coal consumption will decrease by 30% until 2020, respectively 40% until 2030, compared to their 2005 levels. At the same time, gas consumption remains stable which leads to an increase of the share of gas in gross inland consumption from 24% to 26% in 2030. Remarkable is also the increase of the share of biomass and of other renewables to gross inland consumption from 5% respectively 2% in 2005 to almost 16% respectively 8% in 2030.

This picture differs quite strongly from the development of the fuel mix in the reference scenario. Unlike the Integrated Scenario, in the reference case gross oil and coal consumption remain stable at around 650 mtoe, respectively 350 mtoe and the share of biomass and of other renewables to gross inland consumption increases much more slowly (to reach only 5%, respectively 3%, by 2030).

The share of domestic energy production remains above 50% in the EU27 (see Figure 5-8). The rise in biomass and other renewables which is more related to domestic production outweighs the decrease of domestic fossil fuel production. In the EU12 we can even identify an increase in the share of domestic energy production mainly due to the increase of biomass production.

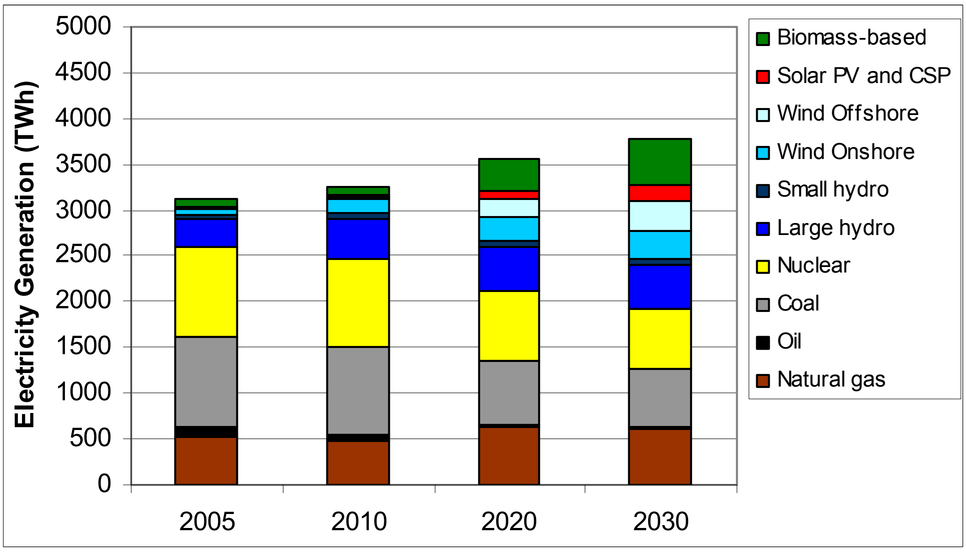


Source: iTREN-2030 – POLES model

Figure 5-8: Share of domestic energy production

In the power sector, coal-based power generation would be reduced by around one third between 2005 and 2030 in the Integrated Scenario. Oil-based power generation decreases even more strongly, while gas-based power generation remains stable. Together these trends illustrate the fossil fuel switch which is propelled by the increase of the carbon value.

At the same time, electricity generated by renewable energy generation (without large hydropower) increases by a factor of 5 (see Figure 5-9). The increasing trend of biomass and wind-onshore will continue and they will reach 10%, respectively 8%, in 2030 (see Figure 5-9). Wind-offshore and solar energy are expected to enter the market before 2020 with a presumable share. They will reach 5%, respectively 2%, in 2020 and may increase towards 9% respectively 5% in 2030.

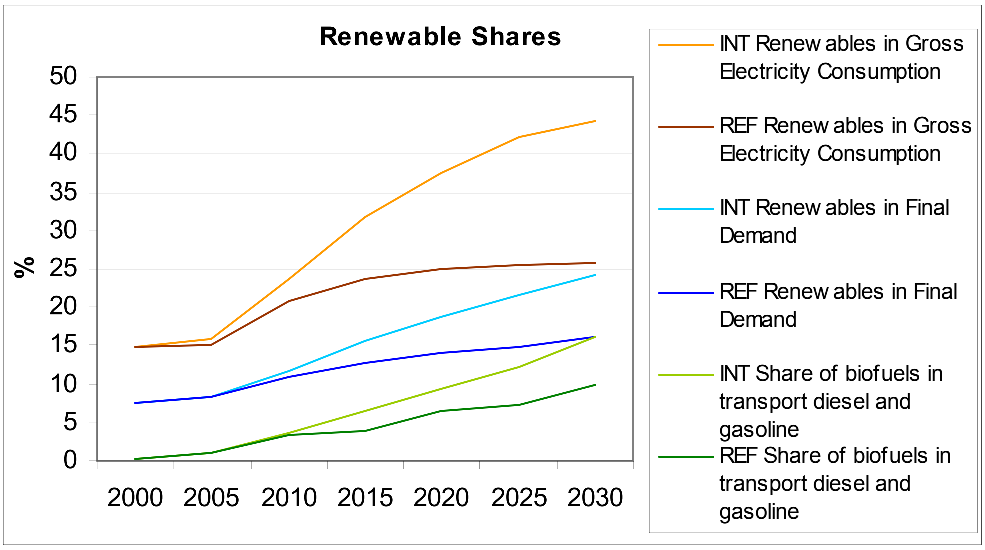


Source: iTREN-2030 – POLES

Figure 5-9: Electricity generation by fuel in the INT Scenario (EU27)

Consequently, in the Integrated Scenario renewable sources account for 37% of total electricity generation by 2020 in the EU, rising further to 44% by 2030 (see Figure 5-10), while in the Rference Scenario renewable sources reach 25% by 2020 and remain almost stable thereafter. A similar trend across the scenarios can also be observed for biofuels, which experience a continuous rapid increase in the Integrated Scenario (see 5.1.2), whereas they would grow at a much slower pace in the Reference Scenario.

Overall, the share of renewables in final energy demand reaches 18.7% instead of 20% in 2020, as the POLES model in its current version does not take some emerging technology options into consideration [8] (see Figure 5-10). In the Reference Scenario where the renewable target was not implemented it reaches only 14% in 2020.



Source: iTREN-2030 – POLES

Figure 5-10: Shares of renewables in electricity, transport demand and final energy demand

5.1.4 Emissions

The combination of stagnating energy demand and the decreasing carbon intensity of power generation leads to substantial reductions in the emission of greenhouse gases, both compared to a baseline and the 1990 levels (see Figure 5-11).

By 2020, the energy-related GHG emissions would be 21.9 % below the emissions in 1990 (see Figure 5-11) in line with the targets set for the scenario. The reduction of energy-related GHG emissions is slightly higher compared to the envisaged target because of the fact that the Integrated Scenario has to reach the renewable target as well. The renewable target is more difficult to meet than the GHG emission reduction target, especially due to the GDP crisis. The lower levels of GDP make it easier to reach the GHG emissions as they cause lower energy demand. The feed-in tariff and the carbon price that is necessary to meet the renewable target causes slightly higher GHG emission reductions.

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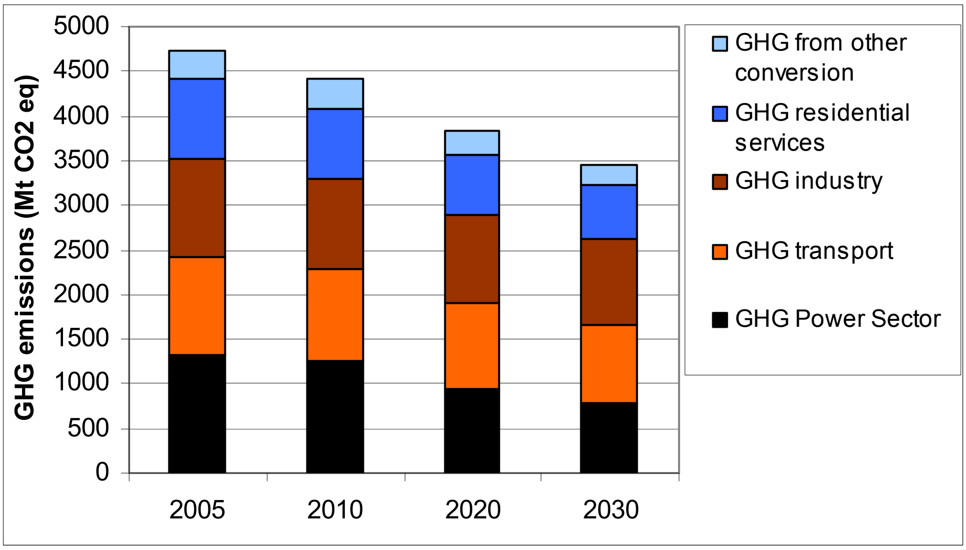
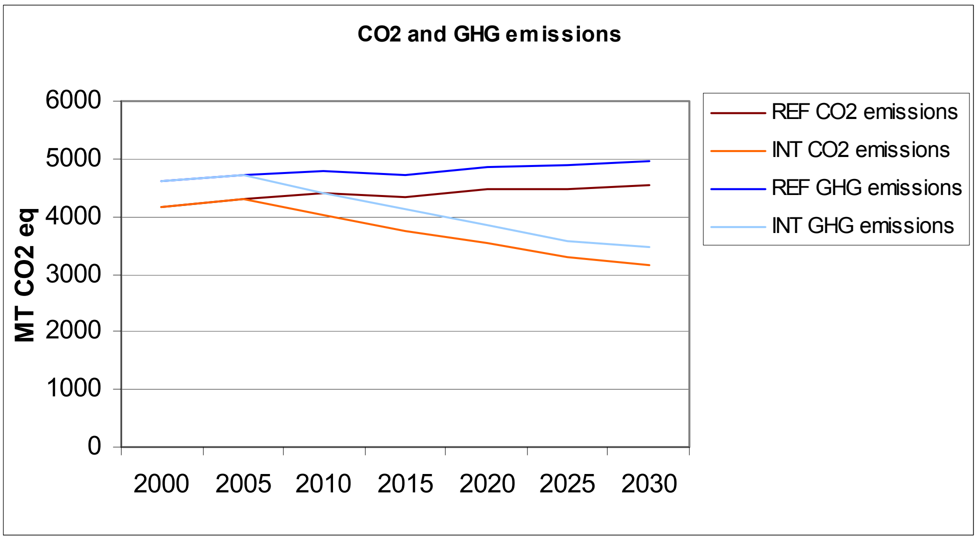
8 In a comparison between renewable energy scenarios done with the POLES and the GreenX models, it was found that these missing categories account for 1.2-1.3% of renewables in final demand by 2020 [Resch et al., 2009].

The GHG emissions will fall further, to 31% below 1990 levels by 2030. Major parts of the emission reductions are realized in the power sector (-36% between 2005 and 2030) but also in the residential sector (-34% over the same period).



Source: iTREN-2030 – POLES

Figure 5-11: Development of GHG emissions (EU27)



Source: iTREN-2030 – POLES

Figure 5-12: Comparison of emissions between reference and integrated scenario

Overall, the Integrated Scenario can be summarized as an ambitious development of the European (and global) energy system that encounters the challenges of drastic emission reductions and higher fossil fuel prices with a further switch towards low-carbon fuels and higher energy efficiency. At the same time, the consequences of the present economic downturn play an important role in reducing energy demand, especially over the coming decade.

5.2 Analysis of the drivers behind the changes

In order to analyze the drivers behind the changes between the scenarios, a breakdown analysis was carried out, taking energy-related CO_2 emissions as the example. In the reference case we determined a slight increase in energy related CO_2 emissions in the EU 27, while they would fall by 21.9 % in the Integrated Scenario. Therefore, the differences between the two scenarios are even higher, at 21% in 2020 and 32% in 2030. We investigated the reasons for this effect in our analysis. Differences in CO_2 emissions emerge, due to economic conditions and policy measures that lead to responses of the energy system. The following causes could be investigated:

- economic downturn
- reduction of energy consumption
- switch within fossil fuels from high- to low-carbon fuels (e.g. coal to gas)
- switch from fossil to non-fossil fuels, i.e.
    - renewable energy sources with 0 direct emissions
    - nuclear energy
- capturing of CO_2 emission and storage.

A breakdown of these factors should illustrate their relative importance in moving from a baseline to a reduction case. The breakdown applies to energy-related CO_2 emissions only.

However, it should be noted that many of the factors are interrelated and a decision has to be taken on where to set the system boundaries of each factor. For example, switching from coal- to gas-fired electricity production reduces the specific CO_2 emissions, both due to the lower carbon content of gas (and thus accounted for in "fossil fuel switch") and to the higher efficiency of CCGT compared with conventional coal power plants. The latter, however, is accounted for under "energy savings" as it is energy not used.

Furthermore, the different factors cannot be directly attributed to specific policies and measures. For example, "energy savings" describes the reduction in total energy consumption. This can be achieved either by energy efficiency measures or by structural changes of the economy leading to lower energy intensities or by changes in consumer's behavior.

The basic method underlying the analysis will be described in the following:

- The change due to the economic downturn is calculated by applying the CO_2 emissions per GDP of the Reference Scenario to the GDP of the Integrated Scenario:

$$\Delta Emissions_{economic\ downturn} = (\frac{CO_2 emissions_{ref}}{GDP_{ref}}) \cdot GDP_{int}$$

- The fraction "energy savings" is derived by calculating the difference in emissions due to the changes of the gross inland energy consumption for every time step. It is thus

$$\Delta Emissions_{saving} = (GIEC_{ref} - GIEC_{int}) * CI_{ref}$$
$$with \quad CI = carbon\ intensity = CO_2 emissions / GIEC$$

- The other factors could be summarized by just one factor that would describe the changes in the carbon intensity between the scenarios at constant energy consumption in the reduction case:

$$\Delta Emissions_{fuel\ mix\ change} = (CI_{ref} - CI_{int}) * GIEC_{int}$$

- Nevertheless, we would like to break down this latter factor into the contribution of renewables, nuclear, CCS and fossil fuel switch. It is relatively straightforward to calculate the contribution of different technologies to emission reduction for scenarios with constant energy demand. However, if the demand changes between scenarios, things become more difficult. For instance, the same share of nuclear in a reduction case would lead to a net increase in emissions as there is less nuclear in total terms in the reduction case. This means that we will need to factor in the overall lower energy consumption in the reduction case. In other words: we will need to compare the relative contributions of nuclear or renewables to the gross inland energy consumption in the 2 scenarios.

  We thus investigate how much emission we would have avoided if we had the share of renewables as in the baseline, but at the gross inland energy consumption of the reduction case and compare that to the avoided emissions due to the share of renewables in the reduction case. As we assume zero emissions for both renewables and nuclear, the emissions avoided are thus those from the baseline. That means for the contribution of renewables:

$$\Delta Emissions_{renewables} = (REshare_{int} - REshare_{ref}) * GIEC_{int} * CI_{ref}$$

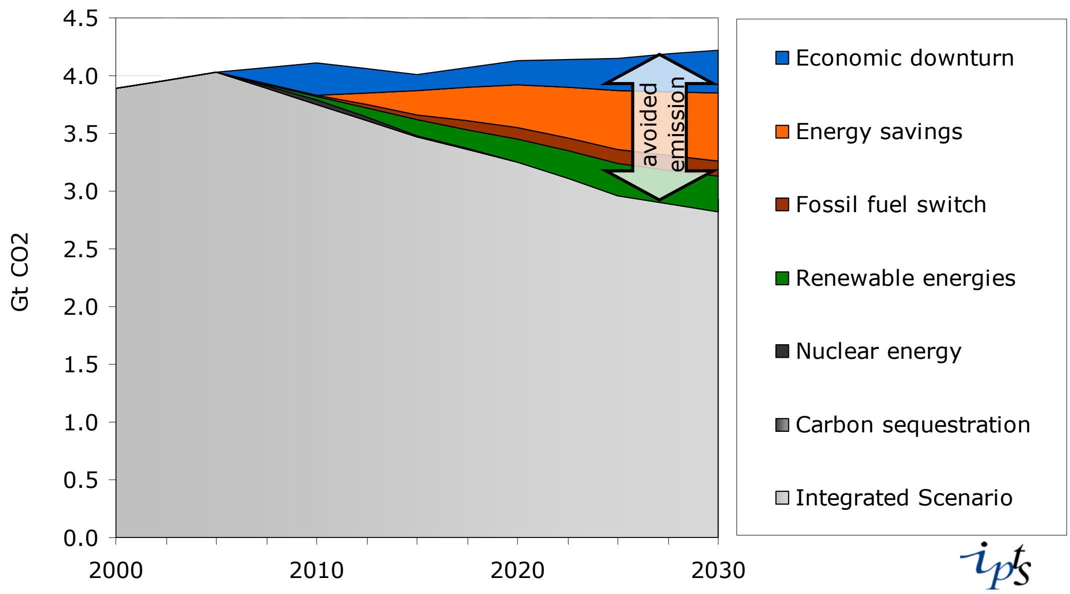
  Similar for the nuclear emissions:

$$\Delta Emissions_{nuclear} = (NUCshare_{int} - NUCshare_{ref}) * GIEC_{int} * CI_{ref}$$

The avoided emissions due to CCS are given as model output. From that, we can derive the CO_2 emissions reductions that are due to changes in the fossil fuel mix by

$$\Delta Emissions_{fossil\ fuels} = \Delta Emissions_{fuel\ mix\ change} - \Delta Emissions_{nuclear} - \Delta Emissions_{renewables} - CCS$$

The results of the breakdown analysis are shown in Figure 5-13.



Source: iTREN-2030

Figure 5-13: Breakdown of the CO_2 emission reduction

The most import factor for the CO_2 emission reduction are the energy savings due to improvements in energy efficiency. Their share in the total CO_2 emission reduction remains stable over the time period and stays above 40%. That energy efficiency has to play the largest role in cutting CO_2 emissions of the EU was also confirmed for long-term studies until 2050 [Schade/Jochem et al. 2009].

The economic downturn has the second largest impact on the CO_2 emission reduction, but the impact varies over time. It already has a high impact in 2010. Due to the recovery, the impact will shrink until 2015. From 2015 onwards, the economic downturn contributes between 24% and 27% of the total CO_2 emission reduction. The remaining 30% of the CO_2 emission reductions stem from changes in the fuel mix (including CCS). The most important components are the renewable energies. Due to their increased use, 200 Mt CO_2 in 2020 and 300 Mt CO_2 in 2030 can be avoided. The impact of the fossil fuel switch is much lower, with 100 Mt CO_2 in 2020 respectively 130 Mt CO_2 in 2030.

Overall, the analysis shows the high impact of the economic downturn which makes it much easier to reach the 20% target of CO_2 emission reduction. Energy efficiency improvements leading to energy savings and renewable energies have a high impact as well. Unlike the economic downturn, the latter are the result of the policy measures implemented in the Integrated Scenario.

6 Vehicle Fleet in the Integrated Scenario

The development of vehicle fleets, their technological composition and energy efficiency play an important role in view of the envisaged reduction of transport-related GHG emissions in the EU27. This section presents firstly an overview of the implemented policy measures in the iTREN-2030 Integrated Scenario that are supposed to impact the vehicle fleet composition in a direct or indirect way. In the following, the resulting road vehicle fleet trends for passenger cars, buses and coaches, as well as light and heavy duty vehicles are shown.

Main data sources underpinning the assumptions for the fleet are the TREMOVE and ASTRA models. Bus and heavy duty vehicle fleet results are taken from the TREMOVE model, light duty vehicle trends from the ASTRA model. For passenger cars, results for diesel and gasoline cars are taken from TREMOVE, while ASTRA is the source for alternative fuel car developments. Thus the resulting fleet is a hybridisation of results from TREMOVE and ASTRA.

6.1 Policies measures and trends

Vehicle fleets are currently in a transition process regarding their engine technology concept. The internal combustion engine burning fossil fuels is still the dominant propulsion and fuel technology, but alternatives like CNG, bioethanol or electric batteries have already entered the market. These changes are likely to continue within the time horizon of the present assessment, driven by growing scarcity of fossil fuels, challenges to avoid a dramatic change of the world climate system and increasing competitiveness of new technologies. Taking this into account, the iTREN-2030 Integrated (INT) Scenario is backed up by the following specific trends:

- Fuel efficiency potentials of internal combustion engines in conventional passenger cars are still high, but by comparison, the potentials for gasoline are higher than for diesel engines.
- Internal combustion engines in heavy duty vehicles (HDV) cannot be replaced by alternative technologies until 2030.
- Battery electric cars increase their competitiveness in short and medium distance car transport due to technological improvements in battery technology.
- Manufacturers of light duty vehicles offer battery electric technology for deliveries in urban areas. The further introduction of environmental zones in cities increases the need to use low or zero emission light duty vehicles.

- The market share of CNG cars grows as a result of improving filling station infrastructure and fuel price differences.
- Hydrogen fuel cell cars enter the market in the years prior to 2030, but their market share remains limited until 2030.

The following policy measures are implemented in the iTREN-2030 Integrated Scenario:

- All new passenger cars are labelled according to their energy efficiency, beginning in 2009. The labels are similar to those used in household appliances and increase the energy efficiency, respectively reduce CO_2 emissions on average by -3.5% by 2030.
- A trading scheme (ETS) is introduced in 2010. The CO_2 certificate prices are computed in the POLES model and added to the fuel prices in ASTRA and TREMOVE. Due to increased energy efficiency, the CO_2 certificate price is quite moderate until 2030.
- A binding CO_2 emission regulation is implemented, limiting CO_2 emissions of new registered passenger cars and light duty vehicles (LDV). For passenger cars, the limits are 130 g CO_2 per km as an average for new cars until 2015 and 95 g CO_2 per km until 2020. Technical measures are applied to the new conventional car (gasoline and diesel) assuming that extra strong downsizing without learning will occur [Sharpe and Smokers 2009]. The limits for LDVs are 175 g CO_2 per km until 2016 and 135 g CO_2 per km until 2020. As a result, average prices for passenger cars are assumed to increase, depending on the car and engine size.
- Apart from the technical measures, a series of supplementary measures such as low rolling resistance tires (LRRT), tire pressure monitoring systems (TPMS), low viscosity lubricants (LVL), fuel-efficient air conditioning equipment (MAC) will be implemented for passenger cars. Ex-tax retail prices (for TPMS), extra yearly maintenance costs (for LRRT and LVL) and fuel-efficiency improvements for these technologies have been taken from the Task A study [TNO, IEEP and LAT 2006].
- There will be a breakthrough in hydrogen fuel cell technology due to policy support for R&D, field tests and subsidies at market entry. Additionally, the filling station network will be expanded.
- Incentives will lead to an increased number of filling stations providing CNG.

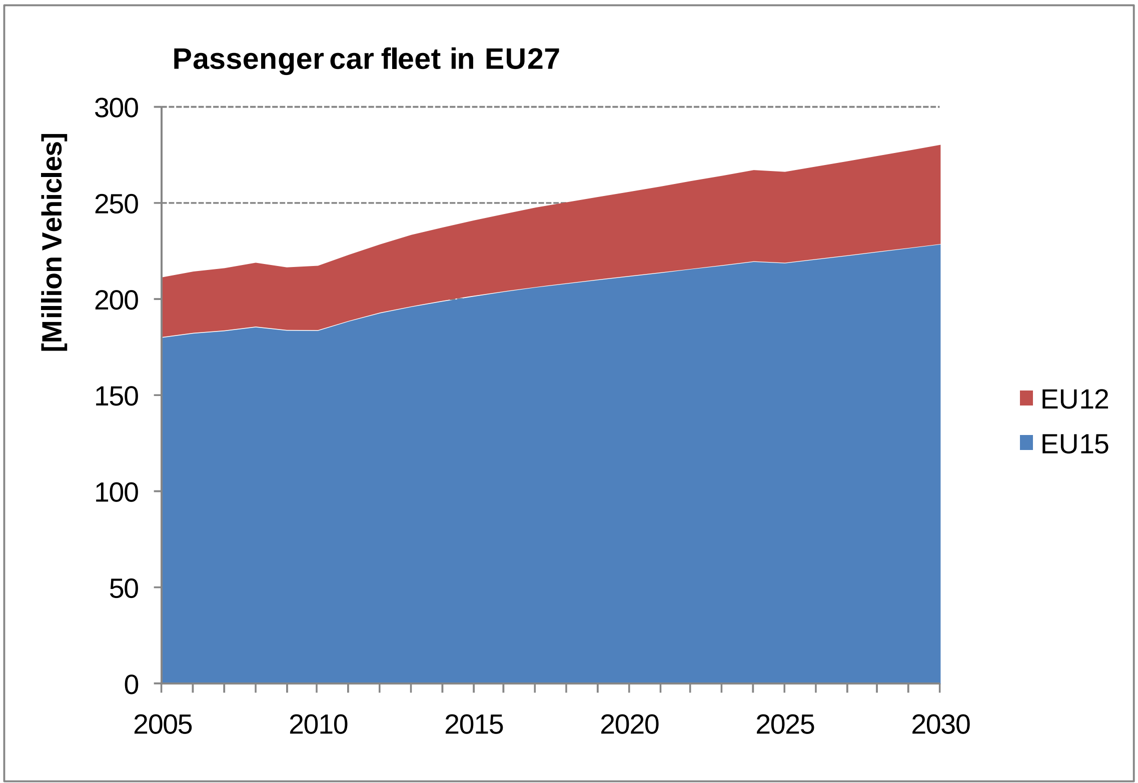
In addition to these policies and trends, the iTREN-2030 INT Scenario simulates the impacts of the financial crisis. The development of vehicle fleets, especially goods vehicle fleets, have been influenced significantly by the crisis. As the iTREN-2030 Reference (REF) Scenario does not consider the impacts of the financial crisis, the following description of the results focuses more on absolute developments than on the direct comparison with the REF Scenario.

6.2 Scenario results

6.2.1 Passenger cars

The car fleet model in ASTRA and TREMOVE consists of a stock model, a purchase model and a choice model for the selection of newly purchased cars. The car fleet model constitutes one of the most policy-sensitive model elements as it reacts to policies that support new technologies (e.g. subsidies), to taxation policies (i.e. on car and on fuels) and to fuel price changes, including changes of CO_2 certificates and energy tax changes. Other socio-economic drivers also affect the development of the car fleet, especially income, population and the existing level of car ownership. The choice of new car depends on fuel prices (incl. taxes), car prices, taxation of car technologies, efficiency of cars, filling station network.

Figure 6-1 presents the development of passenger car stocks in the EU15 and EU12 until 2030. The number of passenger cars in the EU27 increases by +32.8% (+1.1% annually) compared with the base year 2005 and reaches a level of 280 million cars in 2030. In the EU15 the passenger car fleet grows by +26.3% (+0.9% annually), significantly lower than for the EU12, where the fleet grows by +71.5% (+2.2% annually) until 2030. Hence, the motorisation rates in the EU12 are catching up and will be at 539 cars per thousand inhabitants at a similar level to the EU15 (574 cars per thousand inhabitants). In comparison with the REF Scenario, the passenger car stocks in the EU27 will be -4.7% (13 million cars) lower. As the decline of the fleet in the year 2010 indicates, the difference is mainly influenced by the economic crisis in the year 2009. The increasing energy efficiency of the total passenger car fleet compared with the REF Scenario even leads to a rebound effect in the INT Scenario, as average operation costs of passenger cars are decreasing compared with the REF case.



Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-1: Passenger car fleet in the EU15 and EU12

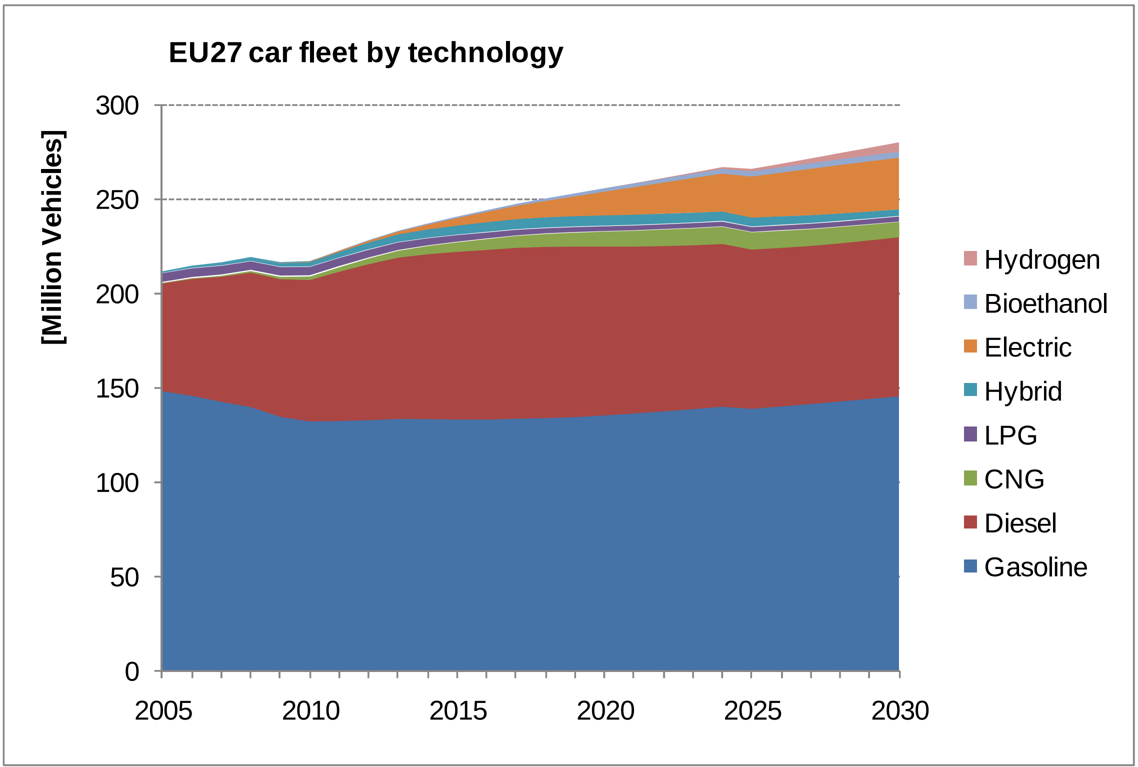
Passenger cars in the TREMOVE model (gasoline and diesel) and in the ASTRA model (alternative fuel cars) are divided into the following car categories according to engine technology and engine size:

- Gasoline cars: three types differentiated by cubic capacity (<1.4l, 1.4-2.0l, >2.0l),
- Diesel cars: two types differentiated by cubic capacity (<2.0l, >2.0l),
- Compressed natural gas (CNG) cars,
- Liquefied petroleum gas (LPG) cars,
- Bioethanol cars, i.e. cars that can run on 85% bioethanol (incl. flex fuel),
- Hybrid cars, meaning advanced hybrid cars depending on timing, i.e. plug-in hybrids with the ability to run for a significant distance on electricity,
- Battery electric cars, i.e. smaller cars running in battery-only mode,
- Hydrogen fuel cell vehicles (the hydrogen internal combustion engine is not considered a reasonable option).

Figure 6-2 illustrates the development of passenger cars in the EU27 by their engine technologies. Conventional (diesel and gasoline) technologies still dominate the picture, with a share of 82% on total vehicles in 2030. Overall, about 230 million diesel and gasoline cars will be in the EU27 market.

The trend of the past years towards increasing diesel car sales will continue only for a few more years. About 37% of the total car fleet in the EU27 will be diesel-fuelled in 2015. In the following years, higher fuel efficiency potentials of gasoline engine technology in combination with diesel prices catching up lead to growing competitiveness of gasoline compared with diesel cars. The models estimate about 145 million registered gasoline cars and 85 million diesel cars in the EU27 in 2030. Overall, the number of diesel cars increases by 0.6% annually, compared with 0.5% for gasoline cars.

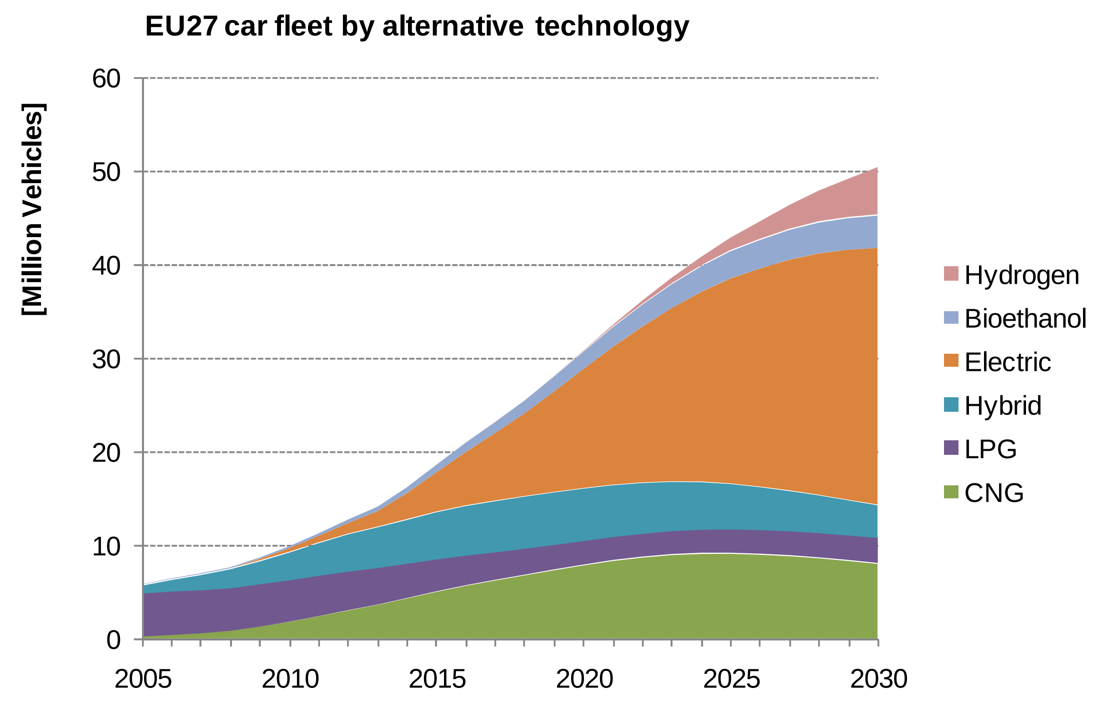
The development of gasoline and diesel car fleets in the EU27 reflects the fuel price trends generated in the POLES model. In the decade until 2020, POLES even estimates decreasing gasoline and diesel fuel prices such that the attractiveness of alternative car technologies are moderate in this decade, even if technologies are already advanced and available. As a result, the conventional car fleet will increase until 2020 and stagnate in the following decade.



Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-2: Passenger car fleet by technology in the EU27

The policies and trends assumed in the INT Scenario lead to an increase of the share of alternatively fuelled cars from 3.4% up to 18% in 2030 (see Table 6-1). ASTRA estimates about 50 million alternatively fuelled cars (see Figure 6-3). LPG technology is being increasingly substituted by CNG which reaches a maximum share of about 10 million cars in the year 2023. The breakthrough in battery technology (lithium-ion batteries) leads to a decline of battery prices and increases performance, so that battery electric cars will diffuse into car fleets in the EU27 strongly than any other alternative car technology. ASTRA simulates a share of battery electric cars in the INT Scenario of about 10% or about 27 million cars in the EU27 by 2030. Bioethanol-driven cars remain a niche product over the whole period, as the POLES model simulates a stronger price increase for bioethanol than for other alternative fuels which is due to the price rise in agricultural commodities.

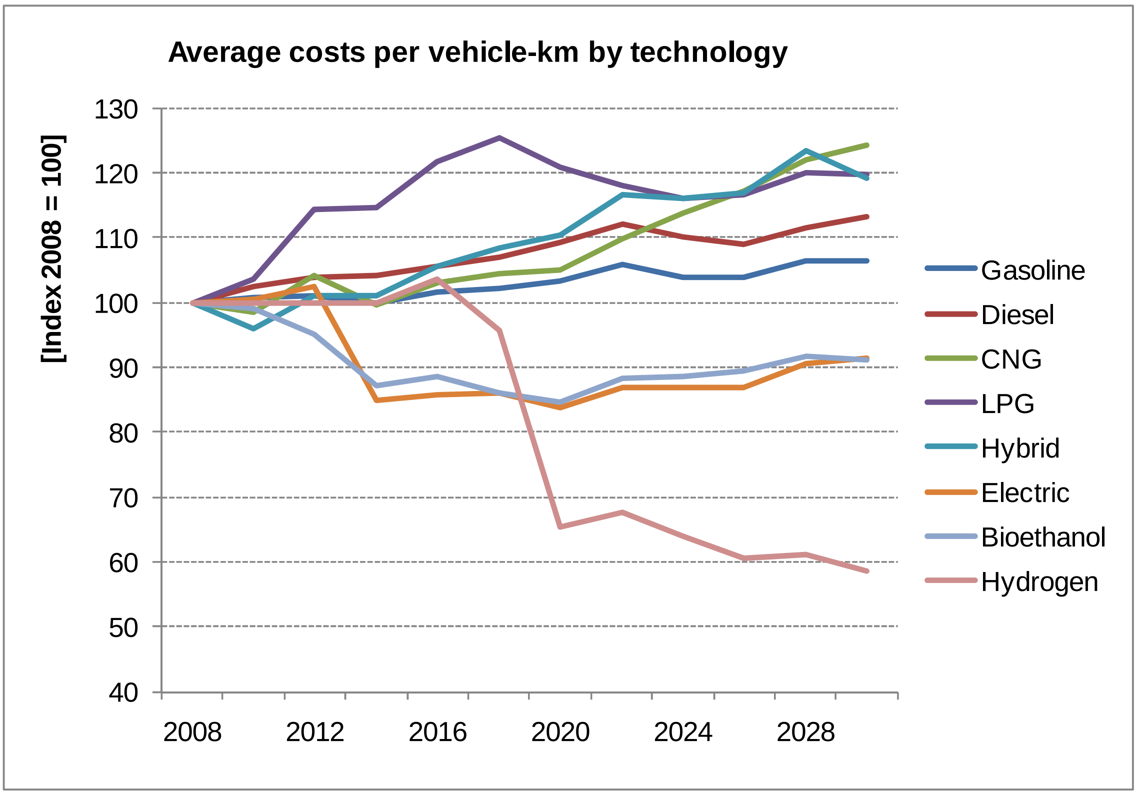


Source: iTREN-2030 – ASTRA

Figure 6-3: Passenger car fleet by alternative technology in the EU27

Hybrid cars today like the Toyota Prius or advanced plug-in hybrid cars in future generations are characterised by a strong growth until 2015. The efforts of car manufacturers to reduce the CO_2 emissions of their fleets according to the binding regulation until 2020 are reflected in this estimation, as the reduction is achieved by adding hybrid technology to conventional cars, in particular to large size cars. Growing efficiency of conventional gasoline, diesel and other alternative fuel cars lead to a stagnation of hybrid cars in the EU27 after 2015. Finally, hydrogen fuel cell cars will enter the EU27 market already in the years prior to 2030. ASTRA estimates about 5 million fuel cell cars until 2030. This trend is enabled by policy support for research and development of fuel cell technology, field tests, building up filling station infrastructures and subsidies for reaching a significant share in the market.

The depicted diffusion of alternative fuel technologies is a result of technological improvements in fuel efficiency, fuel price trends, tank technology and the development of filling station infrastructure. Figure 6-4 illustrates the development of average costs per vehicle-km by technology. The extracted costs represent fuel, maintenance, taxation and investment costs per vehicle-km for each considered technology. In order to translate total costs like investment costs in costs per vehicle-km, the average yearly mileages and lifetimes are taken. The moderate diffusion probabilities of alternative fuel cars in the INT scenario are a result of the optimistic cost development for gasoline and diesel cars. Average costs per vehicle-km in absolute terms range between 19 euro cent for electric cars and 37 euro cent for LPG cars in 2030. Hence, electric cars especially are the cheapest technology for short and medium distances.



Source: iTREN-2030 – ASTRA

Figure 6-4: Average costs per vehicle-km by technology in the EU27

Table 6-1 presents the differences in the technological composition of passenger car fleets between the EU15 and EU12. When considering the conventional technologies, EU12 countries have a significantly lower share of diesel cars compared with EU15 countries. The estimated developments are similar, with a growing share of alternative fuel cars in the INT Scenario. The share of alternative fuel cars in the EU15 reaches 17% in 2030, while in the EU12 the share is even higher at about 21%. A closer look at the results reveals that the shares of CNG and LPG cars in the EU12 are significantly higher. For LPG, this picture is shaped by the historical fleet composition where at least in some countries like Poland, LPG cars already constituted a significant share of the total passenger car fleet. On the other hand, EU12 countries are characterised by a slower diffusion of hydrogen fuel cell cars caused by high costs of subsidising filling station infrastructure and market entry.

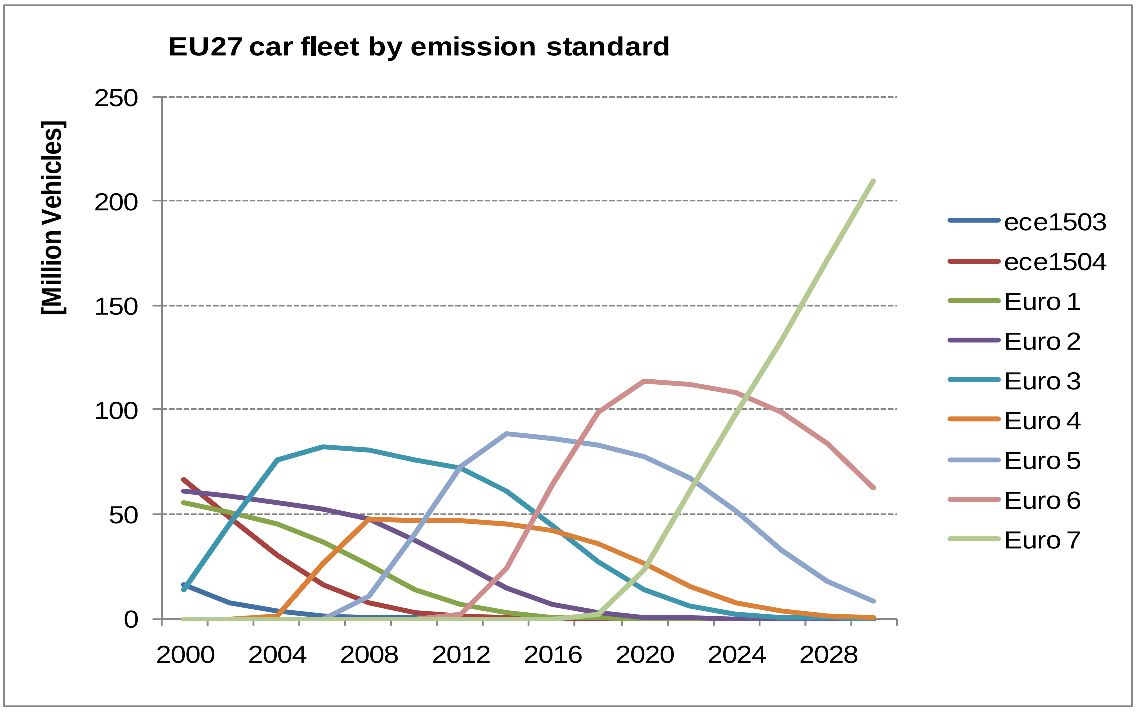
Table 6-1: Share of technologies in EU passenger car fleets

	EU27			EU15			EU12		
Technology	**2010**	**2020**	**2030**	**2010**	**2020**	**2030**	**2010**	**2020**	**2030**
Gasoline	60.7%	52.8%	51.8%	58.4%	49.6%	48.8%	72.8%	67.8%	64.4%
Diesel	34.8%	35.2%	30.2%	37.8%	39.1%	33.8%	18.9%	17.0%	14.9%
CNG	0.8%	3.1%	2.9%	0.9%	2.9%	2.5%	0.5%	3.8%	4.7%
LPG	2.1%	1.0%	1.0%	1.2%	0.5%	0.6%	6.6%	3.3%	2.6%
Hybrid	1.4%	2.2%	1.2%	1.4%	2.3%	1.3%	0.9%	1.6%	0.8%
Electric	0.2%	5.0%	9.8%	0.1%	4.8%	9.6%	0.3%	5.8%	10.6%
Bioethanol	0.1%	0.7%	1.2%	0.1%	0.7%	1.2%	0.0%	0.6%	1.5%
Hydrogen	0.0%	0.0%	1.8%	0.0%	0.0%	2.1%	0.0%	0.0%	0.4%

Source: iTREN-2030 –ASTRA/TREMOVE

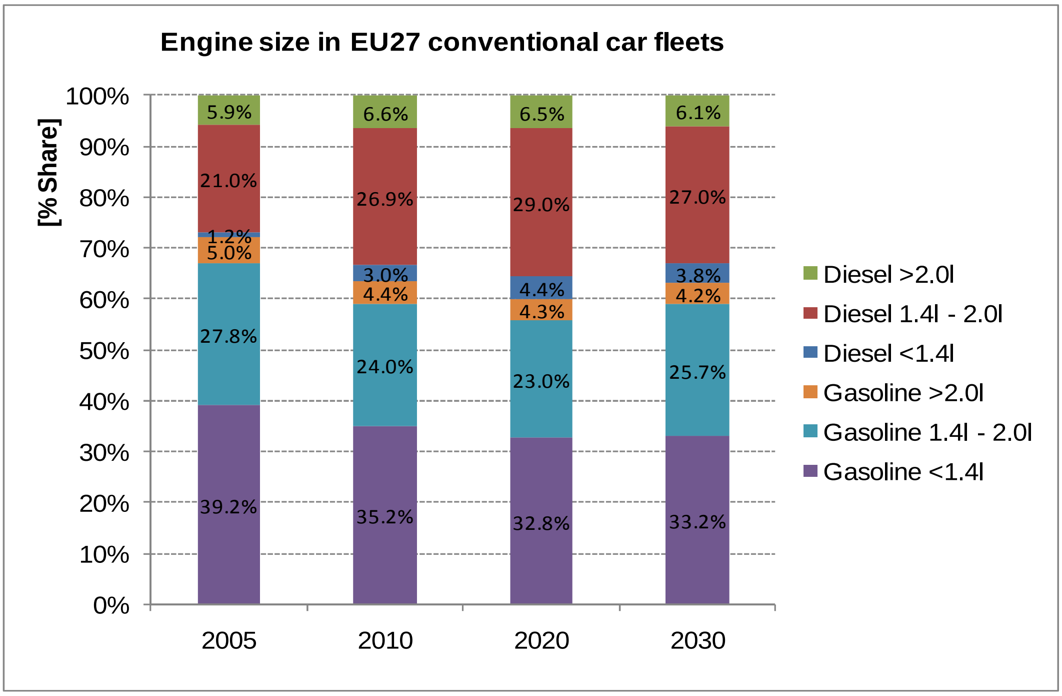
Both models TREMOVE as well as ASTRA allocate passenger cars to emission standards. The time when a new car is purchased determines which emission standard it belongs to and which emission factors have to be applied to model its emissions. The models distinguish at maximum between nine emission standards (2 pre-euro standards, Euro-1 to Euro-7 standard). For example, if a car is purchased in 2005, it is assumed that it complies at least with the Euro-3 standard. Euro-7 can be considered as a fictitious standard that incorporates further improvements in efficiency. Figure 6-5 shows the diffusion of emission standards into car fleets in the EU27.

Car fleets with conventional technology are further differentiated in TREMOVE and ASTRA by engine size in terms of cubic capacity. Figure 6-6 illustrates this development in terms of percentage shares in the EU27 until 2030 extracted from TREMOVE. With regard to the development of fuel prices and fuel efficiency, the stagnating share of conventional cars provides an optimistic view of the future fleet composition. According to trends observed in the last years, the growth of small-engined diesel cars is also rather pessimistic. Overall, the simulated down-sizing of conventional cars is probably underestimated by the models.



Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-5: Passenger car fleet by emission standard in the EU27

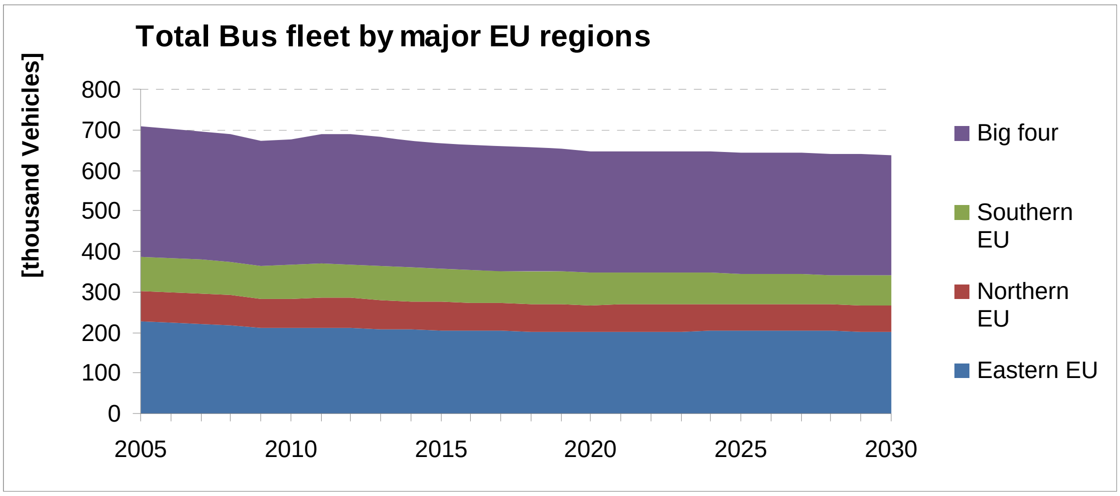


Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-6: Conventional passenger car fleet by engine size in the EU27

6.2.2 Buses

Nowadays, there are around 707 thousand buses in the EU27. More than 45% of these fleets are found in France, Germany, the UK and Italy (the "Big Four") while more than 31% are found in the Eastern European countries. The share of buses in the four major regions as shown in Figure 6-7 remains relatively constant during the next 25 years. Meanwhile, in the Integrated Scenario, the total number of buses in the EU27 can be expected to decrease by around -9.8% between 2005 and 2030 (around -0.4% per year). The economic crisis introduced in the Integrated Scenario influences the development of the total number of buses: from 2008 to 2009 the total numbers of bus fleets decreases abruptly; -5% less than in 2005 and it rebounds back in 2011-2012; only -2.6% less than in 2005. Subsequently, the total number of buses decreases steadily.

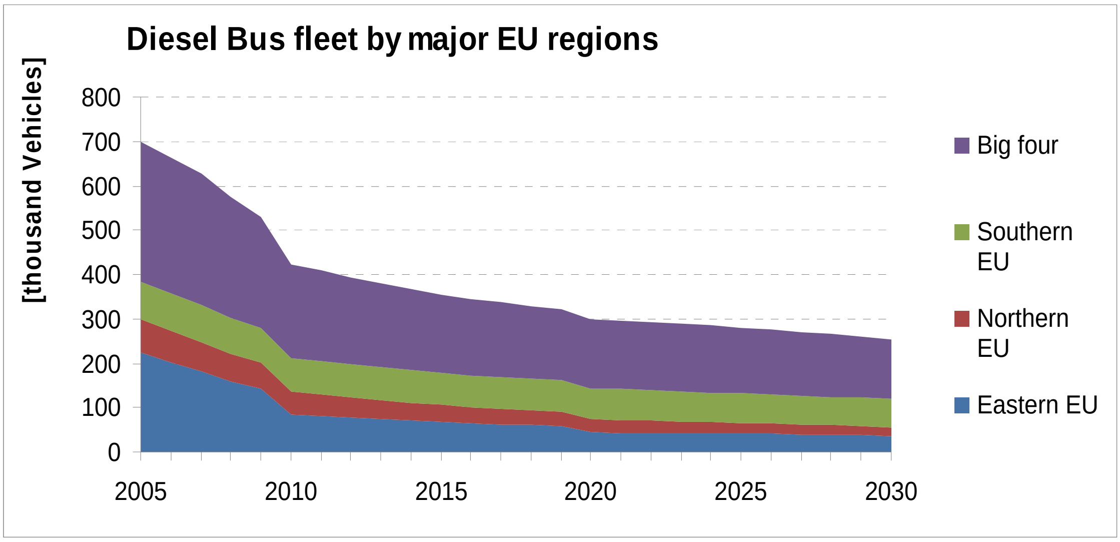


Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-7: Total bus fleet by major European regions

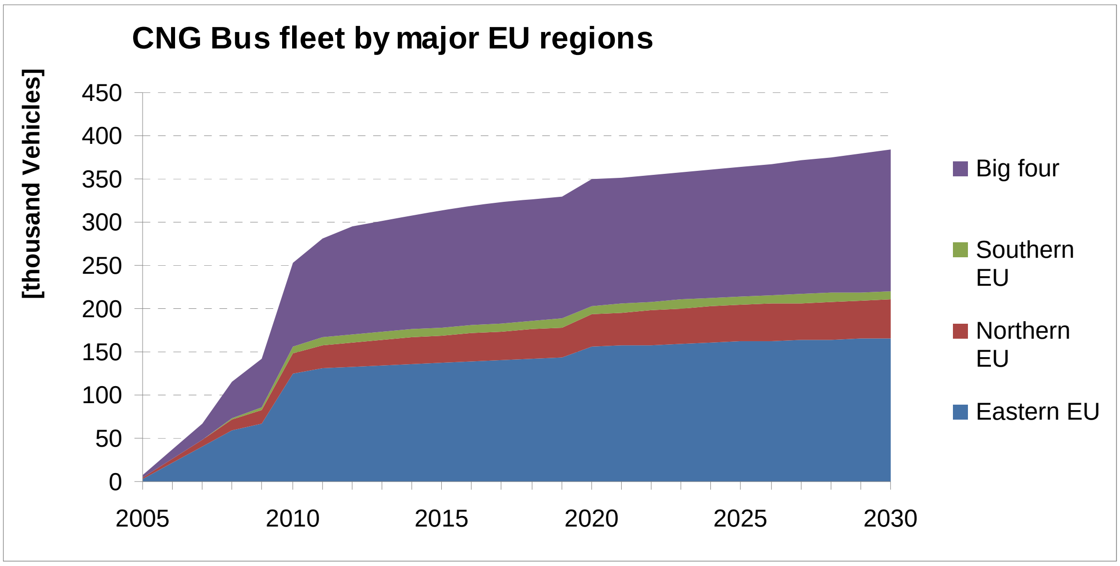
Bus fleets in TREMOVE are composed of diesel and CNG buses. Most of the decrease in the number of buses is due to a strong reduction of the diesel buses. More than 98% of the bus fleets today are composed of diesel buses, while this percentage will be merely 40% in 2030. In other words, around 2.5% of the diesel buses are taken out of the market each year. Inversely, the number of CNG buses can be expected to increase by almost 50 times from now to 2030.

Taking into account the very competitive character of the bus industry, the lifetime driving costs per vehicle-km are used as the only technology variable entering the binomial logit choice model between the diesel and CNG buses in TREMOVE. The development of these costs in the next 25 years is then the main factor influencing the share of these two types of buses as shown in the Figure 6-8 to Figure 6-10.



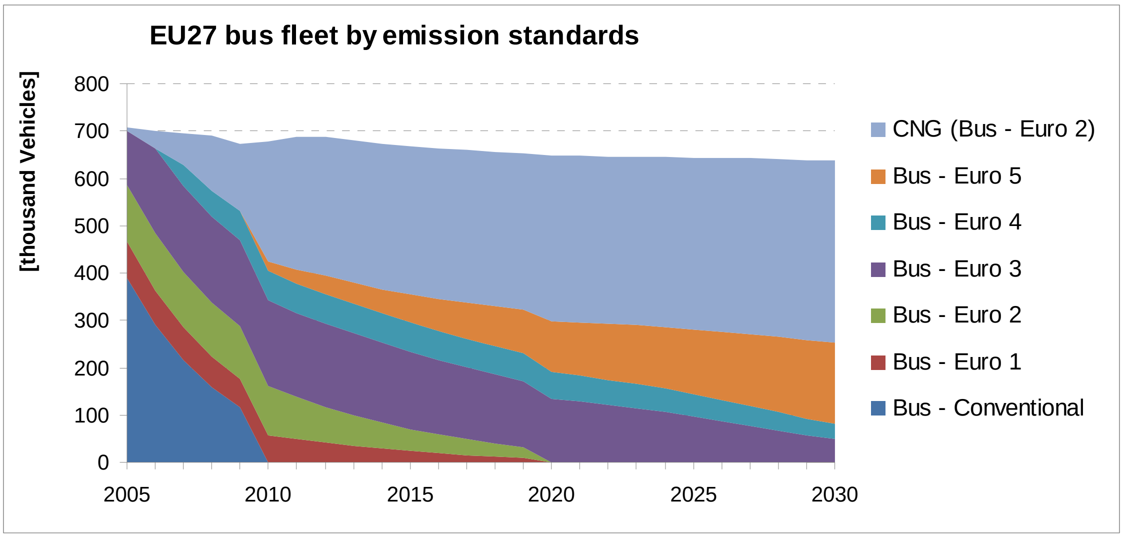
Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-8: Diesel bus fleet by major European regions



Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-9: CNG bus fleet by major European regions

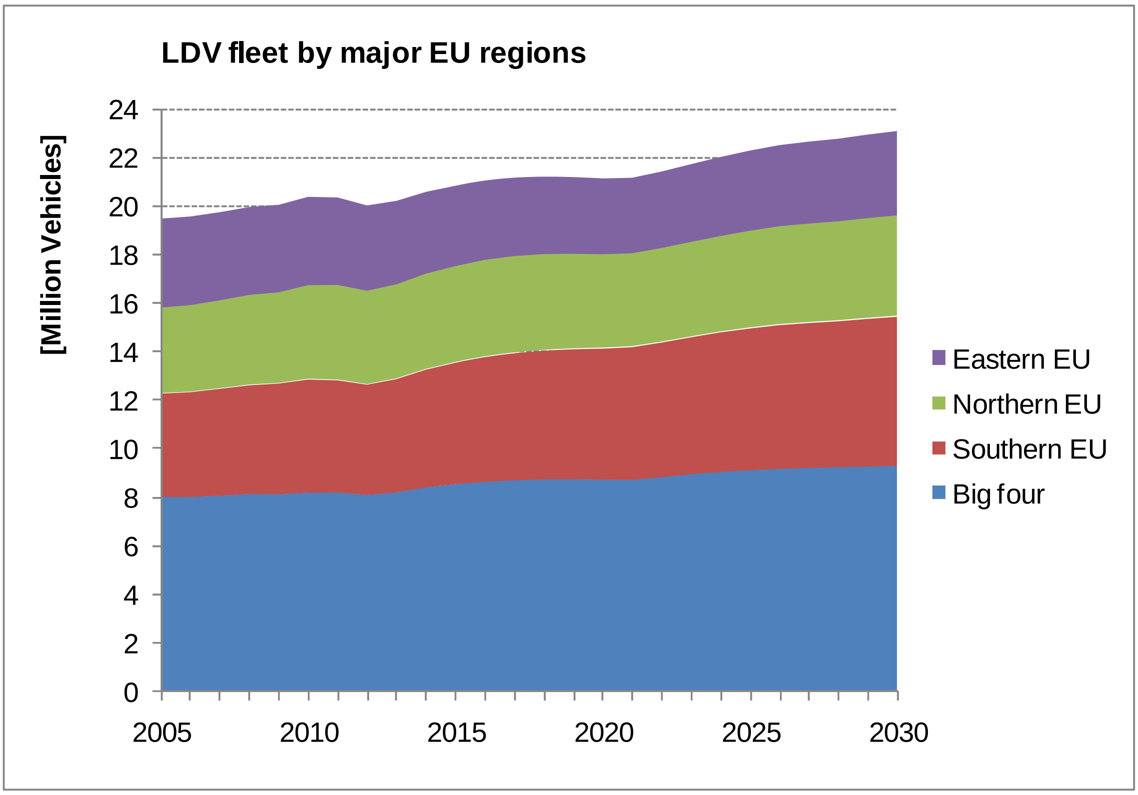


Source: iTREN-2030 – ASTRA/TREMOVE

Figure 6-10: Bus fleet by emission standard

6.2.3 Light duty vehicles

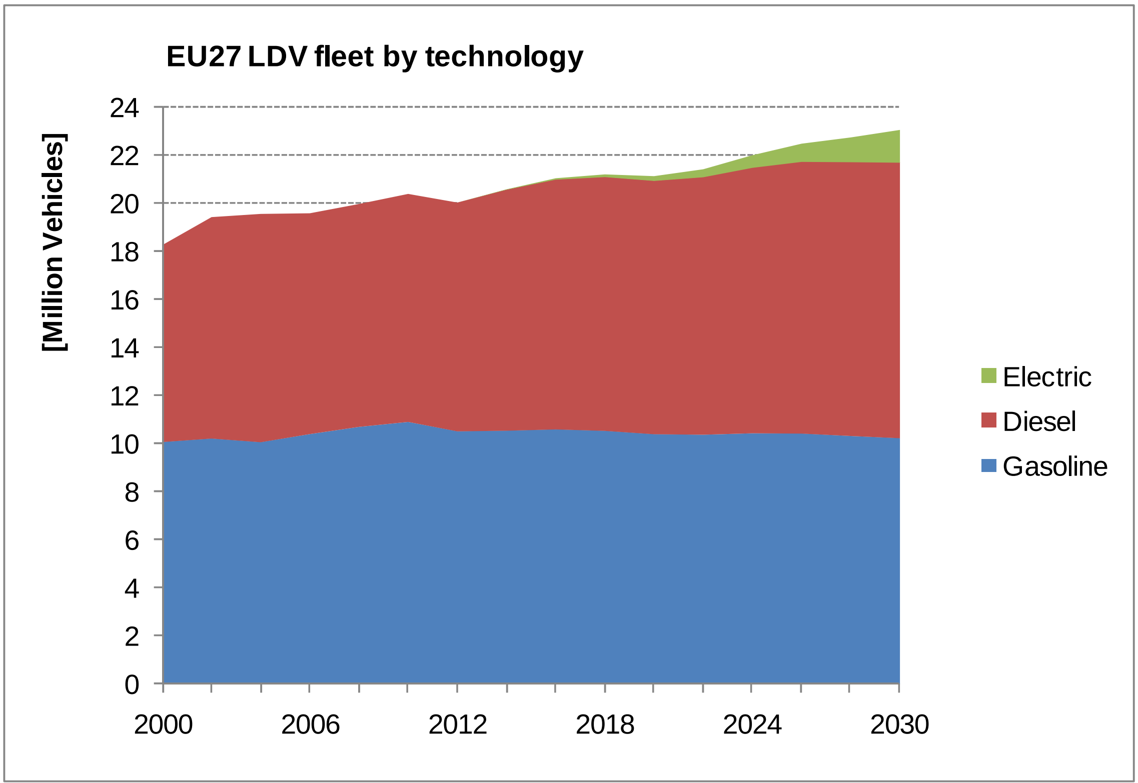
The light duty vehicle (LDV) category in ASTRA and TREMOVE includes all goods vehicles with less than 3.5 tons curb weight plus payload. Similar to the passenger car fleets, LDVs are allocated to emission standards depending on the initial vehicle registration date. Additionally, ASTRA differentiates between gasoline, diesel and electric engines in LDVs. Currently, all three technologies are available at different prices. The development of LDV new registrations is driven by adding fractions of local, regional and medium distance freight transport performance in terms of vehicle-km. This indicator already takes improvements in logistics leading to higher load factors and higher yearly mileage of LDVs into consideration.



Source: iTREN-2030 –ASTRA

Figure 6-11: Light duty vehicle fleet by major EU regions

Figure 6-11 shows the light duty vehicle results taken from the ASTRA model. The total LDV fleet in the EU27 will increase by +18% (0.6% annually) from 2005 to 2030. As for heavy duty vehicles (HDV), the economic crisis impacts the development significantly in the years after 2009. Decreasing freight transport performance leads to a slight decline of LDVs in the EU27. The second obvious point in which the curve stagnates reflects the introduction of interurban road charges on all interurban roads. Freight transport reacts directly to this policy and this results in a stagnation of demand for new LDVs. The impacts of the financial crisis and the introduction or adaptation of truck road charges are visible in all European regions. The strongest reaction can be observed in Eastern Europe where LDV fleets decrease by – 5% until 2030, compared with the base year. The “Big Four” countries - Germany, France, Great Britain, Italy – and the northern European countries are characterised by an increase of +16% until 2030, while LDV fleets in the southern European countries even grow by +44%.

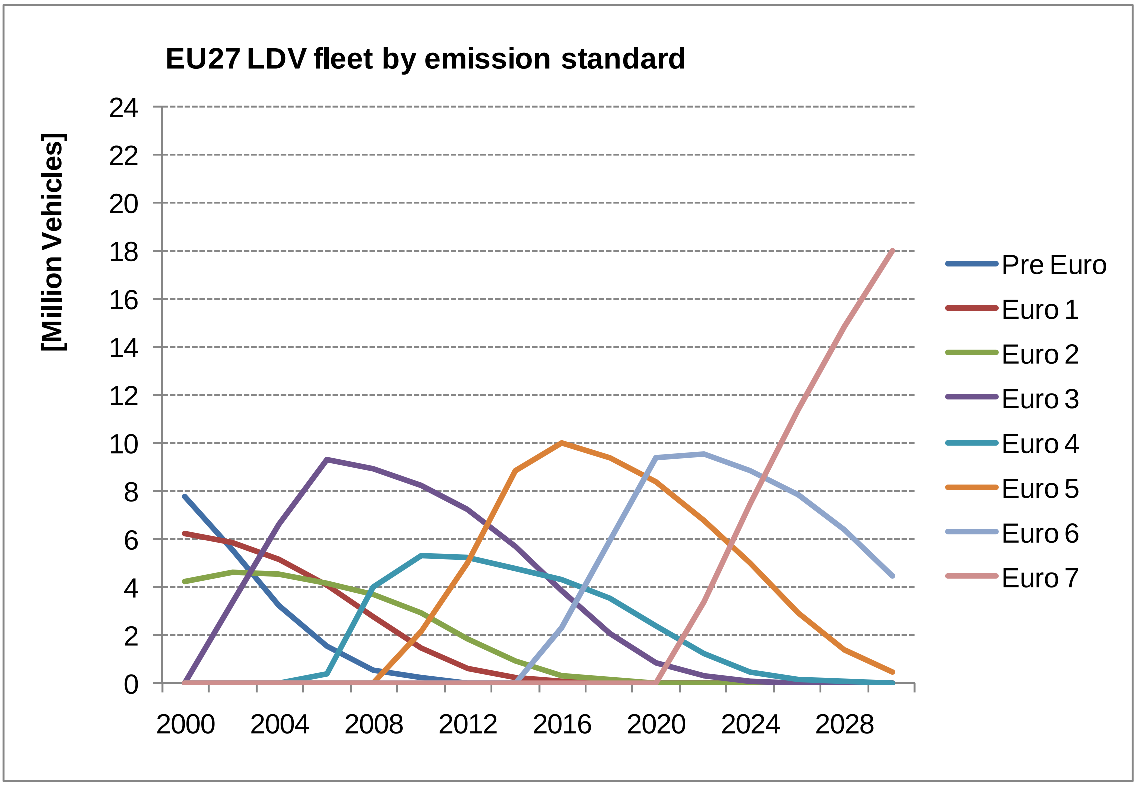


Source: iTREN-2030 –ASTRA/TREMOVE

Figure 6-12: Light duty vehicle fleet by technology in the EU27

The technological composition and structure of EU27 LDV fleets changes as well until 2030. The share of gasoline technology decreases while diesel gains. The break-through in battery technology also influences the LDV market, so that a certain number of electric LDVs are offered to the customers. In combination with the stronger rise of diesel and gasoline prices and the extension of environmental zones in cities, the number of electric LDVs in the EU27 reaches a level of 1.3 million vehicles in 2030. Especially in last-mile delivery, electric LDVs are competitive or until 2030 are the cheaper solution, compared with conventional diesel or gasoline LDVs. Nevertheless, the market share of 6% is still moderate.

Figure 6-13 illustrates the life-cycles of emission standards in LDV fleets in the EU27. Similar to other vehicle fleets, the LDV fleets are assigned to emission categories pre-Euro to Euro-7 according to the time of first registration.

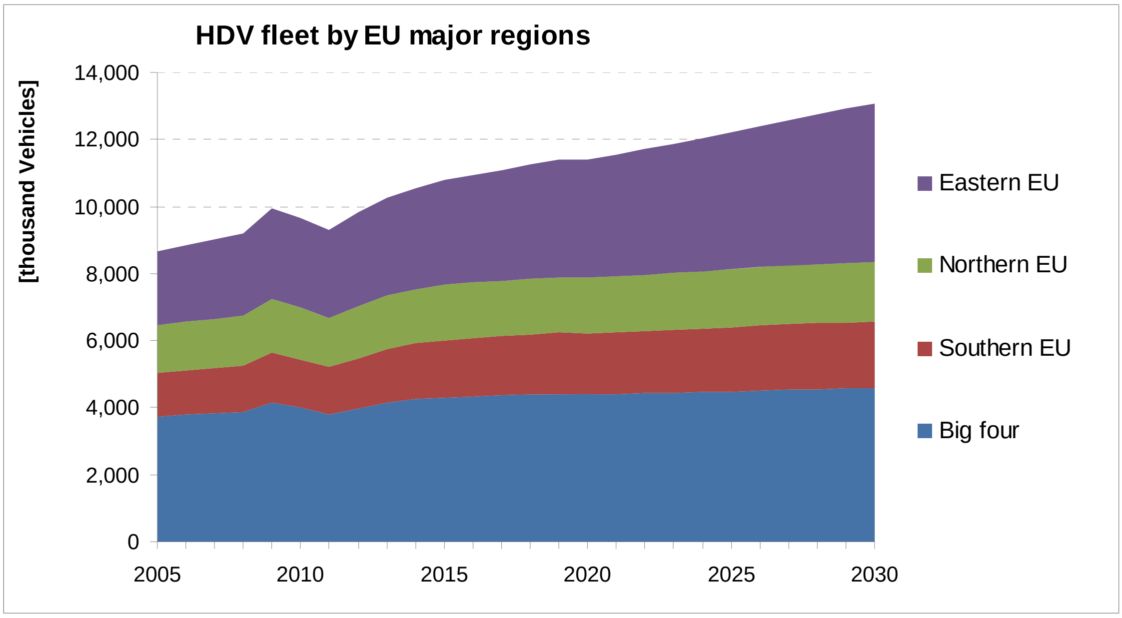


Source: iTREN-2030 –ASTRA

Figure 6-13: Light duty vehicle fleet by emission standard in the EU27

6.2.4 Heavy duty vehicles

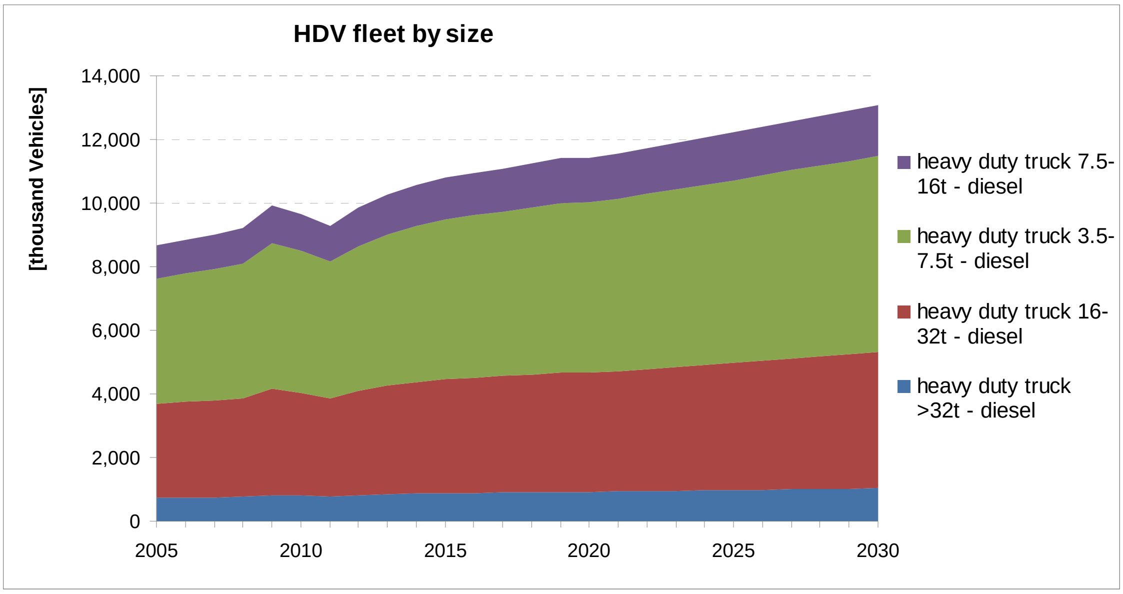
Nowadays, there are around 8.6 million of heavy duty vehicles (trucks) in the EU27. The number of trucks can be expected to increase by around 50% from 2005, to reach 13 million trucks in 2050 in the Integrated Scenario. This increase follows the 40% growth in freight road demand during the same period. The fastest increase in the number of HDV fleets can be expected to happen in the eastern European countries, from 2.2 million in 2005 to 4.7 million in 2030, an average annual growth rate of 4.6%. The increase of the total numbers of HDV fleets is interrupted by the economic crisis, as shown by a sudden decrease in the 2011 figures. The share of those countries in HDV fleets is 25% in 2005 and 36% in 2030. Inversely, the share of the "Big Four" (France, Germany, the UK, and Italy) in term of HDV fleet will decrease from 43% in 2005 to 35% in 2030 (Figure 6-14).



Source: iTREN-2030 –TREMOVE

Figure 6-14: Heavy duty vehicle fleet by major EU regions

In terms of size, more than 45% of the HDV in the EU27 are small HDV of 3.5 - 7.5 tonnes. This share remains relatively constant from 2005 to 2030 as shown in Figure 6-15 and Table 6-2.



Source: iTREN-2030 –TREMOVE

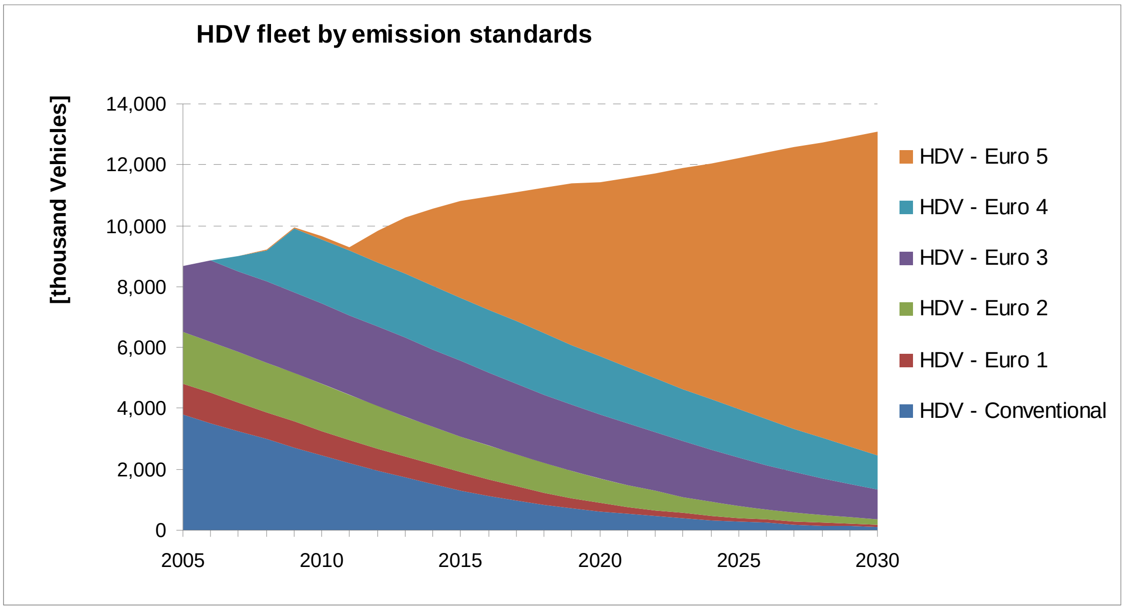
Figure 6-15: Heavy duty vehicle fleet by size

Table 6-2: Share of HDV by size

	2005	2010	2015	2020	2025	2030
Heavy duty truck >32t - diesel	8.47%	8.31%	8.22%	8.10%	8.04%	7.97%
Heavy duty truck 16-32t - diesel	34.10%	33.54%	33.10%	32.75%	32.73%	32.72%
Heavy duty truck 7.5-16t - diesel	11.95%	12.07%	12.20%	12.27%	12.28%	12.29%
Heavy duty truck 3.5-7.5t - diesel	45.47%	46.08%	46.48%	46.88%	46.95%	47.03%

Source: iTREN-2030 –TREMOVE

Five emissions standards are included in the TREMOVE model: pre-euro trucks or "conventional", Euro 1 (1992), Euro 2 (1998), Euro 3 (2000), Euro 4 (2005), and Euro 5 (2008). The dates given in the brackets are the dates of the new type approval which in most cases are one year later than the implementation date.



Source: iTREN-2030 –TREMOVE

Figure 6-16: Heavy duty vehicle fleet by emission standard in the EU27

In 2008, heavy duty vehicle fleets are mostly composed of conventional trucks (around 32%) followed by Euro 3 trucks (29%). Euro 3 trucks can be expected to form the biggest part of the truck fleet between 2010 and 2014. From 2015 onward, Euro 5 trucks will become the majority of the truck fleet. In 2030, this emission standard will form more than 75% of the truck fleet. Less than 3% of the fleet in that year will be formed by the remaining conventional, Euro 1 and Euro 2 trucks.

Table 6-3: Share of HDV by emission standard

	2005	2010	2015	2020	2025	2030
HDV - Conventional	43.9%	25.5%	12.2%	5.4%	2.4%	1.0%
HDV - EURO 1	11.7%	8.4%	5.4%	2.4%	1.0%	0.6%
HDV - EURO 2	19.5%	15.8%	11.0%	7.2%	3.2%	1.7%
HDV - EURO 3	24.9%	27.4%	22.9%	18.3%	13.1%	8.4%
HDV - EURO 4	0.0%	21.8%	19.3%	16.7%	12.9%	9.6%
HDV - EURO 5	0.0%	1.2%	29.3%	50.0%	67.5%	78.8%

Source: iTREN-2030 –TREMOVE

7 Passenger transport in the Integrated Scenario

The mid term review of the White Paper states that the transport industry is an important element of a functioning economy and contributes a significant part of total GDP in the EU27 [EC 2006]. Hence, transport and climate policy measures have to be aligned in such a way that they support both GHG emission reductions and economic growth.

In the Integrated Scenario (INT), passenger transport demand is simulated with the ASTRA model in a classical four-stage modelling approach and with the TREMOVE model. The basis for this transport demand modelling comes from the TRANS-TOOLS model that provided the transport data for the Reference Scenario (REF). In the REF, passenger transport performance in ASTRA was harmonized with the results of the TRANS-TOOLS model [Fiorello et al. 2009]. For the INT scenario, the ASTRA model generated new passenger transport trends by considering three issues:

- the impact of the economic and financial crisis of 2008/2009 including longer-term effects,
- the impact of energy and transport policies taken after 2008, and
- the correction of a few outliers for 2005 transport performance, so that the ASTRA results fit better into the Eurostat statistical pocket book [European Commission 2007a].

The following chapter starts with a brief description of the policy measures assumed in the iTREN-2030 Integrated (INT) Scenario that are expected to impact passenger transport demand in the EU27. The chapter provides an overview of how the ASTRA passenger transport model expects the passenger transport trends to develop until 2030. Finally, results in terms of aggregated passenger transport performance are presented and analyzed in comparison with other studies.

7.1 Policy measures

Several policies and technological measures are implemented in the INT Scenario. Additionally, the financial crisis with all its effects is considered in the INT as opposed to the REF Scenario. Therefore, the sole impacts of the policy measures are difficult to quantify as the crisis influences passenger transport significantly, especially during the years of the crisis. All other policies and measures can be assigned to three topics: road pricing, regulation and technical measures. For the issue road pricing, the following measures are considered in the INT Scenario:

- road charges on all interurban networks for passenger cars are introduced in 2025 (based on truck road charges),

- city tolls are implemented in all EU27 metropolitan areas from 2025 on at 0.357€/vehicle-km during the peak period,
- ETS is assumed to be installed for air transport in 2010 and for road transport in 2020. Certificate price development is estimated in POLES and provided to ASTRA.

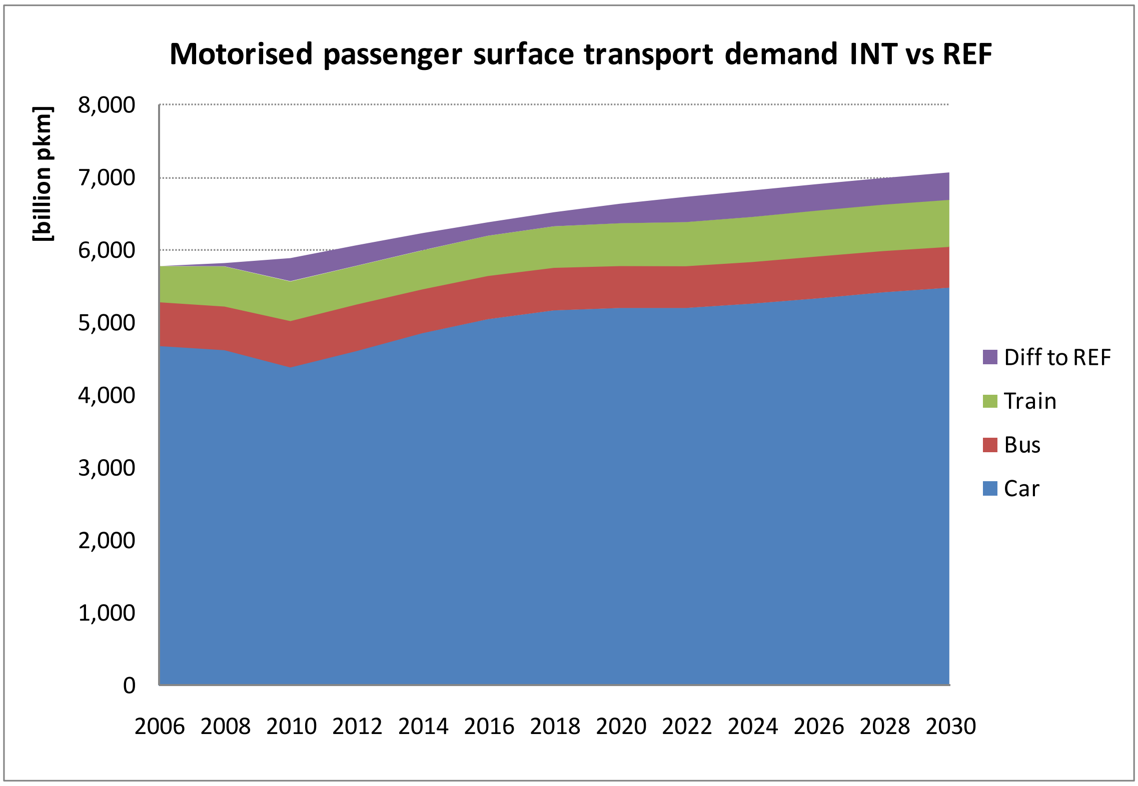
The ASTRA model considers the impact of pricing mechanisms in the passenger transport model in terms of changes of trip distribution and modal split. Besides pricing policies, regulative measures are also considered, like the binding CO_2 emission limits for new passenger cars which limit the average emissions of the new fleet of that year to 130g CO_2 per km in 2015 and 105g CO_2 per km in 2020.

Finally, a series of technical and supplementary measures are considered which aim mainly to improve fuel efficiency. Those measures impact passenger transport in different ways. On the one hand, average costs per vehicle-km for passenger cars are decreasing, even if the additional measures lead to a slight increase of purchase costs. On the other hand, lower costs per vehicle-km impact the trip distribution and modal split so that the competitiveness of the mode car improves. Among these are: low rolling resistance tires (LRRT), tire pressure monitoring systems (TPMS), low viscosity lubricants (LVL) and fuel-efficient air conditioning equipment (MAC).

7.2 Scenario results

The changes in economic framework conditions induced by the financial crisis are reflected in most figures and numbers presented in this chapter on INT passenger transport results. Business and private mobility have changed, at least according to available statistics, for the first quarter of 2009 due to the crisis. In Germany, about 8.3% less passengers left German airports by plane compared with the first quarter on 2008. In France and Italy, passenger vehicle-km in the first quarter decreased by -4.1%, respectively -7.3% (according to statistics of the International Transport Forum).

Figure 7-1 reflects these observations even if air transport is not included, as it covers only originating motorised surface passenger transport demand. Especially car pkm show a sharp fall in 2009 and 2010 by about -6.4% compared to the iTREN-2030 REF Scenario. In total, surface pkm decline by -4.6% which shows that train and bus pkm could benefit due to a modal shift. In the decade after the crisis, car transport performance recovers, but does not catch up completely. Improvements in fuel efficiency and the diffusion of alternative car technologies (especially electric vehicles) lead to a decline of average costs per vehicle-km so that the cars are becoming more competitive. Starting in 2020, the different pricing mechanisms put a strain on passenger car transport, so that until 2030 car pkm are decreasing by about -7.1% compared with REF. Total surface pkm are expected to be -5.4% lower in the INT than in the REF Scenario in 2030. Factoring out the impacts of the crisis, the measures assumed in the INT Scenario do not significantly change the passenger transport performance (excluding air transport) in terms of originating pkm.

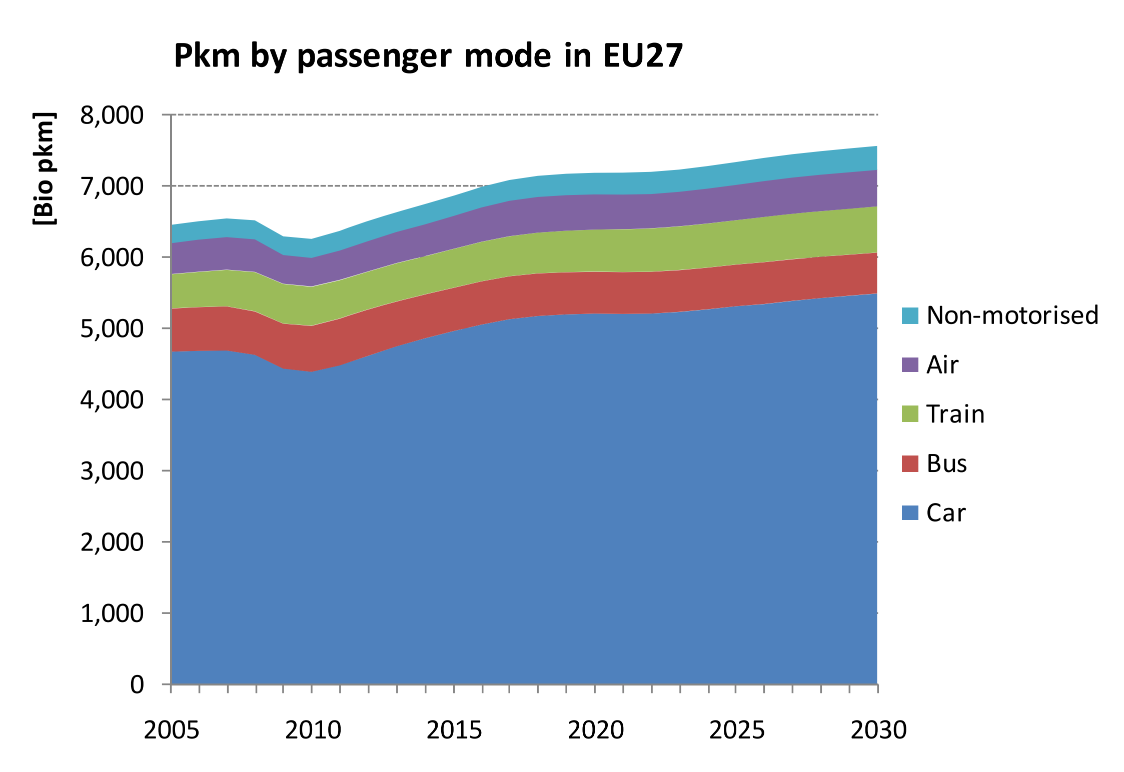


Source: iTREN-2030 – ASTRA

Figure 7-1: Changes of motorised passenger surface transport demand in INT

Figure 7-2 and Table 7-1 present the development of passenger transport demand per mode in terms of pkm in the INT Scenario in the EU27. All numbers represent originating pkm. Air transport pkm covers originating pkm of intra-EU flights. ASTRA assesses an increase of total passenger transport demand of 17.3%, which is nearly the same growth as for car pkm in the period 2005 to 2030. A look at the performance of the simulated modes reveals that train (including pkm by train as well as by metro or tram) demonstrates the highest growth by 35.6% followed by non-motorised pkm with 31% between 2005 and 2030. Air pkm are influenced significantly by the crisis and, thus, increase by only 19% until 2030. Bus pkm show a continuous decline after the crisis, which could be observed already in the years prior to the crisis and is caused by the catching-up in motorisation in the EU12 and the declining number of children.

In absolute numbers, ASTRA estimates a total passenger transport demand of 7,577 billion pkm for EU27 in 2030. Car pkm are expected to increase up to 5,493 billion pkm, train up to 645 billion pkm, intra-EU air travel up to 528 billion pkm.



Source: iTREN-2030 – ASTRA. Air includes domestic and Intra-EU flights.

Figure 7-2: Pkm by passenger mode in EU27

Regarding the modal share, this means stagnation for the car mode at 72.4%, while train and non-motorised pkm grow from 7.4% to 8.6%, respectively 4% to 4.5%, from 2005 to 2030.

Table 7-1: Pkm per passenger mode in the EU27 (billion pkm)

Passenger Mode	2005	2010	2015	2020	2025	2030
Car	4,678	4,397	4,966	5,211	5,315	5,493
Bus	602	643	603	585	580	570
Train	475	542	540	588	621	645
Air	442	409	473	506	509	528
Non-motorised	260	271	288	306	323	341
Total	6,458	6,260	6,870	7,196	7,347	7,577

Source: iTREN-2030 –ASTRA

Table 7-2 depicts the average annual growth rates of originating pkm per mode in the EU27. Total pkm are expected to increase moderately, by on average 1.0% per year in the period from 2010 to 2030. In the first decade, the growth is due to catching-up after the crisis, an increase of 1.4%, while the combination of policy measures burdening passenger transport and demographic development leads to a lower annual growth of 0.5% in the second decade. Car pkm grow by 1.1%, train by 0.9%, air by 1.3%, non-motorised transport by 1.2% while bus pkm decrease on average yearly by -0.6% between 2010 and 2030. The inclusion into EU-ETS, the increased competitiveness of rail and the slow-down of the trend towards longer distance travel puts a strain especially on air transport, so that the estimated growth rate is rather moderate. Other pricing measures mainly slow down car transport growth in the second decade until 2030.

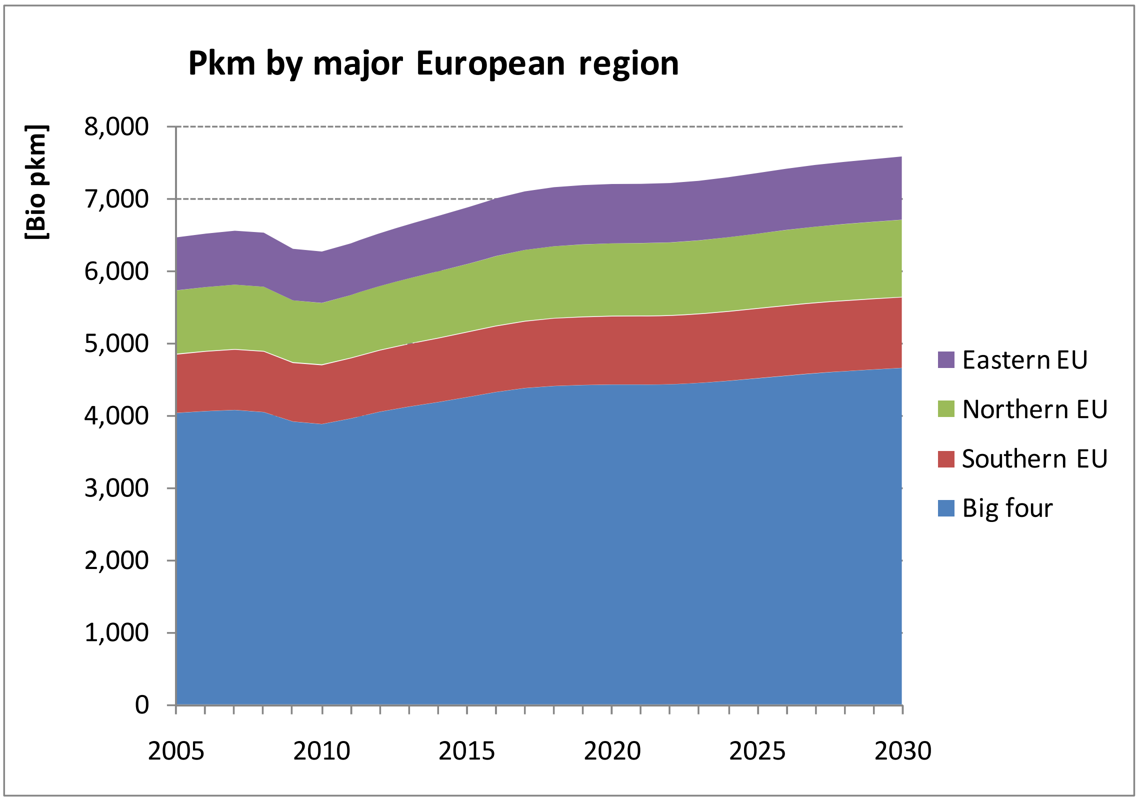
Table 7-2: Average annual growth rates of pkm per mode in EU27

Passenger Mode	**2005-2010**	**2010-2020**	**2020-2030**	**2010-2030**
Car	-1.2%	1.7%	0.5%	1.1%
Bus	1.3%	-0.9%	-0.2%	-0.6%
Train	2.7%	0.8%	0.9%	0.9%
Air (intra EU)	-1.6%	2.2%	0.4%	1.3%
Non-motorised	0.8%	1.2%	1.1%	1.2%
Total	-0.6%	1.4%	0.5%	1.0%

Source: iTREN-2030 –ASTRA

Figure 7-3 illustrates the regional development of originating pkm in the EU27. The growth in the "Big Four" (France, Germany, Italy and the UK) and the southern European countries is the lowest by (on average) 0.9% per year between 2010 and 2030. Passenger transport demand in eastern and northern European countries is assessed to grow by 1.1% annually, which is partially explained by the higher economic growth of these countries.

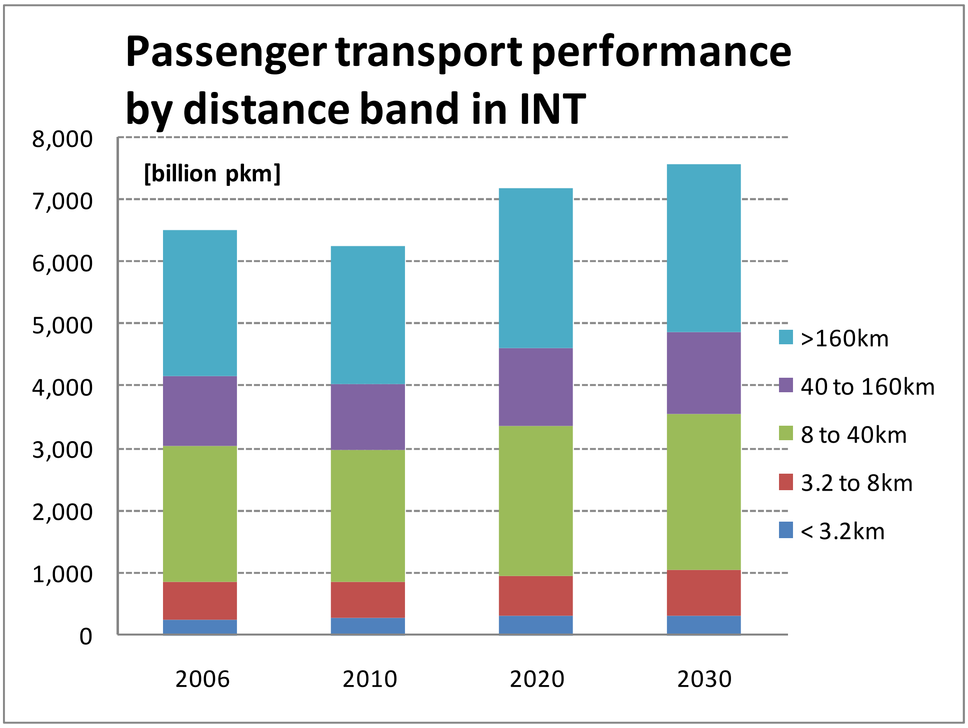
Looking more closely at the regional differences, ASTRA estimates the highest growth of car pkm in the eastern European countries by +1.5% annually, followed by the northern European countries with +1.3% between 2010 and 2030. The total growth in the northern European countries is driven by a strong growth in air pkm by +1.7%. Western and southern European air pkm are expected to increase by +1.1%, respectively +1.2% annually.



Source: iTREN-2030 – ASTRA

Figure 7-3: Pkm by major European regions

Looking at the distribution of demand across distance bands (see Figure 7-4), it can be observed that the crisis in particular reduced demand in the longest distance band (trips above 160 km length), which then largely affects air transport. After the crisis the total transport performance grows as well as the demand in each distance band, but a slightly stronger growth can be observed for the shorter distances i.e. a shift within the local/regional distance bands from 8-40km distances towards the two shortest distance bands and within the long distance bands from above 160km to the 40-160km distances.



Source: iTREN-2030 – ASTRA

Figure 7-4: Transport performance in INT by trip distance class

7.3 Comparison of demand forecasts with other studies

The current sub-chapter contains a positioning of the passenger demand forecast generated for the iTREN-2030 Integrated Scenario with respect to other studies. The most recent study to be used for such a comparison is the TRANSvisions projects, in which – apart from the baseline scenario – four strategic scenarios were developed as follows [Petersen et al. 2009]:

- **Baseline scenario** representing basically a prolongation of existing trends.
- **Decoupled scenario** combining moderate economic growth with strong social sustainability and with political emphasis on pricing, modal shift and public-private partnerships (PPP).
- **Reduced scenario,** combining weak economic growth with strong social and environmental sustainability. Behavioural policies reducing demand for motorised transport are applied, as well as speed limits for roads and land-use regulations which lead towards an increase in public transport.
- **Induced scenario** combining strong economic growth with risks for social sustainability. It emphasizes technology, supply management and market

spontaneous self-organisation. Higher investment in research and development and productive infrastructure are assumed.

- **Constrained scenario** combining very high growth in the short term and an increase of population due to migration. It is attached to a pessimistic vision concerning the capacity of Europeans to carry out structural reforms.

Long-term forecasts until 2050 have been generated within the TRANSvisions project[9]. However, only the forecasts until 2030 have been used for the comparison.

When comparing the passenger demand forecasts of iTREN-2030 with the TRANSvisions baseline for the period of time 2005-2020 (see Table 7-3), the forecasts by iTREN are – except for air transport – significantly below the forecasts by TRANSvisions. This pattern can be explained by the fact that the economic crisis is only considered in the iTREN-2030 Integrated Scenario. In case of all other scenarios by TRANSvisions, the differences between TRANSvisions and iTREN-2030 forecasts are more prominent, particularly with regard to the Decoupled, Induced and Constrained Scenarios of TRANSvisions.

Table 7-3: iTREN-2030 Integrated Scenario compared to TRANSvisions: Annual passenger demand variation 2005-2020

Average annual passenger transport demand variation 2005-2020						
	iTREN 2030	TRANSvisions Scenarios				
	Integrated Scenario	Baseline	Decoup-led	Reduced	Induced	Con-strained
Road	0,53%	1,5%	1,8%	0,9%	3,0%	3,4%
Rail	1,43%	1,8%	3,8%	1,4%	3,2%	4,0%
Air	0,92%	0,9%	1,2%	0,0%	3,5%	4,1%
Total	**0,73%**	**1,5%**	**1,9%**	**0,9%**	**3,1%**	**3,5%**

Source: iTREN-2030

As far as the passenger demand forecasts for the forecast horizon 2020-2030 are concerned (see Table 7-4), common patterns can be recognised for the iTREN-2030 and TRANSvisions forecasts. First, rail is the mode that is expected to develop most dynamically. Second, the expected growth in overall passenger mobility is expected to be less intense than in the period of time 2005-2020. Although the impacts of the economic crisis considered by the iTREN-2030 approach can be expected to become less

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9 The forecasts displayed for TRANSvisions stem from MCRIT [2009]) and refer to inter- and intra-zonal passenger transport demand.

relevant for this forecast horizon, the overall increase in passenger mobility in TRANSvisions – in most of the scenarios – is higher than in the iTREN-2030 Integrated Scenario. Particularly, the growth of rail passenger demand is expected to be significantly higher in all TRANSvisions Scenarios, particularly in the Baseline, Constrained, Decoupled and Reduced Scenarios. In the iTREN-2030 Integrated Scenario, air passenger demand is expected to be still on a growth path, while in TRANSvisions air passenger demand is expected to decline considerably in the Baseline Scenario, and showing significant diverse development patterns in case of the other scenarios.

Table 7-4: iTREN-2030 Integrated Scenario in comparison to TRANSvisions: Annual passenger demand forecasts 2020-2030

Average annual passenger transport demand variation 2020-2030						
	iTREN 2030	TRANSvisions Scenarios				
	Integrated Scenario	Baseline	Decoupled	Reduced	Induced	Constrained
Road	0,28%	0,7%	0,7%	-0,1%	1,6%	0,6%
Rail	0,94%	3,0%	3,3%	3,1%	1,3%	4,1%
Air	0,43%	-2,1%	-0,9%	-2,5%	2,0%	1,7%
Total	**0,51%**	**0,7%**	**0,9%**	**0,1%**	**1,6%**	**1,0%**

Source: iTREN-2030

8 Freight transport in the Integrated Scenario

This chapter starts with a discussion of the general trends in freight transport and logistics identified in other studies. This is followed by an overview of the measures and trends in the Integrated (INT) Scenario that play an important role in the development of the freight transport flows in the EU27. Subsequently, the scenario results of freight transport flows into the INT scenario based on the ASTRA model runs are presented. These results start from the REF Scenario for which ASTRA was adapted to TRANSTOOLS, but in the INT they include both the impacts of the economic crisis and the policies of the INT. The chapter concludes with a comparison of iTREN-2030 results with previous studies.

8.1 General freight and logistics trends

The recent strategic vision of the EC for transport [European Commission 2009c] highlights the major social and economic changes which will shape the future of transport. According to this study, the main drivers in the next decades will be the ageing of society, migration, environmental challenges, scarcity of fossil fuels, urbanisation and the changing global balance of power (economically and politically), which have largely also been addressed in the storyline of the INT scenario (see chapter 3).

New supply chain configurations can be expected, caused by demand from emerging markets; at the same time, suppliers located in these markets will provide new sources of supply and thereby influence procurement strategies. The major target regions for globalisation are converging on China and India, while eastern Europe is catching up as a top outsourcing destination.

Multi-modal transportation will become increasingly important. Multi-modal Origin-Destination chains will be constructed as a function of not only cost and time, but also of the carbon footprint. Green supply chain strategies will become a source of competitive distinction and a key consideration when expanding the supply chain globally [MIT 2009].

A number of key drivers can help to explain the large structural shifts within the global supply chain, most importantly the handling factor and average length of haul. The handling factor represents the average number of links in the supply chain while average length of haul corresponds to the average length of these links.

A study by Piecyk et al. [2007] found that centralisation and decentralisation strategies will have the greatest impact on the supply chain structure, whereby centralisation appears to have reached a plateau. This may lead to a decrease in the average length of haul. Furthermore, customers who are increasingly voicing environmental concerns will support more local sourcing of products. Increasing fuel prices, CVRS technology and working time legislation are likely to reduce the distance that freight travels. Contrary to this, global sourcing strategies still dampen this effect. The use of hub-and-spoke networks, freight consolidation initiatives and the growth of reverse logistics are expected to increase the number of links in the chain and inflate the handling factor. On the other hand, more goods are being imported or purchased online, thus leading to logistics chains which reduce the number of links of the traditional supply chain.

The recent reduction of the average length of haul, increasing congestion, and a trend toward higher frequencies and smaller shipment sizes make it more difficult for the companies to avoid running empty trucks. Therefore the level of empty running, and similarly for the loading factor, is expected to remain relatively stable in the near future.

In summary, it can be said that there are many contrary effects influencing parameters, such as average length of haul or the handling factor, which determine the overall amount of freight transport and which will shape region-specific and different developments of freight transport demand.

8.2 Policy measures and trends

The policy measures considered in the INT Scenario that have a substantial impact on the freight transport flows are listed below:

- consideration of most probable impacts of the financial crisis adjusted to the observed impacts until the second quarter of 2009,
- implementation of road user charges for trucks using the cost values identified by the IMPACT Handbook on external cost of transport (about 7 to 10 €ct/vehicle-km) starting in 2020 (see Table 3-2),
- inclusion of road transport and short sea shipping into EU-ETS by an upstream approach in the year 2020 (certificate price in 2020 is about 27 $€_{2005}$ per ton of CO_2),
- harmonisation of fuel taxes according to EC Directive 2003/96/EC from the year 2020 onwards (tax levels of 35.9 €ct/l gasoline and 41 €ct/l diesel).

Additionally, several regulations and technological measures are implemented that have an impact on fuel efficiency. As a result, average costs per vkm during driving can be reduced and improve the competitiveness of the respective freight transport mode. These measures are:

- regulations setting CO_2 limits for average new LDV fleet with a limit value of 175 g CO_2 per vkm in 2015 and 135 g CO_2 per vkm in 2020,
- binding use of low resistance tires for trucks, resulting in a reduction of energy consumption by -3.5% from 2012 onwards,
- manufacturers of light duty vehicles offer competitive battery electric technology for deliveries in urban areas.

The developments with the greatest impact on the freight transport volumes are the financial crisis and the user charges for trucks. As user charges according to the Greening Transport Package are implemented in the year 2020, charges will become lower than in the previous years in some countries of the EU. Countries like Austria, Spain, France, Germany, Ireland, Italy, Portugal, Czech Republic and Poland are already at higher levels so the consideration of the proposed charges would mean a decrease of charges per tkm. Hence, the impact will be different in those countries.

Measures aiming at fuel efficiency improvements and accelerated diffusion of battery electric trucks for last mile delivery in urban areas lead to a reduction of costs during driving. As these costs are supposed to influence the freight distribution and modal split, in the ASTRA model the concerned mode benefits from these measures. Nevertheless, additional burdens, especially for road freight transport, resulting from several measures and policies considered in the INT Scenario have to be considered.

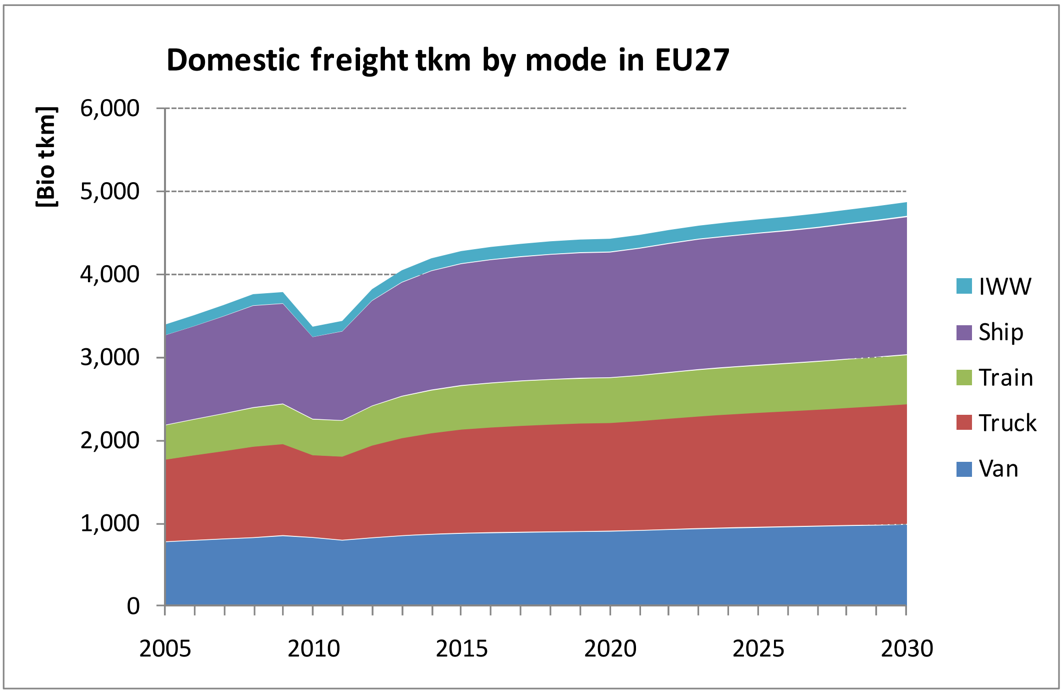
8.3 Scenario results for freight transport

In this chapter the freight transport results of the Integrated Scenario are presented. In the first section an overview of domestic transport is given and in the second section an overview of the total originating transport.

8.3.1 Domestic freight transport

In Figure 8-1 an overview is given of the domestic freight transport by transport mode in the EU27. The concept of domestic transport describes the transport on national territory, i.e. transit trips are accounted with their share of a national territory as opposed to originating transport, which includes all transport that originates from a country independent of which territory it is crossing. Ship transport is included in the originating concept to complete the picture in this section. The corresponding numbers are included in the two tables following this figure (Table 8-1 and Table 8-2). Figure 8-1and Table 8-1 include the volume in ton-km by mode of transport, Table 8-2 describes the average growth rate in % of the volume in ton-km.

These results show a strong decrease of domestic freight transport as a result of the economic crisis. In the long run-up to 2030, intra-EU shipping shows a strong growth, with an average annual growth figure of 2.6% which is far above the average annual growth figure of total domestic freight transport of 1.9%. The growth of road transport (HDV) is equal to the average at 1.9%, the growth of rail at 1.6% and the growth of inland waterways at 1.5% are still somewhat below the average. The growth of the vans (LDV) at 0.9% lies below the average growth figure. In general, the annual growth figures are much higher in the period 2010 – 2020 compared to the annual growth figures in the period 2020 – 2030. This corresponds largely with the GDP growth figures that are also significantly higher in the first decade than in the second decade.



Source: iTREN-2030 – ASTRA/TREMOVE

Figure 8-1: Domestic freight tkm by mode in the EU27

Table 8-1: Domestic freight tkm per mode in the EU27

Freight Mode	2005	2010	2015	2020	2025	2030
Van	779	831	882	907	955	991
Truck	981	986	1,246	1,302	1,378	1,445
Train	416	434	531	545	574	598
Ship	1,082	990	1,466	1,511	1,586	1,660
IWW	127	123	147	154	159	165
Total	3,385	3,365	4,272	4,420	4,652	4,859

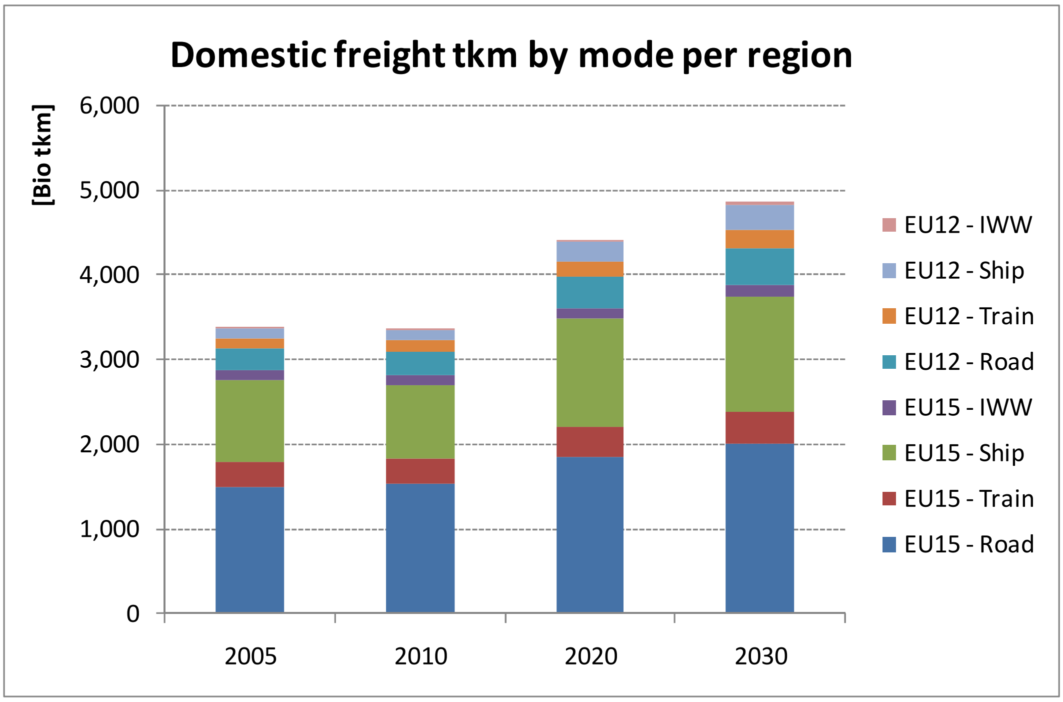
Source: iTREN-2030 –ASTRA/TREMOVE

Table 8-2: Annual growth rates of domestic freight tkm per mode in the EU27

Freight Mode	2005-2010	2010-2020	2020-2030	2010-2030
Van	1.3%	0.9%	0.9%	0.9%
Truck	0.1%	2.8%	1.0%	1.9%
Train	0.9%	2.3%	0.9%	1.6%
Ship (Intra-EU)	-1.8%	4.3%	0.9%	2.6%
IWW	-0.6%	2.3%	0.7%	1.5%
Total	-0.1%	2.8%	1.0%	1.9%

Source: iTREN-2030 –ASTRA/TREMOVE

Figure 8-2 describes domestic freight transport by region (EU15 and EU12) and by mode of transport. The total domestic freight transport in the EU15 increases by 38% in the period 2010 – 2030, in the EU12 the increase amounts to 75%. That means that over the whole period these growth figures are similar to GDP growth of about 32% and 85%, respectively. In general, the growth of freight in the period before 2020 is much higher than in the period after 2020. The growth of domestic transport in the EU15 in the period after 2020 is low, with an increase of 7%, compared to an increase of 21% in the EU12. In general, it seems that after 2020 first signs of decoupling of freight transport from economic growth are expected, as the GDP growth is higher than the freight growth at 13% and 42%.

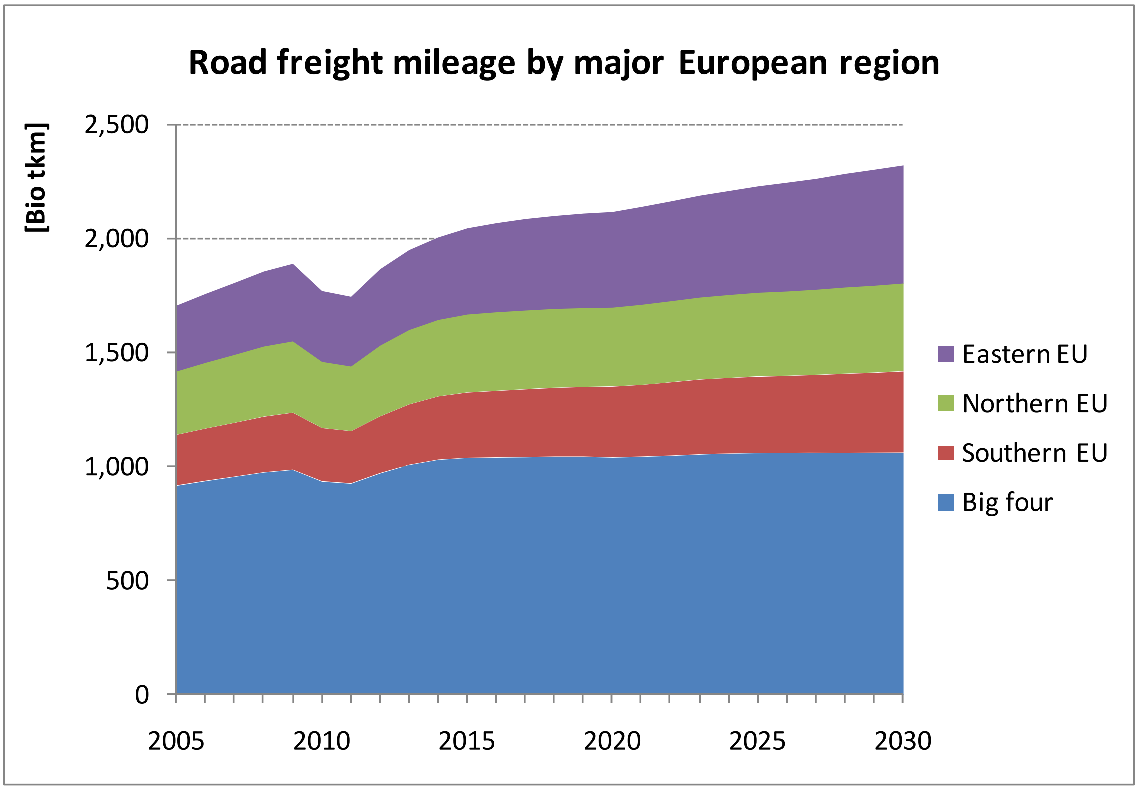


Source: iTREN-2030 – ASTRA/TREMOVE

Figure 8-2: Domestic freight tkm by mode per region

8.3.2 Total originating freight transport

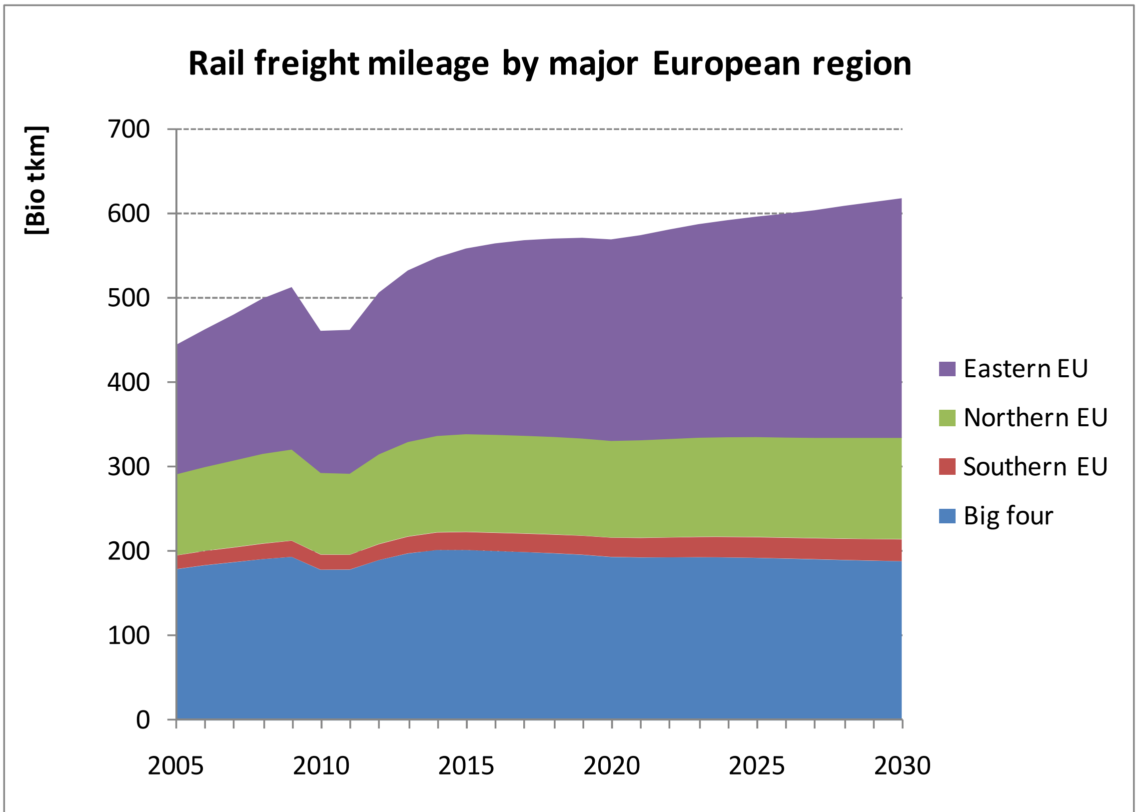
In this section figures are included showing the total freight volumes by mode of transport in the EU27 for the major European regions (as originating region). The overall growth of road transport between 2010 and 2030 is 31%. The growth per major European region is 14% for the "Big Four", 52% for the southern EU, 32% for the northern EU and 67% for the eastern EU.



Source: iTREN-2030 – ASTRA

Figure 8-3: Total road freight transport by major European region (region of origin)

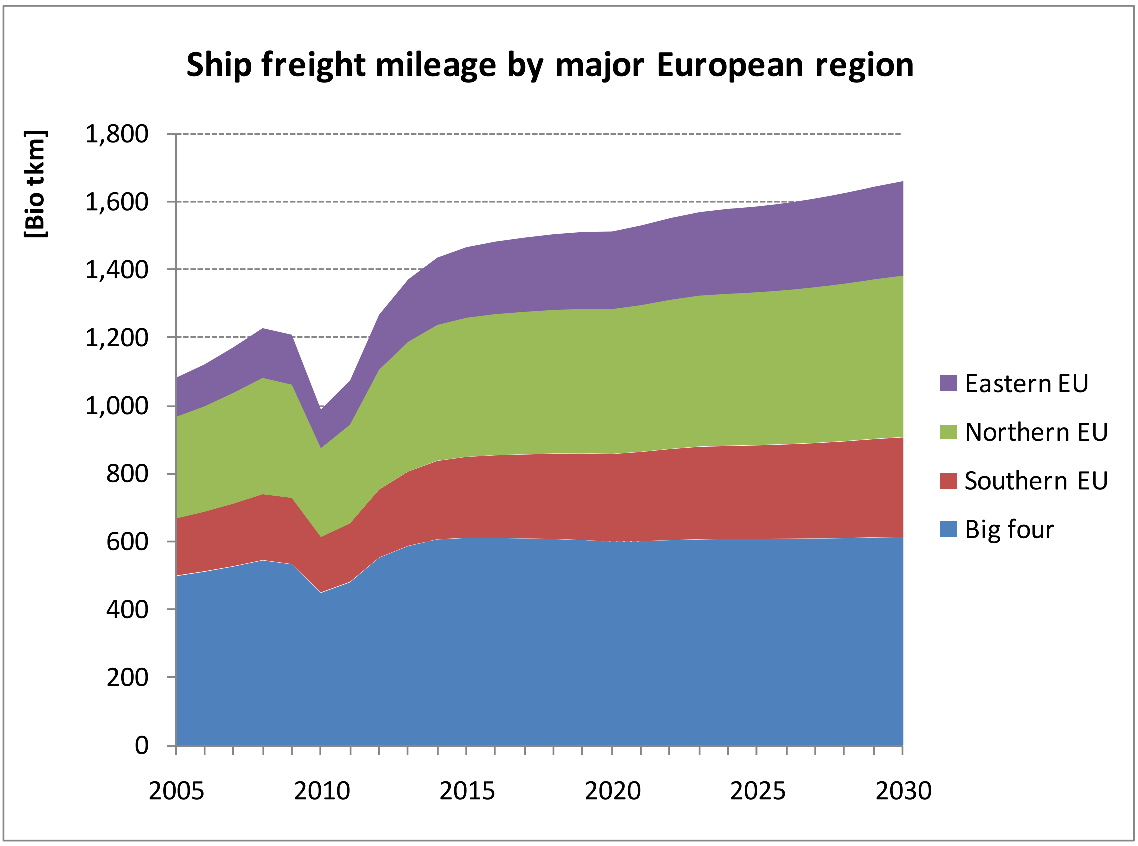
The overall growth of rail transport between 2010 and 2030 is 34%. The growth per major European region is 6% for the "Big Four", 43% for the southern EU, 24% for the northern EU and 69% for the eastern EU. It is also obvious that in the eastern EU the decline of rail freight transport can be stopped and the trend reversed to a growth path. The growth figure for the "Big Four" is rather low, for the period after 2015 the volume of rail freight transport decreases for the "Big Four". One explanation would be that the reduction of energy demand in the INT Scenario in combination with increased use of renewables reduces demand for bulk primary energy goods (i.e. coal, oil products), which were largely transported by rail. Further, the policies add additional cost to road transport, in particular in the eastern countries, while liberalisation and infrastructure construction in the rail sector continues, thus strengthening the competitiveness of rail.



Source: iTREN-2030 – ASTRA

Figure 8-4: Total rail freight transport by major European region (region of origin)

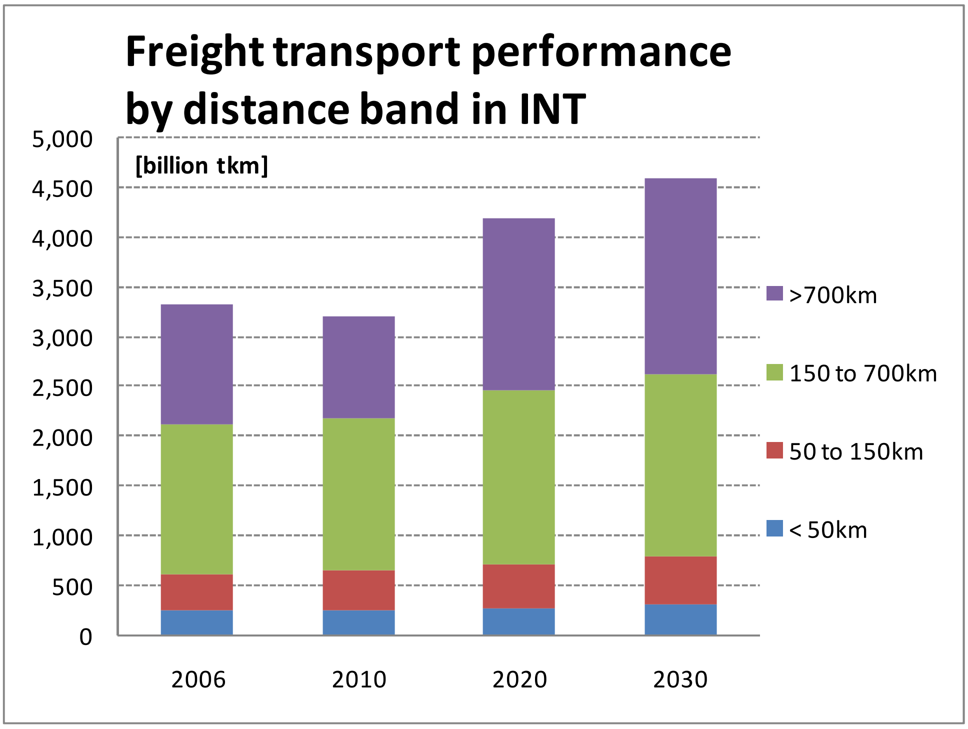
The overall growth of intra EU shipping transport between 2010 and 2030 is by 68%. The growth per major European region is 37% for the "Big Four", 78% for the southern EU, 81% for the northern EU and 145% for the eastern EU. The growth of the "Big Four" is substantial in the period 2010 – 2030, however, from 2015 onwards the volume stabilises in the "Big Four" region. Again, one reason for this could be the reduction in demand for fossil primary energy bulk goods.



Source: iTREN-2030 – ASTRA

Figure 8-5: Total intra-EU shipping freight transport by major European region (origin region)

Looking at the growth in the different distance bands it can be observed that the longest distance band for freight transport above 700km is most sensitive to changes in the scenario framework. During the crisis, in particular, these trips are reduced due to the drastic decline in export, which largely generates such long trips. But also the rebound of exports between 2010 and 2020 causes the strong growth of these trips, which then favours the ship mode in particular. Between 2010 and 2030 the average annual growth of demand in the longest distance band is above 3%, while for the other distances it remains below or around 1%.



Source: iTREN-2030 – ASTRA

Figure 8-6: Total intra-EU shipping freight transport by major European region (origin region)

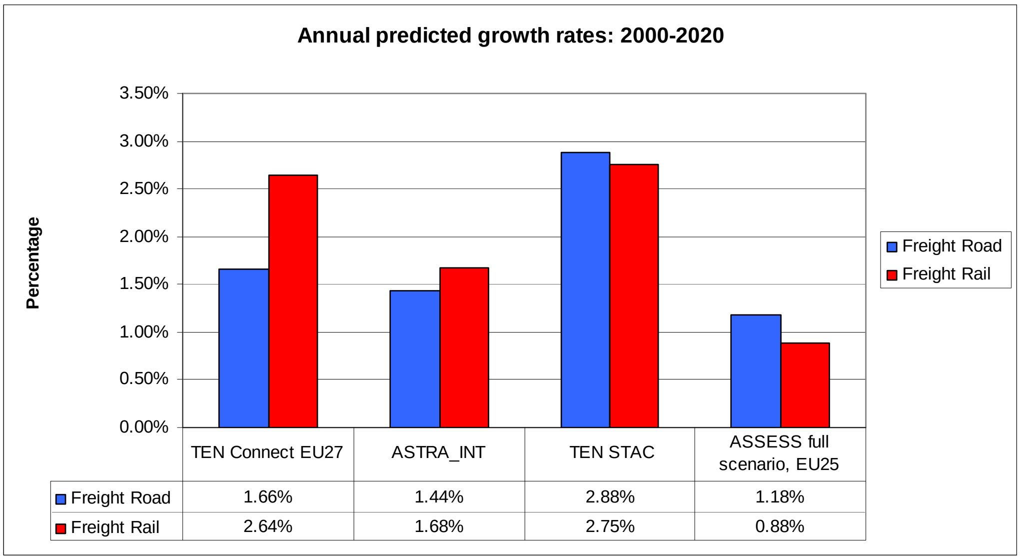
8.4 A comparison of freight transport projections

Three major EU studies of recent years produced forecasts of freight transport demand, namely TEN-STAC (2004), ASSESS (2005) and TEN-Connect (2008). TEN-STAC developed transport scenarios and European traffic forecasts for trans-European transport networks and was based on the NEAC model for freight. ASSESS provided technical support related to mid-term assessment of the European Transport White Paper. ASSESS was based on the SCENES model. TEN-Connect assessed major transport corridors in the EU and neighbouring countries. The freight forecasts in TEN-Connect were based on TRANSTOOLS version 2 (TTv2). Furthermore, the TEN-Connect study represents the reference scenario for iTREN-2030. None of the previous analyses takes the economic crisis into consideration.

Figure 8-7 below compares the annual growth rates of the three studies with the ASTRA Integrated Scenario (ASTRA_INT). TEN-STAC predicted the highest annual growth rates for road (+2.88%) and rail freight transport (+2.75%). Interestingly, the ASSESS full scenario produced lower estimates than ASTRA_INT. Only the land modes are compared here, since equivalent results for IWW and maritime transport were not available, as the applied methodologies differed.

The attached table shows four series:

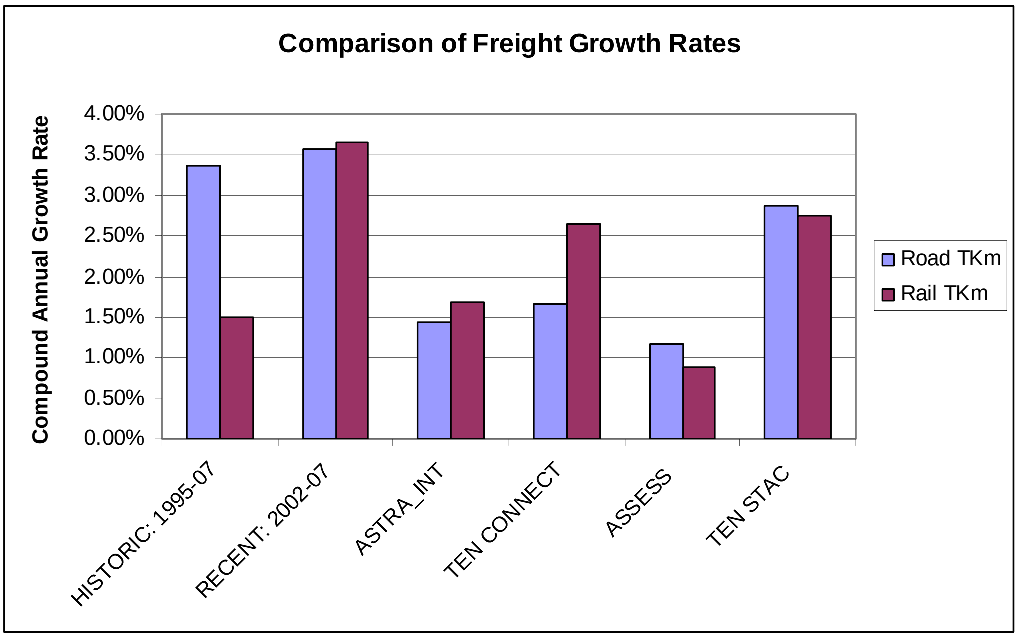
- Two previous forecasts, which were carried out prior to iTREN-2030, came from TEN-STAC and ASSESS.
- Two current forecasts were imported for iTREN-2030: the TRANSTOOLS based reference scenario was derived from the TEN Connect study and provided the iTREN-2030 Reference Scenario. The ASTRA-based INT Scenario was used as the Integrated Scenario in iTREN-2030.



Source: iTREN-2030

Figure 8-7: Comparison of growth rates of different studies

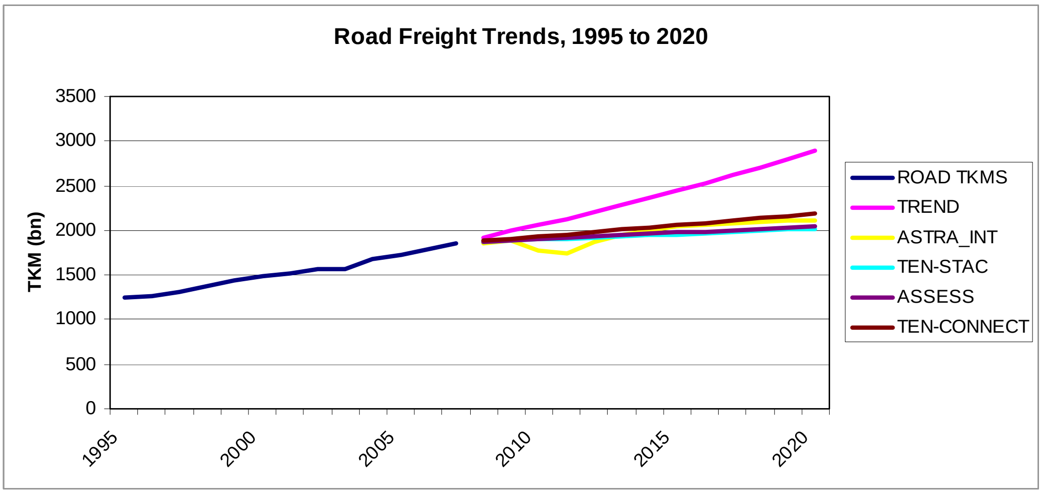
Figure 8-8 below compares the freight growth rates from the models to historic values for two different periods.



Source: iTREN-2030

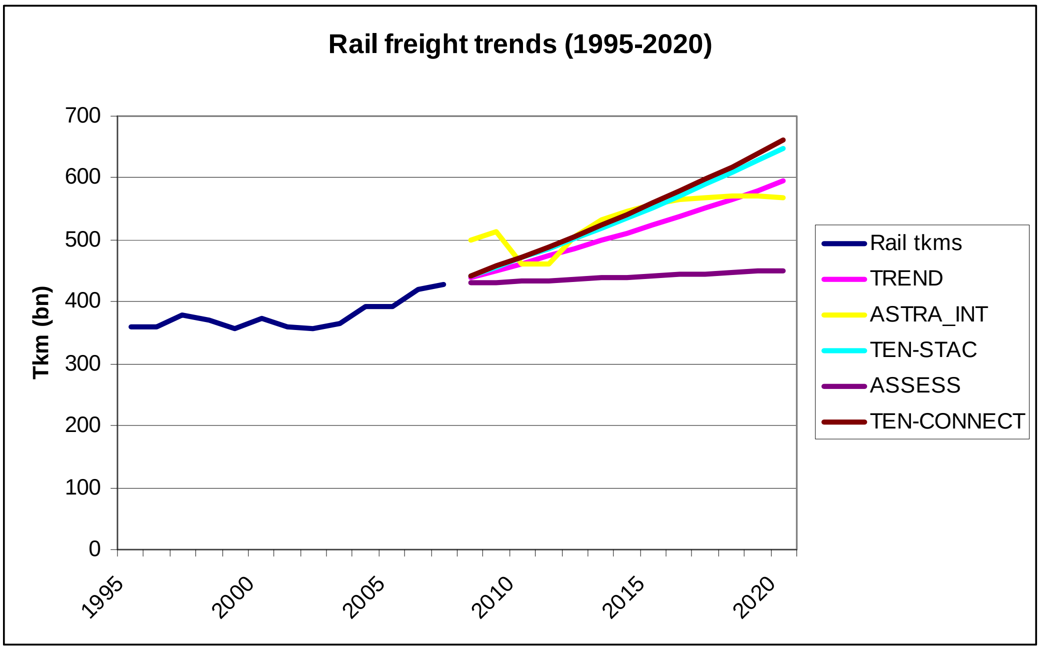
Figure 8-8: Comparison of growth rates of different studies with historic trends

The following Figure 8-9 and Figure 8-10 show the comparisons for road and rail freight transport in absolute terms (billion tkm). TEN-Connect provides the most optimistic results in relation to road and rail freight transport. The lowest estimates for road freight transport come from TEN-STAC; in rail freight transport ASSESS provides the most pessimistic forecasts. In general, the INT Scenario of iTREN-2030 remains within the lower part of the corridor spanned by the analysed studies.



Source: iTREN-2030

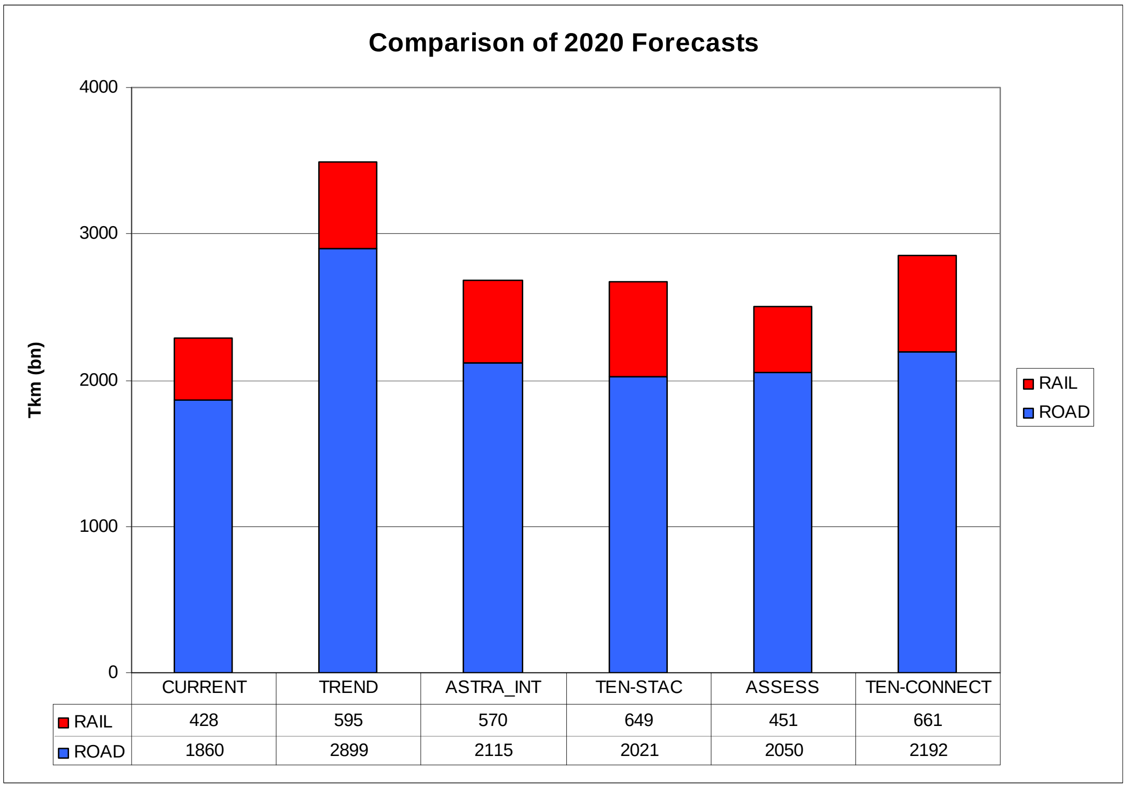
Figure 8-9: Comparison of road freight trends of different studies



Source: iTREN-2030

Figure 8-10: Comparison of rail freight trends of different studies

The following Figure 8-11 summarizes the freight transport forecasts from the different sources for the year 2020.



	CURRENT	TREND	ASTRA_INT	TEN-STAC	ASSESS	TEN-CONNECT
RAIL	428	595	570	649	451	661
ROAD	1860	2899	2115	2021	2050	2192

Source: iTREN-2030

Figure 8-11: Summary of freight forecasts for 2020

A crucial difference between ASTRA and TEN Connect and the other studies concerns the result of a larger growth rate for rail transport than for road transport. This was not expected by the previous studies, but was observed already for the period 2000 until 2007. It seems that European policy fostering the competitiveness of rail mode is successful and will remain successful, which was also concluded by the COMPETE study [Schade et al. 2006].

It should be noted that none of the reference studies took the impacts of the economic crisis into account. The ASTRA model in iTREN-2030 therefore represents a first modelled approach which integrates the economic downturn. In comparison to static approaches, the deviations between ASTRA and TTv2 results are quite high, at least for some modes. For example, TTv2 calculates a 26% higher originating road pkm than the Statistical Pocketbook (ASTRA about 3% for 2005) [European Commission 2007a]. So sometimes the model results differ significantly.

9 Environment in the Integrated Scenario

9.1 Policies and measures considered

The policies implemented in the iTREN-2030 Integrated Scenario have been listed in section 3. In summary these are:

- Efficiency labelling of cars;
- CO_2 pricing;
- CO_2 emission limits for cars and LDVs;
- Battery technology breakthrough (e-mobility), policy support (cars and LDVs);
- Hydrogen fuel cell breakthrough, policy support for R&D, field tests and subsidies at market entry. Building up fuel station networks ;
- Bioethanol quota (partly by blending in gasoline);
- User charging on HDV implemented between 2020 and 2030 as road charges on all interurban networks based on the Greening Transport Package proposal;
- User charging on passenger cars implemented between 2020 and 2030 as road charges on all interurban networks whose values are based on truck charges and ratio between car and truck marginal costs;
- City tolls implemented between 2025 and 2030 on all passenger cars at 0.357€/vehicle-km during peak period.

9.2 Scenario results on CO_2 emissions

The results presented in the following section on CO_2 emissions in the Integrated Scenario focus not only on well-to-wheel emissions from transport. As opposed to the numbers presented in the Annex of this deliverable, the amount of CO_2 emitted during the production of road vehicles is added to well-to-wheel CO_2 emissions from road passenger and freight transport. Road vehicle production is expected to emit about 145 Mt of CO_2 in 2006 respectively 152 Mt of CO_2 in 2030. The main producer is the passenger car industry which is estimated to emit about 128 Mt of CO_2 in 2006 and 135 Mt in 2030. Van production is supposed to cause about 13 Mt, truck production about 3 Mt and bus production about 0.3 Mt of CO_2 in 2030.

9.2.1 Total CO_2 emissions from transport

he total well-to-wheel (WTW) CO_2 emissions from transport in the EU27 nowadays are around 1190 Mt CO_2. By applying the policy measures in the Integrated Scenario, we can expect that this number will drop by around 13% in the year 2030.

The biggest share of these total emissions comes from road passenger modes, which drop from 65% in 2006 to 58% in 2030. Such a fall is the consequence of applying CO_2 target curves for cars in the Integrated Scenario and is indeed the main contributor to the decrease of the total CO_2 transport emissions.

The second biggest share comes from road freight modes, heavy and light duty vehicles, whose share grows only slightly from 25% nowadays to 30% in 2030, while in absolute terms their emissions remain relatively stable at around 300 Mt CO_2. The improvement in unitary CO_2 emissions can be found in the application of light duty trucks CO_2 targets in the Integrated Scenario. For the heavy duty trucks, the assumption is the same of the Reference Scenario: 1% yearly improvement in fuel efficiency.

The share of (intra-EU) air transport CO_2 emissions during the observed period 2006-2030 can be expected to remain relatively constant between 6.5% and 7%, while the share of rail modes emissions increase from 2% to 4%. The share of emissions from inland waterways (IWW) and short sea shipping (SSS) modes altogether would remain low at around 1.3% during the whole period.

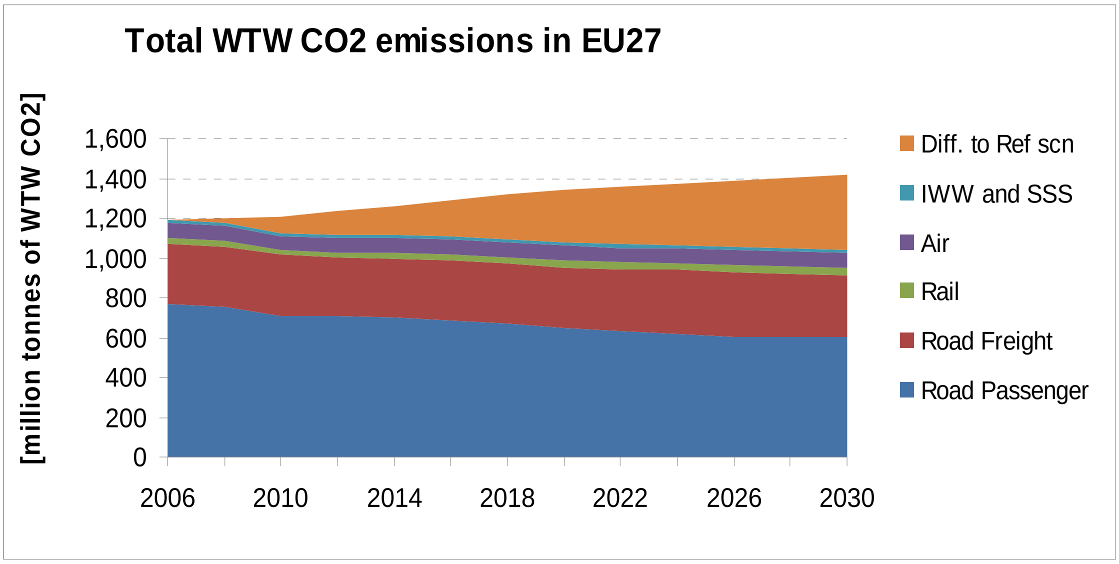


Figure 9-1: Total Well-to-Wheel CO_2 emissions from transport in the EU27

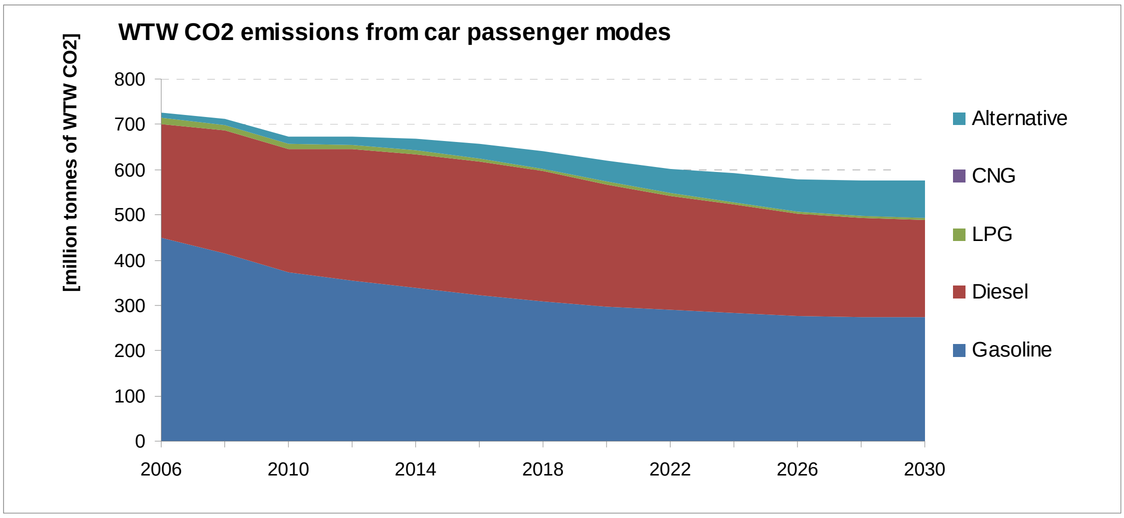
The comparison to the Reference Scenario reveals on the one hand the impacts of the Financial Crisis and the policy measures adopted in the Integrated Scenario: total

WTW CO_2 transport emissions in 2030 are 26% lower than those of Reference Scenario. In absolute term, this means a reduction of up to 370 Mega tonnes of WTW CO_2 emissions in the year 2030.

9.2.2 CO_2 emissions from road passenger modes

Binding CO_2 emission targets for conventional passenger cars can be expected to be the main factor reducing the total emissions of CO_2 from the transport sector. In the Integrated Scenario, total CO_2 emissions from all passenger cars decrease by more than 20% between 2006 and 2030, with gasoline cars emissions decreasing more than diesels: 38% and 15% respectively. In absolute terms, this means a reduction of 150 million tonnes of CO_2.

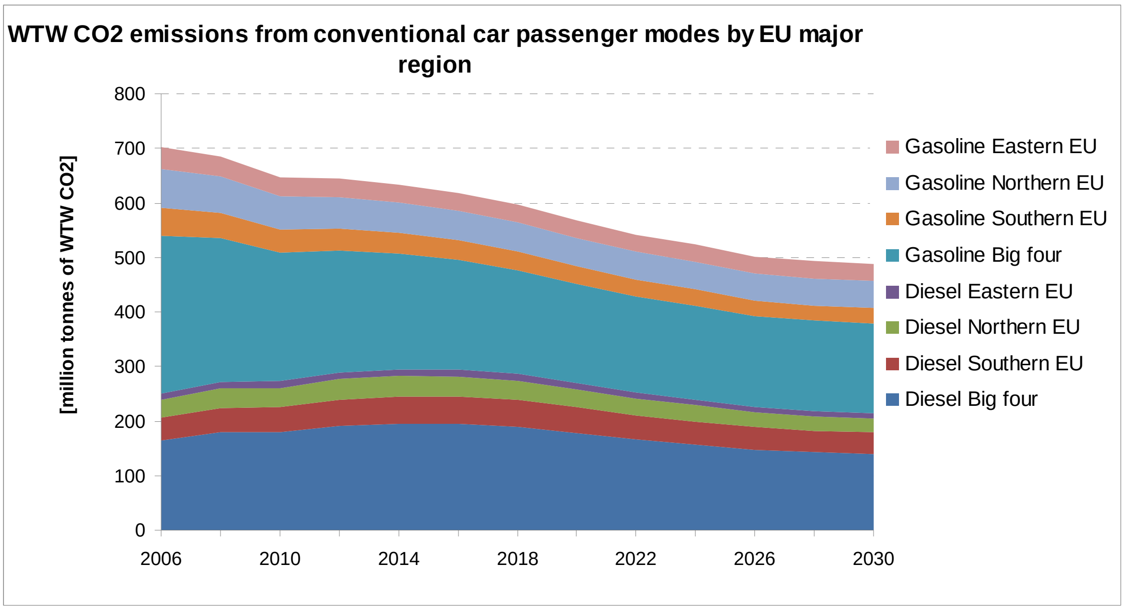
The share of conventional gasoline cars CO_2 emissions also drops from 62% in 2006 to 47.6% in 2030, while that of conventional diesel cars increase slightly from 34.6% in 2006 to 37% in 2030. The share of CO_2 emissions of LPG and CNG cars remains very low (less than 2% during the whole period), while the share of CO_2 emissions from alternative technologies (electric and hybrid) in cars increases significantly from 1.7% (12.6 million tonnes CO_2) in 2006 to 14.5% (83.7 million tonnes CO_2) in 2030 (Figure 9-2). It should be noted that hybrid cars include gasoline and diesel hybrid cars as well such that part of emissions of alternative cars comes from gasoline and diesel, too.



Source: iTREN-2030 – ASTRA/TREMOVE

Figure 9-2: CO_2 emissions (WTW) from car passenger modes in the EU27

In terms of EU regions, the "Big Four" (Germany, France, Italy, the UK) are the major contributors of CO_2 emissions from conventional gasoline and diesel cars, with a share slightly above 60% during the whole period. Northern and southern European regions shares are around 15% and 14% respectively, while eastern countries contribute around 8% (Figure 9-3).



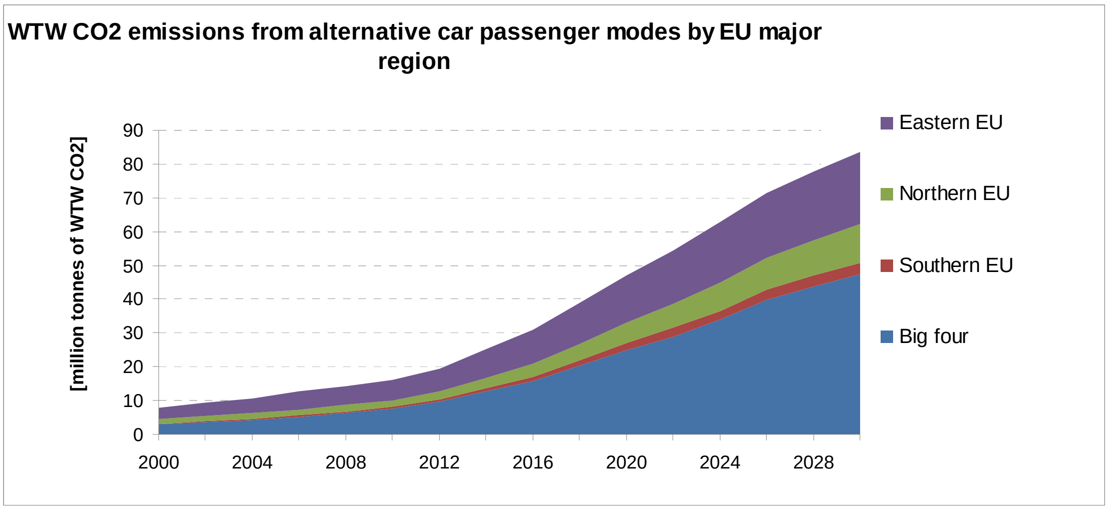
Source: iTREN-2030 – ASTRA/TREMOVE

Figure 9-3: CO_2 emissions (WTW) from conventional car passenger modes in the EU27

Concerning well-to-wheel CO_2 emissions from alternative vehicles, nowadays the biggest shares are contributed by the "Big Four" and the eastern countries, with slightly more than 41% of share each. In 2030, the share of the "Big Four" can be expected to rise to 56.6%, while the eastern countries' share decreases to 25.7%. The shares of southern and northern EU countries remain relatively stable during the whole period: around 4% and 14% respectively (Figure 9-4). In absolute terms, CO_2 emissions of alternative cars from all regions increase significantly between 2006 and 2030, with the fastest growth in the "Big Four" countries (more than 9 times), followed by southern countries (8.5 times), northern countries (6.4 times) and eastern countries (4.1 times).

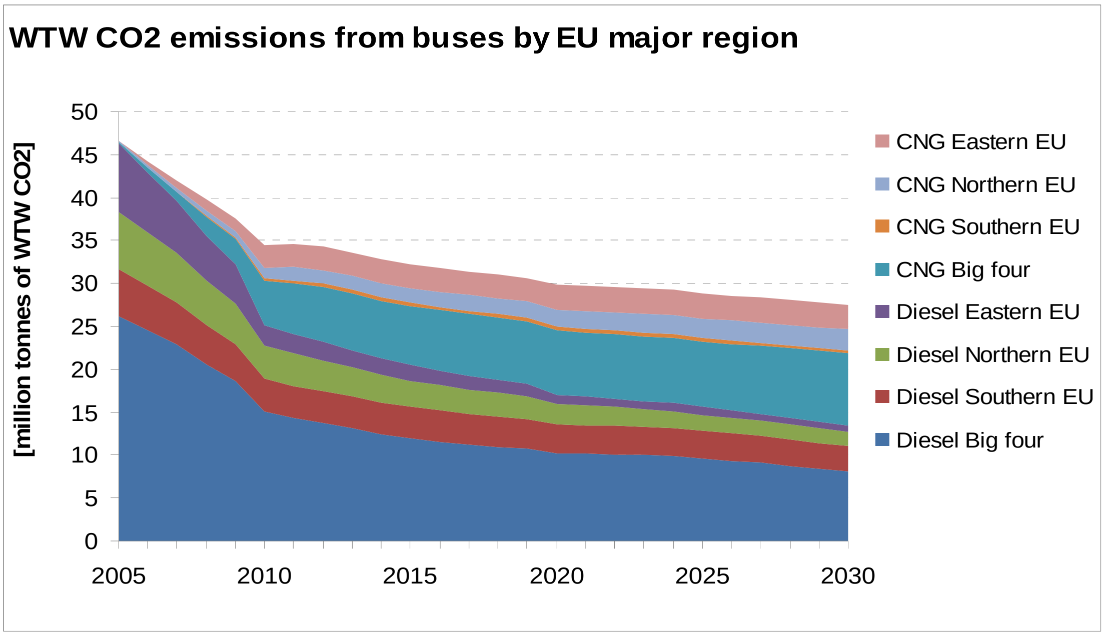
It is important to remark that CO_2 emissions from alternative vehicles are emitted mostly in the well-to-tank phase, i.e. production of the fuel and the vehicles manufacturing process.

Strong reduction of more than 40% in the CO_2 emissions are expected to occur in bus transport, caused mainly by the strong market penetration of CNG buses, whose share goes up from a mere 7% of the overall bus fleet in 2006 to almost 60% in 2030 (Figure 9-5).



Source: iTREN-2030 – ASTRA

Figure 9-4: CO_2 emissions (WTW) from alternative car passenger modes by major regions



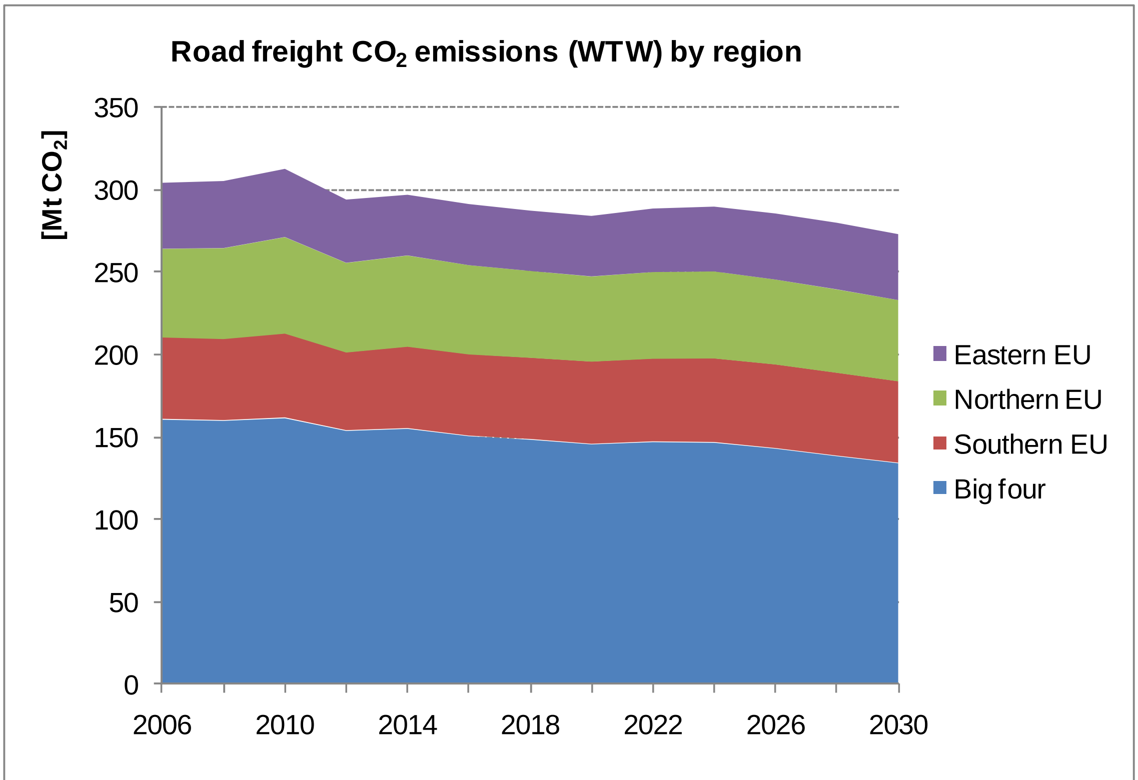
Source: iTREN-2030 – TREMOVE

Figure 9-5: CO_2 emissions (WTW) from buses by major regions

9.2.3 CO_2 emissions from road freight modes

Decreasing foreign trade and domestic production are the major causes for the significant decline of freight transport in Europe in the years of the financial crisis. The impact of the crisis on road freight transport is not as strong by far as on maritime transport, but at about -7.6% in t-km is still substantial.

Figure 9-6 illustrates the development of well-to-wheel CO_2 emissions from road freight transport by four major regions of the EU27 simulated by the ASTRA model. The slump in CO_2 emissions after 2009 is obviously the result of the financial crisis. Due to the simulated recovery of road freight transport after 2011 and the limited technological improvements in the rolling stock, CO_2 emissions decrease only in a moderate way until 2030, so that approximately 273 Mt of CO_2 will be emitted by road freight transport in 2030. Technical innovations in trucks that allow for significantly lower NOx and particles emissions are accompanied by higher fuel consumption and, hence, induce stagnating or even slightly increasing CO_2 emission factors. Until 2020, the binding CO_2 emission regulation for light duty vehicles (LDV) leads to a decline of CO_2 emissions. After 2025 the road charges on complete interurban networks plus CO_2 pricing dampens the freight transport development and results in decreasing CO_2 emissions.



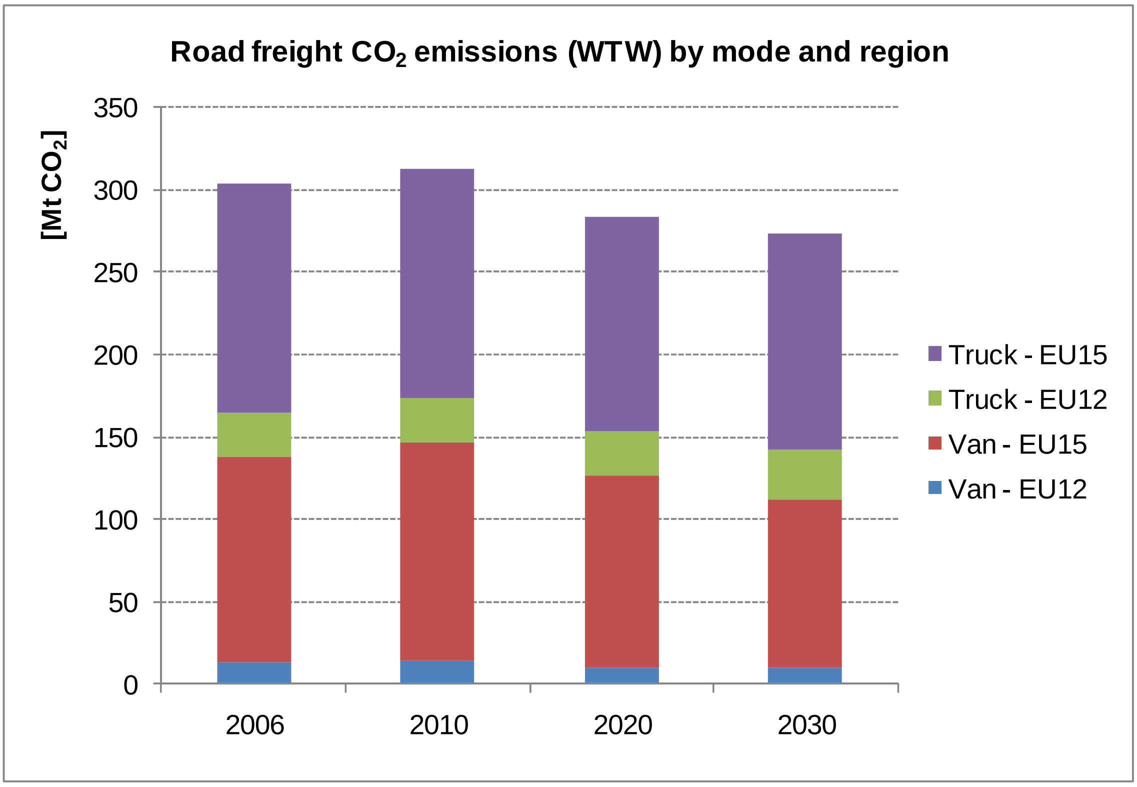
Source: iTREN-2030 – ASTRA

Figure 9-6: CO_2 emissions (WTW) from road freight transport by major regions

The "Big Four" countries - France, Germany, Italy and the United Kingdom – remain at about 49% the major producers of road freight CO_2 emissions, but the share decreases slightly, as road freight transport in the EU12 countries increases more than in the EU15.

Figure 9-7 shows that the share of CO_2 emissions from trucks (heavy duty vehicles) in total road freight emissions is expected to decrease only slightly until 2030. The development of CO_2 emissions from vans reflects the diffusion of low emission technologies (like battery electric LDV) and the binding CO_2 emission regulation. The application of alternative fuel technologies in trucks is according to experts limited. Improvements in terms of lower fuel consumption and CO_2 emissions from trucks are achieved by measures like driver education, low resistance tires, low resistance lubricants and aerodynamics optimisation.

ASTRA estimates about 59% of CO_2 emissions from road freight transport caused by HDVs in 2030, compared with 55% in 2006. In absolute values this means about 161 Mt CO_2 emitted by HDV in 2030, or a decrease of about -3.3% from 2006 to 2030. CO_2 emissions from LDV can be reduced by 18% from 2006 to 2030.



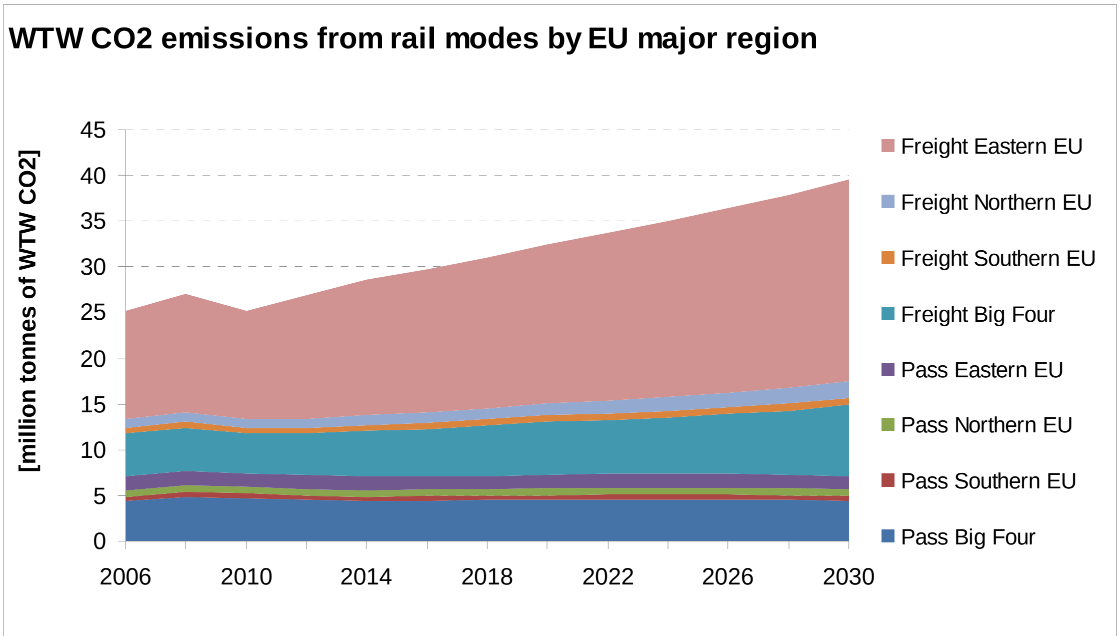
Source: iTREN-2030 – ASTRA

Figure 9-7: CO_2 emissions (WTW) from road freight transport by mode and region

9.2.4 CO_2 emissions from rail modes

Improvement in terms of CO_2 emissions is limited in the rail sector. The only source of reduction in the CO_2 emission factor is the replacement of the old train fleet, although this effect is fairly small, given the long life cycle of trains (around 40 years in most cases). As no emissions-related measure has been implemented in the rail sector, the CO_2 emissions from these modes are determined mostly by demand development. The impact of rail liberalisation measures starting to be implemented in 2010 in the model has, however, only a negligible impact on rail demand.

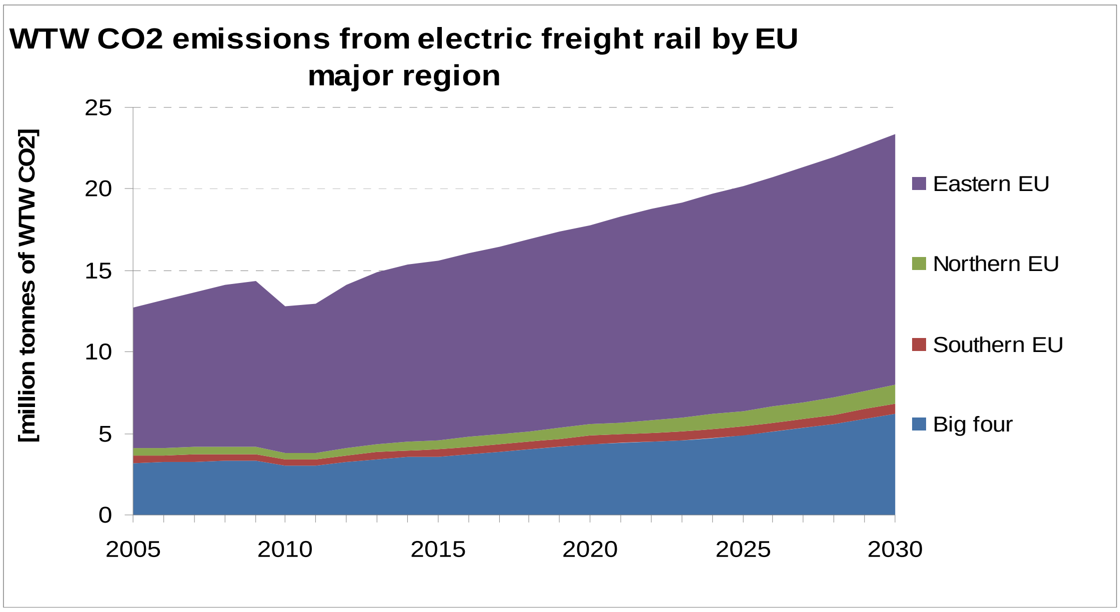
The overall WTW CO_2 emissions from rail can be expected to increase by almost 57% during the 24 years of the observed period. Most of this increase comes from the contribution of freight rail CO_2 emissions in the eastern European countries which make up around 50% of the overall CO_2 emissions from trains in Europe (Figure 9-8).



Source: iTREN-2030 – TREMOVE/ASTRA

Figure 9-8: CO_2 emissions (WTW) from rail modes in the major regions

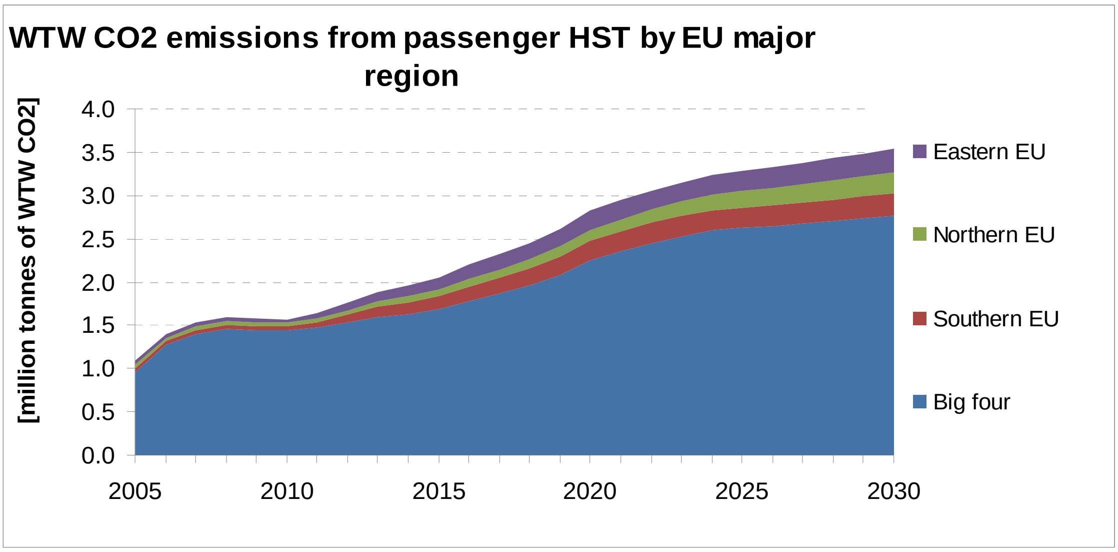
Electric freight rail alone emits more than 50% of the CO_2 emissions from rail modes in Europe. This reflects how electricity production in the rail sector, especially in the eastern countries, still depends on fossil fuels (Figure 9-9).



Source: iTREN-2030 – TREMOVE

Figure 9-9: CO_2 emissions (WTW) from electric freight rail in the major regions

It is interesting to note the strong increase of CO_2 emissions from the high speed passenger trains (HST), as shown in the Figure 9-10. Overall, CO_2 emissions from HST can be expected to increase by 3.2 times between 2006 and 2030. The share of HST emissions from the "Big Four" countries will remain the largest during the whole period, although faster development of HST networks in other parts of Europe will increase significantly.



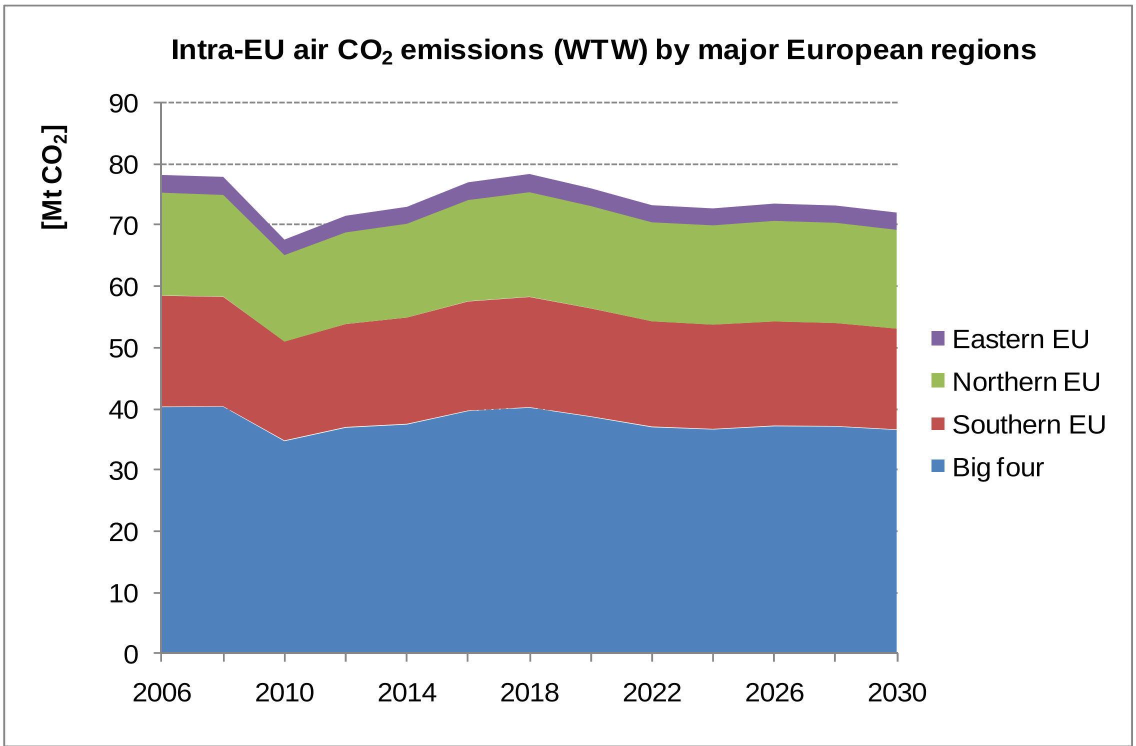
Source: iTREN-2030 – TREMOVE

Figure 9-10: CO_2 emissions (WTW) from passenger HST by major regions

9.2.5 CO_2 emissions from air modes

Well-to-wheel CO_2 emissions caused by passenger air transport are calculated with the ASTRA model, which covers only emissions from intra-EU flights. International bunkers are excluded from this. In the course of the financial crisis, airline companies experienced a strong decline of demand. ASTRA assesses this decrease of demand by -12% less pkm in 2009 compared with 2008 and stagnation in 2010 and the development of CO_2 emissions presented in Figure 9-11 reflects this breakdown. Given that the average life time of civilian aircraft is about 30 years, technological improvements in efficiency can be seen only in real long-term assessment.

One of the drivers of the picture shown in the iTREN-2030 INT Scenario is the introduction of the European Emission Trading System (ETS) for air transport. In iTREN-2030, the POLES model is responsible for the simulation of CO_2 certificate prices. This price increases significantly and makes flights more expensive: travellers' reaction result in only moderate growth rates of p-km after 2020, so that CO_2 emissions peak in 2018 and decrease slightly afterwards. ASTRA projects 72 Mt of CO_2 emissions in 2030 and, thus, about 6 Mt CO_2 saved compared with 2006. In relative terms, CO_2 emissions from intra-EU air transport decline by -7.8% compared with 2006.

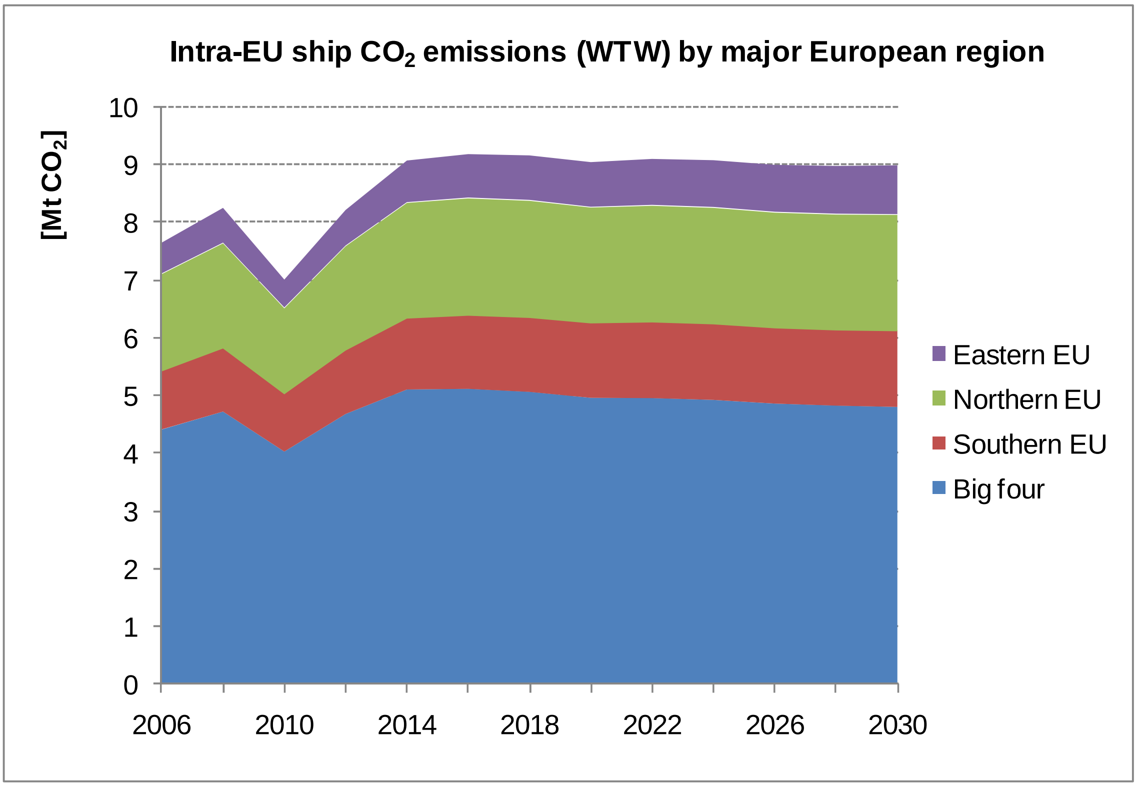


Source: iTREN-2030 – ASTRA

Figure 9-11: CO_2 emissions (WTW) from air passenger transport by major regions

9.2.6 CO_2 emissions from short sea shipping and inland waterways

CO_2 emissions caused by short sea shipping and inland waterways are more influenced by the financial crisis than those from any other freight mode. Considering that ASTRA simulates only short sea shipping within the EU27, the decrease is even lower than for longer distances. Nevertheless, the estimated decline of tkm of about -18% in 2009 has positive impacts on CO_2 emissions. Maritime fuel consumption factors in ASTRA are assumed to decrease by about 8% from 2006 to 2030, due to technological improvements and renewal of the ship fleets. In the long term, the assumed catching-up process of short sea shipping tkm leads to a strong increase of CO_2 emissions until 2015 (see Figure 9-12). After 2015, the price increase of CO_2 certificates for maritime transport leads to a modal shift in favour of rail and road modes and a stagnation of CO_2 emissions at the 2015 level. In absolute terms, about 9 Mt of CO_2 are emitted by short sea shipping in 2030, +17.5% compared with 2006.

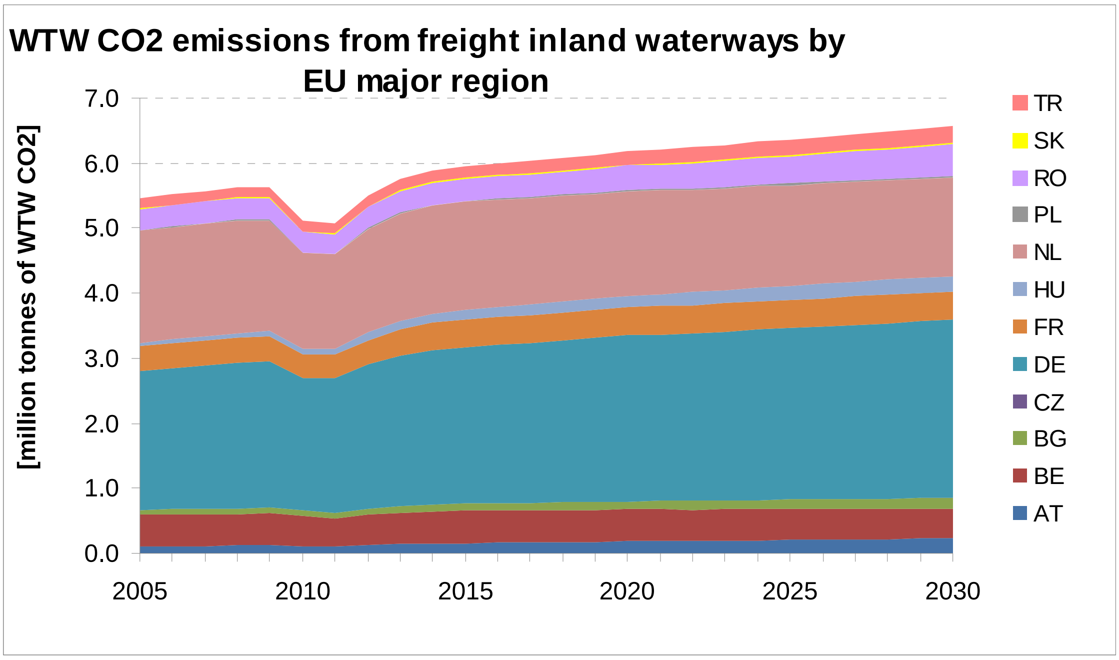


Source: iTREN-2030 – ASTRA

Figure 9-12: CO_2 emissions (WTW) from short sea shipping by major regions

Freight inland waterways CO_2 emissions are completely determined by demand development. The vessel replacement effect is not taken into account at all, since the life cycle of vessels is really long. Emission factors, as well as fuel consumption factors, are differentiated by vessel tonnage without any improvement assumed during the observed period but, as the fleet is not modeled explicitly, the TREMOVE model does not enable assessment of policies that directly affect fleet composition, load factors and shares of t-km transported by the different vehicle types[10].

The development of the CO_2 emissions from freight IWW is given in the Figure 9-13. An increase of almost 19% of CO_2 emissions is expected from 5.5 million tons in 2006 to 6.5 million tons of CO_2 in 2030, with Germany and the Netherlands being the biggest contributors (more than 65% altogether).



Source: iTREN-2030 – TREMOVE

Figure 9-13: CO_2 emissions (WTW) from Inland waterways by major regions

10 The choice between vessel types is not only affected by relative vehicle costs, but is also determined by industry practices, size of the waterways, detailed type of the good, etc. which are all factors that cannot be explicitly represented in an aggregate model such as TREMOVE. However, TREMOVE could enable modelling of policies on fuel choice and fuel specification (e.g. low sulphur fuel), technology standards and emission taxes leading to the use of add-on technologies as catalytic converters or de-NO_x equipment and policies that promote the use of more efficient engines. But none of these measures are applied in iTREN-2030.

9.3 Scenario results on other air emissions

9.3.1 Total NO_x emissions from transport

Total well-to-wheel NO_x emissions from transport decrease by around 41.5% from today's level of 4.3 mega tonnes to 2.5 mega tonnes in 2030. The biggest contribution to this drop is attributed to road modes, whose emissions decline more than 68% (slightly more than 2 mega tonnes) during the observed period. In terms of share, road modes contribute to almost 70% of the total WTW NO_x emissions in 2006 and fall to a mere 37.6% in 2030 (Figure 9-14). The main driver here is the implementation of the Euro emission standards and in fact a similarly strong reduction is found also in the Reference Scenario.

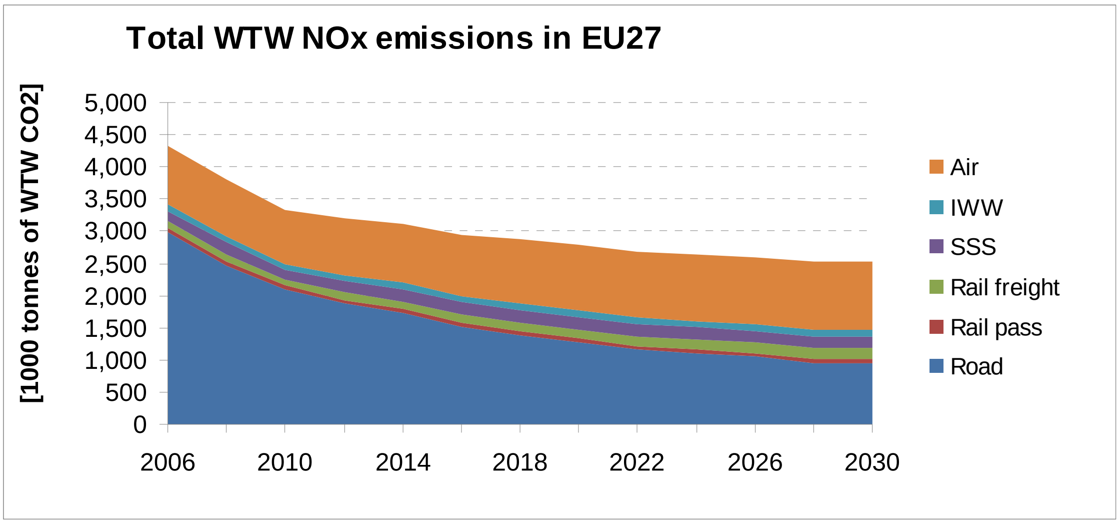
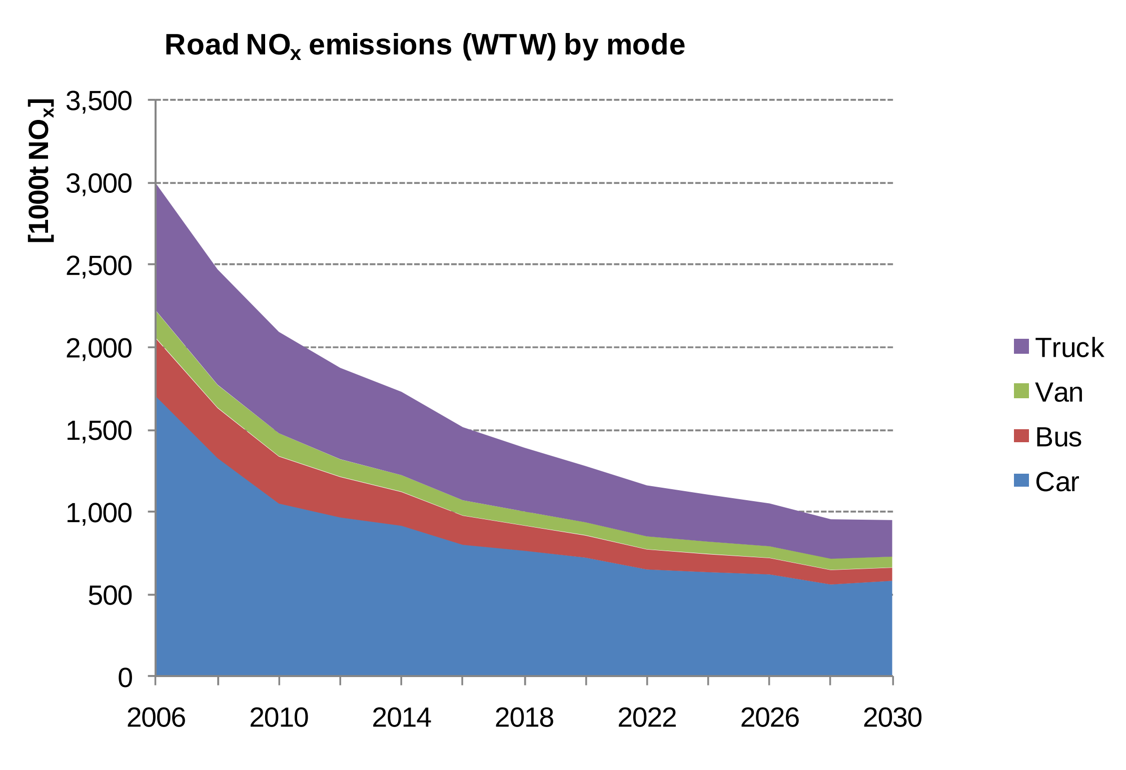


Figure 9-14: Total well-to-wheel NO_x emissions from transport sector in the EU27

9.3.2 NO_x emissions from road modes

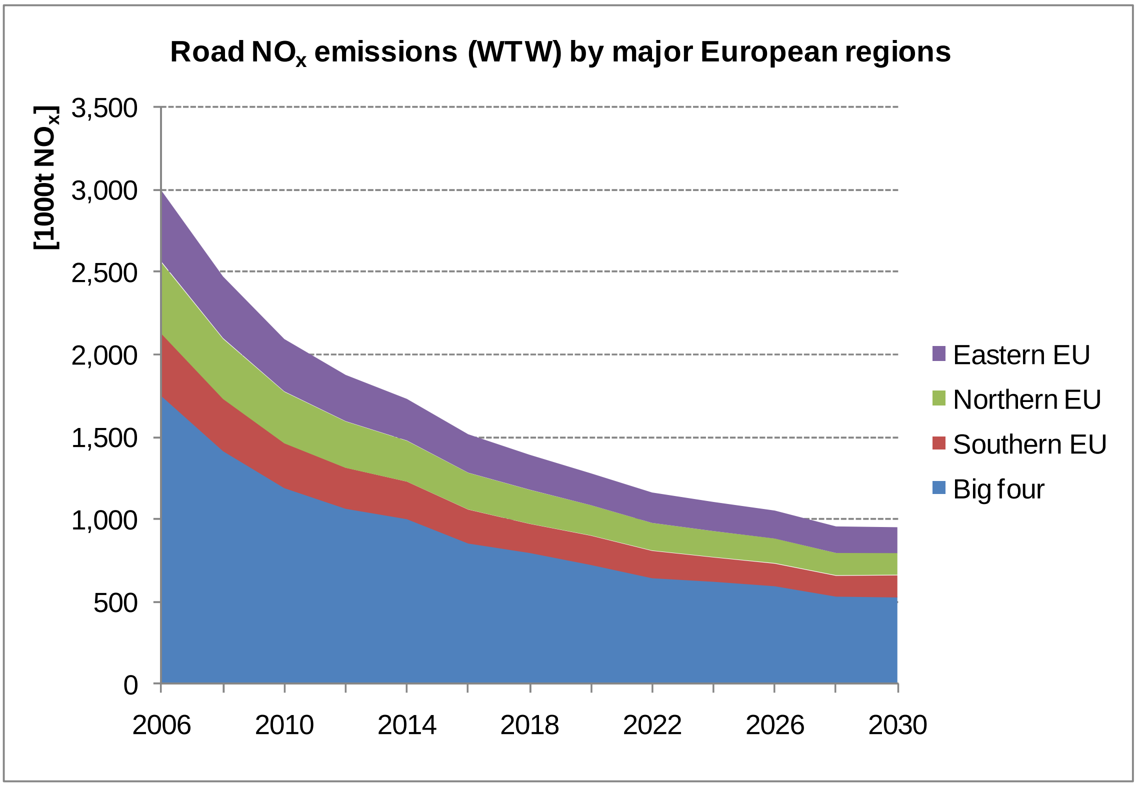
NO_x emissions are computed in ASTRA by the same inputs as all other emissions: vehicle km are derived from the transport model and multiplied with specific emission factors per emission standard and vehicle technology. Therefore, the technological composition of the vehicle fleets and the development of the passenger and freight transport performance are the major drivers for NO_x emissions. Technological improvements like catalytic converters enable significant reductions of NO_x emissions caused in combustion engines. The diffusion of new registered vehicles with better emission standards lead to decreases of NO_x emissions from cars, buses, vans (LDV) and trucks (HDV). Besides the measures implemented to improve the efficiency of road modes, no special measures are considered to further improve NO_x emissions. Nevertheless, passenger car NO_x emissions are expected to decline by -65%, bus emissions by -77%, van emissions by -59% and truck emissions by -71%. In absolute numbers, this means a reduction of -2 Mt NO_x until 2030 compared with 2006. The development of NO_x emissions per road mode illustrated in Figure 9-15 demonstrates that the reduction potential is higher for buses and trucks, while the technological standards for passenger cars and vans are at a higher level already in 2006. Hence, the share of NO_x emissions by passenger cars increases until 2030 up to 61% of all road NO_x emissions.



Source: iTREN-2030 – ASTRA

Figure 9-15: NO_x emissions (WTW) from road transport by mode

A closer look at the regional differences (see Figure 9-16) reveals that the "Big Four" and northern European countries are able to reduce NO_x emissions more substantially than the eastern and southern European countries. This development is caused by the smaller road transport performances in the first two country groups and the higher emission standards of their vehicle fleet.

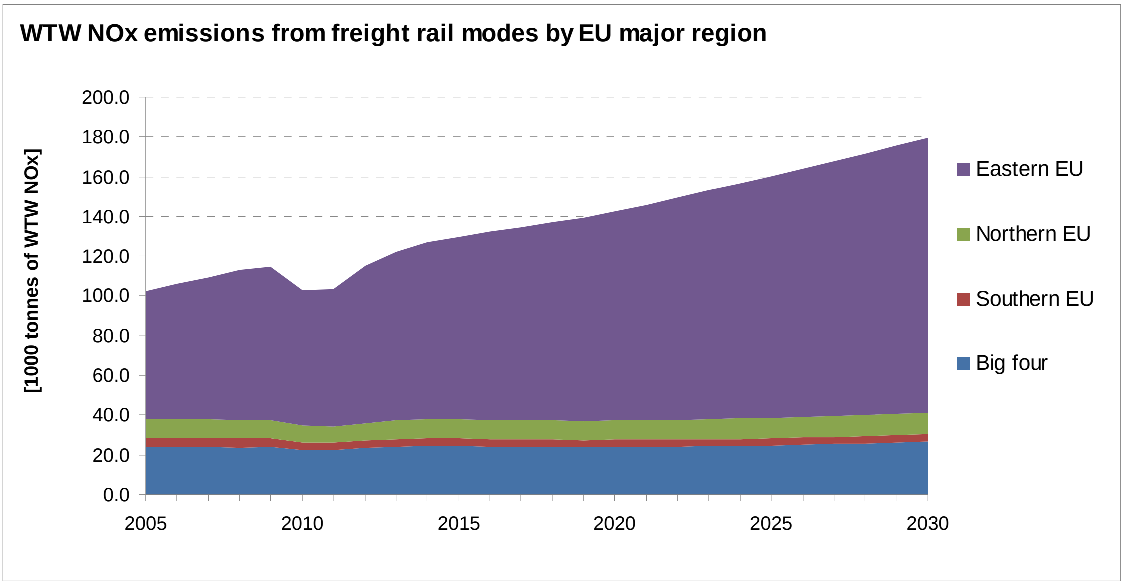


Source: iTREN-2030 – ASTRA

Figure 9-16: NO_x emissions (WTW) from road transport by major European regions

9.3.3 NO_x emissions from rail modes

It was previously mentioned that no specific measure has been implemented in terms of rail modes emissions. As happened for CO_2 emissions (Section 9.2.4), the total NO_x emission from freight rail modes increase by more than 38% between 2006 and 2030. Due to the strong increase of rail freight activities in the region, most of these emissions will be produced in the eastern European countries, 63% in 2006 which rises to 77% in 2030 (Figure 9-17).



Source: iTREN-2030 – TREMOVE

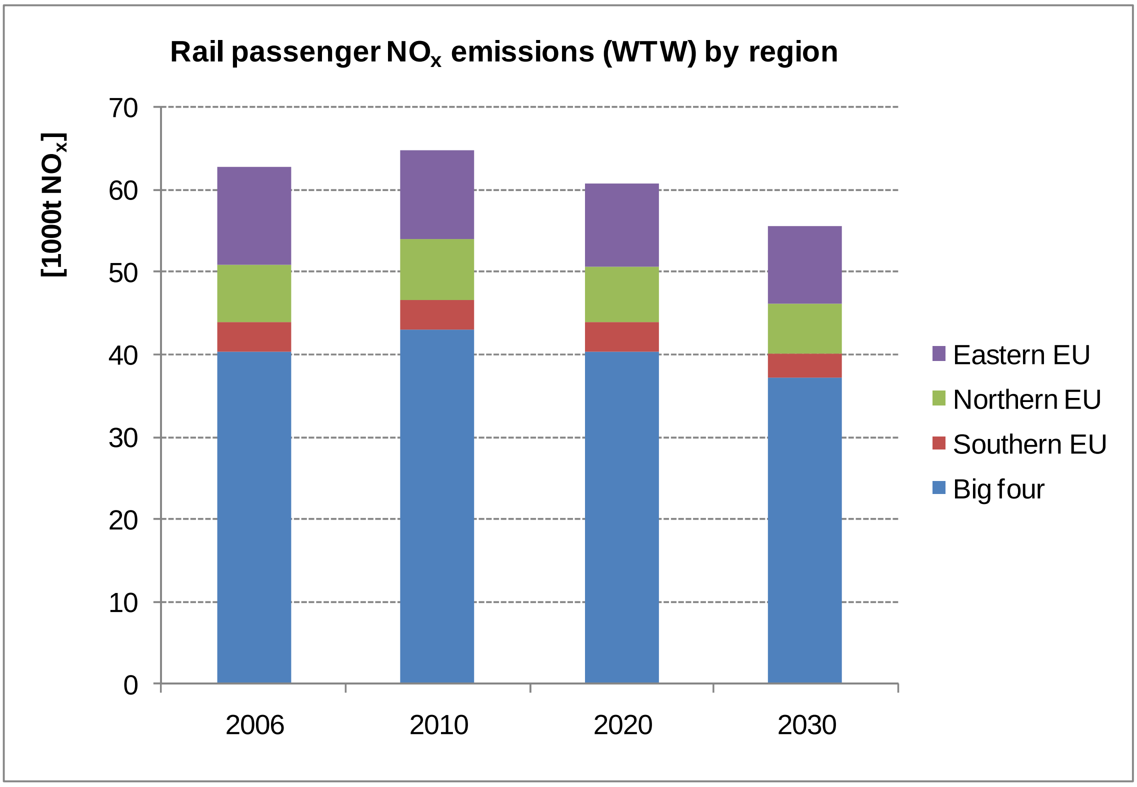
Figure 9-17: NO_x emissions (WTW) from rail freight modes by major regions

Freight diesel trains are the main contributor of the total exhaust (tank-to-wheel) NO_x emissions from freight rail modes, as shown in Table 9-1. The well-to-tank NO_x emissions produced by electric trains also show significantly larger shares than those produced by diesel trains, which is caused not only by the fact that demand for the electric trains is higher than the diesel trains, but also by the higher average of well-to-tank NO_x emission factors of electric trains.

Table 9-1: Share of different NO_x emission types from rail freight modes

Fuel	Nox emission type	2006	2010	2014	2018	2022	2026	2030
Diesel	Exhaust	69.39%	70.46%	71.70%	72.97%	74.03%	75.04%	76.10%
Diesel	Well-to-tank	2.54%	2.57%	2.62%	2.67%	2.70%	2.74%	2.78%
Electric	Well-to-tank	28.07%	26.97%	25.69%	24.37%	23.27%	22.22%	21.12%

Figure 9-18 shows the development of NO_x emissions from passenger rail transport by four major European regions. The ASTRA model estimates a reduction of NO_x emissions by -11% in the EU27 from 2006 to 2030. As the life-times of railway rolling stock are significantly higher than for road modes, the diffusion of more efficient engines or catalytic converters is a long-term process. The major factor leading to a reduction of NO_x emissions from passenger rail transport is the technological improvement of emissions from power plants and the energy mixture, including the share of electric current produced by renewable energy sources.

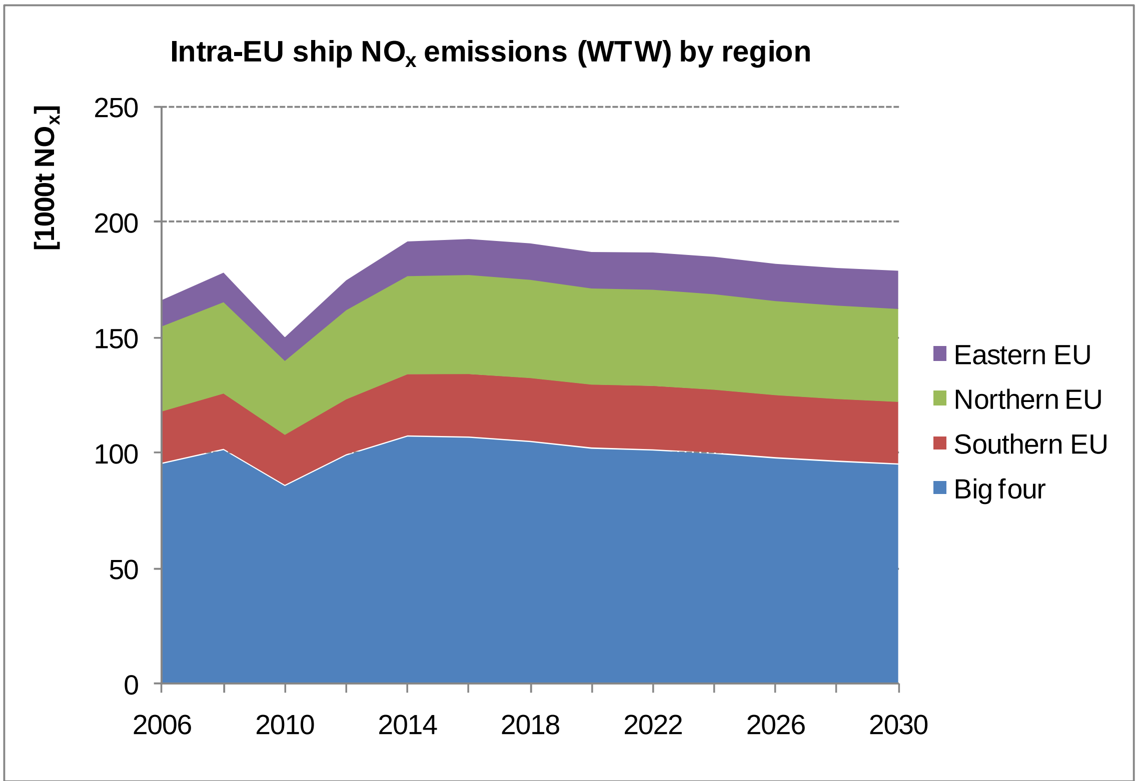


Source: iTREN-2030 – ASTRA

Figure 9-18: NO_x emissions (WTW) from rail passenger by major European regions

9.3.4 NO_x emissions from short sea shipping and inland waterways

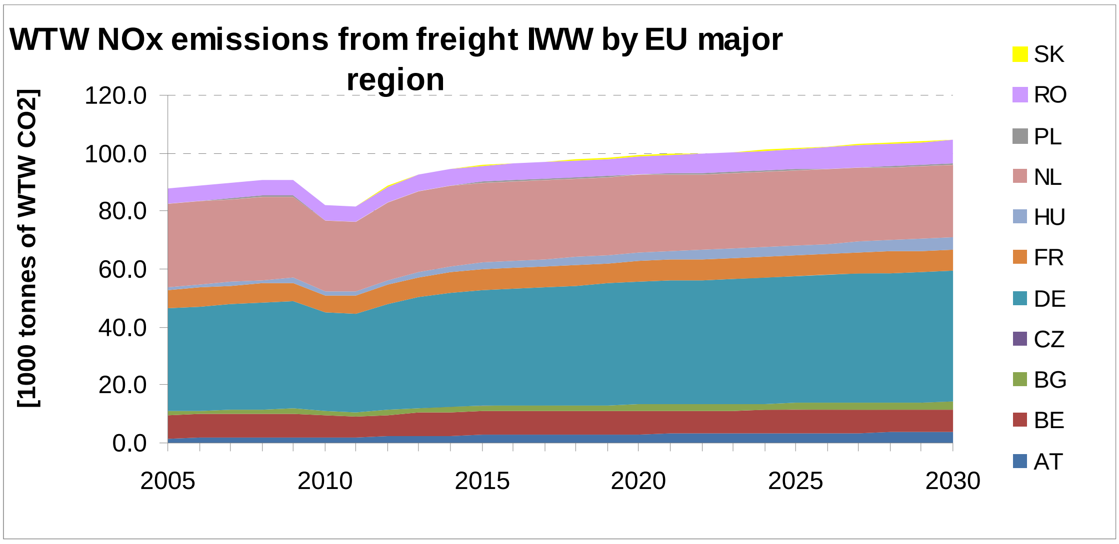
As for CO_2 emissions, demand development is the only driver of intra-EU short sea shipping and freight inland waterways NO_x emissions. Therefore, the growth of NO_x emissions illustrated in Figure 9-19 resembles the pattern of CO_2 emission development. A strong decline of NO_x emissions due to the slump in maritime transport performance in 2009 and 2010 is followed by a catching-up process and a slight decrease after 2015. Hence, the ASTRA model estimates about 1.3 Mt NO_x emissions from intra-EU short sea shipping in the EU27 in 2030, which means a slight increase of +7.5% compared with 2006. Short sea shipping originating in the "Big Four" countries contributes 53% to the total emissions. Other big contributors are Belgium, Greece, Poland, Sweden, Spain and the Netherlands, which are expected to emit 33% of the total NO_x emissions in 2030.



Source *iTREN-2030 – ASTRA*

Figure 9-19: NO_x emissions (WTW) from intra-EU short sea shipping by major regions

For freight inland waterways, an overall increase of 18% of the total NO_x emissions between 2006 and 2030 can be expected, with the Netherlands and Germany contributing around 70% of the total emissions each year (Figure 9-20). The slight difference in the development curves of the NO_x and CO_2 emissions is due to the different emission factors of NO_x and CO_2 in the vessel tonnage classes.



Source: iTREN-2030 – TREMOVE

Figure 9-20: NO_x emissions (WTW) from freight inland waterways by major regions

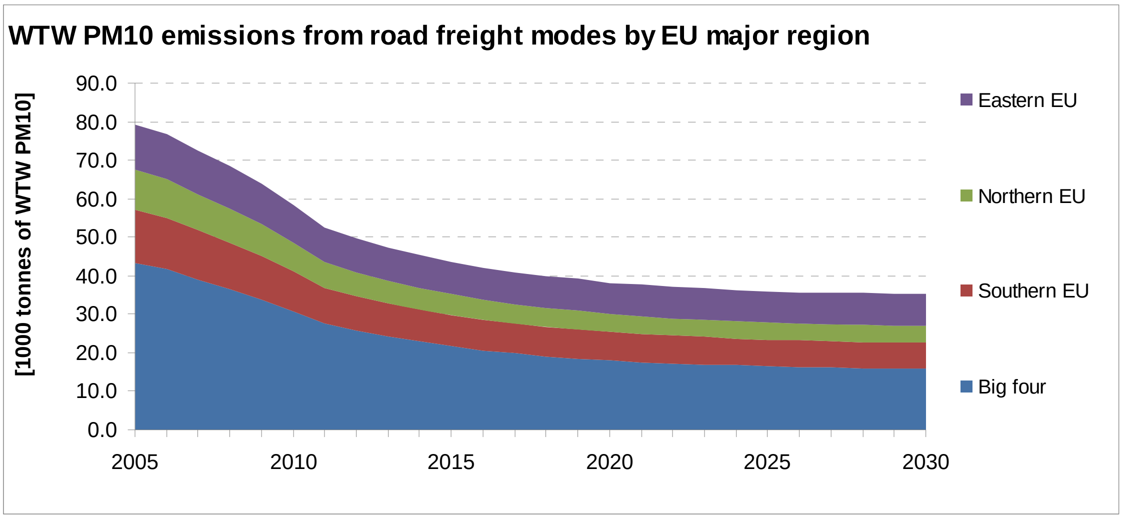
9.3.5 PM_{10} emissions from road modes

PM_{10} decrease strongly in freight and passenger road modes, as a result of the market penetration of new vehicles with new emission standards. The following emission standards have been implemented in the Integrated Scenario:

- Passenger cars: Euro 5 (introduced in 2009), Euro 6 (2014)
- Freight light duty vehicles and passenger vans: Euro 5 (2010), Euro 6 (2015)
- Heavy duty vehicles: Euro 5 (2008)

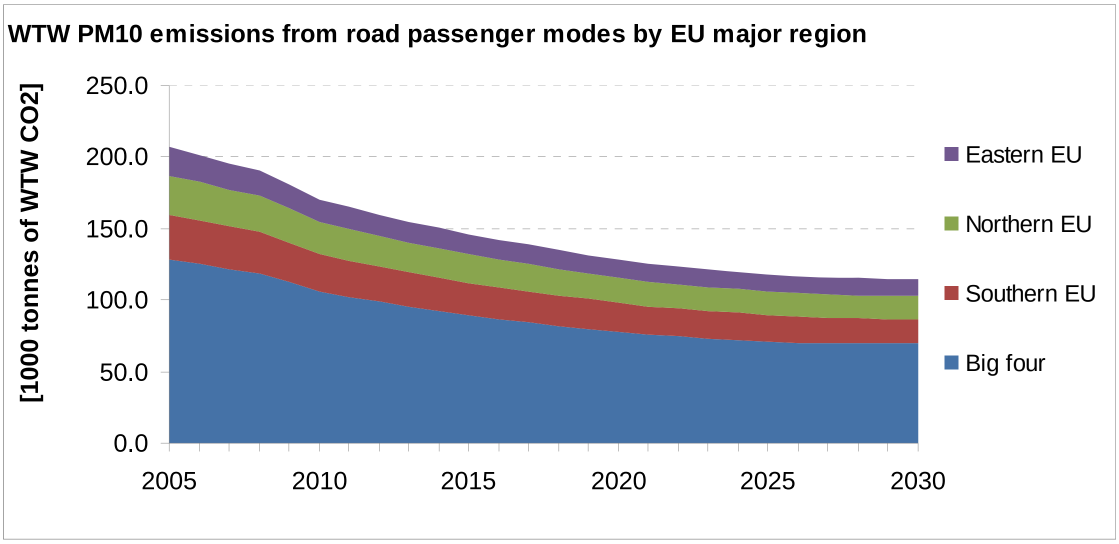
No new emission standards are assumed to enter the market after 2015, the year of the implementation of Euro 6 for LDV and vans, and starting from 2016 onwards, the only source of PM_{10} reduction is the renewal of the fleet following vehicle stock dynamics. As a consequence, the decrease slopes of PM_{10} emissions curves after 2015 become less steep compared to the previous years, as shown in Figure 9-21 and Figure 9-22.

For road freight modes, it can be expected that during the 24-year period the total PM_{10} emissions will decrease by nearly 54%, or 2.24% annually. In absolute terms, PM_{10} emissions from road freight modes will decrease in all of the major regions in the EU27. The "Big Four" countries reduce their share in total PM_{10} emissions from road freight modes significantly, while at the same time the share of the eastern EU countries will increase.



Source: iTREN-2030 – TREMOVE

Figure 9-21: PM_{10} emissions (WTW) from road freight modes by major regions



Source: iTREN-2030 – TREMOVE

Figure 9-22: PM_{10} emissions (WTW) from passenger road modes by major regions

On the passenger side, the decrease between 2006 and 2030 will be nearly 43% (or 1.8% per year). The share of the PM_{10} emissions between the different major regions remains relatively stable during the whole period, with the "Big Four" countries as the major contributor with more than 60% and the eastern countries as the smallest contributor (10%). The share of northern and southern EU countries remains at the level of 13-14% during the whole period.

10 Policy Package Scenarios

As mentioned in the description of INT results in the previous chapters, a classical impact assessment of policy measures implemented in the INT Scenario is difficult to carry out, as the financial crisis was taken into account in the INT, but not in the REF scenario. A detailed assignment of impacts to policies and crisis causes is not possible. The only possibility to assess impacts is to define homogeneous policy packages out of all INT measures, exclude them from a new scenario that then represents an INT minus policy package scenario, and then compare these to the full INT Scenario. A scenario analysis of this type is performed and described in this chapter.

Three consistent packages of policies and technical measures are chosen. In order to facilitate the analysis of the three packages, the policy packages are defined by excluding policy measures from the complete INT Scenario set.

Further, the purpose of these policy packages is twofold:

- First, the analysis should differentiate the impacts of the various policy packages as part of the full impacts of the Integrated Scenario.
- Second, it is a methodological test to gather experience in using the full model suite versus the use of selected model groups or single models of the model suite.

Thus the policy packages are analysed, applying not the full model system of iTREN-2030 as in the Integrated Scenario, but to selected model(s) that seem appropriate to undertake the analysis. The following three policy packages have been designed and analysed:

- **PP1** – Energy and transport pricing, which excludes the pricing policy measures (e.g. feed-in tariffs, tax harmonisation, EU-ETS extensions). This package is analysed using the ASTRA-POLES model combination.
- **PP2** - Regulation and new efficiency technologies, which excludes the setting of CO_2 emissions standards for cars and light duty vehicles. This package is analysed using the TREMOVE model.
- **PP3** - New engine technologies and soft measures, which excludes the emergence of new engine technologies (i.e. battery electric vehicles and hydrogen fuel cell), of ultrafluid lubricants and low resistance tires, and of enforcing truck driver education. This package was supposed to be analysed using the ASTRA-POLES model combination, but the impacts in POLES were very limited, so the results analysed concentrate on the effects measured by the ASTRA model.

10.1 PP1 – Energy and transport pricing

10.1.1 Policy measures in PP1

The Integrated Scenario PP1 is based on the INT scenario but the pricing policies are altered:

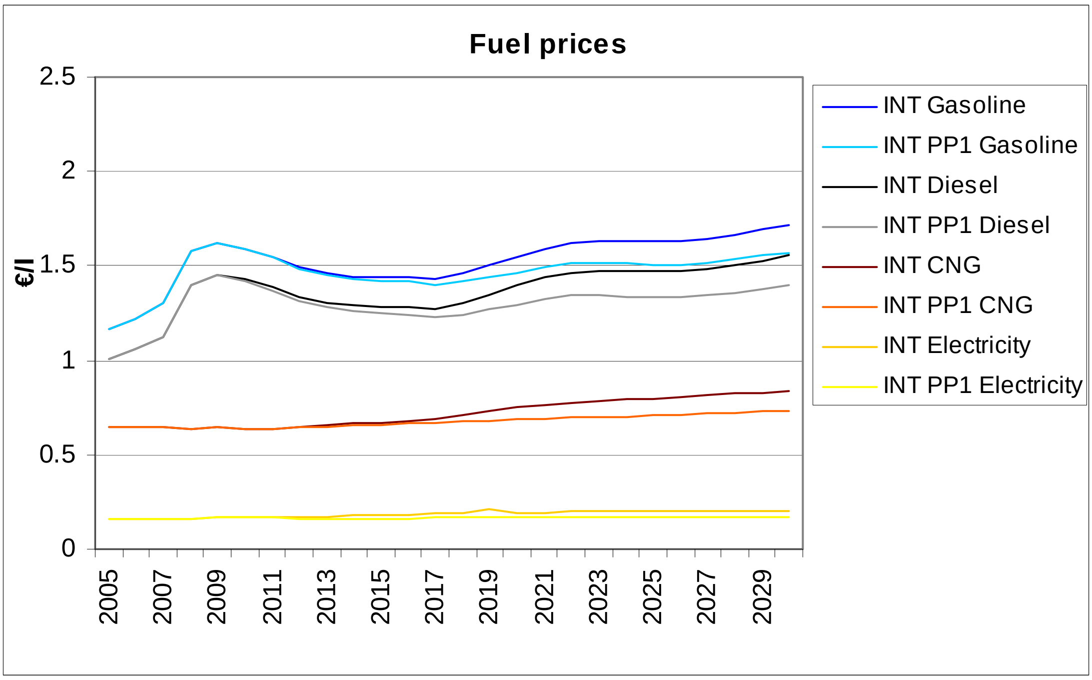
- We do not consider the binding unilateral European greenhouse gas reduction target for 2020 (i.e. -20% below 2020 levels). Instead, CO_2 emission targets agreed by the Kyoto Protocol and implemented in national allocation plans (NAP I + II) are considered. Plans are defined country-wise and on a sectoral basis, therefore their translation into modelling input is quite complex. Main policy instrument to reach the CO_2 emission target is the European Emission Trading System (EU-ETS). In POLES ETS is reflected by a carbon price which is applied to energy intensive sectors which are included in the first phases of EU-ETS. Therefore, the carbon price increases from todays level less than in the INT scenario. It reaches a level of around 16 $€_{2005}$ per tonne of CO_2 in 2020 (instead of 27 $€_{2005}$ as in INT).
- The European target of a 20% share of renewables in final energy demand is not taken into account. Therefore, existing feed-in tariffs are considered until 2010, but are removed afterwards.
- The fuel tax harmonisation and especially the Diesel Directive is not considered. Fuel taxes remain at the current levels.
- Road pricing measures like the charges for trucks and cars on interurban road network or city tolls are excluded from PP1.
- Additionally, the inclusion of air transport into EU-ETS is factored out.

Improvements in energy efficiency and increase of energy savings are considered as in INT. Member States are supposed to reduce their final energy consumption by 20% compared to a base scenario. A special focus is directed towards the reduction of energy consumption for buildings.

With respect to the energy supply side, in PP1 it is assumed that the energy mix (including nuclear and renewables) is mainly driven by prices. However, some countries decided to phase out nuclear energy. The phasing-out of nuclear energy is considered in the investment model, so that in those countries the stock of nuclear power plants is not renewed.

10.1.2 PP1 scenario results

Transport fuel prices experienced a strong increase until 2007/08 and a decline due to lower oil prices afterwards. After a period when transport prices stabilise they are expected to increase after 2015. The main increase of transport prices emerges due to growing oil prices. In 2020, the PP1 policy package leads to an increase of gasoline price from 1.46 to 1.55 €$_{2005}$/l and of diesel price from 1.29 to 1.39 €$_{2005}$/l. This equals an increase of 5% respectively 7% lower in 2020. Until 2030 the price differences increase to 8% and 10% respectively.

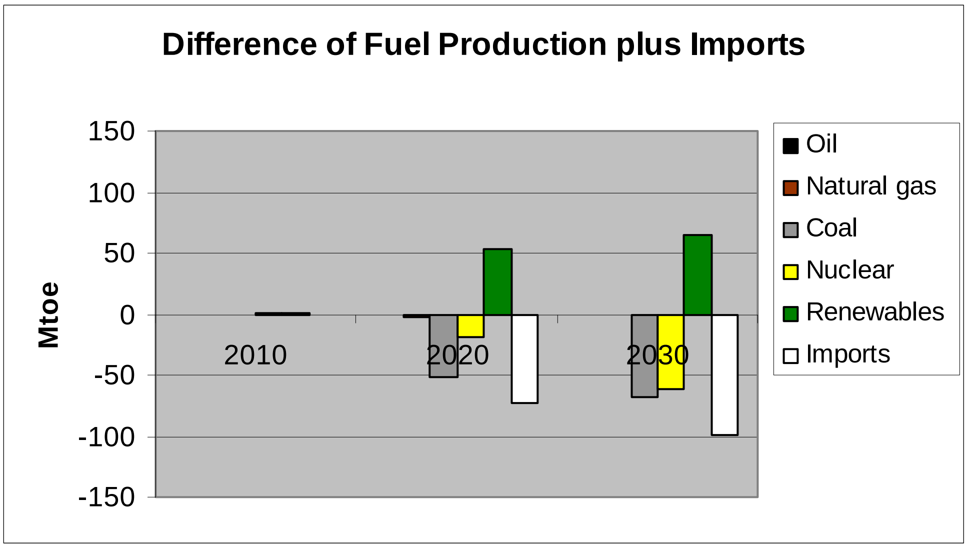


Source: iTREN-2030 – POLES

Figure 10-1: Fuel price development in PP1 scenario

The price of CNG is growing slightly, while the price of electricity (the price refers to the energy content) remains stable. Prices of CNG and electricity are by 9% and 12% higher in 2020 due to PP1. Until 2030 the difference increases to 13% and 18% respectively. The reason for the high difference in the case of electricity is because of the implementation of the higher feed-in-tariffs to reach the renewable target.

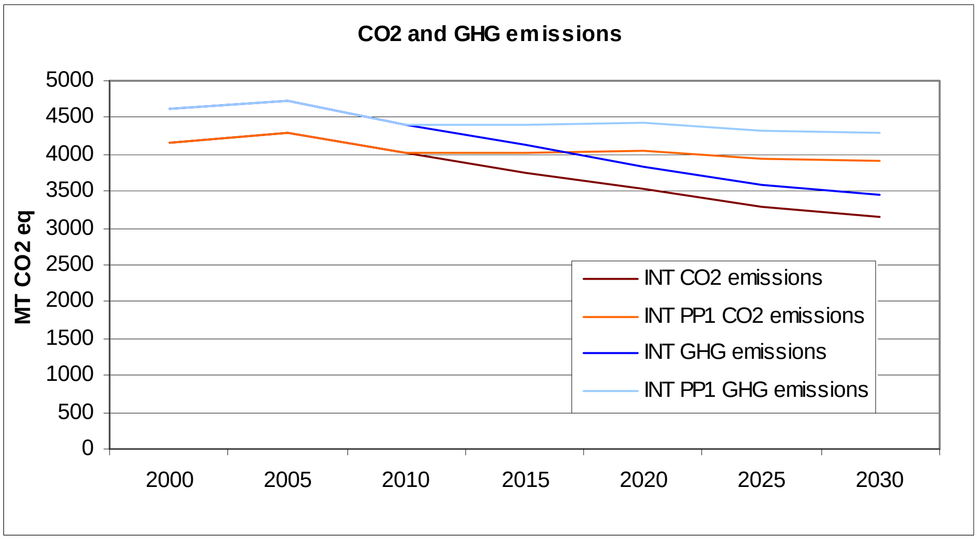
On the energy supply side, we derive similar patterns for both scenario. PP1 will lead to a further increase of renewables by some 50 mtoe and lower fuel production of coal and nuclear. Furthermore, the amount of fuel imports will be lower. Overall the fuel production will be by 150 mtoe lower.



Source: iTREN-2030 – POLES

Figure 10-2: Effect of PP1 on Fuel production plus imports

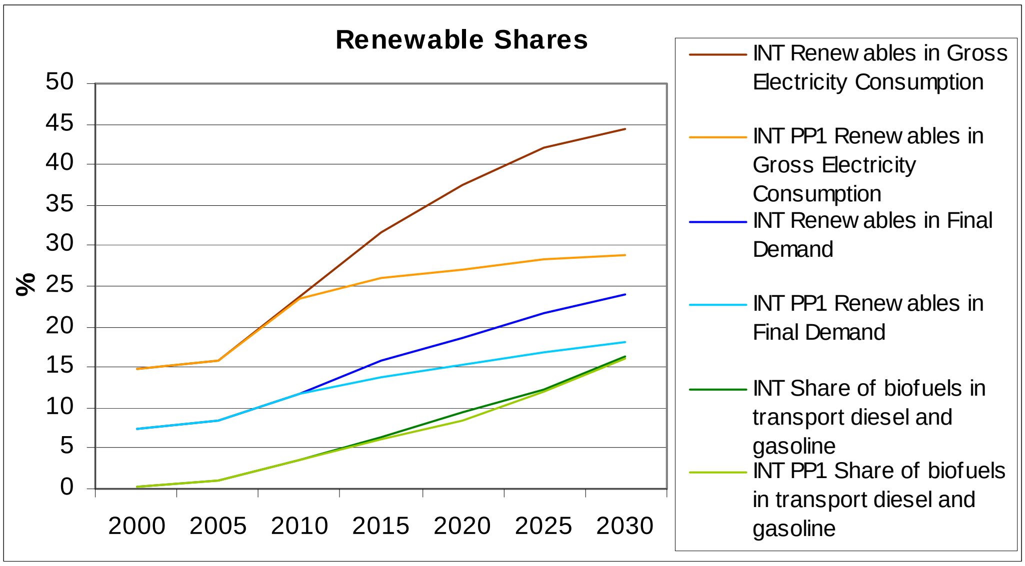
On the demand side, overall energy demand is expected to be stable after a short decline in 2010 due to the economic crises. On a sector basis the energy demand slightly declines, while it slightly increases for the residential sector. With PP1 energy demand of industry is 5% lower in 2020 and 12% in 2030, while it is 2% and 4% decreased in the residential sector and 1% and 2% in the transport sector. This means that the transport sector is less affected by the changes of the pricing measures than in the other two sectors.



Source: iTREN-2030 – POLES

Figure 10-3: CO_2 and GHG emissions in INT and PP1 scenario

Altogether the picture changes quite drastically for the CO_2 and GHG emissions. After a decline due to the economic crises the emission level remains stable until 2020 without implementation of the PP1 policy package. Emissions decline slightly afterwards due to efficiency improvements. But PP1 would lead to further decrease of emissions and enables to meet the GHG emission targets in 2020.



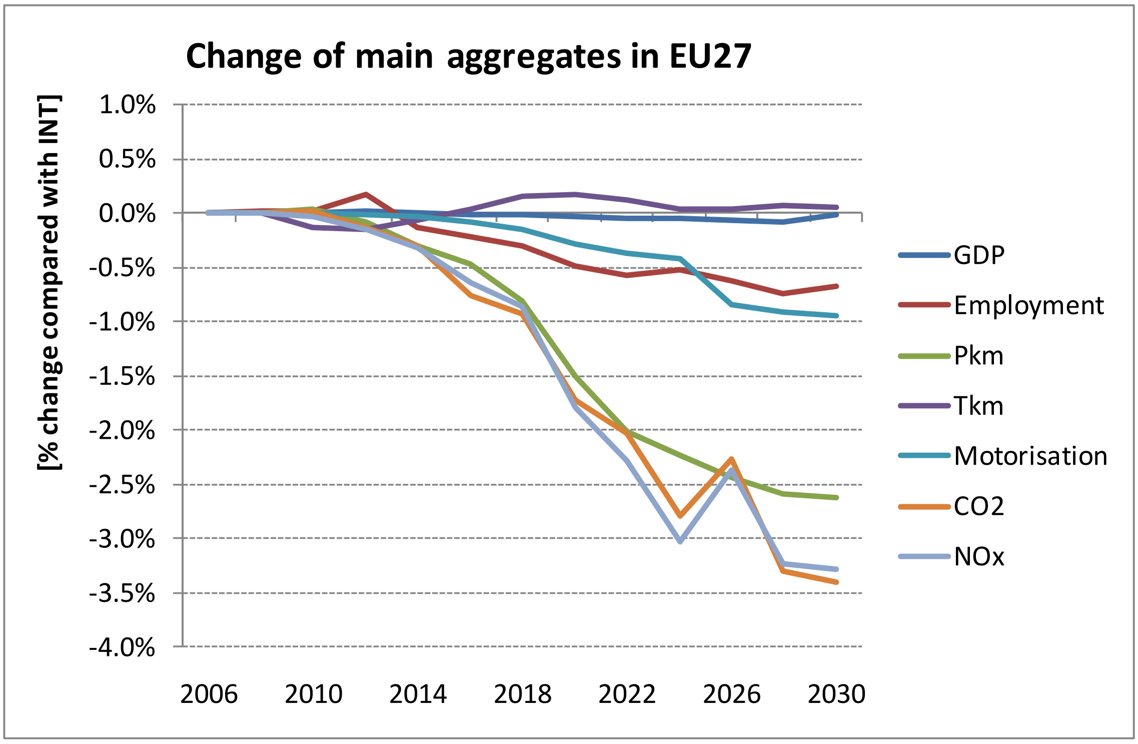
Source: iTREN-2030 – POLES

Figure 10-4: Share of renewables in INT and PP1 scenario

The share of biofuels in transport increases in both scenarios towards 9% in 2020 and continues to increase afterwards. With PP1 the share is slightly higher due to the fuel tax harmonisation and the increase of fuel taxes. However, renewable shares in final energy demand and electricity consumption change more drastically. With PP1 the renewable share in the final energy demand increases towards 18.7% which means that the renewable target is met (see chapter 5). Without PP1 the renewable share would be only 15%. The main reason for the difference is the development of renewables in the electricity sector. While with PP1 there was a strong increase close to 40% in 2020 it remains below 30% without the implementation of pricing policies.

The following figures (Figure 10-5 to Figure 10-8) depict the changes caused by the measures allocated to policy package 1 (PP1). All indicators are computed with the ASTRA model and illustrate the percentage change of each indicator in the INT Scenario compared with the INT PP1 scenario. Hence, a positive change would mean a positive influence of the introduction of the policy package measures.

Figure 10-5 presents the change of major socio-economic, transport and environmental indicators in the EU27 due to PP1. The economic performance in the EU27 is moderately influenced by the pricing mechanisms. Stronger negative impacts caused by the additional burdens for passenger and freight transport are avoided, due to the assumed refunding of at least parts of the toll revenues in the ASTRA model. In the INT scenario 56% of the revenues are refunded in terms of a reduction of direct taxes. GDP is expected to stagnate in the EU27 until 2030. Growing consumption due to the refunding mechanism nearly compensates the negative impacts of pricing measures. In the ASTRA model, passenger transport pricing changes are supposed to influence the input-output model, in such a way that gross value-added in the service sectors is declining. In the following the total employment decreases by -0.7% until 2030. Stronger impacts can be observed for passenger transport performance. ASTRA assesses a decrease of total pkm in the EU27 of -2.6% until 2030. The harmonisation of fuel taxes and the inclusion of air transport in ETS especially are responsible for this development. One of the side effects of this reduction in passenger transport demand is an improvement of average transport times which influences, on the one hand, foreign trade and freight transport performance. The result is a moderate increase of tkm by +0.2% until 2020. The introduction of truck road charges in 2020 on the entire interurban network does not lead to a significant break in this trend until 2030. This is a result of the dimension of the truck road charges suggested in the greening transport package proposal. Truck road charges in countries like Austria, Spain, France, Germany, Ireland, Italy, Portugal, the Czech Republic and Poland are already higher, so that implementing the proposed charges would mean a (real) decrease of charges per tkm. As a result of the significant decline of passenger transport demand and only moderate growth of tkm, ASTRA projects a reduction potential of the pricing measures for CO_2 by -3.4% and for NO_x by -3.3%. In addition to the change of transport performance, the technological composition of passenger car fleets (see Figure 10-8) plays an important role for the depicted emission trends. The preliminary peak in CO_2 and NO_x emissions in 2024 is a result of the combined passenger and freight transport performances which are influenced by the pricing mechanisms.

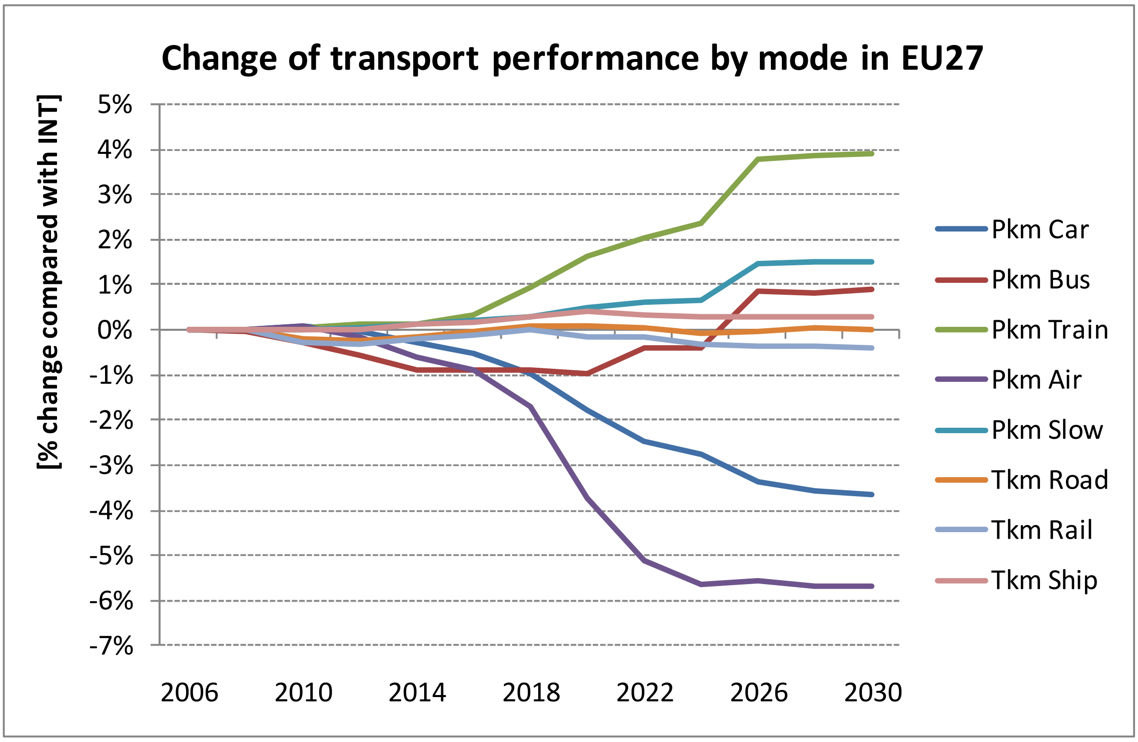


Source: iTREN-2030 – ASTRA

Figure 10-5: Change of main aggregates in the EU27 due to PP1

The change of passenger and freight transport performance per mode in the EU27 in terms of pkm respectively tkm is presented in Figure 10-6. The relative decline of pkm compared to the INT PP1 scenario is mainly driven by the changes in car and air transport performance. Fuel price increases for fossil fuels due to the harmonisation of fuel taxes and the consideration of ETS lead to a changing passenger transport distribution and a modal shift from air and car to bus and train. In addition, the introduction of road charges for passenger cars on the interurban network and congestion charges in metropolitan areas leads to an immediate reaction in the first two years after the introduction, 2025 and 2026. This reaction can be observed in the strong growth of train, bus and non-motorised pkm in these years compared to the case without pricing measures. Finally, ASTRA estimates an increase of train pkm by +3.9%, bus pkm by +0.9% and non-motorised pkm by +1.5% until 2030. Car pkm and air pkm in the EU27 are supposed to decrease by -3.6% respectively -5.7% compared to the case without pricing measures.

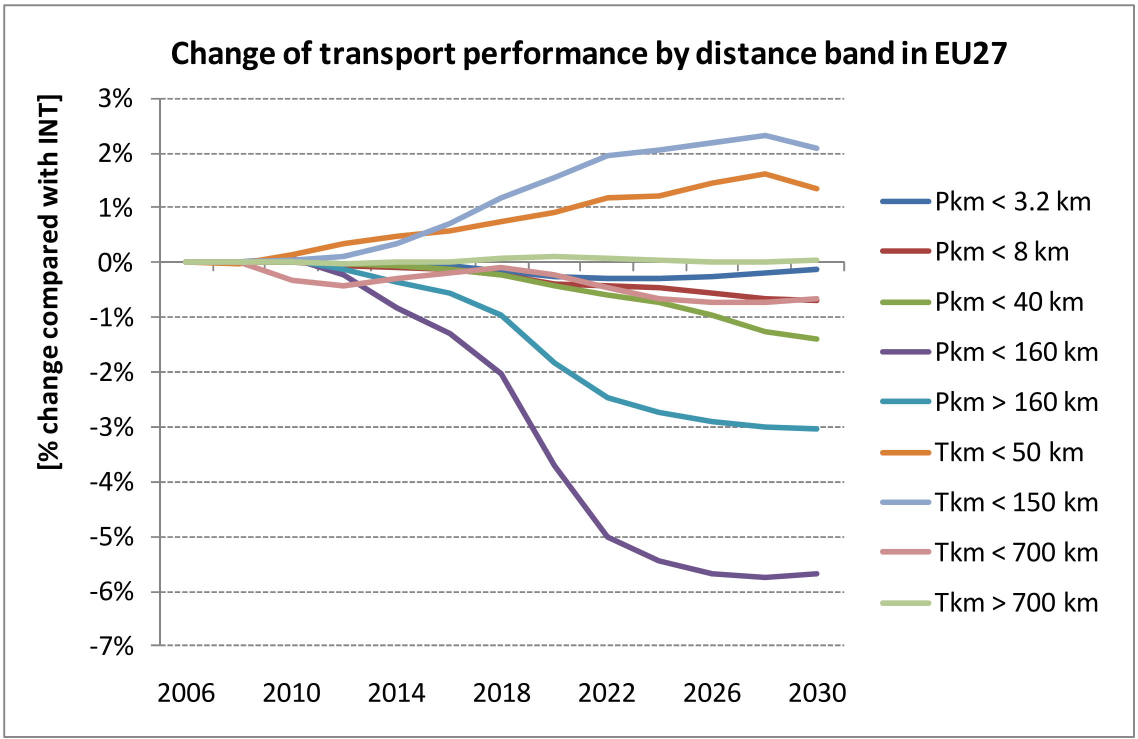
As mentioned above, the reactions on freight transport demand are moderate, compared with the passenger transport demand changes. Tkm changes are nearly zero and the envisaged modal shift from road to rail is even inverted as the pricing package considers lower charges for most EU27 countries in the INT than in the INT PP1 scenario. Hence, rail freight transport demand is expected to lose slightly in terms of a decreasing modal share.



Source: iTREN-2030 – ASTRA

Figure 10-6: Change of transport performance by mode in the EU27 due to PP1

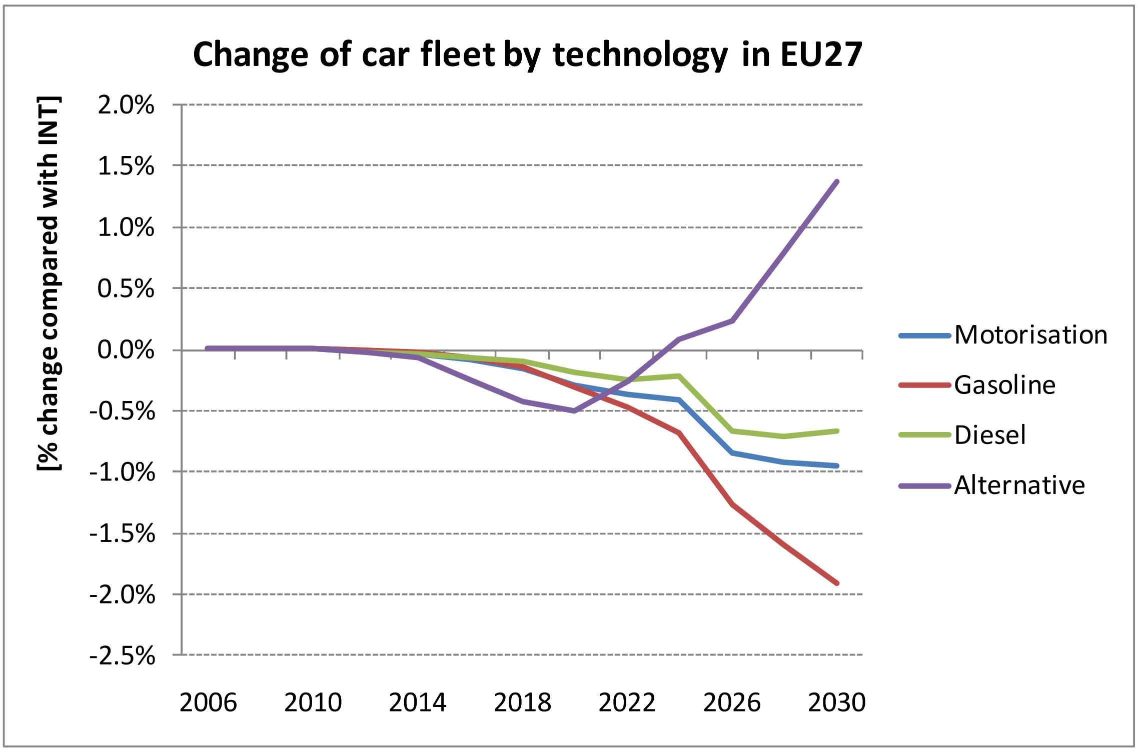
Figure 10-7 demonstrates another effect of the pricing policies in PP1. Additional costs such as road charges, costs induced by ETS and higher fuel prices due to fuel tax harmonisation lead to a decrease of transport demand, especially in the long and medium distance bands. This applies to passenger as well as to freight transport.



Source: iTREN-2030 – ASTRA

Figure 10-7: Change of transport performance by distance in the EU27 due to PP1

According to Figure 10-5, the consideration of pricing policies leads to a slight decrease in the EU27 car fleet stock of -1% until 2030 compared with the INT PP1 scenario. Increasing average fuel prices and road user charges are the drivers of this trend. Figure 10-8 gives an overview on the impacts of the pricing policies on the technological composition of the car fleet. Until 2020 the number of alternatively fueled cars decreases even more than fossil fuel cars as prices for most alternative fuels increase at least as significantly as the prices for fossil fuels, compared with the scenario excluding policy package 1. ASTRA estimates an increase of alternatively fueled cars in EU27 car fleets of +1.4% until 2030. The gasoline car fleet is expected to decrease by -1.9% while diesel cars at -0.7% are less represented in the EU27 car fleet compared with the INT PP1 scenario. As ETS will be introduced for road transport by the beginning of 2020, the prices of fossil fuels will increase significantly after 2020.



Source: iTREN-2030 – ASTRA

Figure 10-8: Change of car fleet stock by technology in the EU27 due to PP1

10.2 PP2 – Regulation and new efficiency technologies

10.2.1 Policy measures in PP2

The integrated scenario PP2 is also based on the INT Scenario, but all measures aiming to achieve the CO_2 target curves for cars and light duty vehicles are removed in the TREMOVE model. These removed measures include:

- the binding CO_2 emission regulation on new registered passenger cars and light duty vehicles (LDV) through technical measures (extra strong down-sizing – without learning) and
- the series of supplementary measures: low rolling resistance tires (LRRT), tire pressure monitoring systems (TPMS), low viscosity lubricants (LVL), and fuel-efficient air conditioning equipment (MAC).

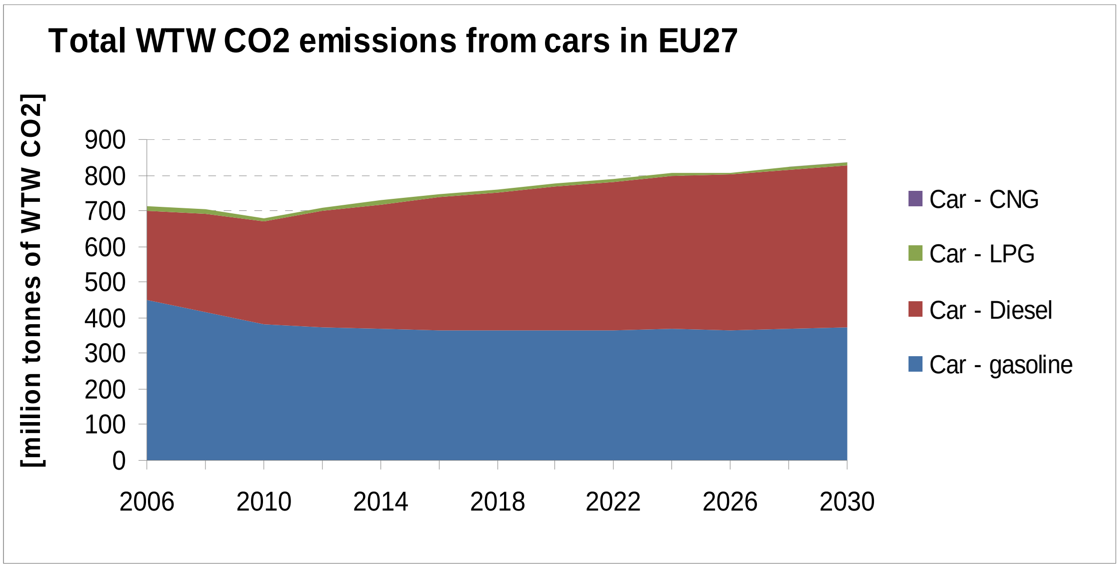
In consequence, the main policy measures that directly affect transport emissions are:

- User charges on HDV implemented between 2020 and 2030 as road charges on all interurban networks based on the greening transport package proposal
- User charging on passenger cars implemented between 2020 and 2030 as road charges on all interurban networks whose values are based on truck charges and ratio between car and truck marginal costs
- City tolls implemented between 2025 and 2030 on all passenger cars at 0.357€/vehicle-km during the peak period

10.2.2 PP2 scenario results

As the PP2 scenario is formed by removing policy measures aiming at achieving CO_2 emission targets of car and LDV from the INT Scenario, the most relevant PP2 scenario results presented in this sub-section thus mainly concern the impact of this removal on the conventional car and LDV CO_2 emissions.

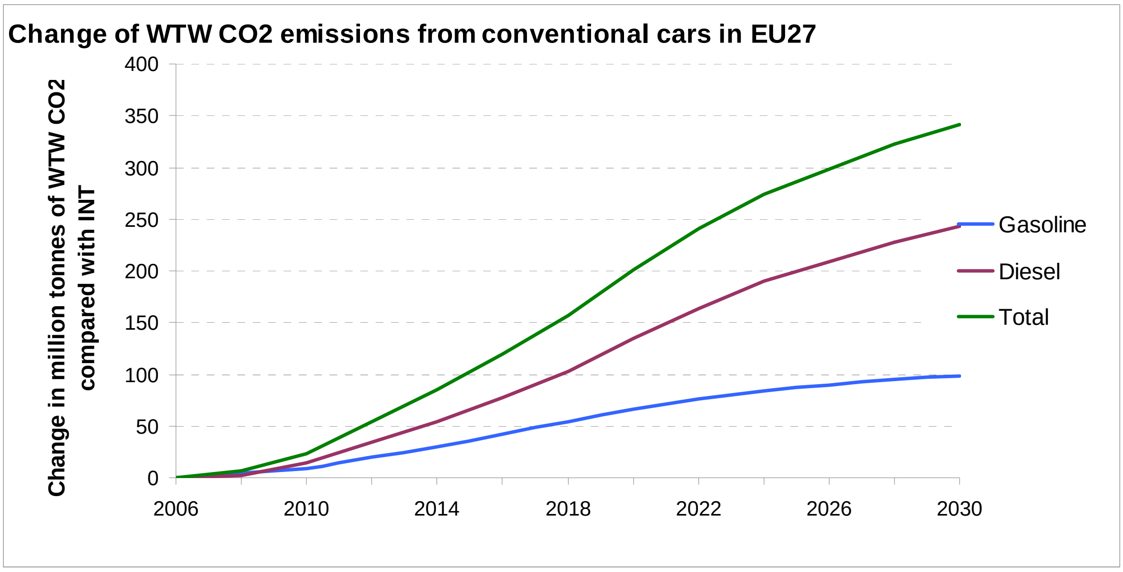
Total well-to-wheel emissions from passenger cars in the EU27 in the PP2 scenario can be expected to increase by around 17% from today's around 700 million tonnes CO_2 to 837 million tonnes CO_2. In this PP2 scenario situation where no CO_2 target is determined, CO_2 emissions from gasoline cars will still decrease from 450 million tonnes in 2006 to 373 million tonnes in 2030 (around 17%), due to the shift in car type choice to other fuel types, diesel principally, triggered by the development of user cost that is estimated to be unfavourable for gasoline cars. CO_2 emissions from diesel cars, in contrary, can be expected to increase greatly, by more than 80% during the observed period (Figure 10-9).



Source: iTREN-2030 – TREMOVE

Figure 10-9: Total WTW CO_2 emissions from cars in the EU27 (PP2 scenario)

In comparison to the Integrated (INT) Scenario, it can be seen from Figure 10-10 that CO_2 target policy measures applied to gasoline cars in INT Scenario reduce the CO_2 emissions from these cars even further, to reach a level of 274 million tonnes in 2030 or a decrease of nearly 40% between 2006 and 2030. The difference between CO_2 emissions from gasoline cars between the two scenarios in 2030 is nearly 100 million tonnes as shown by the blue curve in the figure. The effect of CO_2 target policy measures to the CO_2 emissions from diesel cars is obvious, as shown by the purple curve in the figure: the difference of CO_2 emissions from diesel cars between the two scenarios is 242 million tonnes in 2030.



Source: iTREN-2030 – TREMOVE

Figure 10-10: Change in million tonnes of WTW CO_2 emissions from cars in the EU27 due to PP2

Finally, it is interesting also to observe the impact of the policy package (PP2) scenario on the energy demand from conventional cars in the EU27 (as shown in Figure 10-11). In terms of evolution, due to the PP2 scenario, energy demand from conventional cars in the EU27 can be expected to increase by around 23%, from around 192 mtoe in 2010 to 236 mtoe in 2030. On the contrary, through the application of the INT scenario (with its CO_2 targets), energy demand will decrease by 14% from around 188 mtoe in 2010 to 162 mtoe in 2030. The difference between the two scenarios goes up from 4 mtoe in 2010 to almost 75 mtoe in 2030.

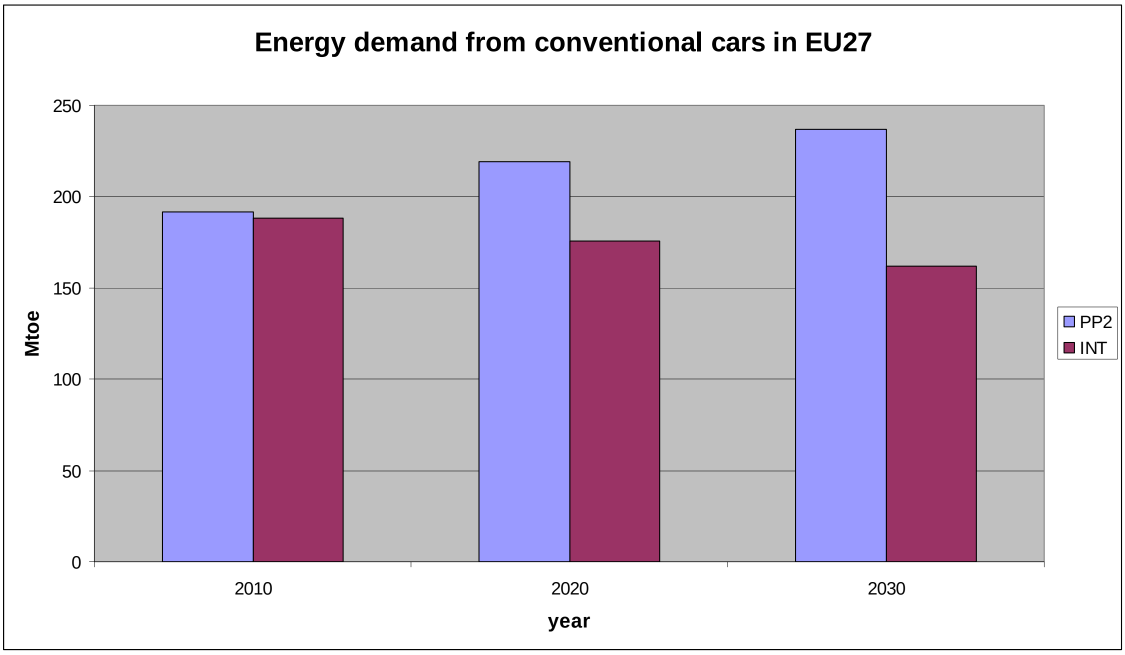


Figure 10-11: Energy demand from conventional cars

10.3 PP3 – New engine technologies and soft measures

10.3.1 Policy measures in PP3

The INT PP3 scenario considers all measures of the INT Scenario, except technical and soft measures. The Scenario excludes the following measures in order to assess the impacts of these measures and assumptions:

- Breakthrough of battery technology so that:
    - battery electric cars enter city car markets after 2012;
    - battery electric LDV enter the market of urban delivery vans after 2015;
- Effective car labelling related to GHG efficiency comes in 2010;
- Binding legislation to use low resistance lubricants in passenger cars in 2010;
- Binding legislation to use low resistance tires in heavy duty vehicles (> 3.5 tons) in 2013;
- Mandatory legislation for regular truck driver education courses to improve fuel efficiency in 2011;
- Enforced implementation of CNG filling stations;

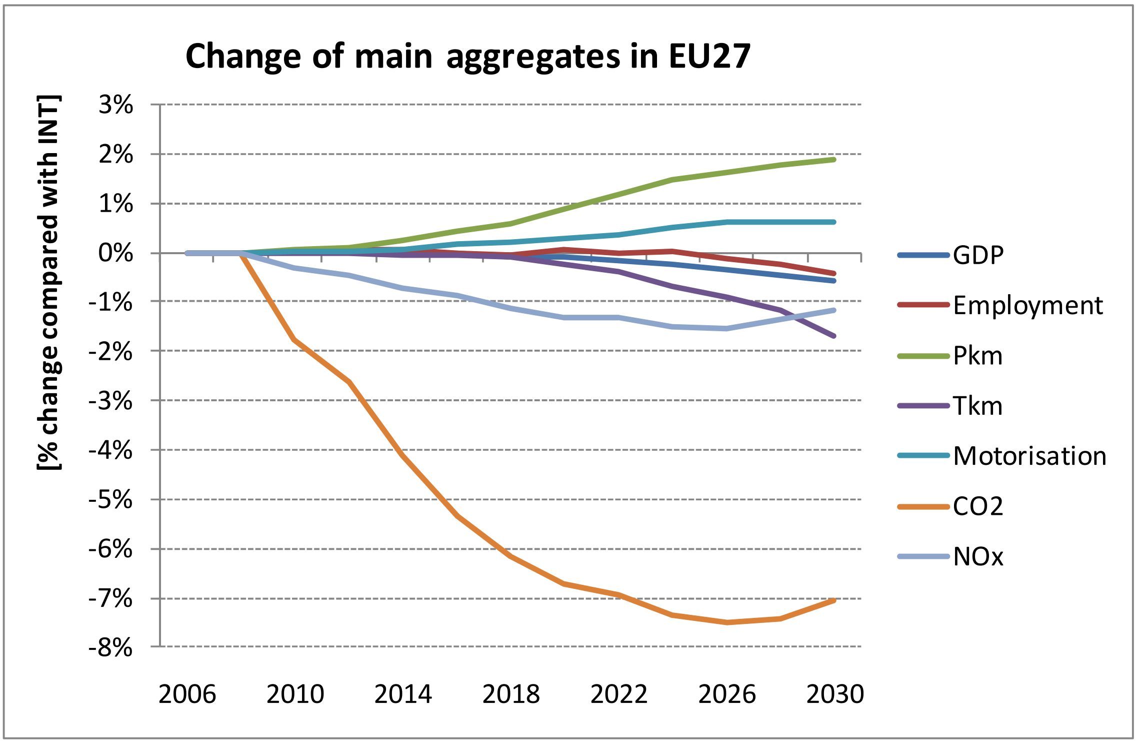
As the complete set of measures is only implemented in the ASTRA model, the following impact assessment is based on ASTRA INT PP3 results.

10.3.2 PP3 scenario results

Similar to the analysis of the PP1 scenario, the results are presented in terms of changes between the INT and INT PP3 scenarios. Positive changes reflect positive impacts of the measures excluded in the INT PP3 scenario. All results are expressed for the EU27.

Figure 10-12 shows the change of major indicators caused by the PP3 measures. ASTRA simulates a moderate decline of GDP in the EU27 by -0.6% until 2030 in the INT, compared with the INT PP1 scenario. Employment follows the GDP trend as gross value-added is one of the drivers of labour market developments in ASTRA and influenced by final demand, respectively, in the end GDP again. The loss of GDP is induced by the development of government revenues which decrease, due to the changing vehicle fleet structure. The substitution of fossil fuel cars by mainly electric battery cars initiated by the PP3 measures leads to a slump in fuel tax revenues and growing government debt. Investments react first to this development and initiate a slight negative change of GDP.

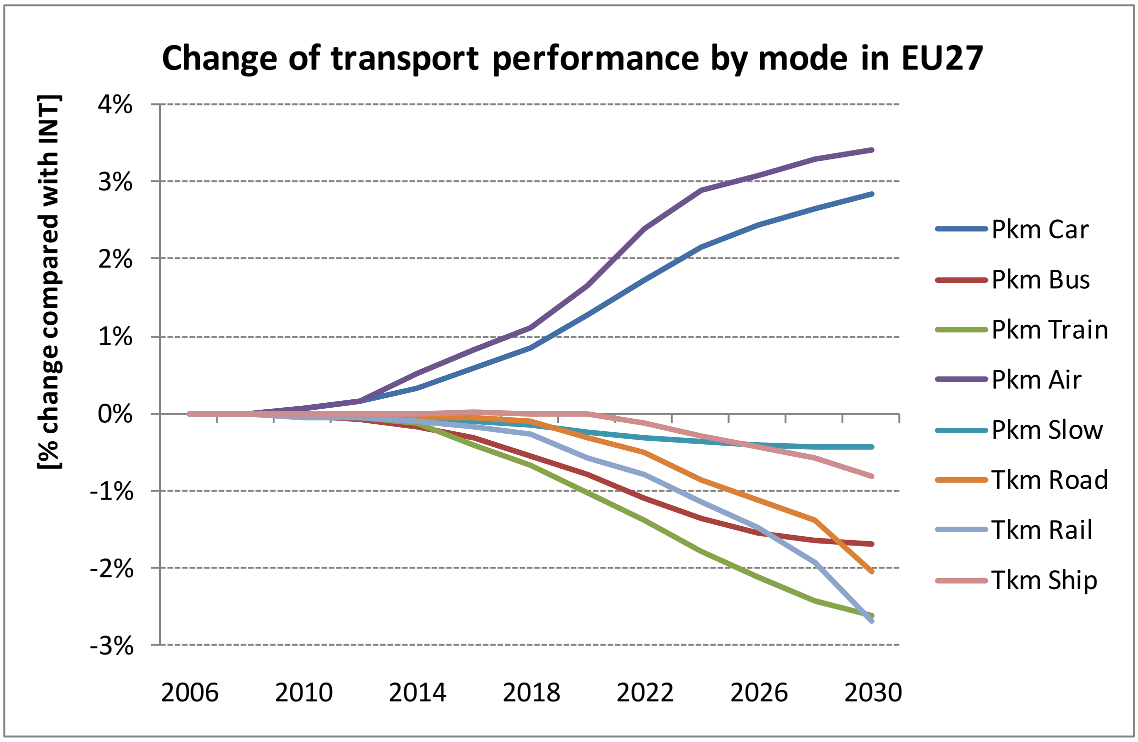
Passenger transport demand in terms of pkm is expected to change by +1.9% until 2030. Improvements in fuel efficiency due to the mandatory measures for passenger cars and the influence on car purchase choice by GHG efficiency labelling lead to decreasing average costs per vehicle-km. In the last decade, the increasing share of battery electric cars initiate an additional effect, as battery electric cars are about 35% cheaper per vkm than average fossil fuel cars. Therefore motorisation (+0.6% until 2030) and pkm increase. A similar effect of soft measures in road freight transport is not observed, as freight volumes are linked to export and national production development in ASTRA. The moderate negative economic development results in a decrease of tkm of -1.7% until 2030 due to the measures of PP3. This impact is enforced by the positive change of passenger transport demand which leads to rising average transport times, especially for road freight transport. As a result of the technological change of vehicle fleets and the transport performance, CO_2 emissions are expected to decrease by -7.1% until 2030. The change of CO_2 emissions is rather moderate due to increasing passenger transport demand, especially for car and air transport (see Figure 10-13).



Source: iTREN-2030 – ASTRA

Figure 10-12: Change of main aggregates in the EU27 due to PP3

The change of passenger and freight transport performance by transport mode is illustrated in Figure 10-13. Air pkm and car pkm are expected to gain modal shares compared with the INT PP1 scenario. The development of car pkm (+2.9% until 2030) is not astonishing, as fuel efficiency improvements and growing motorisation increase the competitiveness of the car mode. The result of growing air transport performance is a second round effect which seems to be implausible at first sight. The distribution of passenger trips in ASTRA is driven by changes of averaged generalised costs over all modes. As these costs decrease on average due to the improvements for passenger cars, the probability of longer distance trips grows. In the modal split stage, the higher demand for longer trips leads to an increase of air pkm. Nevertheless, the ASTRA projection can be seen as an optimistic projection of this increase. Modal shares of passenger rail are substituted by car and air due to the PP3 measures which worsen the environmental performance of the PP3 measures slightly.

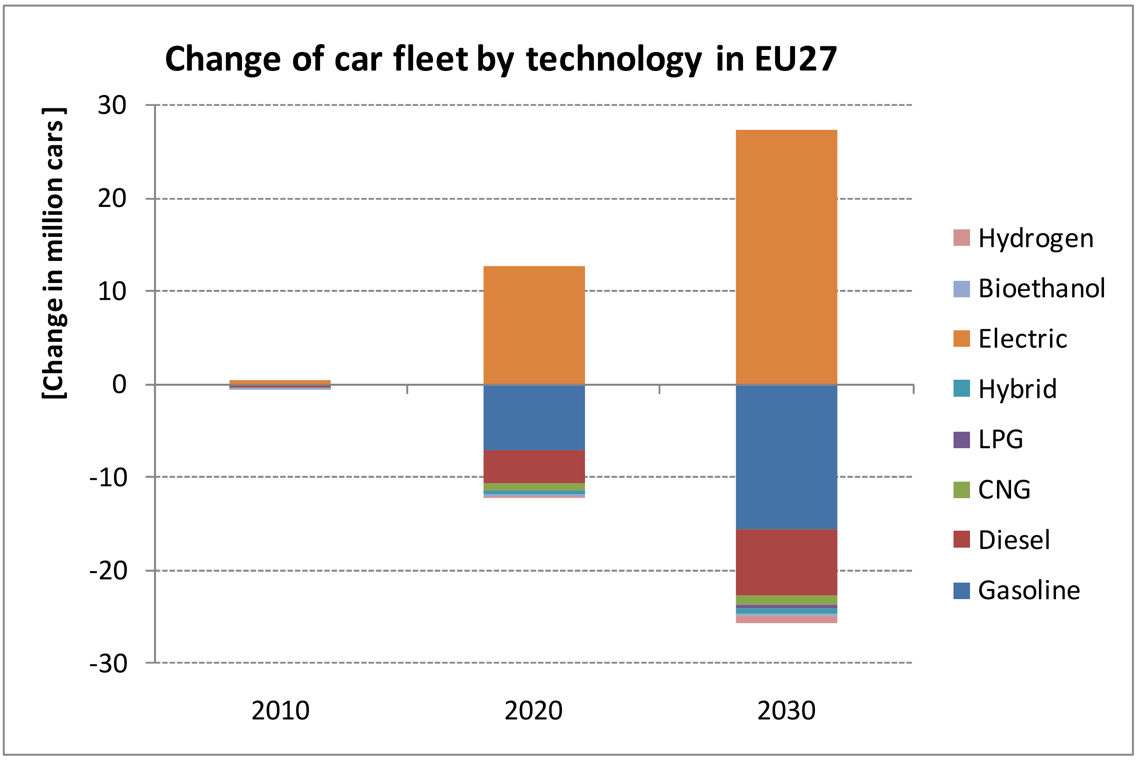


Source: iTREN-2030 – ASTRA

Figure 10-13: Change of transport performance by mode in the EU27 due to PP3

The depicted changes for freight transport performance demonstrate the influence of transport times on the modal split in ASTRA. Ship tkm are decreasing less than truck tkm, that is, by -0.8% compared with 2.1%. Growing road passenger transport demand leads to increasing average transport times, which influences the freight modal split. Therefore, the positive impacts of low resistance tires and driver education is not as obvious as the measures leading to passenger car fuel efficiency improvements.

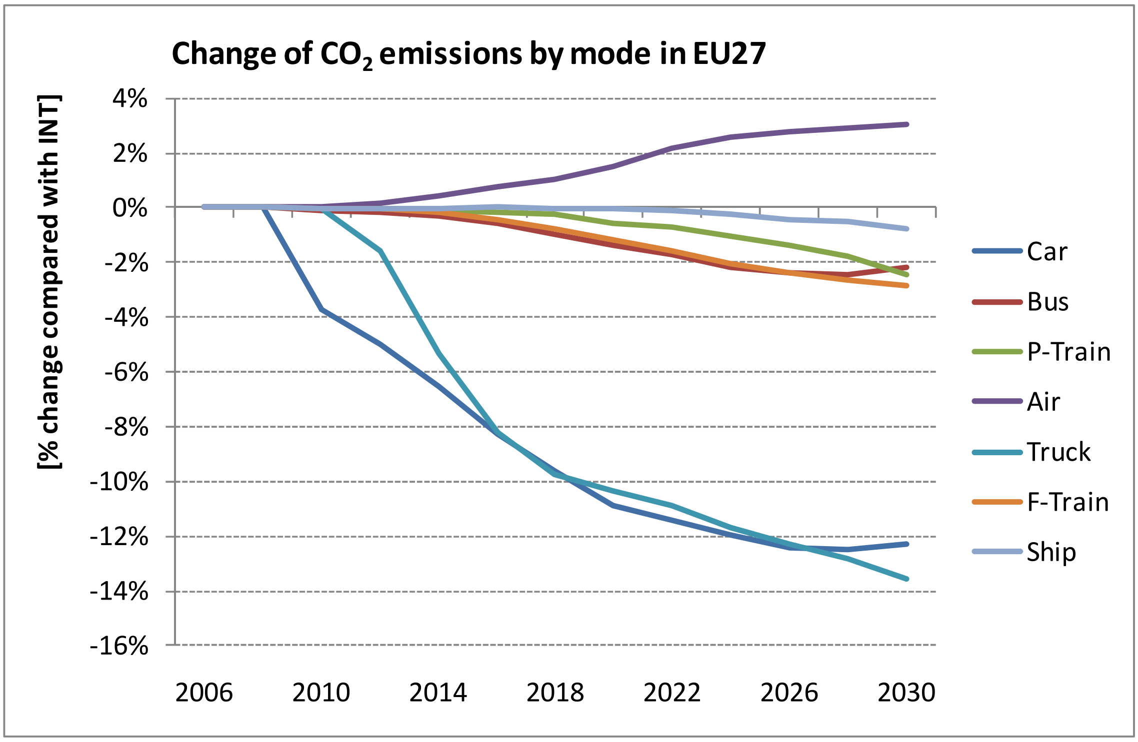
Figure 10-14 presents the difference in car technology diffusion brought about by the assumed breakthrough in battery technology. Besides the technical improvements in battery technology, leading to growing cruising ranges in battery electric cars, the INT Scenario assumes an increased acceptance of battery electric cars in metropolitan areas. The scenario supposes that the economic advantages of using battery electric cars for small and medium distance trips help to overcome the still present demand for large-scale cars that are flexible for each distance. In technical terms, this assumption is implemented by an adjustment of the logit constant representing residual disutilities. Finally, the originally dampening constant is in a similar range as for gasoline, diesel and other alternative fuel cars. ASTRA assesses about 27 million more battery electric cars as a result of this assumption. In absolute terms, mainly gasoline and diesel cars are substituted by this change. In relative terms, the change is in a similar range between -9% (diesel) and -13% (hybrid).



Source: iTREN-2030 – ASTRA

Figure 10-14: Change of car fleet by technology in the EU27 due to PP3

Figure 10-15 demonstrates the resulting changes of transport-related emissions per mode due to the measures assigned to PP3. The significant impact of the battery electric car breakthrough becomes obvious, despite growing car pkm until 2030. CO_2 emissions by passenger cars are expected to decline by -12.2% until 2030. Truck CO_2 emissions can be reduced in a similar range by -13.5% in the INT compared with the INT PP3 scenario. The increase of CO_2 emissions from air transport by +3% is in fact an artefact of the four-stage transport modelling approach as in the generation-distribution stage the average generalized cost are the decisive factor. These cost are reduced by the efficiency improvements of car transport, that in turn generates longer distances transport demand, which in the modal-split stage also increases air transport performance. Thus, the increase of CO_2 from air transport should be neglected.



Source: iTREN-2030 – ASTRA

Figure 10-15: Change of CO_2 emissions by mode in the EU27 due to PP3

10.4 Summary of the findings of policy packages

The results of the policy packages differ between the transport and energy systems. Pricing policy (PP1) is very effective in reducing GHG emissions in the energy sector (both by the ETS and by the feed-in tariffs for renewables), while the impact on the transport sector is limited. At least this means that the pricing measures must be implemented more ambitiously for transport to contribute to stronger GHG reductions than in INT. Otherwise, they should be mainly seen as a flanking instrument to technological and regulatory measures strengthening the reductions of transport GHG emissions of such technological/regulatory measures.

On the other hand, both regulation of vehicle efficiency and support for new technologies combined with soft measures provide significant reductions of GHG transport emissions. With such measures, it is also possible to target reductions for a specifc means of transport, e.g. only cars or only heavy trucks. This would be important when monitoring transport GHG emissions against EU reduction targets reveals that a particular mean/mode of transport endangers the achievement of the reduction targets.

On the methodological side, the findings show that for dedicated policy packages and dedicated analytical purposes of the impact assessment it is sufficient to use only a subset of the models of the iTREN-2030 model suite. For instance, it is sufficient to apply TREMOVE for the efficiency regulation of vehicles as long as the analytical purpose is to address changes of transport energy demand, transport demand and emissions. When the analytical purpose is extended to the economic impacts, it is recommended to also include the ASTRA model to estimate GDP and employment effects.

In particular, if a policy package includes new vehicle technologies, it would be more appropriate to apply ASTRA than TREMOVE, as the vehicle fleet models in ASTRA contain a broader portfolio of vehicle technologies in addition to the conventional diesel and gasoline cars, for which the structure is identical to the TREMOVE fleet model.

Obviously, there would also be some policies for which applying the POLES model only would be sufficient. This concerns energy policies that would change the energy supply mix without significant impacts on fuel prices or on electricity prices, so that the repercussions in the transport system would be very limited. In this case, it might be relevant to link POLES with ASTRA, if the investment patterns of the energy sector are significantly changed in such a way that feedbacks to the economic system would occur.

Generally, the ASTRA and POLES models seem to be most compatible and easily integrated due to:

- the very limited overlap between the models,
- the fact that the major exogenous inputs of one model can be provided endogenously by the other model, and
- implementation on the same software platform, so that the models have the same performance characteristics and use the same technology to implement ex-/import interfaces.

11 Assessment schemes applicable to iTREN-2030

The objective of this chapter is to explain, and prototypically apply, impact assessment schemes that can be used to analyse the findings of the iTREN-2030 Integrated Scenario (INT) besides the analysis of the detailed indicators listed in the Annex. For this purpose, the INT projections for major indicators in the fields of economy, transport, energy, technology and environment are also compared with the Reference Scenario (REF). The impact assessment approaches presented below are based on studies done in previous research projects as well as on scientific literature. At first, a qualitative summary of the changes caused by the policies and measures of the INT Scenario is illustrated by using a scheme for sustainability impact assessment (SIA) that was developed and applied in the TRIAS project [see SCHADE ET AL. 2008]. Secondly, an assessment scheme based on indicators derived from the REFIT project [see MARTINO ET AL. 2006] is shown, which in particular demonstrates the changes for major transport economic indicators. Furthermore, the so-called ASIF scheme to estimate the trends of GHG emissions from transport [see SCHIPPER ET AL. 2000] is presented, by deducing the single components of the ASIF equation from the ASTRA model, which determine the total emissions of greenhouse gases from transport.

11.1 TRIAS – Sustainability impact assessment

Table 11-1 shows a qualitative summary of the changes brought about by the policies and measures of the INT scenario. The depicted impact assessment scheme demonstrates via arrows the direction and intensity of the change of major indicators between the INT and the REF Scenario. Upward pointing arrows painted in green or yellow reflect positive changes of indicators and downward pointing arrows painted in yellow or red represent negative changes of indicators in the INT compared with the REF Scenario. Positive changes in terms of environment and energy consumption would be reductions of emissions and energy, therefore in these fields reductions are displayed via green and yellow upward pointing arrows. For the economy, transport and vehicle fleet, the opposite direction is defined. The previous chapters of this deliverable already pointed out the impacts of the economic crisis. Therefore, the following Table 11-1 demonstrates changes already in the year 2010, even if most measures are assumed to be have been introduced later. The downturn of the economy due to the crisis is obvious. As observed in statistics, for the first two quarters of 2009 the crisis led to significant losses of export volumes and investments, while decreasing consumption and employment are follow-up effects emerging in 2010.

Table 11-1: TRIAS impact assessment scheme of major iTREN-2030 indicators

Topic	Indicator	2010	2020	2030
Economy	GDP	⇘	⇘	⇘
	Employment	⇘	⇘	⇘
	Consumption	⇘	⇘	⇩
	Investment	⇩	⇩	⇩
	Exports	⇩	⇨	⇨
	Transport taxation revenues	⇘	⇘	⇘
Transport	Passenger transport activity originated in the country	⇘	⇘	⇘
	Car	⇘	⇨	⇨
	Bus	⇨	⇘	⇘
	Train	⇘	⇘	⇘
	Air (intra-EU)	⇩	⇩	⇩
	Slow	⇨	⇨	⇨
	Freight transport activity originated in the country	⇩	⇘	⇘
	Road	⇩	⇘	⇘
	Rail	⇩	⇘	⇘
	Ship (intra-EU)	⇩	⇨	⇨
Vehicle Fleets	Car fleet	⇨	⇨	⇨
	Gasoline	⇨	⇘	⇩
	Diesel	⇨	⇨	⇘
	CNG	⇘	⇘	⇩
	LPG	⇨	⇩	⇩
	Hybrid	⇘	⇩	⇩
	Electric	⇧	⇧	⇧
	Bioethanol	⇘	⇨	⇩
	Hydrogen	⇨	⇧	⇧
	Bus fleet	⇘	⇘	⇘
	Light duty vehicle fleet	⇨	⇘	⇘
	Heavy duty vehicle fleet	⇘	⇘	⇩
Energy	Gross inland energy consumption	⇗	⇧	⇧
Environment	CO_2 transport emissions (WTW)	⇗	⇧	⇧
	Road freight	⇨	⇧	⇧
	Road passenger	⇗	⇧	⇧
	Rail freight	⇗	⇗	⇧
	Rail passenger	⇗	⇗	⇗
	Inland navigation	⇗	⇗	⇗
	Maritime (intra-EU)	⇧	⇨	⇗
	Air (intra-EU)	⇧	⇗	⇧
	NO_x transport emissions (WTW)	⇗	⇗	⇧
	Road freight	⇗	⇗	⇧
	Road passenger	⇗	⇗	⇗
	Rail freight	⇗	⇗	⇧
	Rail passenger	⇗	⇗	⇗
	Inland navigation	⇗	⇗	⇗
	Maritime (intra-EU)	⇧	⇨	⇗
	Air (intra-EU)	⇧	⇗	⇧
	GHG non-transport emissions			

Legend:

Economy/Transport/Vehicle Fleet	< -10% = ⇩	< -2% = ⇘	< +2% = ⇨	<+10% = ⇗	> 10% = ⇧
Environment/Energy	< -10% = ⇧	< -2% = ⇗	< +2% = ⇨	<+10% = ⇘	> 10% = ⇩

Source: *iTREN-2030 – ASTRA*

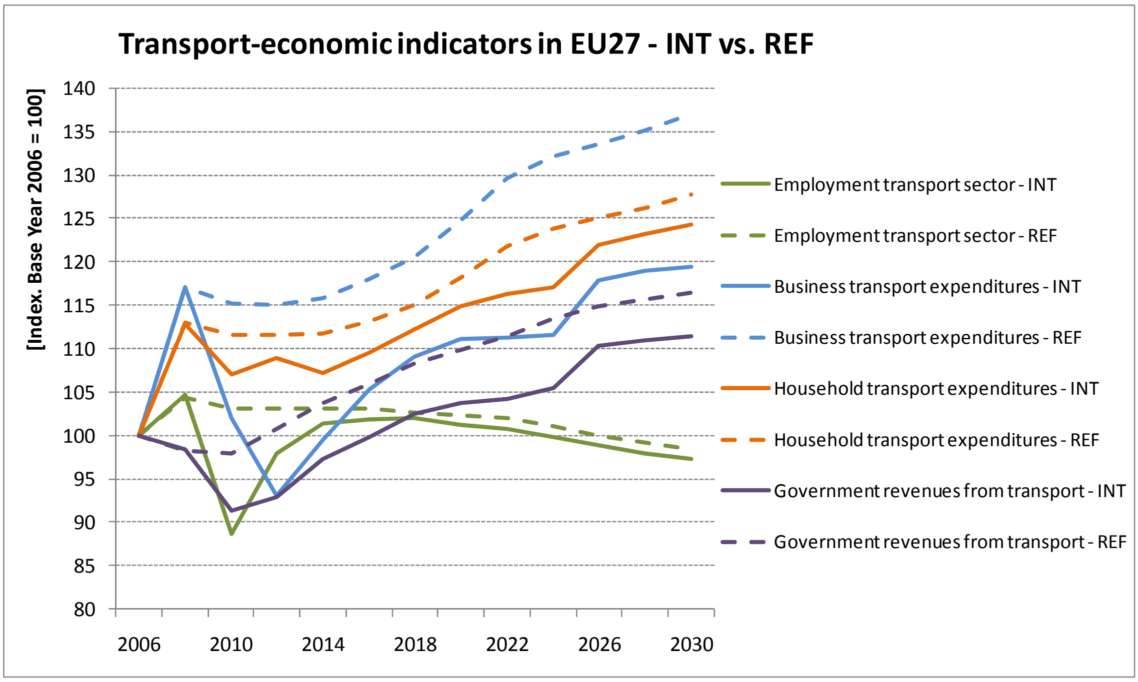
The estimated development of freight transport performance reflects this crisis as well as declining numbers of business trips in passenger transport. Table 11-1 indicates about -5.1% less pkm and -15.8% less tkm in the year 2010, compared with the REF case. The positive consequence of the economic crisis and the lower transport volumes is the reduction of transport-related greenhouse gas emissions in the EU27: total transport-related CO_2 emissions in 2010 are expected to be -7.2% lower than in the REF Scenario and -20% in the case of maritime transport. The projected reduction of CO_2 emissions due to the policies considered in the INT Scenario are rather modest: compared with REF, the ASTRA model estimates about -20.3% less CO_2 emissions in the INT Scenario until 2030, of which about one third seems to be caused by the crisis. The simulated catching-up process in the decade between 2010 and 2020 is the main reason why the economic losses to REF remain limited. As a consequence, freight and passenger transport do catch up as well. Until 2030, ASTRA estimates -3.2% less pkm and -6.7% less tkm which, under the framework of -8.1% loss in GDP compared with the REF case, still constitutes a modest reduction of transport activity.

Despite the downturn of the economy in the years after 2009, the achieved reduction of CO_2 emissions is only moderate, which implies that additional measures should be considered as well or the considered measures should be made more effective. An example for the last category would be road pricing for trucks on the complete interurban networks. Even if the INT covers the complete interurban network and not only motorways, the introduction of the charges and substitution of existing charges according to the Greening Transport Package would result in lower charges on long distances in some countries which already had high motorway tolls for trucks. Another factor which influences the level of change in the INT Scenario is the simulated price development for fossil fuels in the POLES model. As one of the assumptions in POLES is a rather optimistic development of available oil resources until 2030, the prices of fossil fuels do not climb dramatically. Another assumption is the moderate development of CO_2 certificate prices (around € 28 per ton CO_2 in 2030) which does not impact transport significantly.

Besides the changes in the transport activities, the policies induce different speeds of technology diffusion in the EU27 vehicle fleets. The considered breakthrough of battery technology leads to an accelerated diffusion of electric battery cars and light duty vehicles for small and medium distances. Assuming a similar purchasing behaviour as for conventional passenger cars, ASTRA estimates about 27 million battery electric cars in the EU27 by 2030. The computation of CO_2 emissions from electric mobility assumes a high share of renewable energy sources to be used for charging these cars. Besides the positive impacts of a higher share of low emission vehicles in the total EU27 car fleet, a rebound effect emerges in the simulation. Actually, the economic development should result in less passenger car registrations, having an impact on passengers shifting from road to rail or even to slow modes. On the other hand, this is counter-balanced by increasing fuel efficiency, due to the cheaper operation of battery electric cars and to limited CO_2 emissions, which makes the car mode more attractive. Hence, car fleets are expected to develop in similar fashion compared with the REF scenario, despite the weakened economic situation.

11.2 REFIT – Composed sustainability indicators

The iTREN-2030 toolset is able to provide a wide range of sustainability indicators and their development in the fields of transport, the economy, technology and environment. In the REFIT project [MARTINO ET AL. 2006], a series of indicators in the fields of transport, the economy, society and environment have been chosen to perform a sustainability impact assessment. Figure 11-1 shows the expected development of several chosen transport-economy indicators in the INT and the REF Scenario extracted from the ASTRA model and translated into indices, starting with the value 100 for the base year 2006. The first indicator describes the development of employment in all transport service sectors in the EU27 (this excludes all employees of the vehicle production and supplier industries). The economic crisis and its dramatic impacts on freight transport and on passenger flights, leads to a negative development on the labour market in the transport service sectors in the years after 2009. The catching-up process of the economy resulting in strong growth of freight transport after 2010 leads to a re-creation of the labour market in these sectors. Overall, compared to other sectors, the impact of the considered policies on employment in the transport sectors is positive. While total employment changes by -4.7% in the EU27 compared with the REF Scenario, in the case of transport service sectors it is expected to decrease by only -1.5%. Policies like the implementation of road charges and city tolls favour public transport services and thus cause this positive development, compared with the total labour market. Another impact of the crisis is the reduction of total business and private transport expenditures in the EU27 compared to REF (second indicator in Figure 11-1). Business transport activity is influenced significantly, so that the total expenditures for transport services decrease significantly in the years of the crisis. Passenger road charges, which are supposed to be introduced in 2025 in the INT Scenario, are reflected via the obvious growth of household transport service expenditures, but do not bring the spending levels back onto the level in the REF case. The last indicator is the development of total government revenues from transport activities. These revenues cover fuel tax, CO_2 pricing and road toll revenues. Again, the impact of the crisis becomes obvious as passenger and freight transport activity decreases significantly. Despite the introduction of freight (in 2020) and passenger road charges (in 2025), as well as ETS for air and ship transport, the total transport circulation revenues in the INT are expected to be under the level of the REF Scenario. As the assumed measures in the INT Scenario lead to an accelerated diffusion of battery electric cars and light duty vehicles and an improvement of fuel efficiency of conventional road vehicles, fuel tax revenues are decreasing. This decrease is compensated by the additional revenues, but does not exceed the previous level.



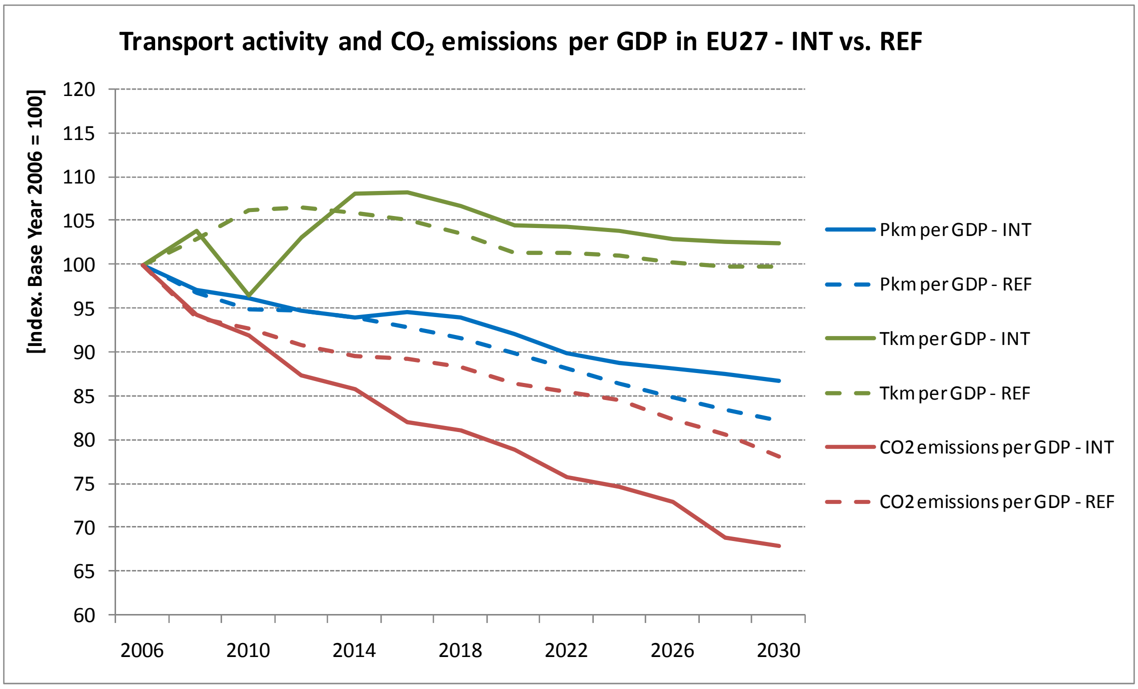
Source: iTREN-2030 – ASTRA

Figure 11-1: Comparison of transport-economic indicators between INT and REF

Figure 11-2 demonstrates the development of passenger and freight transport activities in relation to the economic development represented via GDP in the EU27. The downturn of freight tkm per GDP in the EU27 reflects that freight transport is impacted more severely than GDP in the INT Scenario. Regarding losses of tkm by -16% compared to GDP losses in a range of -6% compared to the REF Scenario, this development is not astonishing. The catching-up process of exports and domestic production leads to a higher growth of tkm per GDP in the INT than in the REF Scenario until 2030. The introduction of standard truck charges on the complete interurban networks in the EU27 influences this development positively, as in many European countries substituting old charges by new ones means a decrease of charges per tkm.

The development of passenger transport activity per GDP seems to be logical at first sight. In times of the crisis, pkm does not decrease as strongly as GDP. As passenger transport activity is derived from socioeconomic dynamics, the impact of the downturn of the economy is only marginal, compared to freight transport. Increased fuel efficiency and thus reduction of variable cost due to the measures of the INT Scenario prevents motorisation from following the GDP trends, so pkm are not affected as severely as GDP.

The last indicator which is presented in Figure 11-2 describes the relation between transport CO_2 emissions and GDP. Despite lower GDP levels in the INT Scenario, this relation is significantly lower than in the REF one. On the one hand, this estimation illustrates the growing fuel efficiency and higher share of battery electric cars and light duty vehicles in the EU27 vehicle fleets, which also reduce the carbon intensity of transport. On the other hand, lower passenger and freight transport activities also contribute to this figure.



Source: iTREN-2030 – ASTRA

Figure 11-2: Transport activity and CO_2 emissions per GDP in INT and REF

11.3 ASIF-scheme for GHG emissions of transport

The ASIF scheme was originally described in a paper prepared by the IEA on behalf of the World Bank [SCHIPPER ET AL. 2000]. It has found prominent application in recent publications of the IEA [IEA 2009, FULTON ET AL. 2009]. ASIF stands for the variables of a generic equation to calculate the GHG emissions of transport that reads:

GHG = **A**ctivity x modal **S**hare x energy **I**ntensity x carbon intensity of **F**uel

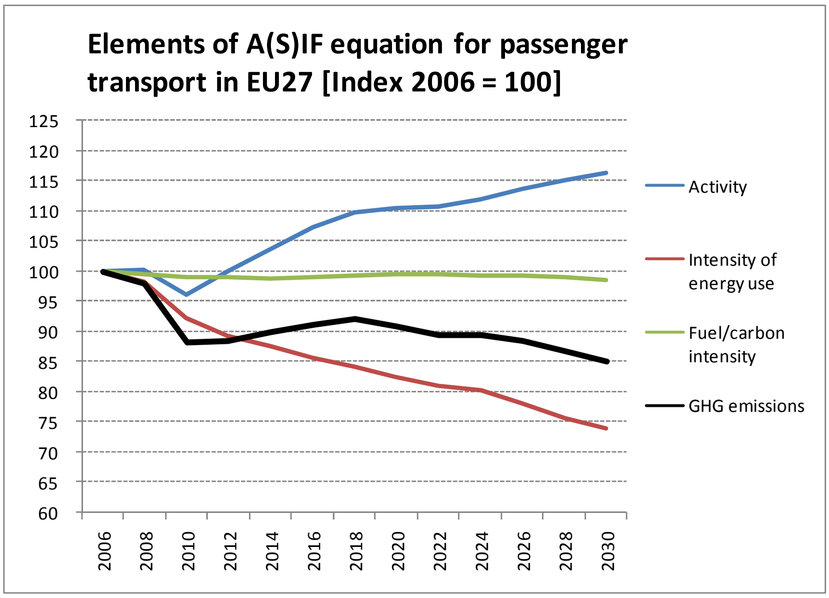
Where:

- GHG means the GHG emissions of transport
- Activity means transport performance (pkm, tkm) or vehicle-km
- Share means the modal-split of passenger and freight transport
- Intensity means the energy demand by mode and by fuel per pkm, tkm or vkm
- Fuel means the carbon intensity per unit of energy demand by fuel.

The ASIF equation exists in many variants, a few applying a more aggregate structure [e.g. SCHÄFER ET AL. 2009], but in most cases differentiating some variables of the ASIF equation into more detailed variables [e.g. as already suggested by the original paper of SCHIPPER ET AL. 2000].

To demonstrate the usefulness and applicability of the ASIF approach for assessing scenario trends or policy impacts related to GHG emissions of transport, we calculate indices with the 2006 base year representing 100 points. We concentrate on the elements A (activity), I (energy intensity) and F (Fuel/carbon intensity) and omit the modal shares (S), so that in fact we apply an A(S)IF approach.

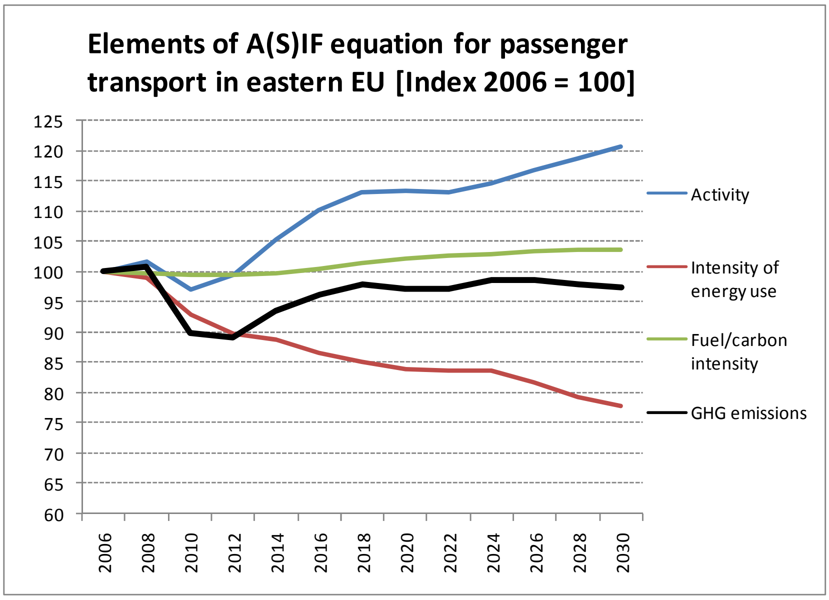
Figure 11-3 presents the findings of the A(S)IF approach for total passenger transport in the EU27. We can observe that, compared with 2006, the GHG emissions (measured as Mt CO_2 per year) are reduced by about -15% until 2030. This happens despite the fact that the activity measured as billion pkm increases by more than +15% and the reason can be identified by the two other indicators. A slight reduction is obtained from reduced fuel/carbon intensity (measured as Mt CO_2 per mtoe of passenger transport), which is slightly affected by the modal shift towards less CO_2-intensive modes and mainly influenced by the decarbonisation of transport fuels (due to the increase of electro-mobility and biofuels). However, the main source of reduction of GHG emissions comes from reduced energy intensity (or in other words, increased energy efficiency), measured as mtoe per billion pkm, that improves by about -25% until 2030, in particular due to the CO_2 emission limits for cars.



Source: iTREN-2030 – ASTRA

Figure 11-3: A(S)IF approach for passenger transport in the EU27

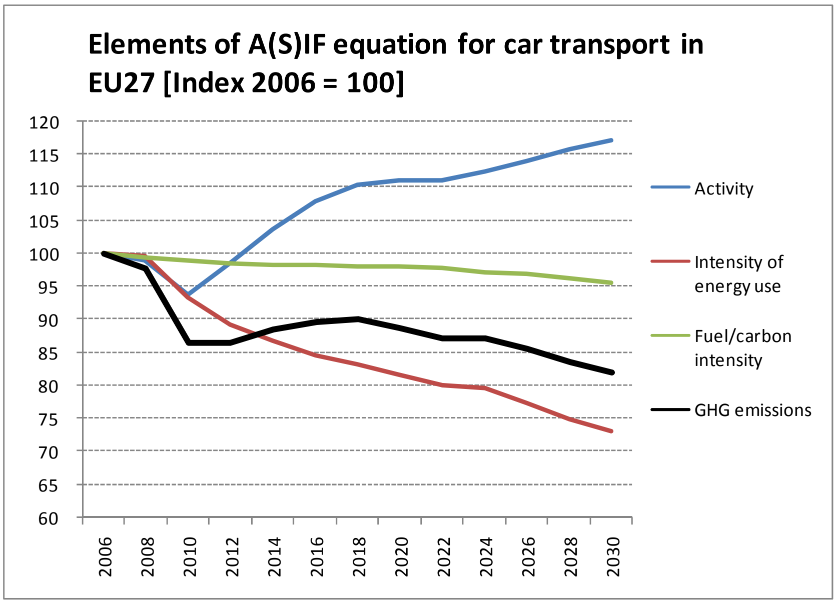
Figure 11-4 reveals in comparison to the previous figure that the mechanisms driving GHG emissions differ between the EU regions. In the eastern EU countries, passenger transport GHG emissions are hardly reduced by 2030, which occurs as the activity growth is larger, energy intensity reduction is smaller and, in particular, the fuel/carbon intensity is growing instead of declining due to the fact of strongly growing motorisation, increasing car size, and the modal-shift particularly from bus to car transport.



Source: iTREN-2030 – ASTRA

Figure 11-4: A(S)IF approach for passenger transport in eastern EU countries

Finally, in Figure 11-5 a closer look at car transport is provided for the EU27. We can observe that the pattern is rather similar to total passenger transport, with the minor observation that the reduction of fuel/carbon intensity is stronger, subject to the market penetration of battery electric vehicles. The similarity of A(S)IF results between total passenger transport and car transport confirms that the GHG emissions of passenger transport are dominated by the car mode.



Source: *iTREN-2030 – ASTRA*

Figure 11-5: A(S)IF approach for car transport in the EU27

11.4 Summary of assessment approaches

The sections above presented three approaches of how the modelling suite of iTREN-2030 could be used to provide results for policy assessments. For simplicity's sake, in most cases all indicators were taken from the ASTRA model, but in general it would be feasible to compose the indicators from the spread-sheets of the Annex, which contain results from ASTRA, POLES, TREMOVE and, in the case of the REF Scenario, also from TRANSTOOLS.

In general, it can be concluded that the variety of indicators estimated by the iTREN-2030 modelling suite and the fact that most of these indicators are provided as time series until 2030 offer the opportunity to apply a large variety of different assessment schemes to support the development of European energy, transport and climate policies.

Looking at the actual results of the assessments, it must be noted that a large part of the changes between REF and INT results from the impacts of the economic crisis and less from the impacts of the applied policies, so it is not recommended to use these results as an impact assessment of the policy package implemented in the INT scenario.

To do so, a new reference scenario should be run that includes the economic crisis but excludes the policies undertaken in 2009 or later, and then analyse the differences between this new scenario and the INT Scenario. Some indications of what these results would look like are provided by the policy packages presented in chapter 10 of this deliverable.

However, for some indicators particularly addressed by the policies it should be noted that the policies do in fact cause stronger impacts than the economic crisis. Transport energy demand and transport CO_2 emissions belong to this group of indicators.

12 Synthesis of results of the Integrated Scenario

This section provides a synthesis of findings and results of the Integrated Scenario (INT). It starts with a reflection on the implications of how major framework conditions of the scenario have been implemented in the models, as well as how major scenario variables have resulted from the models. Secondly, it summarizes the INT results and considers the implications of the economic crisis. Thirdly, the value-added and the critical issues of the iTREN-2030 approach and methodology are discussed. Finally, a thinkpiece on alternative futures and economic foundations for such futures is provided.

12.1 Assessment of major trends of the Scenario

With an **average annual growth rate of GDP of about +1.5%,** the Integrated Scenario anticipates a substantially lower economic growth than past studies expected, where ranges of GDP growth were deemed to be between +2 and +3%. Very recent studies have reduced this to below +2%, but compared with most of these studies the Integrated Scenario is at the lower end of the scale. However, there are some arguments that support such an expectation: first, according to many analysts, the economic and financial crisis is not over. Rather, it can be expected that within a couple of years a similar event will re-occur since the underlying problems of the financial system have not been solved, and on top of this, government budgets have been expanded, increasing government debts and reducing their ability to respond to a crisis. In such a case even +1.5% average annual growth over the next two decades would be optimistic. As an example, we might expect a seven year period with five years of growth of +2% annually and then another crash of two years reducing GDP again by -3%. Such a period would then result in an average annual growth of less than +1% over seven years.

Further, the impacts of a declining and ageing population should be pointed out, i.e. the active labour force is being greatly reduced. These facts are forcing down the expectations of future growth. Of course, there are also a few arguments in favour of expecting higher growth, like the emergence of a new long wave (Kondratieff Wave) of new cross-cutting technologies opening up business opportunities and driving growth. An example of such cross-cutting technologies would be a shift towards a low/no carbon and energy-efficient economy. In conclusion: in general, we believe that a long-term average annual growth of +1.5% for the next 20 years is a plausible figure for the EU, in fact being rather in the middle range of possible developments than at the lower end.

A second major trend concerns the **development of oil prices**. The oil prices are estimated by the POLES model that takes world energy demand and supply into account.

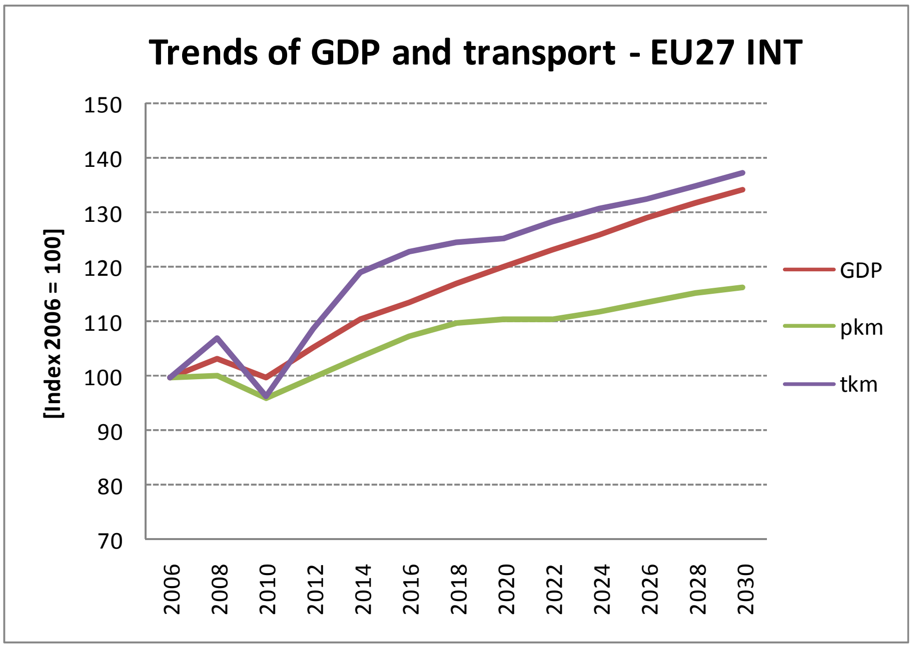
Though the POLES model applied the most well-known studies to model the availability of crude oil, uncertainties about the available resources of crude oil and thus about oil production still remain. In fact, we assume the crude supply estimates are on the optimistic side, which implies that the oil price developments used in iTREN-2030 are at the lower boundary of the possible future ranges, at least if we do not expect a future world economic crisis that significantly reduces the oil demand growth in the emerging economies. The expectation of higher oil prices would increase the push towards alternative non-fossil-fuel-based technologies, as well as it would dampen transport demand growth.

The European Commission defined the target of -10% GHG emissions for the non-ETS sectors from 2005 until 2020. Though electric rail transport and air transport after 2012 are included in the EU-ETS, this **GHG reduction target** holds for the largest part of the transport sector, which constitutes a non-ETS sector. However, even with the crisis, the reductions obtained by the INT Scenario compared with 2005 only amount to -7% until 2020 and to -12% until 2030. Thus the reductions fall short of the objective for 2020. For 2030 we can compare with studies that estimate reduction paths for all sectors until 2050 to fulfil the EU target of reaching a 2-degree climate change scenario. Such studies like the ADAM project require CO_2 reductions in transport of -62% by 2050 and -28% until 2030 [Schade/Jochem et al. 2009]. Obviously, the iTREN-2030 reductions until 2030 are much lower. A number of reasons have been identified for this: first, the Reference Scenario of iTREN-2030 expects little efficiency improvements and thus leads to higher emissions compared with the ADAM reference case. Second, ADAM considered more ambitious policies related to biofuels, bringing second generation biofuels earlier and in larger quantities onto the market. Third, on the transport pricing side, transport costs increased in ADAM, e.g. by not applying fuel tax harmonization and road charging that in the end reduces transport cost in many countries. Instead a price path for CO_2 certificates was considered that achieves about 55 €/tCO_2 in 2030 and not only 28 €/tCO_2 as in iTREN-2030 (both in €$_{2005}$ values). Fourth, CO_2 emission limits for cars and LDVs were also strengthened after 2020 and not only until 2020. Finally, corporate logistics and improved rail logistics foster modal shift from road to rail, which was not implemented in the INT Scenario. In conclusion, the INT Scenario achieved GHG reductions for transport, but in particular towards 2030 they should be stronger, which requires further adoption of policies in the medium term but before 2020 (e.g. intensifying the CO_2 emission limits for cars and LDVs), so that the measures can unfold their full impacts in the period 2020 to 2030.

Motorization (i.e. car ownership) seems to be at the higher end of possible trends. With higher oil prices and enforced climate policy, but also with dedicated but realistic assumptions of changing behaviour towards re-urbanization and extended car-sharing, motorization would be significantly lower than projected in the Integrated Scenario. First indications show that, in the urban context, completely new mobility concepts will develop such as integrating car-sharing, bikes, public transport and electro-mobility in a barrier-free manner with new business models and usage concepts to provide access to the different transport alternatives.

12.2 Summary of results of the Integrated Scenario

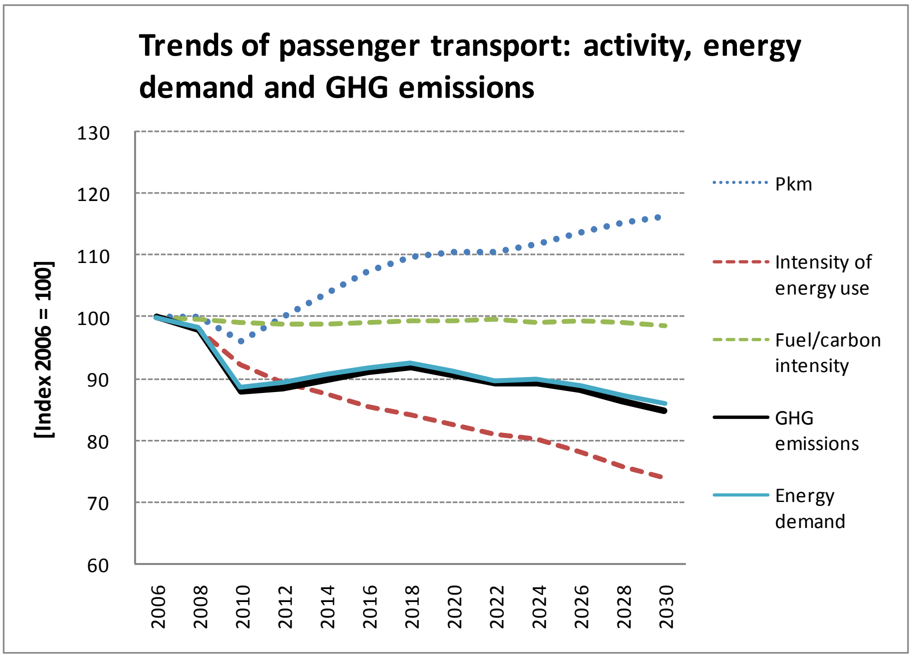
In light of the above assessment of major trends underlying the INT, we present the results of the Integrated Scenario in the following paragraphs. Figure 12-1 describes the relationship between economic development and transport demand represented by GDP, freight and passenger transport performance. We can observe the different relationships between GDP and the two other indicators. Freight transport in the first five years after the crisis catches up and grows stronger than GDP. So no decoupling of freight transport takes place. But after that it grows at a slightly slower rate than GDP, which shows some signs of relative decoupling. Passenger transport was already relatively decoupling from GDP and this will be continued in the next decades. Of course, relative decoupling occurs because of stagnating population and in some regions first signs of reaching “peak travel” are observed, while e.g. in eastern European countries the growth trend of passenger transport continues.



Source: iTREN-2030

Figure 12-1: Major trends in the Integrated Scenario in the EU27

Looking more closely at the transport system in Figure 12-2, we compare the development of passenger demand with the trends of energy demand and GHG emissions from passenger transport. Despite the growth of transport performance by +16%, we observe that energy demand and GHG emissions can be reduced by -14% and -15%, respectively, until 2030. To a minor extent this is achieved by reducing the carbon intensity of fuel (which includes fuel switch and modal shift), but most improvements come from the reduced energy intensity, i.e. which is the same as improved energy efficiency of passenger transport. As explained earlier, this is driven in particular by the success of the CO_2 emission limits of cars.



Source: iTREN-2030

Figure 12-2: Major trends in passenger transport in the EU27

Car fleet development in the EU27 still reveals an upward trend, such that until 2030 the number of cars reaches 280 million, which as described above belongs to the curves which according to iTREN-2030 should be at the upper range of possible developments. In total the increase of cars between 2010 and 2030 amounts to +29% for the EU27. The fleet in the EU15 and EU12 develops along significantly different lines. The EU15 fleet grows more slowly than EU27 at +24%, while the EU12 fleet grows faster at +54%. Thus the motorization in the EU12 catches up with the EU15.

The structure of the car fleet by engine technology is presented in Table 12-1. Again the difference between the EU15 and EU12 is significant. For the EU27 we observe that the share of gasoline cars drops from about 60% to somewhat over 50%. Shares of CNG vehicles reach about 3% or close to 11 million cars and for battery electric vehicles a share of 10% until 2030 is observed, mainly city cars and small-size cars that reach 27 million in 2030. In particular, the development of electric vehicles seems to be on the optimistic side for 2020, but considering the framework of the INT Scenario with its ambitious climate policy and awareness of growing fuel scarcity, it seems a feasible pathway, with facing the main risk being unavailability of sufficient production capacities for affordable batteries. Given the plans of car manufacturers presented by the beginning of 2010 (see chapter 3), we believe that this development can be realized. After 2020 we expect that hydrogen fuel cell cars will also slowly enter the market, reaching 5 million by 2030. This is more pessimistic than current announcements of car manufacturers, who plan to introduce these vehicles to the market already in 2015.

Table 12-1: Share of technologies in EU passenger car fleets

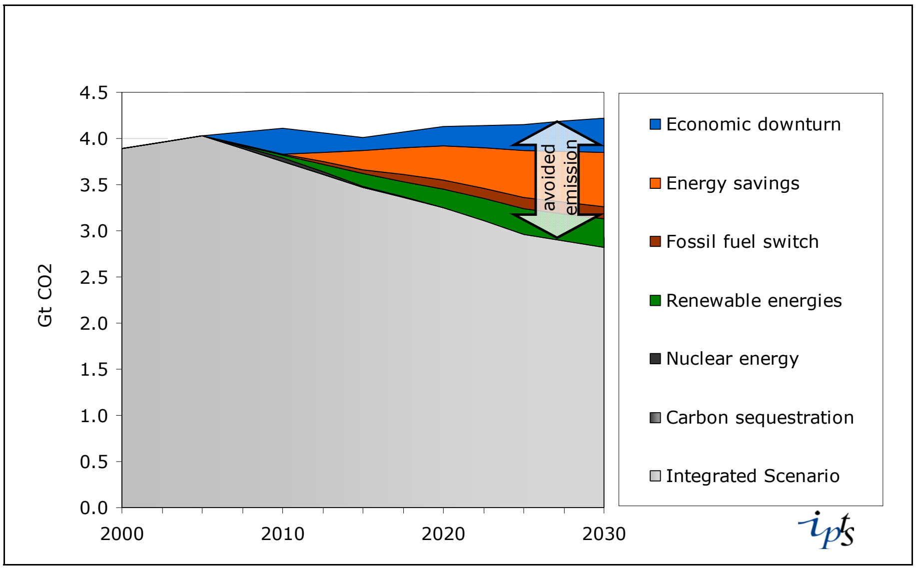
	EU27			EU15			EU12		
Technology	**2010**	**2020**	**2030**	**2010**	**2020**	**2030**	**2010**	**2020**	**2030**
Gasoline	60.7%	52.8%	51.8%	58.4%	49.6%	48.8%	72.8%	67.8%	64.4%
Diesel	34.8%	35.2%	30.2%	37.8%	39.1%	33.8%	18.9%	17.0%	14.9%
CNG	0.8%	3.1%	2.9%	0.9%	2.9%	2.5%	0.5%	3.8%	4.7%
LPG	2.1%	1.0%	1.0%	1.2%	0.5%	0.6%	6.6%	3.3%	2.6%
Hybrid	1.4%	2.2%	1.2%	1.4%	2.3%	1.3%	0.9%	1.6%	0.8%
Electric	0.2%	5.0%	9.8%	0.1%	4.8%	9.6%	0.3%	5.8%	10.6%
Bioethanol	0.1%	0.7%	1.2%	0.1%	0.7%	1.2%	0.0%	0.6%	1.5%
Hydrogen	0.0%	0.0%	1.8%	0.0%	0.0%	2.1%	0.0%	0.0%	0.4%

Source: iTREN-2030

The truck fleet grows more than the car fleet, in particular the heavy duty vehicles (HDV). HDVs' growth in the EU27 is +36% between 2010 and 2030 and for light duty vehicles (LDV) the growth is lower, reaching +13%. This depends on the dynamics of the different freight categories, which is much higher for freight transport over long distances than for short distances. And usually HDVs will be used for transport services for the longer distances.

Total CO_2 emissions of the energy system in the INT Scenario as well as the measures that caused the reductions until 2030 are shown in Figure 12-3. The depicted CO_2 emissions are aggregated across all sectors i.e. industry, services, households, transport and energy conversion. Until 2020 the CO_2 emissions of the whole energy system in the EU27 will fall by about -22% compared with the level of 1990. Until 2030 the reduction will amount to about -31%. This means the overall reduction targets of the EU will be fulfilled by 2020.

Figure 12-3 also presents an analysis of the factors contributing to the reductions. The economic and financial crisis of 2008/2009 is the sole contributor to reductions in the first years. When policy measures start to have significant effects, the share of the economic downturn shrinks to between 24% and 27% of the total CO_2 emission reduction. The most import factor is the energy savings due to improvements in energy efficiency. Their share in the total CO_2 emission reduction remains stable over the time period and stays above 40%. The remaining 30% of the CO_2 emission reductions stem from changes in the fuel mix (including CCS). Here, the most important components are the renewable energies. Due to their increased use, 200 MT CO_2 in 2020 and 300 Mt CO_2 in 2030 can be avoided.



Source: iTREN-2030

Figure 12-3: CO_2 emission reductions in the energy system of the EU27

So far, the results presented focus on the Integrated Scenario. The following Table 12-2 puts the results of the INT in the context of the REF Scenario and compares the two, assessing whether developments in the next decades will improve or decline. Upwards pointing arrows painted in green or yellow reflect positive changes of indicators and downwards pointing arrows painted in yellow or red represent negative changes of indicators in the INT compared with the REF scenario. In fact, the indicators can be grouped into those with negative changes belonging mainly to economic and transport indicators, which is the result of the economic crisis that shifted economic activity levels and transport activity levels down in the INT Scenario, and those with positive changes as the result of the policy measures in INT. Indicators like energy demand and emissions from transport and market penetration of alternative fuel vehicles belong in this group.

Table 12-2: Impact assessment of major indicators for the EU27 (INT vs REF)

Topic	Indicator	2010	2020	2030
Economy	GDP	↘	↘	↘
	Employment	↘	↘	↘
	Consumption	↘	↘	↓
	Investment	↓	↓	↓
	Exports	↓	→	→
	Transport taxation revenues	↘	↘	↘
Transport	Passenger transport activity originated in the country	↘	↘	↘
	Car	↘	→	→
	Bus	→	↘	↘
	Train	↘	↘	↘
	Air (intra-EU)	↓	↓	↓
	Slow	→	→	→
	Freight transport activity originated in the country	↓	↘	↘
	Road	↓	↘	↘
	Rail	↓	↘	↘
	Ship (intra-EU)	↓	→	→
Vehicle Fleets	Car fleet	→	→	→
	Gasoline	→	↘	↓
	Diesel	→	→	↘
	CNG	↘	↘	↓
	LPG	→	↓	↓
	Hybrid	↘	↓	↓
	Electric	↑	↑	↑
	Bioethanol	↘	→	↓
	Hydrogen	→	↑	↑
	Bus fleet	↘	↘	↘
	Light duty vehicle fleet	→	↘	↘
	Heavy duty vehicle fleet	↘	↘	↓
Energy	Gross inland energy consumption	↗	↑	↑
Environment	CO_2 transport emissions (WTW)	↗	↑	↑
	Road freight	→	↑	↑
	Road passenger	↗	↑	↑
	Rail freight	↗	↗	↑
	Rail passenger	↗	↗	↗
	Inland navigation	↗	↗	↗
	Maritime (intra-EU)	↑	→	↗
	Air (intra-EU)	↑	↗	↑
	NO_x transport emissions (WTW)	↗	↗	↑
	Road freight	↗	↗	↑
	Road passenger	↗	↗	↗
	Rail freight	↗	↗	↑
	Rail passenger	↗	↗	↗
	Inland navigation	↗	↗	↗
	Maritime (intra-EU)	↑	→	↗
	Air (intra-EU)	↑	↗	↑
	GHG non-transport emissions			

Legend:

Economy/Transport/Vehicle Fleet < -10% = ↓ < -2% = ↘ < +2% = → <+10% = ↗ > 10% = ↑

Environment/Energy < -10% = ↑ < -2% = ↗ < +2% = → <+10% = ↘ > 10% = ↓

Source: iTREN-2030

We look in more detail at energy demand from transport, presented in Table 12-3. This table shows an impressive break-in-trend where energy demand for total transport and all modes increased in the Reference Scenario, while in the Integrated Scenario the growth trend is reversed for total transport as well as the major modes passenger car and freight truck, and energy demand reveals negative average annual changes between 2005 and 2030. This means a change from average annual growth rates of +0.7% to average annual decrease rates on -0.4% for total transport.

Table 12-3: Transport energy demand growth rates by mode between 2005 and 2030 (INT, REF)

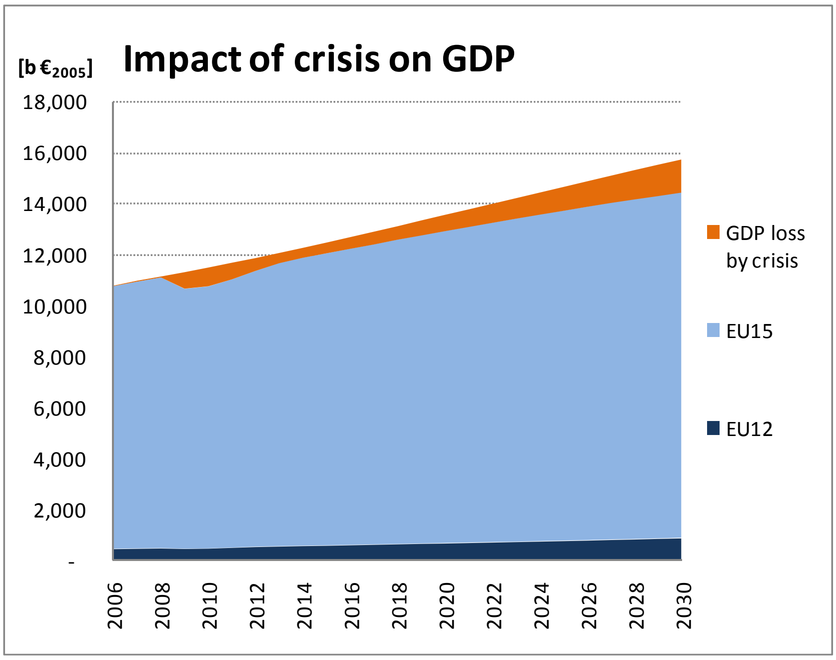
Average annual changes in final energy demand [%]	Integrated Scenario	Reference Scenario
Transport – all modes	**-0.4**	**0.7**
Road transport cars	-0.6	0.8
Road transport freight	-0.5	0.6
Rail	0.4	1.2
Aviation	0.4	0.8
Other transport	-0.7	-0.7

Source: iTREN-2030

12.3 Impact of the economic crisis

The general observation is that the effect of the economic crisis of 2008/2009 is the dominating impact for the economic variables and the economic driven variables, in particular freight transport. However, the picture is different for environmental impacts as the crisis of course also matters for these impacts, but the impact of policy measures taken in the INT scenario is more important for changes between REF and INT scenario. This is explained by the following figures.

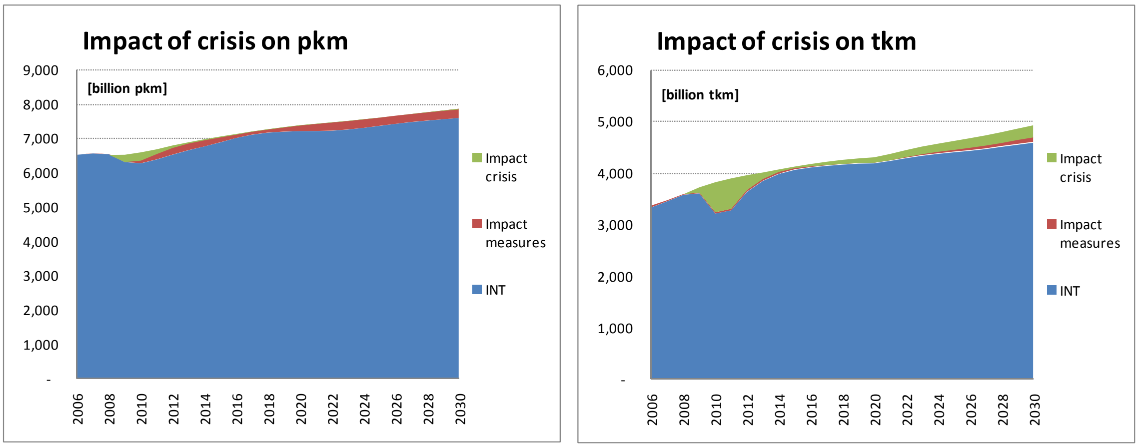
Figure 12-4 presents the impact of the crisis on GDP development for the EU27. The sharp drop of GDP in 2008/2009 and the catching-up process fostered by the economic stimulus packages can be easily observed in the following years. However, in the long run, GDP development never achieves the level of the Reference Scenario and remains about -8% below the level in the Reference Scenario. Also, the impact of the measures on GDP remains negligible compared with the impacts of the crisis.



Source: iTREN-2030

Figure 12-4: Impact of economic crisis on GDP

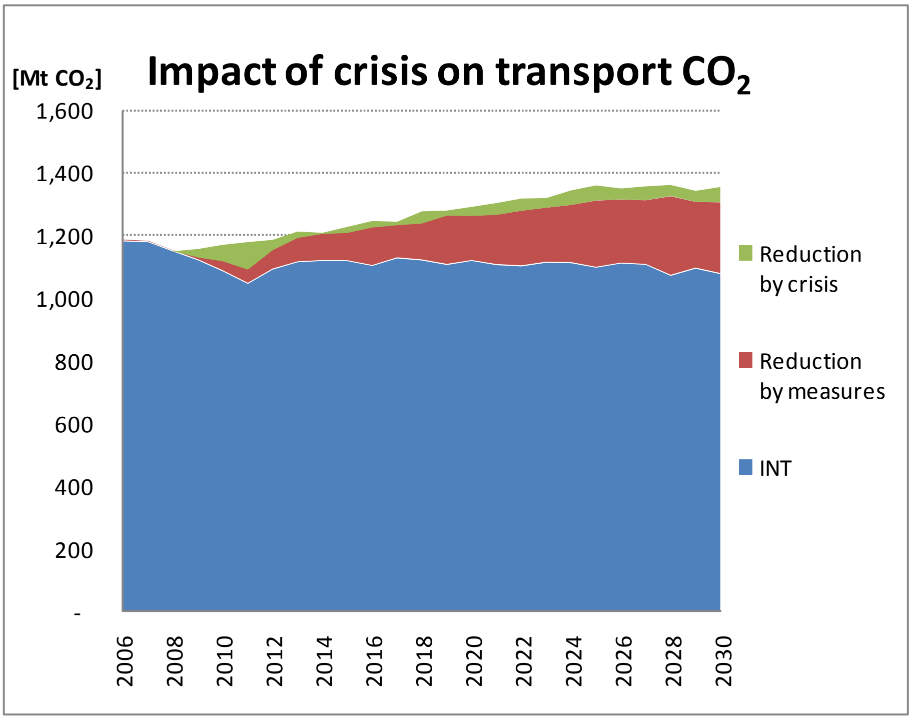
Figure 12-5 depicts the impact of the crisis on transport performance compared with the impact of the measures. For passenger transport, the crisis only dominates in the first five years after which the impact of the measures is stronger and leads to a reduction of pkm by about -3% in 2030. For freight transport, the crisis represents the dominating influence over the whole period, though after 2020 the policy measures tend to slightly check freight transport growth. In total, the tkm are more than -7% lower than in the Reference Scenario.



Source: iTREN-2030 – ASTRA model

Figure 12-5: Relationship between impact of economic crisis and of policy measures on transport performance in the EU27

In terms of CO_2 emissions from transport, Figure 12-6 shows that, in the short run, the crisis exerts the dominating influence, while the policy measures of the INT Scenario lead to significant reductions of emissions in the long run. In 2030, roughly one fifth of reductions can be assigned to the impacts of the crisis, while four fifths are caused by the policy measures. This reveals that the crisis helps to reduce the climate pressure of transport but that it remains absolutely necessary to implement transport measures for climate impact mitigation.



Source: iTREN-2030 – ASTRA model

Figure 12-6: Relationship between impact of economic crisis and of policy measures on transport CO_2

Finally, two remarks should be considered: (1) the REF Scenario applied to analyse the crisis impacts included some model improvements that were not part of the REF in deliverable D4 [Fiorello et al. 2009], and (2) the numbers only refer to the ASTRA model and do not reflect the feedbacks between the models. For both reasons the figures in this analysis may differ slightly from final results of the REF and INT Scenarios.

12.4 Impact of policy packages

In the iTREN-2030 project, three policy packages were designed and compared against the results of the Integrated Scenario as otherwise the impacts of the economic crisis would dominate the assessment of the policy impacts. The packages are designed to focus on different issues like pricing, regulation or new technologies and include:

- **PP1** – Energy and transport pricing which includes the pricing policy measures (e.g. feed-in tariffs, tax harmonization, EU-ETS extension).
- **PP2** - Regulation and new efficiency technologies which includes the setting of CO_2 emissions standards for cars and light duty vehicles.
- **PP3** - New engine technologies and soft measures which includes the emergence of new engine technologies (i.e. battery electric vehicles and hydrogen fuel cell), of ultra-fluid lubricants and low resistance tires, and of enforcing truck driver education.

The results of the policy packages differ between the transport and energy systems. Pricing policy (PP1) is very effective in reducing GHG emissions in the energy sector (both by the ETS and by the feed-in tariffs for renewables), while the impact on the transport sector is limited. The reason was that the pricing policies, though following the Greening Transport Package, implemented transport charges that in some countries even led to reductions in existing charges in the models. This means that the pricing measures must be implemented more ambitiously for transport to contribute to stronger GHG reductions than in INT. Otherwise they should mainly be seen as an instrument accompanying technological and regulatory measures to strengthen the incentives to reduce transport GHG emissions of such technological/regulatory measures.

On the other hand, both regulation of vehicle efficiency and support for new technologies combined with soft measures lead to significant reductions of GHG transport emissions. With such measures, it is also possible to target reductions for a specific means of transport, e.g. only cars or only heavy trucks. This would be important if monitoring transport GHG emissions against EU reduction targets reveals that a particular mean/mode of transport is endangering achievement of the reduction targets.

12.5 Value-added of the iTREN-2030 approach

The iTREN-2030 approach consists of two main elements: (1) the integration of several models of different fields of application and (2) an intensive stakeholder process to validate the model and scenario inputs and results. The value-added of the iTREN-

2030 approach concerns three major aspects: scenario development, cross-validation of model results and value for future applications.

The integration of several models enables generation of a consistent quantified baseline scenario that covers all fields relevant for energy and transport systems. This includes environmental models to provide scenarios of the environmental impacts of the systems, and whether the scenario would support sustainable development or not. It also includes technology and vehicle fleet models, which supports the identification of promising R&D and innovation strategies in the energy and transport fields. Since the two fields are becoming increasingly interlinked, it is of utmost importance to integrate them in order to develop a baseline scenario. Finally, important drivers of the energy and transport systems are located in the economic system, global trade and global energy supply so that a model system to develop a consistent baseline scenario should integrate all these elements. The iTREN-2030 model suite consisting of ASTRA, POLES, TREMOVE and to limited extent, also TRANSTOOLS includes all these elements so that it has the appropriate value-added to generate consistent baseline scenarios for energy and transport.

Similarly, it can be argued that assessing large policy programmes consisting of energy, transport and climate policies require the same set of aspects to be covered as for creating a quantified baseline scenario, so the iTREN-2030 modelling suite provides a value-added for this task as well. On the other hand, it will generally not be necessary to apply the whole model suite in order to assess the detailed impacts of a single policy.

A further value-added of the iTREN-2030 approach is the cross-validation of results. This occurs in two ways: (1) the models of the model suite overlap so that the results of one model can be validated by the other model. Of course, this does not mean that they always generate the same results, due to differences in underlying model structures, model parameters or applied calibration data. But already raising questions about the results of one model by the other model helps to validate and improve the model results. (2) Further, the iTREN-2030 approach meant discussing intermediate results at three workshops with the stakeholders and feeding back their comments to the model and scenario development.

Finally, the iTREN-2030 project provides a suitable and well documented starting point for further developing policies in the climate, energy and transport fields.

12.6 Critical issues of the iTREN-2030 approach

The most critical issue for iTREN-2030 is to achieve sufficient congruence between the models. Given the uncertainty that is inherent in futures scenarios, it is not necessary that the models exactly generate the same results for the overlapping model elements. But sufficient consistency means that two models show the same trends and that even average annual growth rates should not be too different, since over a time horizon of 20 years even a difference of a few percentage points (e.g. 0.3 or 0.4%) cause larger absolute differences towards the end of the time horizon.

The problems with achieving consistency already start with the model structures. One example is the truck fleet that is modelled both in ASTRA and in TREMOVE. But the structure differs, in that truck weight classes differ between models and the disaggregation into heavy duty trucks and light duty trucks criss-crosses between the two models. Comparing the data and results then implies making assumptions on how to split categories and develop a comparable categorization into which the results of the models can be transformed for comparison purposes. Often full consistency cannot be achieved in such cases.

A further difficulty might concern the applied functions in the model. Again, looking at overlapping model elements an example might be that one model applies an exponential function, while the other model uses a linear function to estimate a variable. In such a case it will not be possible to create fully consistent models maintaining their structures, as the trajectories will always differ. The option to achieve consistency would be that one of the models adapts its equations to use the other model's type of function.

Finally, it must be said that such consistency checks are time-consuming as one starts by comparing the aggregate figures e.g. for the EU27, but often in order to trace the reasons for differences it will be necessary to disaggregate into countries, technologies, distance categories, vehicle classes etc. so that specific tools have to be developed to facilitate the comparison.

These examples illustrate the difficulty of achieving consistency between the models of the iTREN-2030 suite. The project team undertook considerable efforts to improve consistency, including adaptations of model parameters that were explained in deliverable D4 [Fiorello et al. 2009]. Nevertheless, aspects remain for which the consistency between the models is limited, either because models could technically not be adapted so as to generate the same results or because simply the adaptation would be too complex within the given time budget of the project. Nevertheless, we believe that the models are sufficiently consistent and generate results that are not exactly the same, but are sufficiently close to each other.

12.7 Thinkpiece on alternative futures to the Integrated Scenario

In this deliverable we have argued that the Integrated Scenario is based on trend-breaks that we expect from our analysis, likely and relevant policies that are driven by climate policy, growing scarcity of fossil fuels, emerging low-carbon technologies and an economic system returning to stability. Though the iTREN-2030 consortium concentrated on modelling and quantifying future scenarios, the timing of the study, and the debates that have taken place surrounding the financial crisis have drawn attention to wider issues, and the need to question the axioms contained in models that were developed at a time of greater financial certainty. In our team, this led to discussion and questioning of the assumption of a continuously stable economic system in the future in the form that we have known in the last two decades. Possible changes to this economic system would lead to alternative pictures for European economic development that we add here as food for thought.

The thinkpiece deals with a debate about competing past economic thoughts, with the question of long-term limits to growth, and the effects of greater international interdependence. It considers thoughts on economists and economic thinking from Heilbronner [1999] and Pasinetti [2000] and on the future of capitalism and the world economy from Soros [2008], Mahbubani [2008] and Arrighi [2009]. The economy under the spotlight may be Europe, but Europe as the world's largest consumer market is only a short side-step from the global market, heavily dependent upon global land, capital and labour resources to feed its appetite.

When considering the future, it is hard to avoid a closer examination of the past, and this puts into perspective the relationship between economic thought and the context in which it is fostered.

It seems that economic thought has always been propelled by the fundamental forces taking place in society. Economics as a branch of political philosophy was born in an era of change and greater intellectual liberty, with the traditional power of feudal landlords and organized religion giving way to the new forces of commerce and rational science. The new agents of the market needed an ideology, and they found one. Early economists were drawn in by the discovery of the market as a self-organizing system and the understanding of the power unleashed by division of labour, competition and the price mechanism. There was no way back from here. Trade, wealth and military power were all inter-related, and there were empires to be built.

With the arrival of capitalism and its victory over the land-owning classes came a more sober awareness of its power, its capability to create and sustain a different but still devastating inequality, leading to an ideological split between Ricardo's new breed of industrialists and the champions of labour, following Marxist lines. An ideological schism developed as east and west diverged. Keynesian economics, later emerging as the European social model could be seen in this context as a practical compromise and an elegant attempt to alleviate rogue capitalist tendencies and to define a managerial role for the state and for international economic institutions, to reconcile social anxieties without killing capitalism's golden goose.

Ultimately, capitalism could not be restrained by the state. Gradually, seductive liberal tendencies surfaced and with it a new form of global capitalism, rooted in North American post-colonial exuberance, and exported westwards via Japan, and eastwards via the European Community. Driven on by the Schumpeterian dynamic of technological innovation and the emerging power of the entrepreneur, the majority inside the system prospered. So much so that we even stopped fighting each other.

Optimizing capitalism was the next step emerging from Walrasian general equilibrium models and pushing what is called "marginalism". By applying marginalism in times of stable or only slowly changing conditions, the capitalist system was continuously shaped towards the optimum of the static state.

In the final chapter of global capitalism's triumph, Marxism and the labour movement was beaten, opening up vast new reserves of surplus labour in the resource-rich economies of China, Russia, India and beyond. Nothing could possibly go wrong now.

Or could it? Global warming and resource depletion, global terrorism from minorities among the global dispossessed and the global financial crisis triggered within the optimized economies run by the global possessed, open up sudden new anxieties about the future. Whereas powerful land-owners might once have felt equal to the power being wielded by Ricardo's merchant classes, now disenfranchised land-owners in the shape of suburban home owners and agriculture-based developing economies came to understand how real the transfer of power from land and labour to global capitalism had become, supported by the economic ideology that created it and which was created by it. The rosy, once reassuring, paternalistic face of the Keynesian state paled, as billions were borrowed by the democratic leaders from the unborn masses to bail out the few. The west cannot be allowed to stop consuming, the world depends on it, they said.

So we arrive at the final question. What happens next?

Economists are not bound by the same conventions as historians, who wisely refrain from speculation about the future. If we as bearers of a modern, scientific economics cannot predict the future of the economy, we can at least predict how other economists will predict it. In time-honoured tradition, two theories, the eternal optimized one hand and the other hand are left competing. In the first, consensus, ideology and hope dictate that we return to capitalism's perpetual motion, riding out the financial crisis and returning to a world of technological dynamism and growth to complete what we started. Renewable energy, safe transport, decarbonization are all within grasp, with the credit crunch a mere punctuation mark in the drive towards endless progress.

But economists have always been puzzled by success, nursing anxieties about the long term – the undiscovered place where we all are dead. In our second future, Marx and Malthus have returned. Growing inequality, peak oil, peak food? These are also within grasp. Perhaps capitalism's first victim, land, will indeed have the final word, as Europe finds itself over-extended, trying to bargain with the last remaining resource rich and fuel producers, and ignored as the capitalist wave that Europe and her colonial sisters started, disappears over the horizon to entertain its new, more patient Confucian hosts.

In the end, it is not economists and entrepreneurs who have the most important role to play: it is politics. In times of sharply changing framework conditions, resilience and stability of the economic and financial system are going to be valued more than optimization and marginalism. Increasing welfare without compensating those who stand to lose out at the lower end of the income pyramid will sharpen inequality and set the whole system at risk. Continuing to think along the path of physical growth and neglecting the option of a more sustainable, steady state together with still improving quality of life blocks the decisions required to solve the distributional issues in the transition towards the physically steady state. It seems that these are the major choices politics has to make to respond to the changing global conditions and bring Europe a bright future, of which an example is developed in the Integrated Scenario.

13 Conclusions

The conclusions obtained from iTREN-2030 can be divided into three fields, namely conclusions on the applied methodology of linking and integrating various models and achieving consistency, on the results of the scenario projections integrating the impacts of the economic crisis, and on policies regarding (1) their impacts as a policy, and (2) their fit into the general European policy framework.

13.1 Methodological conclusions

iTREN-2030 applied a methodology to create consistent scenarios for the energy and transport system until 2030 that combines the development of an integrated model system with an intensive stakeholder approach to develop policy scenarios and validate intermediate findings of the scenario results obtained by the model system.

The methodological step that posed the biggest challenge, and to which the project contributed significantly, is the integration of models from different fields related to the energy and transport system. The challenge consists in making the models sufficiently consistent so that they can be used to quantify an energy-transport-environment-economy scenario in which the different scenario indicators are provided by different models, but together form a coherent scenario. iTREN-2030 succeeded in this attempt, but it must be stated that the consistency could still be improved, though in most cases this would require model modification to adapt structures, which can become a resource-consuming task.

We conclude that the iTREN-2030 approach to apply such a model suite consisting of ASTRA, POLES, TREMOVE and TRANSTOOLS is particularly useful to generate baseline or reference scenarios, as in such cases the models cross-validate each other, and when supported by a sound stakeholder process it can also be guaranteed that such a validation process improves the results, if the stakeholder inputs do not become the dominant force shaping them.

Applying such a model suite is also recommended for evaluating large climate, energy and transport policy programmes as these fields are becoming increasingly interconnected. But application of the model suite is less appropriate for the detailed assessment of single policies or limited policy packages.

13.2 Scenario conclusions

The iTREN-2030 Integrated Scenario describes a world shaped by the economic crisis of 2008/2009, but which is also gradually and undisturbed in future years escaping from this economic crisis.. Transport policy is leaving its traditional paths and instead is being driven by newly emerging issues, i.e. climate policy and growing GHG mitigation requirements for the transport sector, demand- and supply-driven fossil fuel scarcity and new propulsion technologies, leading to the application of a diversity of fuels and engine technologies in the transport sector. However, behavioural change in the scenario remains limited to adopting new engine technologies, without changing urban settlement structures, travelling behaviour or mobility concepts.

The result of such a scenario is an increase of transport activity until 2030 compared with 2005, for passenger transport by +16% and for freight transport by +39%. Despite this growth of transport the energy demand of transport in the EU27 is slightly reduced, by -2%. Consequently, the greenhouse gas emissions of transport are also declining, achieving a reduction of -7% until 2020 and of -12% by 2030 compared with 2005. However, the objective of reducing these emissions from transport by -10% by 2020 has failed, even though the economic crisis contributed towards reducing energy and transport demand growth. Even more important is that for the period after 2020 stronger policies have to be implemented so that transport contributes to the -80% GHG target of the EU until 2050. This target would require transport GHG reductions until 2030 of about -30%, as other studies indicate, which is significantly more than the -12% estimated for the INT Scenario.

The aggregate target of a -20% reduction of GHG emissions by 2020 in the EU27 is achieved in the INT Scenario. The main elements of this success are increased energy efficiency and increased use of renewable energy that are supported by reductions resulting from the economic crisis. This means that sectors other than transport have done their homework; this holds for the energy conversion sector in particular.

An important break-in-trend is also observed for final energy demand that reverts from the ever increasing path of the past to a stagnating path over the next two decades. Together with the decarbonization of energy production, this causes the decrease of GHG emissions in the EU27.

13.3 Policy conclusions

The pricing policies implemented by iTREN-2030 fall short of what could be achieved with transport pricing due to the low levels of charges. This also holds for the impacts of the EU-ETS, which requires a more ambitious cap to increase CO_2 certificate prices above the 28 €/tCO_2 that was estimated for 2030 by iTREN-2030. In both cases, if implemented, the policies could contribute greater reductions of transport GHG emissions.

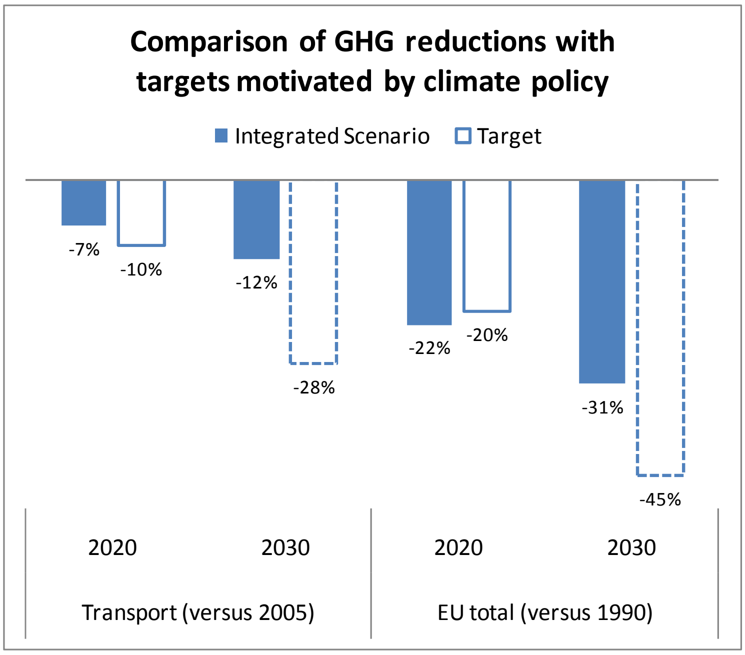
In general, and with the particular settings of the Integrated Scenario, the binding regulation for CO_2 limits of cars and light duty trucks is the most effective measure to reduce transport CO_2 emissions. It is important to consider an extension of this policy after 2020 and to reduce the CO_2 emission limits further. In doing so, it must be taken into account that vehicle manufacturers require a lead time of 5 to 7 years to organize their vehicle concepts accordingly, which means that such limits for the period after 2020 should be defined and implemented into legislation by 2015 at the latest. Also the manufacturers benefit from such a policy, as it provides them with planning certainty in an uncertain world with a diversity of fuels and engine technologies available that can potentially gain market shares in the next decades.

Related to this is the requirement to support R&D and market introduction of alternative engine technologies. In particular, this holds for battery electric vehicles, advanced battery systems for transport applications and hydrogen fuel cell systems, including hydrogen storage. This enables Europe to develop its required portfolio of alternative engine technologies, but it must not mean that efficiency improvements of conventional fossil engines are neglected. However, such technologies are already mature and should be fostered by the enforced CO_2 emissions limits.

An issue that was not implemented in the Integrated Scenario but is of high importance for policy-making concerns the future change in urban mobility. It can be expected that the new electric vehicles, together with the extension of environmental zones in cities and changing mobility behaviour of future young generations will provide the grounds for genuine passenger multi-modality, involving the massive use of car-sharing and bike-sharing in seamless connection with public transport in urban areas. Policy-making can support this process by removing barriers for car- and bike-sharing and by supporting IT technologies to connect these modes and standardize the systems so that they become interoperable between cities, as well as between EU countries.

Policy targets for GHG emissions of the EU27 are shown in Figure 13-1. Until 2020 total EU GHG emissions should be reduced by -20% compared with the base year 1990. For transport, GHG emissions should be reduced by -10% compared with 2005, assuming that transport should contribute a share of reductions equal to the other non-ETS sectors. In the Integrated Scenario, the total GHG emission reduction for 2020 amounts to -22%, i.e. an over-fulfilment of 2%, which could be assigned to the economic downturn of 2008/2009. However, transport only achieves -7% instead of -10%.

For 2030 the objective of limiting the global temperature increase to 2° Celsius until 2100 has to be considered in order to derive a benchmark for 2030. Such a benchmark can be taken from the European ADAM project, that developed a so-called 2-degree scenario that puts Europe onto a pathway towards -80% reduction of GHG emissions until 2050 [Schade/Jochem et al. 2009]. The benchmark of this pathway for 2030 would then be a reduction of -45% for the EU total GHG emissions and for the transport sector a reduction of -28%. These benchmarks are indicated by dashed rectangles in Figure 13-1. Obviously the Integrated Scenario falls short of achieving these benchmarks. This reflects that major policies of the Integrated Scenario are only focusing on 2020 (e.g. CO_2 emission limits for cars and LDVs, CO_2 emissions cap), but require to be toughened after 2020 to generate the required GHG reductions.



Source: iTREN-2030

Figure 13-1: Reductions of CO_2 emissions in comparison with policy targets

The final conclusion is thus: politics is of utmost importance in the next years. It must implement both a framework that stabilizes the economic and financial system, as well as energy and, in particular, transport policies that support climate policy effectively towards and after 2020.

14 Annex

14.1 Content of the annex

In this annex, country-based indicators are provided for the iTREN-2030 Integrated Scenario as well as indicators for the three spatial aggregations EU27, EU15 and EU12. The indicators are drawn from the modelling tools and concern all the domains addressed in iTREN-2030: transport, economy, energy, environment and vehicle fleet.

The indicators are collected in a two pages table for each country/region, reporting both absolute figures and average annual changes at different time intervals.

The tables have the same format used to provide indicators for the iTREN-2030 Reference Scenario (annex to Deliverable D4) allowing for an immediate comparison of data. Nevertheless, it is pointed out that the change of indicators can not be assigned to the policies alone, but is a composite result of the impact of the economic crisis, the policies and a few model improvements required to implement both.

Not all indicators are available for all countries, depending either on the nature of the data (e.g. maritime demand is not existing in Austria) or on the modelling scope of the tools (e.g. fleet data is not available for Croatia). The symbol ‘-‘ in the table means that the data is not available. Zero values mean that data can exist but it is null in the Integrated Scenario.

Belgium and Luxembourg are reported as separate countries as well as a single region, because some models (TREMOVE, TRANSTOOLS) simulate the two countries independently while the others (ASTRA, POLES) simulate the two countries together. Therefore, some indicators are available for both countries, while others are reported only for the two countries together.

Energy indicators are not available for the three Baltic countries (Estonia, Latvia and Lithuania) because these are not separate zones in POLES. However, they are accounted for in the energy indicators for EU12 and EU27.

14.2 Key notes about indicators

The following specifications should be remembered when reading indicators:

All monetary values are expressed in Euros at the value of the year 2005. Any variation of monetary indicators is in real terms.

All transport demand indicators concern traffic within the 31 countries modelled in iTREN-2030 (EU27+ Switzerland and Norway); intercontinental traffic is not dealt with in the models results. Croatia and Turkey are modelled by some of the models, but are not reported in the annex, as they would have too many gaps.

Air demand does not include intra-Europe legs of intercontinental air trips (e.g. passengers incoming from Buenos Aires, landing in Madrid and taking off from Madrid to Wien are not accounted for in the demand indicators. The same holds for intercontinental ship freight demand.

The price of biofuels is expressed in Euro per “equivalent litre of conventional fuel”, i.e. the amount of biofuels correspondent to one litre of conventional fuel in terms of energy content.

iTREN-2030 EU27	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	17,892	18,565	20,670	22,783	0.7	1.1	1.0	1.0
Freight transport activity originated in the country	Billion tonnes-km per year	3,430	3,403	4,424	4,840	-0.2	2.7	0.9	1.8
Road	Billion tonnes-km per year	*1,713*	*1,771*	*2,115*	*2,318*	*0.7*	*1.8*	*0.9*	*1.4*
Rail	Billion tonnes-km per year	*443*	*461*	*569*	*618*	*0.8*	*2.1*	*0.8*	*1.5*
Inland navigation	Billion tonnes-km per year	*192*	*182*	*227*	*244*	*-1.1*	*2.3*	*0.7*	*1.5*
Maritime (Intra-EU)	Billion tonnes-km per year	*1,083*	*990*	*1,512*	*1,660*	*-1.8*	*4.3*	*0.9*	*2.6*
Average freight transport distance	km	192	183	214	212	-0.9	1.6	-0.1	0.7
Freight transport activity on the national territory	Billion tonnes-km per year	2,311	2,375	2,909	3,199	0.5	2.0	1.0	1.5
Road	Billion tonnes-km per year	*1,767*	*1,818*	*2,210*	*2,436*	*0.6*	*2.0*	*1.0*	*1.5*
Rail	Billion tonnes-km per year	*415*	*434*	*545*	*598*	*0.9*	*2.3*	*0.9*	*1.6*
Inland navigation	Billion tonnes-km per year	*130*	*123*	*154*	*165*	*-1.1*	*2.3*	*0.7*	*1.5*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	320	343	352	380	1.4	0.3	0.8	0.5
Trips originated in the country	Million trips per year	475,623	467,205	501,786	515,714	-0.4	0.7	0.3	0.5
Passenger transport activity originated in the cour	Billion pass-km per year	6,457	6,260	7,196	7,577	-0.6	1.4	0.5	1.0
Car	Billion pass-km per year	*4,665*	*4,397*	*5,211*	*5,493*	*-1.2*	*1.7*	*0.5*	*1.1*
Bus	Billion pass-km per year	*615*	*643*	*585*	*570*	*0.9*	*-0.9*	*-0.2*	*-0.6*
Rail	Billion pass-km per year	*477*	*542*	*588*	*645*	*2.6*	*0.8*	*0.9*	*0.9*
Air (Intra-EU)	Billion pass-km per year	*442*	*409*	*506*	*528*	*-1.5*	*2.2*	*0.4*	*1.3*
Slow	Billion pass-km per year	*259*	*271*	*306*	*341*	*0.9*	*1.2*	*1.1*	*1.2*
Average passenger transport distance	km	13.6	13.4	14.3	14.7	-0.3	0.7	0.2	0.5
Passenger transport activity on the national territo	Billion pass-km per year	5,746	5,572	6,372	6,695	-0.6	1.4	0.5	0.9
Road	Billion pass-km per year	*5,267*	*5,027*	*5,780*	*6,047*	*-0.9*	*1.4*	*0.5*	*0.9*
Rail	Billion pass-km per year	*480*	*545*	*591*	*649*	*2.6*	*0.8*	*0.9*	*0.9*
Passenger road vehicles-km on the national territo	Billion vehicles-km per yea	2,744	2,602	3,194	3,467	-1.1	2.1	0.8	1.4
Motorization rate	cars/1000 inhabitants	432	441	515	567	0.4	1.6	1.0	1.3
ECONOMY INDICATORS									
GDP	Billion Euros 2005	10,573	10,757	12,926	14,445	0.3	1.9	1.1	1.5
Employment	1000 Persons	210,749	193,125	203,334	192,645	-1.7	0.5	-0.5	0.0
Agriculture and fishery	1000 Persons	*15,383*	*12,988*	*11,834*	*11,025*	*-3.3*	*-0.9*	*-0.7*	*-0.8*
Construction	1000 Persons	*16,848*	*15,062*	*16,750*	*15,672*	*-2.2*	*1.1*	*-0.7*	*0.2*
Energy and water	1000 Persons	*2,627*	*2,770*	*2,899*	*2,943*	*1.1*	*0.5*	*0.2*	*0.3*
Industry	1000 Persons	*49,739*	*38,088*	*45,036*	*42,816*	*-5.2*	*1.7*	*-0.5*	*0.6*
Transport services	1000 Persons	*7,876*	*7,164*	*8,042*	*7,715*	*-1.9*	*1.2*	*-0.4*	*0.4*
Other services	1000 Persons	*125,086*	*117,053*	*118,773*	*112,473*	*-1.3*	*0.1*	*-0.5*	*-0.2*
Population total	1000 Persons	488,594	492,379	496,269	494,331	0.2	0.1	0.0	0.0
Labour force	1000 Persons	*314,100*	*319,001*	*315,545*	*304,261*	*0.3*	*-0.1*	*-0.4*	*-0.2*
Retired (> 65 years)	1000 Persons	*76,582*	*78,181*	*88,609*	*103,376*	*0.4*	*1.3*	*1.6*	*1.4*
Transport taxation revenues	Million Euros 2005	219,278	204,371	232,003	249,215	-1.4	1.3	0.7	1.0
Fuel taxes	Million Euros 2005	*154,130*	*136,444*	*143,901*	*145,761*	*-2.4*	*0.5*	*0.1*	*0.3*
Emissions certificate	Million Euros 2005	*0*	*2,562*	*12,021*	*11,200*	*0.0*	*16.7*	*-0.7*	*7.7*
Road charges	Million Euros 2005	*65,149*	*65,365*	*76,080*	*92,254*	*0.1*	*1.5*	*1.9*	*1.7*
ENERGY INDICATORS									
Primary energy production	Million toe per year	905	959	953	890	1.2	-0.1	-0.7	-0.4
Share of domestic energy production	%	50	55	56	54	2.2	0.1	-0.4	-0.2
Final energy demand by source	Million toe per year	1,821	1,731	1,699	1,660	-1.0	-0.2	-0.2	-0.2
Oil	Million toe per year	*669*	*580*	*511*	*465*	*-2.8*	*-1.3*	*-0.9*	*-1.1*
Gas	Million toe per year	*443*	*383*	*440*	*434*	*-2.9*	*1.4*	*-0.1*	*0.6*
Coal, Nuclear	Million toe per year	*583*	*596*	*436*	*364*	*0.4*	*-3.1*	*-1.8*	*-2.4*
Biomass	Million toe per year	*89*	*110*	*212*	*268*	*4.2*	*6.8*	*2.4*	*4.6*
Other Renewables	Million toe per year	*37*	*63*	*99*	*128*	*11.3*	*4.7*	*2.6*	*3.6*
Final energy demand by consuming sector	Million toe per year	1,196	1,126	1,138	1,125	-1.2	0.1	-0.1	0.0
Transport freight	Million toe per year	*124*	*116*	*116*	*106*	*-1.3*	*-0.1*	*-0.9*	*-0.5*
Transport passenger	Million toe per year	*250*	*240*	*226*	*219*	*-0.8*	*-0.6*	*-0.3*	*-0.5*
Industry	Million toe per year	*335*	*313*	*312*	*305*	*-1.4*	*0.0*	*-0.2*	*-0.1*
Residential and services	Million toe per year	*486*	*457*	*485*	*495*	*-1.2*	*0.6*	*0.2*	*0.4*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.93	1.26	1.26	1.40	6.4	0.0	1.1	0.5
Gasoline price	Euros2005 per litre	1.07	1.40	1.36	1.48	5.6	-0.3	0.9	0.3
Biofuels price	Euros2005 per eeccf	0.65	1.16	1.26	1.44	12.3	0.8	1.4	1.1
Renewables energy sources on transport demand	%	1	4	9	16	30.0	10.0	5.7	7.8
Share of renewables in electricity	%	15	24	37	44	9.3	4.7	1.7	3.2
Share of renewables in final energy demand	%	8	12	19	24	7.4	4.7	2.6	3.6
Energy intensity of freight transport activity	toe/Million tkm	37	35	26	22	-1.2	-2.8	-1.8	-2.3
Energy intensity of passenger transport activity	toe/Million pkm	40	40	33	30	-0.1	-2.0	-0.8	-1.4
Energy intensity of economic activity	toe/Million Euros 2005	113	105	88	78	-1.5	-1.7	-1.2	-1.5

iTREN-2030 EU27	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO_2 Transport emissions (Intra-EU)	Million tonnes per year	1,044	966	970	923	-1.5	0.0	-0.5	-0.2
Road freight	Million tonnes per year	*285*	*290*	*268*	*257*	*0.3*	*-0.8*	*-0.4*	*-0.6*
Road passenger	Million tonnes per year	*652*	*572*	*579*	*539*	*-2.6*	*0.1*	*-0.7*	*-0.3*
Rail freight	Million tonnes per year	*11*	*18*	*25*	*32*	*9.8*	*3.6*	*2.6*	*3.1*
Rail passenger	Million tonnes per year	*7*	*7*	*7*	*7*	*1.3*	*-0.2*	*-0.2*	*-0.2*
Inland navigation	Million tonnes per year	*5*	*5*	*6*	*6*	*-0.6*	*1.9*	*0.5*	*1.2*
Maritime (Intra-EU)	Million tonnes per year	*7*	*7*	*9*	*9*	*-1.2*	*2.6*	*-0.1*	*1.3*
Air (Intra-EU)	Million tonnes per year	*76*	*68*	*76*	*72*	*-2.4*	*1.2*	*-0.5*	*0.3*
CO_2 intensity of freight transport activity	tonnes/1000 tkm	0.091	0.095	0.070	0.063	0.9	-3.0	-1.1	-2.1
Road	tonnes/1000 tkm	*0.161*	*0.159*	*0.121*	*0.105*	*-0.2*	*-2.7*	*-1.4*	*-2.0*
Rail	tonnes/1000 tkm	*0.027*	*0.041*	*0.046*	*0.054*	*8.8*	*1.2*	*1.6*	*1.4*
Inland navigation	tonnes/1000 tkm	*0.039*	*0.040*	*0.039*	*0.038*	*0.5*	*-0.4*	*-0.2*	*-0.3*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.007*	*0.007*	*0.006*	*0.005*	*0.6*	*-1.7*	*-1.0*	*-1.3*
CO_2 intensity of passenger transport activity	tonnes/1000 pkm	0.119	0.108	0.096	0.086	-1.9	-1.2	-1.2	-1.2
Road	tonnes/1000 pkm	*0.124*	*0.114*	*0.100*	*0.089*	*-1.7*	*-1.3*	*-1.2*	*-1.2*
Rail	tonnes/1000 pkm	*0.015*	*0.014*	*0.012*	*0.011*	*-1.3*	*-1.0*	*-1.2*	*-1.1*
Air	tonnes/1000 pkm	*0.173*	*0.166*	*0.150*	*0.136*	*-0.9*	*-1.0*	*-0.9*	*-1.0*
NO_x Transport emissions	1000 Tonnes per year	4,424	3,074	2,559	2,357	-7.0	-1.8	-0.8	-1.3
Road freight	1000 Tonnes per year	*982*	*706*	*391*	*261*	*-6.4*	*-5.7*	*-4.0*	*-4.9*
Road passenger	1000 Tonnes per year	*2,112*	*1,120*	*649*	*515*	*-11.9*	*-5.3*	*-2.3*	*-3.8*
Rail freight	1000 Tonnes per year	*102*	*103*	*142*	*180*	*0.2*	*3.3*	*2.4*	*2.8*
Rail passenger	1000 Tonnes per year	*61*	*65*	*61*	*55*	*1.1*	*-0.7*	*-0.9*	*-0.8*
Inland navigation	1000 Tonnes per year	*85*	*82*	*99*	*105*	*-0.6*	*1.9*	*0.5*	*1.2*
Maritime (Intra-EU)	1000 Tonnes per year	*163*	*150*	*187*	*179*	*-1.6*	*2.2*	*-0.4*	*0.9*
Air (Intra-EU)	1000 Tonnes per year	*918*	*848*	*1,029*	*1,062*	*-1.6*	*2.0*	*0.3*	*1.1*
PM_{10} Transport emissions	1000 Tonnes per year	290	229	166	150	-4.6	-3.1	-1.0	-2.1
Road freight	1000 Tonnes per year	*80*	*58*	*38*	*35*	*-6.2*	*-4.1*	*-0.8*	*-2.5*
Road passenger	1000 Tonnes per year	*210*	*170*	*128*	*115*	*-4.1*	*-2.8*	*-1.1*	*-1.9*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	211,173	217,189	255,775	280,279	0.6	1.6	0.9	1.3
Gasoline	1000 vehicles	*147,824*	*131,809*	*135,067*	*145,153*	*-2.3*	*0.2*	*0.7*	*0.5*
Diesel	1000 vehicles	*57,454*	*75,525*	*89,958*	*84,772*	*5.6*	*1.8*	*-0.6*	*0.6*
LPG/CNG	1000 vehicles	*4,944*	*6,317*	*10,496*	*10,816*	*5.0*	*5.2*	*0.3*	*2.7*
Bioethanol	1000 vehicles	*46*	*209*	*1,859*	*3,468*	*35.5*	*24.4*	*6.4*	*15.1*
Hybrid	1000 vehicles	*905*	*2,957*	*5,598*	*3,493*	*26.7*	*6.6*	*-4.6*	*0.8*
Electric	1000 vehicles	*0*	*371*	*12,761*	*27,526*	*0.0*	*42.4*	*8.0*	*24.0*
Fuel cells	1000 vehicles	*0*	*0*	*36*	*5,051*	*0.0*	*0.0*	*64.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*80,531*	*72,892*	*73,728*	*76,384*	*-2.0*	*0.1*	*0.4*	*0.2*
Gasoline 1400-2000 cc	1000 vehicles	*57,072*	*49,747*	*51,744*	*59,064*	*-2.7*	*0.4*	*1.3*	*0.9*
Gasoline >2000 cc	1000 vehicles	*10,221*	*9,169*	*9,595*	*9,705*	*-2.1*	*0.5*	*0.1*	*0.3*
Diesel <2000 cc	1000 vehicles	*45,418*	*61,936*	*75,242*	*70,799*	*6.4*	*2.0*	*-0.6*	*0.7*
Diesel >2000 cc	1000 vehicles	*12,036*	*13,589*	*14,716*	*13,973*	*2.5*	*0.8*	*-0.5*	*0.1*
PreEURO	*1000 vehicles*	*32,390*	*9,841*	*407*	*2*	*-21.2*	*-27.3*	*-42.9*	*-35.5*
EURO I	1000 vehicles	*43,795*	*21,934*	*1,793*	*46*	*-12.9*	*-22.2*	*-30.7*	*-26.6*
EURO II	1000 vehicles	*48,896*	*35,078*	*4,086*	*179*	*-6.4*	*-19.3*	*-26.9*	*-23.2*
EURO III	1000 vehicles	*79,578*	*69,291*	*18,893*	*1,234*	*-2.7*	*-12.2*	*-23.9*	*-18.2*
EURO IV	1000 vehicles	*619*	*45,715*	*23,436*	*2,292*	*136.4*	*-6.5*	*-20.7*	*-13.9*
EURO V or later	1000 vehicles	*0*	*25,474*	*176,411*	*226,173*	*0.0*	*21.4*	*2.5*	*11.5*
Light duty vehicle fleet size	1000 vehicles	19,542	20,259	21,057	22,929	0.7	0.4	0.9	0.6
Gasoline and Diesel	1000 vehicles	*19,542*	*20,259*	*20,858*	*21,562*	*0.7*	*0.3*	*0.3*	*0.3*
Electric	1000 vehicles	*0*	*0*	*199*	*1,367*	*n.a.*	*n.a.*	*21.2*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	8,309	9,661	11,421	13,092	3.1	1.7	1.4	1.5
3.5-7.5 tonnes	1000 vehicles	*3,769*	*4,452*	*5,354*	*6,157*	*3.4*	*1.9*	*1.4*	*1.6*
7.5-16 tonnes	1000 vehicles	*990*	*1,166*	*1,402*	*1,608*	*3.3*	*1.9*	*1.4*	*1.6*
16-32 tonnes	1000 vehicles	*2,839*	*3,240*	*3,741*	*4,283*	*2.7*	*1.4*	*1.4*	*1.4*
>32 tonnes	1000 vehicles	*711*	*803*	*925*	*1,044*	*2.5*	*1.4*	*1.2*	*1.3*
PreEURO	*1000 vehicles*	*3,676*	*2,511*	*658*	*114*	*-7.3*	*-12.5*	*-16.1*	*-14.3*
EURO I	1000 vehicles	*930*	*790*	*324*	*105*	*-3.2*	*-8.5*	*-10.6*	*-9.6*
EURO II	1000 vehicles	*1,567*	*1,480*	*800*	*198*	*-1.1*	*-6.0*	*-13.0*	*-9.6*
EURO III	1000 vehicles	*2,135*	*2,730*	*2,196*	*1,023*	*5.0*	*-2.2*	*-7.4*	*-4.8*
EURO IV	1000 vehicles	*1*	*1,709*	*1,578*	*939*	*387.5*	*-0.8*	*-5.1*	*-3.0*
EURO V or later	1000 vehicles	*0*	*441*	*5,866*	*10,713*	*346.6*	*29.5*	*6.2*	*17.3*

iTREN-2030 EU15	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	14,785	15,225	17,075	18,574	0.6	1.2	0.8	1.0
Freight transport activity originated in the country	Billion tonnes-km per year	2,805	2,747	3,447	3,656	-0.4	2.3	0.6	1.4
Road	Billion tonnes-km per year	*1,421*	*1,459*	*1,692*	*1,796*	*0.5*	*1.5*	*0.6*	*1.0*
Rail	Billion tonnes-km per year	*289*	*292*	*330*	*333*	*0.2*	*1.2*	*0.1*	*0.7*
Inland navigation	Billion tonnes-km per year	*133*	*124*	*152*	*157*	*-1.3*	*2.0*	*0.3*	*1.2*
Maritime (Intra-EU)	Billion tonnes-km per year	*963*	*871*	*1,273*	*1,370*	*-2.0*	*3.9*	*0.7*	*2.3*
Average freight transport distance	km	190	180	202	197	-1.0	1.1	-0.3	0.4
Freight transport activity on the national territory	Billion tonnes-km per year	1,910	1,937	2,341	2,513	0.3	1.9	0.7	1.3
Road	Billion tonnes-km per year	*1,506*	*1,536*	*1,852*	*2,000*	*0.4*	*1.9*	*0.8*	*1.3*
Rail	Billion tonnes-km per year	*289*	*293*	*357*	*376*	*0.2*	*2.0*	*0.5*	*1.3*
Inland navigation	Billion tonnes-km per year	*116*	*108*	*132*	*137*	*-1.3*	*2.0*	*0.3*	*1.2*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	270	289	297	315	1.3	0.3	0.6	0.4
Trips originated in the country	Million trips per year	396,192	389,295	419,926	432,073	-0.4	0.8	0.3	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	5,696	5,522	6,341	6,664	-0.6	1.4	0.5	0.9
Car	Billion pass-km per year	*4,213*	*3,962*	*4,676*	*4,912*	*-1.2*	*1.7*	*0.5*	*1.1*
Bus	Billion pass-km per year	*474*	*510*	*458*	*448*	*1.4*	*-1.1*	*-0.2*	*-0.6*
Rail	Billion pass-km per year	*389*	*454*	*491*	*539*	*3.1*	*0.8*	*0.9*	*0.9*
Air (Intra-EU)	Billion pass-km per year	*410*	*379*	*467*	*484*	*-1.6*	*2.1*	*0.4*	*1.2*
Slow	Billion pass-km per year	*209*	*218*	*250*	*280*	*0.8*	*1.4*	*1.2*	*1.3*
Average passenger transport distance	km	14.4	14.2	15.1	15.4	-0.3	0.6	0.2	0.4
Passenger transport activity on the national territ	Billion pass-km per year	5,088	4,935	5,635	5,909	-0.6	1.3	0.5	0.9
Road	Billion pass-km per year	*4,695*	*4,478*	*5,140*	*5,367*	*-0.9*	*1.4*	*0.4*	*0.9*
Rail	Billion pass-km per year	*392*	*457*	*495*	*543*	*3.1*	*0.8*	*0.9*	*0.9*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	2,439	2,304	2,810	3,037	-1.1	2.0	0.8	1.4
Motorization rate	cars/1000 inhabitants	468	471	534	574	0.1	1.3	0.7	1.0
ECONOMY INDICATORS									
GDP	Billion Euros 2005	10,112	10,269	12,229	13,541	0.3	1.8	1.0	1.4
Employment	1000 Persons	169,140	151,440	154,317	144,003	-2.2	0.2	-0.7	-0.3
Agriculture and fishery	1000 Persons	*8,308*	*7,649*	*6,778*	*5,980*	*-1.6*	*-1.2*	*-1.2*	*-1.2*
Construction	1000 Persons	*12,537*	*11,140*	*11,764*	*10,690*	*-2.3*	*0.5*	*-1.0*	*-0.2*
Energy and water	1000 Persons	*2,265*	*2,439*	*2,574*	*2,604*	*1.5*	*0.5*	*0.1*	*0.3*
Industry	1000 Persons	*34,529*	*26,062*	*30,054*	*28,416*	*-5.5*	*1.4*	*-0.6*	*0.4*
Transport services	1000 Persons	*6,181*	*5,638*	*5,924*	*5,553*	*-1.8*	*0.5*	*-0.6*	*-0.1*
Other services	1000 Persons	*106,539*	*98,513*	*97,224*	*90,760*	*-1.6*	*-0.1*	*-0.7*	*-0.4*
Population total	1000 Persons	384,812	390,214	396,997	398,382	0.3	0.2	0.0	0.1
Labour force	1000 Persons	*246,831*	*250,425*	*250,451*	*243,288*	*0.3*	*0.0*	*-0.3*	*-0.1*
Retired (> 65 years)	1000 Persons	*62,194*	*63,790*	*71,345*	*84,145*	*0.5*	*1.1*	*1.7*	*1.4*
Transport taxation revenues	Million Euros 2005	198,332	182,531	205,881	219,178	-1.6	1.2	0.6	0.9
Fuel taxes	Million Euros 2005	*140,881*	*123,788*	*130,217*	*130,618*	*-2.6*	*0.5*	*0.0*	*0.3*
Emissions certificate	Million Euros 2005	*0*	*2,262*	*10,623*	*9,767*	*0.0*	*16.7*	*-0.8*	*7.6*
Road charges	Million Euros 2005	*57,450*	*56,480*	*65,041*	*78,793*	*-0.3*	*1.4*	*1.9*	*1.7*
ENERGY INDICATORS									
Primary energy production	Million toe per year	735	760	752	686	0.7	-0.1	-0.9	-0.5
Share of domestic energy production	%	48	53	53	50	2.0	0.1	-0.6	-0.2
Final energy demand by source	Million toe per year	1,543	1,446	1,410	1,368	-1.3	-0.2	-0.3	-0.3
Oil	Million toe per year	*601*	*512*	*445*	*400*	*-3.2*	*-1.4*	*-1.1*	*-1.2*
Gas	Million toe per year	*383*	*334*	*376*	*367*	*-2.7*	*1.2*	*-0.2*	*0.5*
Coal, Nuclear	Million toe per year	*451*	*455*	*344*	*286*	*0.2*	*-2.7*	*-1.9*	*-2.3*
Biomass	Million toe per year	*75*	*88*	*159*	*205*	*3.3*	*6.1*	*2.6*	*4.3*
Other Renewables	Million toe per year	*33*	*56*	*86*	*111*	*11.4*	*4.3*	*2.6*	*3.5*
Final energy demand by consuming sector	Million toe per year	1,029	956	949	927	-1.5	-0.1	-0.2	-0.2
Transport freight	Million toe per year	*111*	*103*	*102*	*92*	*-1.4*	*-0.1*	*-1.0*	*-0.6*
Transport passenger	Million toe per year	*225*	*213*	*194*	*182*	*-1.1*	*-0.9*	*-0.6*	*-0.8*
Industry	Million toe per year	*280*	*254*	*251*	*250*	*-2.0*	*-0.1*	*-0.1*	*-0.1*
Residential and services	Million toe per year	*413*	*386*	*401*	*403*	*-1.3*	*0.4*	*0.0*	*0.2*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.94	1.28	1.28	1.43	6.3	0.0	1.1	0.5
Gasoline price	Euros2005 per litre	1.09	1.43	1.38	1.51	5.5	-0.3	0.9	0.3
Biofuels price	Euros2005 per eeccf	0.65	1.17	1.27	1.45	12.4	0.9	1.3	1.1
Renewables energy sources on transport demand	%	1	3	9	15	26.1	9.6	5.9	7.7
Share of renewables in electricity	%	16	25	37	44	9.4	4.2	1.8	3.0
Share of renewables in final energy demand	%	8	12	18	23	7.7	4.4	2.7	3.6
Energy intensity of freight transport activity	toe/Million tkm	39	37	28	24	-1.0	-2.6	-1.7	-2.2
Energy intensity of passenger transport activity	toe/Million pkm	41	40	32	28	-0.4	-2.3	-1.1	-1.7
Energy intensity of economic activity	toe/Million Euros 2005	102	93	78	68	-1.8	-1.8	-1.2	-1.5

The ITREN-2030 integrated scenario until 2030

iTREN-2030 EU15	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO_2 Transport emissions (Intra-EU)	Million tonnes per year	923	845	843	788	-1.7	0.0	-0.7	-0.4
Road freight	Million tonnes per year	*246*	*250*	*232*	*218*	*0.3*	*-0.7*	*-0.6*	*-0.7*
Road passenger	Million tonnes per year	*582*	*510*	*514*	*474*	*-2.6*	*0.1*	*-0.8*	*-0.4*
Rail freight	Million tonnes per year	*6*	*6*	*8*	*10*	*-1.3*	*2.9*	*2.9*	*2.9*
Rail passenger	Million tonnes per year	*5*	*6*	*6*	*6*	*1.9*	*-0.3*	*-0.2*	*-0.3*
Inland navigation	Million tonnes per year	*5*	*4*	*5*	*5*	*-1.7*	*1.7*	*0.2*	*1.0*
Maritime (Intra-EU)	Million tonnes per year	*7*	*6*	*8*	*8*	*-1.2*	*2.4*	*-0.2*	*1.1*
Air (Intra-EU)	Million tonnes per year	*71*	*63*	*70*	*66*	*-2.4*	*1.1*	*-0.6*	*0.3*
CO_2 intensity of freight transport activity	tonnes/1000 tkm	0.092	0.095	0.070	0.062	0.7	-3.0	-1.2	-2.1
Road	tonnes/1000 tkm	*0.163*	*0.163*	*0.125*	*0.109*	*-0.1*	*-2.6*	*-1.4*	*-2.0*
Rail	tonnes/1000 tkm	*0.022*	*0.020*	*0.022*	*0.028*	*-1.5*	*0.9*	*2.4*	*1.6*
Inland navigation	tonnes/1000 tkm	*0.042*	*0.041*	*0.040*	*0.039*	*-0.4*	*-0.3*	*-0.1*	*-0.2*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.007*	*0.007*	*0.006*	*0.006*	*0.8*	*-1.4*	*-0.9*	*-1.2*
CO_2 intensity of passenger transport activity	tonnes/1000 pkm	0.120	0.109	0.097	0.085	-1.9	-1.2	-1.2	-1.2
Road	tonnes/1000 pkm	*0.124*	*0.114*	*0.100*	*0.088*	*-1.7*	*-1.3*	*-1.2*	*-1.3*
Rail	tonnes/1000 pkm	*0.014*	*0.013*	*0.012*	*0.011*	*-1.1*	*-1.0*	*-1.2*	*-1.1*
Air	tonnes/1000 pkm	*0.174*	*0.166*	*0.151*	*0.137*	*-0.9*	*-1.0*	*-0.9*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	3,824	2,638	2,181	1,973	-7.2	-1.9	-1.0	-1.4
Road freight	1000 Tonnes per year	*801*	*567*	*315*	*208*	*-6.7*	*-5.7*	*-4.1*	*-4.9*
Road passenger	1000 Tonnes per year	*1,845*	*979*	*564*	*444*	*-11.9*	*-5.4*	*-2.4*	*-3.9*
Rail freight	1000 Tonnes per year	*38*	*35*	*37*	*41*	*-1.8*	*0.8*	*1.0*	*0.9*
Rail passenger	1000 Tonnes per year	*50*	*54*	*51*	*46*	*1.6*	*-0.6*	*-0.9*	*-0.8*
Inland navigation	1000 Tonnes per year	*80*	*74*	*87*	*89*	*-1.7*	*1.7*	*0.2*	*1.0*
Maritime (Intra-EU)	1000 Tonnes per year	*152*	*140*	*171*	*162*	*-1.6*	*2.0*	*-0.5*	*0.7*
Air (Intra-EU)	1000 Tonnes per year	*858*	*790*	*955*	*981*	*-1.6*	*1.9*	*0.3*	*1.1*
PM10 Transport emissions	1000 Tonnes per year	258	203	145	130	-4.6	-3.3	-1.1	-2.2
Road freight	1000 Tonnes per year	*68*	*48*	*30*	*27*	*-6.7*	*-4.7*	*-1.1*	*-2.9*
Road passenger	1000 Tonnes per year	*189*	*155*	*115*	*103*	*-4.0*	*-2.9*	*-1.1*	*-2.0*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	180,108	183,674	211,871	228,559	0.4	1.4	0.8	1.1
Gasoline	1000 vehicles	*124,096*	*107,270*	*105,039*	*111,598*	*-2.9*	*-0.2*	*0.6*	*0.2*
Diesel	1000 vehicles	*52,254*	*69,352*	*82,764*	*77,285*	*5.8*	*1.8*	*-0.7*	*0.5*
LPG/CNG	1000 vehicles	*2,902*	*3,927*	*7,359*	*7,041*	*6.2*	*6.5*	*-0.4*	*3.0*
Bioethanol	1000 vehicles	*45*	*196*	*1,583*	*2,714*	*34.5*	*23.2*	*5.5*	*14.0*
Hybrid	1000 vehicles	*811*	*2,658*	*4,894*	*3,079*	*26.8*	*6.3*	*-4.5*	*0.7*
Electric	1000 vehicles	*0*	*271*	*10,197*	*22,021*	*0.0*	*43.8*	*8.0*	*24.6*
Fuel cells	1000 vehicles	*0*	*0*	*36*	*4,822*	*0.0*	*0.0*	*63.4*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*65,435*	*57,075*	*54,605*	*55,532*	*-2.7*	*-0.4*	*0.2*	*-0.1*
Gasoline 1400-2000 cc	1000 vehicles	*49,305*	*41,858*	*41,857*	*47,537*	*-3.2*	*0.0*	*1.3*	*0.6*
Gasoline >2000 cc	1000 vehicles	*9,356*	*8,337*	*8,577*	*8,530*	*-2.3*	*0.3*	*-0.1*	*0.1*
Diesel <2000 cc	1000 vehicles	*40,964*	*56,554*	*68,902*	*64,202*	*6.7*	*2.0*	*-0.7*	*0.6*
Diesel >2000 cc	1000 vehicles	*11,291*	*12,798*	*13,863*	*13,082*	*2.5*	*0.8*	*-0.6*	*0.1*
PreEURO	*1000 vehicles*	*26,048*	*8,486*	*394*	*1*	*-20.1*	*-26.4*	*-42.8*	*-35.1*
EURO I	1000 vehicles	*41,603*	*20,153*	*1,751*	*41*	*-13.5*	*-21.7*	*-31.3*	*-26.6*
EURO II	1000 vehicles	*43,419*	*29,938*	*4,086*	*175*	*-7.2*	*-18.1*	*-27.0*	*-22.7*
EURO III	1000 vehicles	*64,650*	*55,025*	*15,507*	*1,218*	*-3.2*	*-11.9*	*-22.5*	*-17.3*
EURO IV	1000 vehicles	*630*	*40,083*	*19,211*	*2,311*	*129.5*	*-7.1*	*-19.1*	*-13.3*
EURO V or later	1000 vehicles	*0*	*22,937*	*146,855*	*185,136*	*0.0*	*20.4*	*2.3*	*11.0*
Light duty vehicle fleet size	1000 vehicles	15,895	16,695	17,966	19,511	1.0	0.7	0.8	0.8
Gasoline and Diesel	1000 vehicles	*15,895*	*16,695*	*17,777*	*18,278*	*1.0*	*0.6*	*0.3*	*0.5*
Electric	1000 vehicles	*0*	*0*	*189*	*1,234*	*n.a.*	*n.a.*	*20.6*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	6,423	6,965	7,830	8,303	1.6	1.2	0.6	0.9
3.5-7.5 tonnes	1000 vehicles	*2,802*	*3,101*	*3,585*	*3,814*	*2.1*	*1.5*	*0.6*	*1.0*
7.5-16 tonnes	1000 vehicles	*759*	*838*	*969*	*1,031*	*2.0*	*1.5*	*0.6*	*1.0*
16-32 tonnes	1000 vehicles	*2,261*	*2,389*	*2,581*	*2,725*	*1.1*	*0.8*	*0.5*	*0.7*
>32 tonnes	1000 vehicles	*601*	*637*	*695*	*733*	*1.2*	*0.9*	*0.5*	*0.7*
PreEURO	*1000 vehicles*	*2,841*	*1,680*	*237*	*33*	*-10.0*	*-17.8*	*-18.0*	*-17.9*
EURO I	1000 vehicles	*784*	*613*	*171*	*28*	*-4.8*	*-12.0*	*-16.4*	*-14.2*
EURO II	1000 vehicles	*1,407*	*1,269*	*613*	*78*	*-2.0*	*-7.0*	*-18.6*	*-13.0*
EURO III	1000 vehicles	*1,389*	*1,776*	*1,271*	*271*	*5.0*	*-3.3*	*-14.3*	*-9.0*
EURO IV	1000 vehicles	*1*	*1,289*	*1,173*	*552*	*357.4*	*-0.9*	*-7.3*	*-4.2*
EURO V or later	1000 vehicles	*0*	*337*	*4,365*	*7,341*	*320.2*	*29.2*	*5.3*	*16.7*

iTREN-2030 EU12	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	3,108	3,340	3,595	4,208	1.5	0.7	1.6	1.2
Freight transport activity originated in the country	Billion tonnes-km per year	625	660	990	1,215	1.1	4.1	2.1	3.1
Road	Billion tonnes-km per year	*292*	*311*	*423*	*522*	*1.3*	*3.1*	*2.1*	*2.6*
Rail	Billion tonnes-km per year	*153*	*169*	*239*	*285*	*1.9*	*3.6*	*1.7*	*2.7*
Inland navigation	Billion tonnes-km per year	*60*	*61*	*89*	*118*	*0.5*	*3.8*	*2.9*	*3.3*
Maritime (Intra-EU)	Billion tonnes-km per year	*120*	*119*	*239*	*290*	*-0.2*	*7.2*	*2.0*	*4.6*
Average freight transport distance	km	201	198	276	289	-0.3	3.4	0.5	1.9
Freight transport activity on the national territory	Billion tonnes-km per year	401	438	568	687	1.8	2.6	1.9	2.3
Road	Billion tonnes-km per year	*261*	*282*	*358*	*435*	*1.5*	*2.4*	*2.0*	*2.2*
Rail	Billion tonnes-km per year	*125*	*141*	*188*	*222*	*2.5*	*2.9*	*1.7*	*2.3*
Inland navigation	Billion tonnes-km per year	*15*	*15*	*22*	*29*	*0.5*	*3.8*	*2.9*	*3.3*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	49	54	55	65	2.0	0.2	1.6	0.9
Trips originated in the country	Million trips per year	79,437	77,910	81,860	83,641	-0.4	0.5	0.2	0.4
Passenger transport activity originated in the cou	Billion pass-km per year	760	738	855	913	-0.6	1.5	0.7	1.1
Car	Billion pass-km per year	*449*	*435*	*535*	*581*	*-0.7*	*2.1*	*0.8*	*1.5*
Bus	Billion pass-km per year	*141*	*133*	*127*	*122*	*-1.2*	*-0.5*	*-0.4*	*-0.4*
Rail	Billion pass-km per year	*88*	*88*	*97*	*106*	*0.0*	*1.0*	*0.9*	*0.9*
Air (Intra-EU)	Billion pass-km per year	*31*	*30*	*40*	*44*	*-0.8*	*2.8*	*1.1*	*1.9*
Slow	Billion pass-km per year	*50*	*53*	*57*	*60*	*0.9*	*0.7*	*0.6*	*0.7*
Average passenger transport distance	km	9.6	9.5	10.4	10.9	-0.2	1.0	0.4	0.7
Passenger transport activity on the national territ	Billion pass-km per year	659	637	737	786	-0.7	1.5	0.6	1.1
Road	Billion pass-km per year	*571*	*549*	*640*	*680*	*-0.8*	*1.6*	*0.6*	*1.1*
Rail	Billion pass-km per year	*88*	*88*	*97*	*106*	*0.0*	*1.0*	*0.9*	*0.9*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	305	298	384	430	-0.5	2.6	1.1	1.9
Motorization rate	cars/1000 inhabitants	299	328	442	539	1.8	3.0	2.0	2.5
ECONOMY INDICATORS									
GDP	Billion Euros 2005	462	488	697	904	1.1	3.6	2.6	3.1
Employment	1000 Persons	41,653	41,684	49,017	48,642	0.0	1.6	-0.1	0.8
Agriculture and fishery	1000 Persons	*7,075*	*5,339*	*5,056*	*5,045*	*-5.5*	*-0.5*	*0.0*	*-0.3*
Construction	1000 Persons	*4,311*	*3,922*	*4,986*	*4,982*	*-1.9*	*2.4*	*0.0*	*1.2*
Energy and water	1000 Persons	*363*	*331*	*325*	*339*	*-1.8*	*-0.2*	*0.4*	*0.1*
Industry	1000 Persons	*15,210*	*12,026*	*14,982*	*14,401*	*-4.6*	*2.2*	*-0.4*	*0.9*
Transport services	1000 Persons	*1,695*	*1,526*	*2,118*	*2,163*	*-2.1*	*3.3*	*0.2*	*1.8*
Other services	1000 Persons	*18,547*	*18,540*	*21,550*	*21,713*	*0.0*	*1.5*	*0.1*	*0.8*
Population total	1000 Persons	103,782	102,165	99,272	95,949	-0.3	-0.3	-0.3	-0.3
Labour force	1000 Persons	*67,269*	*68,576*	*65,094*	*60,972*	*0.4*	*-0.5*	*-0.7*	*-0.6*
Retired (> 65 years)	1000 Persons	*14,387*	*14,391*	*17,264*	*19,231*	*0.0*	*1.8*	*1.1*	*1.5*
Transport taxation revenues	Million Euros 2005	20,946	21,840	26,122	30,036	0.8	1.8	1.4	1.6
Fuel taxes	Million Euros 2005	*13,248*	*12,655*	*13,685*	*15,143*	*-0.9*	*0.8*	*1.0*	*0.9*
Emissions certificate	Million Euros 2005	*0*	*300*	*1,398*	*1,433*	*0.0*	*16.6*	*0.2*	*8.1*
Road charges	Million Euros 2005	*7,698*	*8,885*	*11,040*	*13,461*	*2.9*	*2.2*	*2.0*	*2.1*
ENERGY INDICATORS									
Primary energy production	Million toe per year	170	199	201	204	3.1	0.1	0.2	0.1
Share of domestic energy production	%	61	70	69	70	2.6	0.0	0.1	0.0
Final energy demand by source	Million toe per year	278	285	289	292	0.5	0.1	0.1	0.1
Oil	Million toe per year	*68*	*68*	*67*	*66*	*0.0*	*-0.2*	*-0.1*	*-0.2*
Gas	Million toe per year	*60*	*48*	*64*	*66*	*-4.1*	*2.8*	*0.3*	*1.6*
Coal, Nuclear	Million toe per year	*132*	*141*	*92*	*79*	*1.4*	*-4.2*	*-1.5*	*-2.9*
Biomass	Million toe per year	*15*	*22*	*53*	*63*	*8.2*	*9.3*	*1.8*	*5.5*
Other Renewables	Million toe per year	*4*	*6*	*13*	*17*	*10.3*	*7.4*	*2.9*	*5.1*
Final energy demand by consuming sector	Million toe per year	167	170	189	198	0.4	1.1	0.5	0.8
Transport freight	Million toe per year	*13*	*13*	*14*	*13*	*-0.5*	*0.5*	*-0.4*	*0.1*
Transport passenger	Million toe per year	*25*	*27*	*32*	*37*	*1.8*	*1.4*	*1.5*	*1.5*
Industry	Million toe per year	*55*	*59*	*60*	*55*	*1.3*	*0.3*	*-0.9*	*-0.3*
Residential and services	Million toe per year	*73*	*71*	*83*	*93*	*-0.6*	*1.6*	*1.1*	*1.3*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.75	1.09	1.09	1.21	8.0	-0.1	1.1	0.5
Gasoline price	Euros2005 per litre	0.93	1.24	1.22	1.35	5.9	-0.1	1.0	0.5
Biofuels price	Euros2005 per eeccf	0.61	1.10	1.20	1.37	12.6	0.9	1.4	1.1
Renewables energy sources on transport demand	%	0	5	15	23	99.7	11.6	4.4	7.9
Share of renewables in electricity	%	12	18	41	46	8.9	8.7	1.3	4.9
Share of renewables in final energy demand	%	10	13	24	29	5.8	6.2	1.8	4.0
Energy intensity of freight transport activity	toe/Million tkm	26	23	17	14	-1.8	-3.1	-2.3	-2.7
Energy intensity of passenger transport activity	toe/Million pkm	36	41	41	44	2.5	-0.1	0.8	0.4
Energy intensity of economic activity	toe/Million Euros 2005	361	349	271	219	-0.7	-2.5	-2.1	-2.3

iTREN-2030 EU12	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	128	121	127	135	-1.1	0.5	0.6	0.6
Road freight	Million tonnes per year	*39*	*40*	*36*	*39*	*0.3*	*-0.9*	*0.7*	*-0.1*
Road passenger	Million tonnes per year	*70*	*62*	*65*	*65*	*-2.4*	*0.5*	*0.0*	*0.3*
Rail freight	Million tonnes per year	*11*	*12*	*17*	*22*	*1.4*	*3.9*	*2.4*	*3.1*
Rail passenger	Million tonnes per year	*2*	*1*	*1*	*1*	*-1.2*	*-0.1*	*-0.2*	*-0.1*
Inland navigation	Million tonnes per year	*0*	*1*	*1*	*1*	*14.0*	*3.2*	*2.8*	*3.0*
Maritime (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-1.1*	*4.8*	*0.8*	*2.8*
Air (Intra-EU)	Million tonnes per year	*5*	*5*	*6*	*6*	*-1.6*	*1.7*	*0.1*	*0.9*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.098	0.094	0.068	0.064	-0.7	-3.2	-0.6	-1.9
Road	tonnes/1000 tkm	*0.149*	*0.140*	*0.101*	*0.089*	*-1.2*	*-3.2*	*-1.3*	*-2.3*
Rail	tonnes/1000 tkm	*0.088*	*0.084*	*0.092*	*0.099*	*-1.1*	*0.9*	*0.7*	*0.8*
Inland navigation	tonnes/1000 tkm	*0.019*	*0.035*	*0.033*	*0.033*	*13.4*	*-0.6*	*0.0*	*-0.3*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.004*	*0.004*	*0.003*	*0.003*	*-0.9*	*-2.2*	*-1.1*	*-1.7*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.111	0.102	0.093	0.087	-1.7	-1.0	-0.6	-0.8
Road	tonnes/1000 pkm	*0.123*	*0.113*	*0.102*	*0.096*	*-1.6*	*-1.1*	*-0.6*	*-0.8*
Rail	tonnes/1000 pkm	*0.018*	*0.017*	*0.015*	*0.014*	*-1.2*	*-1.0*	*-1.1*	*-1.1*
Air	tonnes/1000 pkm	*0.163*	*0.156*	*0.141*	*0.127*	*-0.8*	*-1.1*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	600	436	378	384	-6.2	-1.4	0.2	-0.6
Road freight	1000 Tonnes per year	*181*	*139*	*76*	*52*	*-5.2*	*-5.9*	*-3.6*	*-4.8*
Road passenger	1000 Tonnes per year	*266*	*141*	*85*	*71*	*-11.9*	*-4.9*	*-1.8*	*-3.4*
Rail freight	1000 Tonnes per year	*64*	*68*	*105*	*138*	*1.3*	*4.4*	*2.8*	*3.6*
Rail passenger	1000 Tonnes per year	*12*	*11*	*10*	*9*	*-1.4*	*-0.7*	*-1.0*	*-0.8*
Inland navigation	1000 Tonnes per year	*4*	*9*	*12*	*16*	*14.0*	*3.2*	*2.8*	*3.0*
Maritime (Intra-EU)	1000 Tonnes per year	*12*	*11*	*16*	*17*	*-1.6*	*4.4*	*0.4*	*2.4*
Air (Intra-EU)	1000 Tonnes per year	*60*	*58*	*74*	*81*	*-0.8*	*2.5*	*0.9*	*1.7*
PM10 Transport emissions	1000 Tonnes per year	32	26	21	20	-4.4	-2.0	-0.2	-1.1
Road freight	1000 Tonnes per year	*12*	*10*	*8*	*8*	*-3.4*	*-1.8*	*0.2*	*-0.8*
Road passenger	1000 Tonnes per year	*20*	*16*	*13*	*12*	*-5.0*	*-2.2*	*-0.5*	*-1.4*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	31,065	33,515	43,904	51,721	1.5	2.7	1.7	2.2
Gasoline	1000 vehicles	*23,643*	*24,387*	*29,765*	*33,324*	*0.6*	*2.0*	*1.1*	*1.6*
Diesel	1000 vehicles	*5,285*	*6,325*	*7,456*	*7,718*	*3.7*	*1.7*	*0.3*	*1.0*
LPG/CNG	1000 vehicles	*2,042*	*2,391*	*3,137*	*3,776*	*3.2*	*2.8*	*1.9*	*2.3*
Bioethanol	1000 vehicles	*1*	*13*	*276*	*755*	*58.6*	*35.5*	*10.6*	*22.4*
Hybrid	1000 vehicles	*95*	*299*	*705*	*414*	*25.9*	*9.0*	*-5.2*	*1.6*
Electric	1000 vehicles	*0*	*101*	*2,565*	*5,505*	*0.0*	*38.2*	*7.9*	*22.1*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*229*	*0.0*	*0.0*	*105.2*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*14,986*	*15,665*	*18,885*	*20,634*	*0.9*	*1.9*	*0.9*	*1.4*
Gasoline 1400-2000 cc	1000 vehicles	*7,775*	*7,873*	*9,842*	*11,498*	*0.3*	*2.3*	*1.6*	*1.9*
Gasoline >2000 cc	1000 vehicles	*882*	*848*	*1,038*	*1,192*	*-0.8*	*2.0*	*1.4*	*1.7*
Diesel <2000 cc	1000 vehicles	*4,511*	*5,496*	*6,549*	*6,779*	*4.0*	*1.8*	*0.3*	*1.1*
Diesel >2000 cc	1000 vehicles	*773*	*828*	*907*	*939*	*1.4*	*0.9*	*0.3*	*0.6*
PreEURO	*1000 vehicles*	*6,279*	*1,432*	*19*	*0*	*-25.6*	*-35.0*	*-44.6*	*-40.0*
EURO I	1000 vehicles	*2,316*	*1,759*	*73*	*5*	*-5.4*	*-27.2*	*-23.5*	*-25.4*
EURO II	1000 vehicles	*5,464*	*4,980*	*70*	*7*	*-1.8*	*-34.7*	*-20.2*	*-27.8*
EURO III	1000 vehicles	*14,868*	*14,154*	*3,327*	*40*	*-1.0*	*-13.5*	*-35.8*	*-25.5*
EURO IV	1000 vehicles	*0*	*5,777*	*4,154*	*26*	*0.0*	*-3.2*	*-39.7*	*-23.6*
EURO V or later	1000 vehicles	*0*	*2,610*	*29,578*	*40,964*	*0.0*	*27.5*	*3.3*	*14.8*
Light duty vehicle fleet size	1000 vehicles	3,647	3,564	3,091	3,417	-0.5	-1.4	1.0	-0.2
Gasoline and Diesel	1000 vehicles	*3,647*	*3,564*	*3,081*	*3,284*	*-0.5*	*-1.4*	*0.6*	*-0.4*
Electric	1000 vehicles	*0*	*0*	*10*	*133*	*n.a.*	*n.a.*	*29.6*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	2,244	2,696	3,591	4,788	3.7	2.9	2.9	2.9
3.5-7.5 tonnes	1000 vehicles	*1,138*	*1,350*	*1,769*	*2,343*	*3.5*	*2.7*	*2.8*	*2.8*
7.5-16 tonnes	1000 vehicles	*277*	*329*	*433*	*577*	*3.5*	*2.8*	*2.9*	*2.9*
16-32 tonnes	1000 vehicles	*695*	*851*	*1,159*	*1,558*	*4.1*	*3.1*	*3.0*	*3.1*
>32 tonnes	1000 vehicles	*134*	*166*	*230*	*310*	*4.5*	*3.3*	*3.0*	*3.2*
PreEURO	*1000 vehicles*	*993*	*827*	*402*	*78*	*-3.6*	*-7.0*	*-15.1*	*-11.1*
EURO I	1000 vehicles	*185*	*178*	*148*	*74*	*-0.7*	*-1.8*	*-6.7*	*-4.3*
EURO II	1000 vehicles	*223*	*217*	*193*	*117*	*-0.6*	*-1.2*	*-4.9*	*-3.1*
EURO III	1000 vehicles	*842*	*948*	*904*	*727*	*2.4*	*-0.5*	*-2.2*	*-1.3*
EURO IV	1000 vehicles	*0*	*422*	*413*	*384*	*n.a.*	*-0.2*	*-0.7*	*-0.5*
EURO V or later	1000 vehicles	*0*	*104*	*1,531*	*3,408*	*n.a.*	*30.9*	*8.3*	*19.1*

iTREN-2030 — Integrated scenario
AT - Austria

Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	376	383	383	433	0.4	0.0	1.2	0.6
Freight transport activity originated in the country	Billion tonnes-km per year	52	52	65	73	-0.3	2.3	1.2	1.7
Road	Billion tonnes-km per year	*33*	*32*	*40*	*45*	*-0.8*	*2.4*	*1.2*	*1.8*
Rail	Billion tonnes-km per year	*16*	*16*	*18*	*20*	*0.0*	*1.5*	*0.7*	*1.1*
Inland navigation	Billion tonnes-km per year	*3*	*4*	*6*	*7*	*2.7*	*5.1*	*2.3*	*3.7*
Maritime (Intra-EU)	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Average freight transport distance	km	139	134	169	168	-0.7	2.3	-0.1	1.1
Freight transport activity on the national territory	Billion tonnes-km per year	61	52	69	79	-3.0	2.8	1.4	2.1
Road	Billion tonnes-km per year	*34*	*32*	*42*	*49*	*-1.0*	*2.8*	*1.4*	*2.1*
Rail	Billion tonnes-km per year	*17*	*17*	*21*	*23*	*-0.2*	*2.3*	*1.0*	*1.6*
Inland navigation	Billion tonnes-km per year	*3*	*3*	*6*	*7*	*2.7*	*5.1*	*2.3*	*3.7*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	6	6	6	7	0.2	0.4	1.2	0.8
Trips originated in the country	Million trips per year	7,863	7,674	8,218	8,308	-0.5	0.7	0.1	0.4
Passenger transport activity originated in the cou	Billion pass-km per year	121	116	135	138	-0.8	1.5	0.3	0.9
Car	Billion pass-km per year	*81*	*75*	*88*	*90*	*-1.7*	*1.7*	*0.2*	*0.9*
Bus	Billion pass-km per year	*16*	*17*	*16*	*15*	*1.3*	*-0.8*	*-0.3*	*-0.6*
Rail	Billion pass-km per year	*11*	*13*	*15*	*16*	*2.9*	*1.3*	*0.8*	*1.1*
Air (Intra-EU)	Billion pass-km per year	*9*	*8*	*12*	*12*	*-2.5*	*3.9*	*0.8*	*2.3*
Slow	Billion pass-km per year	*4*	*4*	*4*	*5*	*0.6*	*1.5*	*1.2*	*1.4*
Average passenger transport distance	km	15.4	15.1	16.4	16.6	-0.3	0.8	0.2	0.5
Passenger transport activity on the national territ	Billion pass-km per year	132	103	117	120	-4.8	1.3	0.3	0.8
Road	Billion pass-km per year	*97*	*92*	*105*	*107*	*-1.1*	*1.3*	*0.2*	*0.7*
Rail	Billion pass-km per year	*10*	*11*	*13*	*14*	*2.7*	*1.5*	*0.9*	*1.2*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	51	47	58	60	-1.4	2.0	0.5	1.2
Motorization rate	cars/1000 inhabitants	506	516	587	631	0.4	1.3	0.7	1.0
ECONOMY INDICATORS									
GDP	Billion Euros 2005	268	275	332	372	0.5	1.9	1.1	1.5
Employment	1000 Persons	3,894	3,508	3,606	3,366	-2.1	0.3	-0.7	-0.2
Agriculture and fishery	1000 Persons	*174*	*185*	*154*	*141*	*1.2*	*-1.8*	*-0.9*	*-1.4*
Construction	1000 Persons	*375*	*329*	*354*	*361*	*-2.6*	*0.7*	*0.2*	*0.5*
Energy and water	1000 Persons	*48*	*56*	*64*	*69*	*2.9*	*1.5*	*0.6*	*1.1*
Industry	1000 Persons	*979*	*779*	*1,005*	*988*	*-4.5*	*2.6*	*-0.2*	*1.2*
Transport services	1000 Persons	*202*	*179*	*193*	*181*	*-2.3*	*0.7*	*-0.7*	*0.0*
Other services	1000 Persons	*2,116*	*1,980*	*1,836*	*1,626*	*-1.3*	*-0.8*	*-1.2*	*-1.0*
Population total	1000 Persons	8,164	8,253	8,414	8,479	0.2	0.2	0.1	0.1
Labour force	1000 Persons	*5,252*	*5,253*	*5,349*	*5,149*	*0.0*	*0.2*	*-0.4*	*-0.1*
Retired (> 65 years)	1000 Persons	*1,339*	*1,449*	*1,574*	*1,876*	*1.6*	*0.8*	*1.8*	*1.3*
Transport taxation revenues	Million Euros 2005	3,115	2,785	2,938	3,281	-2.2	0.5	1.1	0.8
Fuel taxes	Million Euros 2005	*2,016*	*1,732*	*1,838*	*1,895*	*-3.0*	*0.6*	*0.3*	*0.4*
Emissions certificate	Million Euros 2005	*0*	*44*	*217*	*209*	*0.0*	*17.3*	*-0.4*	*8.1*
Road charges	Million Euros 2005	*1,099*	*1,008*	*882*	*1,178*	*-1.7*	*-1.3*	*2.9*	*0.8*
ENERGY INDICATORS									
Primary energy production	Million toe per year	10	11	13	14	2.3	1.6	0.4	1.0
Share of domestic energy production	%	30	38	42	43	4.5	1.1	0.3	0.7
Final energy demand by source	Million toe per year	33	30	32	32	-2.2	0.6	0.1	0.3
Oil	Million toe per year	*15*	*12*	*11*	*9*	*-3.4*	*-1.4*	*-1.3*	*-1.3*
Gas	Million toe per year	*8*	*6*	*8*	*8*	*-5.8*	*2.8*	*0.0*	*1.4*
Coal, Nuclear	Million toe per year	*3*	*3*	*3*	*2*	*1.2*	*-1.9*	*-2.4*	*-2.2*
Biomass	Million toe per year	*4*	*4*	*5*	*7*	*-1.4*	*3.2*	*2.9*	*3.0*
Other Renewables	Million toe per year	*4*	*5*	*5*	*6*	*5.4*	*1.4*	*0.9*	*1.1*
Final energy demand by consuming sector	Million toe per year	28	26	26	26	-1.5	0.3	0.0	0.1
Transport freight	Million toe per year	*2*	*2*	*2*	*2*	*-1.2*	*0.3*	*-0.5*	*-0.1*
Transport passenger	Million toe per year	*6*	*5*	*5*	*4*	*-2.4*	*-1.1*	*-0.8*	*-1.0*
Industry	Million toe per year	*8*	*7*	*7*	*8*	*-1.9*	*0.3*	*0.1*	*0.2*
Residential and services	Million toe per year	*11*	*11*	*12*	*12*	*-0.7*	*1.0*	*0.3*	*0.7*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.84	1.18	1.15	1.29	7.0	-0.2	1.1	0.4
Gasoline price	Euros2005 per litre	1.00	1.36	1.32	1.46	6.2	-0.3	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	2	5	11	39.3	11.7	8.7	10.2
Share of renewables in electricity	%	65	76	73	73	3.3	-0.5	0.1	-0.2
Share of renewables in final energy demand	%	25	30	35	41	4.2	1.4	1.6	1.5
Energy intensity of freight transport activity	toe/Million tkm	36	40	31	25	1.9	-2.5	-1.9	-2.2
Energy intensity of passenger transport activity	toe/Million pkm	44	49	38	34	2.4	-2.6	-1.1	-1.8
Energy intensity of economic activity	toe/Million Euros 2005	103	93	80	71	-2.0	-1.6	-1.1	-1.4

iTREN-2030 AT - Austria	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	18	16	16	16	-2.7	0.3	-0.3	0.0
Road freight	Million tonnes per year	*4*	*4*	*4*	*4*	*-1.3*	*-0.4*	*0.3*	*-0.1*
Road passenger	Million tonnes per year	*11*	*10*	*10*	*9*	*-3.3*	*0.2*	*-0.7*	*-0.3*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.1*	*3.5*	*1.2*	*2.3*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*1.7*	*0.1*	*-0.6*	*-0.3*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*5.3*	*3.8*	*2.2*	*3.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.3*	*3.3*	*-0.1*	*1.6*
Air (Intra-EU)	Million tonnes per year	*1*	*1*	*2*	*2*	*-3.4*	*2.7*	*-0.2*	*1.3*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.081	0.089	0.068	0.062	2.0	-2.7	-0.9	-1.8
Road	tonnes/1000 tkm	*0.134*	*0.132*	*0.095*	*0.085*	*-0.3*	*-3.2*	*-1.1*	*-2.2*
Rail	tonnes/1000 tkm	*0.014*	*0.015*	*0.017*	*0.017*	*0.3*	*1.2*	*0.2*	*0.7*
Inland navigation	tonnes/1000 tkm	*0.034*	*0.038*	*0.034*	*0.034*	*2.6*	*-1.2*	*-0.1*	*-0.6*
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.092	0.098	0.089	0.081	1.4	-1.0	-0.9	-1.0
Road	tonnes/1000 pkm	*0.116*	*0.104*	*0.093*	*0.085*	*-2.3*	*-1.1*	*-0.9*	*-1.0*
Rail	tonnes/1000 pkm	*0.009*	*0.009*	*0.008*	*0.007*	*-0.9*	*-1.4*	*-1.5*	*-1.4*
Air	tonnes/1000 pkm	*0.166*	*0.159*	*0.142*	*0.129*	*-0.9*	*-1.1*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	84	61	50	46	-6.3	-1.9	-1.0	-1.4
Road freight	1000 Tonnes per year	*22*	*17*	*9*	*6*	*-5.2*	*-6.1*	*-3.8*	*-4.9*
Road passenger	1000 Tonnes per year	*40*	*24*	*13*	*9*	*-10.1*	*-5.9*	*-3.7*	*-4.8*
Rail freight	1000 Tonnes per year	*1*	*1*	*2*	*2*	*1.9*	*3.9*	*0.8*	*2.3*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*0.9*	*-0.3*	*-1.3*	*-0.8*
Inland navigation	1000 Tonnes per year	*2*	*2*	*3*	*4*	*5.3*	*3.8*	*2.2*	*3.0*
Maritime (Intra-EU)	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-2.7*	*3.0*	*-0.4*	*1.3*
Air (Intra-EU)	1000 Tonnes per year	*17*	*15*	*21*	*23*	*-2.7*	*3.4*	*0.6*	*2.0*
PM10 Transport emissions	1000 Tonnes per year	6	5	4	4	-4.1	-2.4	0.2	-1.1
Road freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-3.8*	*-2.1*	*0.7*	*-0.7*
Road passenger	1000 Tonnes per year	*5*	*4*	*3*	*3*	*-4.2*	*-2.4*	*0.0*	*-1.2*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	4,174	4,258	4,936	5,348	0.4	1.5	0.8	1.1
Gasoline	1000 vehicles	*2,147*	*1,647*	*1,739*	*2,136*	*-5.2*	*0.5*	*2.1*	*1.3*
Diesel	1000 vehicles	*2,023*	*2,523*	*2,959*	*2,887*	*4.5*	*1.6*	*-0.2*	*0.7*
LPG/CNG	1000 vehicles	*0*	*73*	*147*	*145*	*0.0*	*7.3*	*-0.1*	*3.5*
Bioethanol	1000 vehicles	*0*	*0*	*5*	*13*	*89.1*	*36.5*	*9.6*	*22.3*
Hybrid	1000 vehicles	*5*	*10*	*23*	*17*	*17.8*	*8.1*	*-2.9*	*2.5*
Electric	1000 vehicles	*0*	*4*	*63*	*133*	*175.3*	*30.7*	*7.7*	*18.7*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*17*	*0.0*	*0.0*	*57.4*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*968*	*770*	*751*	*815*	*-4.5*	*-0.2*	*0.8*	*0.3*
Gasoline 1400-2000 cc	1000 vehicles	*1,033*	*755*	*847*	*1,141*	*-6.1*	*1.2*	*3.0*	*2.1*
Gasoline >2000 cc	1000 vehicles	*145*	*122*	*140*	*180*	*-3.4*	*1.4*	*2.5*	*1.9*
Diesel <2000 cc	1000 vehicles	*1,636*	*2,094*	*2,469*	*2,387*	*5.1*	*1.7*	*-0.3*	*0.7*
Diesel >2000 cc	1000 vehicles	*386*	*429*	*490*	*500*	*2.1*	*1.3*	*0.2*	*0.8*
PreEURO	*1000 vehicles*	*145*	*15*	*0*	*0*	*-36.3*	*-78.6*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*1,477*	*515*	*0*	*0*	*-19.0*	*-56.6*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*1,100*	*815*	*15*	*0*	*-5.8*	*-32.7*	*-87.3*	*-70.7*
EURO III	1000 vehicles	*1,448*	*1,316*	*303*	*0*	*-1.9*	*-13.7*	*-61.1*	*-42.0*
EURO IV	1000 vehicles	*0*	*969*	*564*	*3*	*0.0*	*-5.3*	*-41.7*	*-25.7*
EURO V or later	1000 vehicles	*0*	*541*	*3,815*	*5,020*	*0.0*	*21.6*	*2.8*	*11.8*
Light duty vehicle fleet size	1000 vehicles	87	88	84	96	0.2	-0.4	1.3	0.4
Gasoline and Diesel	1000 vehicles	*87*	*88*	*83*	*89*	*0.2*	*-0.6*	*0.7*	*0.1*
Electric	1000 vehicles	*0*	*0*	*1*	*7*	*n.a.*	*n.a.*	*21.2*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	22	306	383	461	68.7	2.2	1.9	2.1
3.5-7.5 tonnes	1000 vehicles	*115*	*129*	*160*	*190*	*2.3*	*2.2*	*1.7*	*2.0*
7.5-16 tonnes	1000 vehicles	*30*	*34*	*42*	*50*	*2.2*	*2.2*	*1.7*	*2.0*
16-32 tonnes	1000 vehicles	*102*	*115*	*144*	*176*	*2.4*	*2.3*	*2.0*	*2.2*
>32 tonnes	1000 vehicles	*26*	*29*	*37*	*45*	*2.4*	*2.3*	*2.1*	*2.2*
PreEURO	*1000 vehicles*	*132*	*71*	*0*	*0*	*-11.7*	*-39.5*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*34*	*31*	*6*	*0*	*-1.7*	*-15.1*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*66*	*63*	*43*	*0*	*-1.1*	*-3.6*	*-57.3*	*-35.8*
EURO III	1000 vehicles	*63*	*76*	*74*	*9*	*3.8*	*-0.3*	*-18.6*	*-9.9*
EURO IV	1000 vehicles	*0*	*63*	*64*	*39*	*n.a.*	*0.1*	*-4.9*	*-2.4*
EURO V or later	1000 vehicles	*0*	*2*	*195*	*413*	*n.a.*	*57.5*	*7.8*	*30.3*

iTREN-2030 BE - Belgium	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	803	771	907	948	-0.8	1.6	0.4	1.0
Freight transport activity originated in the country	Billion tonnes-km per year	378	363	427	446	-0.8	1.6	0.4	1.0
Road	Billion tonnes-km per year	*51*	*49*	*59*	*62*	*-0.9*	*2.0*	*0.4*	*1.2*
Rail	Billion tonnes-km per year	*14*	*13*	*15*	*15*	*-0.9*	*1.0*	*0.0*	*0.5*
Inland navigation	Billion tonnes-km per year	*17*	*17*	*16*	*18*	*0.0*	*-0.4*	*1.1*	*0.3*
Maritime (Intra-EU)	Billion tonnes-km per year	*296*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
Average freight transport distance	km	471	471	471	471	0.0	0.0	0.0	0.0
Freight transport activity on the national territory	Billion tonnes-km per year	89	86	101	105	-0.8	1.6	0.4	1.0
Road	Billion tonnes-km per year	*71*	*68*	*82*	*86*	*-0.9*	*2.0*	*0.4*	*1.2*
Rail	Billion tonnes-km per year	*9*	*9*	*10*	*10*	*-0.9*	*1.0*	*0.0*	*0.5*
Inland navigation	Billion tonnes-km per year	*9*	*9*	*9*	*10*	*0.0*	*-0.4*	*1.1*	*0.3*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	7	8	8	9	1.5	0.4	0.4	0.4
Trips originated in the country	Million trips per year	-	-	-	-	-	-	-	-
Passenger transport activity originated in the cou	Billion pass-km per year	-	-	-	-	-	-	-	-
Car	Billion pass-km per year	-	-	-	-	-	-	-	-
Bus	Billion pass-km per year	-	-	-	-	-	-	-	-
Rail	Billion pass-km per year	-	-	-	-	-	-	-	-
Air (Intra-EU)	Billion pass-km per year	-	-	-	-	-	-	-	-
Slow	Billion pass-km per year	-	-	-	-	-	-	-	-
Average passenger transport distance	km	-	-	-	-	-	-	-	-
Passenger transport activity on the national territ	Billion pass-km per year	165	167	187	202	0.2	1.1	0.8	0.9
Road	Billion pass-km per year	*157*	*159*	*178*	*193*	*0.2*	*1.2*	*0.8*	*1.0*
Rail	Billion pass-km per year	*8*	*8*	*9*	*9*	*-0.2*	*0.2*	*0.0*	*0.1*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	87	88	101	111	0.3	1.4	0.9	1.2
Motorization rate	cars/1000 inhabitants	466	472	531	574	0.2	1.2	0.8	1.0
ECONOMY INDICATORS									
GDP	Billion Euros 2005	-	-	-	-	-	-	-	-
Employment	1000 Persons	-	-	-	-	-	-	-	-
Agriculture and fishery	1000 Persons	-	-	-	-	-	-	-	-
Construction	1000 Persons	-	-	-	-	-	-	-	-
Energy and water	1000 Persons	-	-	-	-	-	-	-	-
Industry	1000 Persons	-	-	-	-	-	-	-	-
Transport services	1000 Persons	-	-	-	-	-	-	-	-
Other services	1000 Persons	-	-	-	-	-	-	-	-
Population total	1000 Persons	-	-	-	-	-	-	-	-
Labour force	1000 Persons	-	-	-	-	-	-	-	-
Retired (> 65 years)	1000 Persons	-	-	-	-	-	-	-	-
Transport taxation revenues	Million Euros 2005	0	0	0	0	0.0	0.0	0.0	0.0
Fuel taxes	Million Euros 2005	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Emissions certificate	Million Euros 2005	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road charges	Million Euros 2005	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

The ITREN-2030 integrated scenario until 2030

iTREN-2030 BE - Belgium	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	0	0	0	0	0.0	0.0	0.0	0.0
Road freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Air (Intra-EU)	Million tonnes per year	-	-	-	-	-	-	-	-
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0
Road	tonnes/1000 tkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Rail	tonnes/1000 tkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	tonnes/1000 tkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0
Road	tonnes/1000 pkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Rail	tonnes/1000 pkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Air	tonnes/1000 pkm	-	-	-	-	-	-	-	-
NOx Transport emissions	1000 Tonnes per year	0	0	0	0	0.0	0.0	0.0	0.0
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Air (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
PM10 Transport emissions	1000 Tonnes per year	0	0	0	0	0.0	0.0	0.0	0.0
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	4,887	5,004	5,761	6,333	0.5	1.4	1.0	1.2
Gasoline	1000 vehicles	*2,362*	*1,948*	*2,102*	*2,544*	*-3.8*	*0.8*	*1.9*	*1.3*
Diesel	1000 vehicles	*2,526*	*3,032*	*3,640*	*3,770*	*3.7*	*1.8*	*0.4*	*1.1*
LPG/CNG	1000 vehicles	*0*	*24*	*20*	*19*	*0.0*	*-1.8*	*-0.2*	*-1.0*
Bioethanol	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Hybrid	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,424*	*1,154*	*1,167*	*1,353*	*-4.1*	*0.1*	*1.5*	*0.8*
Gasoline 1400-2000 cc	1000 vehicles	*787*	*661*	*794*	*1,051*	*-3.4*	*1.8*	*2.8*	*2.3*
Gasoline >2000 cc	1000 vehicles	*151*	*132*	*142*	*140*	*-2.6*	*0.7*	*-0.1*	*0.3*
Diesel <2000 cc	1000 vehicles	*2,155*	*2,650*	*3,263*	*3,413*	*4.2*	*2.1*	*0.5*	*1.3*
Diesel >2000 cc	1000 vehicles	*371*	*382*	*377*	*357*	*0.6*	*-0.1*	*-0.6*	*-0.3*
PreEURO	*1000 vehicles*	*587*	*132*	*5*	*1*	*-25.8*	*-28.5*	*-19.7*	*-24.2*
EURO I	1000 vehicles	*775*	*329*	*19*	*2*	*-15.7*	*-24.8*	*-19.7*	*-22.3*
EURO II	1000 vehicles	*965*	*548*	*47*	*3*	*-10.7*	*-21.7*	*-25.5*	*-23.6*
EURO III	1000 vehicles	*1,921*	*1,424*	*259*	*12*	*-5.8*	*-15.7*	*-26.2*	*-21.1*
EURO IV	1000 vehicles	*639*	*1,777*	*613*	*40*	*22.7*	*-10.1*	*-23.9*	*-17.3*
EURO V or later	1000 vehicles	*0*	*771*	*4,799*	*6,256*	*0.0*	*20.1*	*2.7*	*11.0*
Light duty vehicle fleet size	1000 vehicles	0	0	0	0	n.a.	n.a.	n.a.	n.a.
Gasoline and Diesel	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	242	153	173	182	-8.8	1.3	0.5	0.9
3.5-7.5 tonnes	1000 vehicles	*28*	*30*	*35*	*37*	*1.4*	*1.4*	*0.5*	*1.0*
7.5-16 tonnes	1000 vehicles	*33*	*36*	*41*	*43*	*1.4*	*1.4*	*0.5*	*1.0*
16-32 tonnes	1000 vehicles	*41*	*45*	*50*	*52*	*1.4*	*1.2*	*0.4*	*0.8*
>32 tonnes	1000 vehicles	*39*	*42*	*47*	*49*	*1.4*	*1.2*	*0.4*	*0.8*
PreEURO	*1000 vehicles*	*44*	*7*	*0*	*0*	*-30.0*	*-25.4*	*-41.4*	*-33.9*
EURO I	1000 vehicles	*23*	*6*	*1*	*0*	*-23.9*	*-21.3*	*-35.7*	*-28.9*
EURO II	1000 vehicles	*86*	*30*	*5*	*0*	*-19.0*	*-16.4*	*-25.9*	*-21.3*
EURO III	1000 vehicles	*87*	*54*	*15*	*2*	*-9.2*	*-11.8*	*-20.1*	*-16.1*
EURO IV	1000 vehicles	*1*	*29*	*14*	*2*	*95.2*	*-7.3*	*-15.9*	*-11.7*
EURO V or later	1000 vehicles	*0*	*27*	*138*	*177*	*130.8*	*17.8*	*2.5*	*9.9*

iTREN-2030 BLX - Belgium + Luxembourg	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	1,310	1,549	1,819	1,933	3.4	1.6	0.6	1.1
Freight transport activity originated in the country	Billion tonnes-km per year	167	173	230	250	0.7	2.9	0.8	1.9
Road	Billion tonnes-km per year	*75*	*85*	*107*	*115*	*2.7*	*2.3*	*0.8*	*1.5*
Rail	Billion tonnes-km per year	*16*	*19*	*22*	*21*	*3.4*	*1.6*	*-0.3*	*0.6*
Inland navigation	Billion tonnes-km per year	*17*	*17*	*16*	*18*	*0.0*	*-0.4*	*1.1*	*0.3*
Maritime (Intra-EU)	Billion tonnes-km per year	*59*	*52*	*86*	*96*	*-2.7*	*5.2*	*1.1*	*3.1*
Average freight transport distance	km	127	111	127	129	-2.6	1.3	0.2	0.7
Freight transport activity on the national territory	Billion tonnes-km per year	94	114	135	142	3.7	1.7	0.5	1.1
Road	Billion tonnes-km per year	*74*	*84*	*102*	*109*	*2.7*	*1.9*	*0.6*	*1.3*
Rail	Billion tonnes-km per year	*18*	*20*	*24*	*23*	*2.5*	*1.8*	*-0.3*	*0.8*
Inland navigation	Billion tonnes-km per year	*9*	*9*	*9*	*10*	*0.0*	*-0.4*	*1.1*	*0.3*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	18	22	22	23	4.7	0.2	0.1	0.2
Trips originated in the country	Million trips per year	11,022	10,813	11,764	12,222	-0.4	0.8	0.4	0.6
Passenger transport activity originated in the cou	Billion pass-km per year	182	175	203	212	-0.7	1.5	0.5	1.0
Car	Billion pass-km per year	*121*	*113*	*136*	*143*	*-1.4*	*1.9*	*0.5*	*1.2*
Bus	Billion pass-km per year	*17*	*19*	*17*	*17*	*2.4*	*-1.0*	*0.2*	*-0.4*
Rail	Billion pass-km per year	*9*	*12*	*12*	*14*	*5.0*	*0.4*	*1.4*	*0.9*
Air (Intra-EU)	Billion pass-km per year	*29*	*26*	*31*	*31*	*-2.4*	*1.9*	*-0.1*	*0.9*
Slow	Billion pass-km per year	*5*	*6*	*7*	*8*	*1.5*	*1.5*	*1.5*	*1.5*
Average passenger transport distance	km	16.5	16.2	17.3	17.4	-0.3	0.6	0.1	0.4
Passenger transport activity on the national territ	Billion pass-km per year	177	148	171	180	-3.5	1.5	0.5	1.0
Road	Billion pass-km per year	*142*	*137*	*159*	*167*	*-0.8*	*1.5*	*0.5*	*1.0*
Rail	Billion pass-km per year	*9*	*11*	*12*	*14*	*4.6*	*0.6*	*1.3*	*0.9*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	75	70	86	92	-1.4	2.1	0.7	1.4
Motorization rate	cars/1000 inhabitants	-	-	-	-	-	-	-	-
ECONOMY INDICATORS									
GDP	Billion Euros 2005	340	333	384	409	-0.4	1.4	0.6	1.0
Employment	1000 Persons	4,570	3,922	3,911	3,509	-3.0	0.0	-1.1	-0.6
Agriculture and fishery	1000 Persons	*33*	*22*	*28*	*24*	*-7.5*	*2.5*	*-1.5*	*0.5*
Construction	1000 Persons	*270*	*232*	*226*	*197*	*-3.0*	*-0.2*	*-1.4*	*-0.8*
Energy and water	1000 Persons	*41*	*50*	*54*	*53*	*3.7*	*0.8*	*-0.1*	*0.4*
Industry	1000 Persons	*1,067*	*902*	*1,234*	*1,179*	*-3.3*	*3.2*	*-0.5*	*1.3*
Transport services	1000 Persons	*161*	*153*	*168*	*154*	*-1.1*	*0.9*	*-0.9*	*0.0*
Other services	1000 Persons	*2,998*	*2,564*	*2,202*	*1,902*	*-3.1*	*-1.5*	*-1.5*	*-1.5*
Population total	1000 Persons	10,887	11,006	11,291	11,525	0.2	0.3	0.2	0.2
Labour force	1000 Persons	*6,803*	*6,954*	*7,013*	*6,851*	*0.4*	*0.1*	*-0.2*	*-0.1*
Retired (> 65 years)	1000 Persons	*1,835*	*1,822*	*2,069*	*2,441*	*-0.1*	*1.3*	*1.7*	*1.5*
Transport taxation revenues	Million Euros 2005	4,432	4,532	5,433	5,648	0.4	1.8	0.4	1.1
Fuel taxes	Million Euros 2005	*4,432*	*4,371*	*4,530*	*4,401*	*-0.3*	*0.4*	*-0.3*	*0.0*
Emissions certificate	Million Euros 2005	*0*	*122*	*569*	*518*	*0.0*	*16.7*	*-0.9*	*7.5*
Road charges	Million Euros 2005	*0*	*40*	*334*	*729*	*0.0*	*23.7*	*8.1*	*15.6*
ENERGY INDICATORS									
Primary energy production	Million toe per year	15	14	13	12	-2.1	-0.3	-1.1	-0.7
Share of domestic energy production	%	24	23	24	22	-0.8	0.1	-0.5	-0.2
Final energy demand by source	Million toe per year	62	58	56	53	-1.3	-0.4	-0.6	-0.5
Oil	Million toe per year	*26*	*21*	*18*	*16*	*-3.7*	*-1.6*	*-1.2*	*-1.4*
Gas	Million toe per year	*16*	*13*	*14*	*12*	*-3.7*	*0.3*	*-0.9*	*-0.3*
Coal, Nuclear	Million toe per year	*18*	*20*	*16*	*13*	*3.1*	*-2.1*	*-2.1*	*-2.1*
Biomass	Million toe per year	*2*	*2*	*6*	*8*	*-2.7*	*11.8*	*3.9*	*7.7*
Other Renewables	Million toe per year	*0*	*1*	*2*	*2*	*33.0*	*6.5*	*2.3*	*4.4*
Final energy demand by consuming sector	Million toe per year	45	41	40	37	-2.1	-0.2	-0.7	-0.5
Transport freight	Million toe per year	*4*	*4*	*3*	*3*	*-1.9*	*-0.2*	*-1.0*	*-0.6*
Transport passenger	Million toe per year	*9*	*8*	*7*	*6*	*-3.3*	*-1.1*	*-0.8*	*-1.0*
Industry	Million toe per year	*16*	*15*	*15*	*14*	*-1.8*	*0.1*	*-0.9*	*-0.4*
Residential and services	Million toe per year	*16*	*15*	*14*	*14*	*-1.8*	*-0.1*	*-0.3*	*-0.2*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.84	1.18	1.15	1.29	6.9	-0.2	1.1	0.4
Gasoline price	Euros2005 per litre	1.06	1.39	1.37	1.52	5.7	-0.2	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	1	2	4	7	26.1	6.3	5.5	5.9
Share of renewables in electricity	%	5	13	32	43	19.7	9.9	3.0	6.4
Share of renewables in final energy demand	%	4	6	11	17	7.9	7.4	4.0	5.7
Energy intensity of freight transport activity	toe/Million tkm	25	21	16	13	-3.3	-3.1	-1.7	-2.4
Energy intensity of passenger transport activity	toe/Million pkm	45	45	34	30	0.0	-2.6	-1.3	-1.9
Energy intensity of economic activity	toe/Million Euros 2005	133	122	103	90	-1.7	-1.7	-1.3	-1.5

iTREN-2030	Integrated scenario								
BLX - Belgium + Luxembourg									
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	44	43	42	38	-0.5	-0.3	-1.0	-0.7
Road freight	Million tonnes per year	*18*	*21*	*19*	*17*	*3.1*	*-1.1*	*-1.1*	*-1.1*
Road passenger	Million tonnes per year	*20*	*17*	*17*	*16*	*-2.8*	*0.2*	*-0.9*	*-0.4*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*3.7*	*-0.1*	*0.6*	*0.3*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*1*	*1*	*-2.6*	*2.7*	*-0.3*	*1.2*
Air (Intra-EU)	Million tonnes per year	*5*	*4*	*5*	*4*	*-3.3*	*0.9*	*-1.1*	*-0.1*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.126	0.131	0.089	0.074	0.8	-3.8	-1.8	-2.8
Road	tonnes/1000 tkm	*0.248*	*0.252*	*0.187*	*0.157*	*0.3*	*-3.0*	*-1.7*	*-2.3*
Rail	tonnes/1000 tkm	*0.008*	*0.000*	*0.000*	*0.000*	*-100.0*	*0.0*	*0.0*	*0.0*
Inland navigation	tonnes/1000 tkm	*0.053*	*0.000*	*0.000*	*0.000*	*-100.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.008*	*0.008*	*0.006*	*0.006*	*0.0*	*-2.3*	*-1.4*	*-1.9*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.121	0.124	0.110	0.096	0.5	-1.2	-1.3	-1.3
Road	tonnes/1000 pkm	*0.139*	*0.125*	*0.109*	*0.095*	*-2.0*	*-1.3*	*-1.4*	*-1.4*
Rail	tonnes/1000 pkm	*0.011*	*0.010*	*0.010*	*0.009*	*-0.9*	*-0.6*	*-0.7*	*-0.7*
Air	tonnes/1000 pkm	*0.174*	*0.166*	*0.150*	*0.137*	*-0.9*	*-1.0*	*-0.9*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	188	140	122	106	-5.7	-1.4	-1.4	-1.4
Road freight	1000 Tonnes per year	*56*	*45*	*26*	*16*	*-4.6*	*-5.4*	*-4.7*	*-5.0*
Road passenger	1000 Tonnes per year	*47*	*29*	*18*	*14*	*-8.9*	*-4.8*	*-2.5*	*-3.7*
Rail freight	1000 Tonnes per year	*1*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*3.5*	*-0.8*	*-0.3*	*-0.5*
Inland navigation	1000 Tonnes per year	*8*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*11*	*9*	*12*	*11*	*-3.0*	*2.3*	*-0.7*	*0.8*
Air (Intra-EU)	1000 Tonnes per year	*64*	*56*	*66*	*64*	*-2.6*	*1.6*	*-0.2*	*0.7*
PM10 Transport emissions	1000 Tonnes per year	8	0	0	0	-100.0	0.0	0.0	0.0
Road freight	1000 Tonnes per year	*2*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
Road passenger	1000 Tonnes per year	*6*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	5,177	5,436	6,684	7,720	1.0	2.1	1.5	1.8
Gasoline	1000 vehicles	*2,465*	*2,034*	*2,223*	*2,692*	*-3.8*	*0.9*	*1.9*	*1.4*
Diesel	1000 vehicles	*2,691*	*3,271*	*3,925*	*4,128*	*4.0*	*1.8*	*0.5*	*1.2*
LPG/CNG	1000 vehicles	*0*	*51*	*92*	*104*	*0.0*	*6.2*	*1.2*	*3.7*
Bioethanol	1000 vehicles	*0*	*2*	*30*	*49*	*53.2*	*29.1*	*5.0*	*16.5*
Hybrid	1000 vehicles	*20*	*61*	*114*	*89*	*25.2*	*6.4*	*-2.5*	*1.9*
Electric	1000 vehicles	*0*	*17*	*299*	*499*	*166.8*	*33.2*	*5.2*	*18.4*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*159*	*0.0*	*0.0*	*82.7*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,464*	*1,207*	*1,240*	*1,446*	*-3.8*	*0.3*	*1.6*	*0.9*
Gasoline 1400-2000 cc	1000 vehicles	*832*	*686*	*834*	*1,102*	*-3.8*	*2.0*	*2.8*	*2.4*
Gasoline >2000 cc	1000 vehicles	*170*	*141*	*149*	*144*	*-3.7*	*0.6*	*-0.3*	*0.1*
Diesel <2000 cc	1000 vehicles	*2,278*	*2,845*	*3,502*	*3,715*	*4.5*	*2.1*	*0.6*	*1.3*
Diesel >2000 cc	1000 vehicles	*413*	*426*	*423*	*413*	*0.6*	*-0.1*	*-0.2*	*-0.2*
PreEURO	*1000 vehicles*	*591*	*132*	*5*	*1*	*-25.9*	*-28.5*	*-19.7*	*-24.2*
EURO I	1000 vehicles	*784*	*329*	*19*	*2*	*-15.9*	*-24.8*	*-19.7*	*-22.3*
EURO II	1000 vehicles	*1,031*	*549*	*47*	*3*	*-11.8*	*-21.8*	*-25.5*	*-23.6*
EURO III	1000 vehicles	*2,152*	*1,498*	*259*	*12*	*-7.0*	*-16.1*	*-26.2*	*-21.3*
EURO IV	1000 vehicles	*0*	*1,914*	*613*	*40*	*0.0*	*-10.8*	*-23.9*	*-17.6*
EURO V or later	1000 vehicles	*0*	*883*	*5,205*	*6,763*	*0.0*	*19.4*	*2.7*	*10.7*
Light duty vehicle fleet size	1000 vehicles	1,138	1,385	1,623	1,681	4.0	1.6	0.3	1.0
Gasoline and Diesel	1000 vehicles	*1,138*	*1,385*	*1,607*	*1,562*	*4.0*	*1.5*	*-0.3*	*0.6*
Electric	1000 vehicles	*0*	*0*	*17*	*118*	*n.a.*	*n.a.*	*21.6*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	257	169	194	207	-8.0	1.4	0.6	1.0
3.5-7.5 tonnes	1000 vehicles	*36*	*39*	*46*	*50*	*1.7*	*1.6*	*0.9*	*1.2*
7.5-16 tonnes	1000 vehicles	*35*	*38*	*44*	*47*	*1.5*	*1.5*	*0.6*	*1.0*
16-32 tonnes	1000 vehicles	*46*	*49*	*56*	*59*	*1.6*	*1.3*	*0.6*	*0.9*
>32 tonnes	1000 vehicles	*40*	*43*	*48*	*51*	*1.4*	*1.2*	*0.5*	*0.8*
PreEURO	*1000 vehicles*	*49*	*10*	*1*	*0*	*-27.8*	*-23.7*	*-35.6*	*-29.9*
EURO I	1000 vehicles	*25*	*7*	*1*	*0*	*-21.9*	*-19.2*	*-30.2*	*-24.9*
EURO II	1000 vehicles	*90*	*34*	*6*	*0*	*-18.0*	*-15.4*	*-24.3*	*-20.0*
EURO III	1000 vehicles	*91*	*58*	*18*	*2*	*-8.5*	*-11.0*	*-19.0*	*-15.1*
EURO IV	1000 vehicles	*1*	*33*	*17*	*3*	*100.3*	*-6.7*	*-14.6*	*-10.7*
EURO V or later	1000 vehicles	*0*	*27*	*152*	*201*	*131.8*	*18.6*	*2.8*	*10.5*

iTREN-2030 BU - Bulgaria	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	482	499	470	544	0.7	-0.6	1.5	0.4
Freight transport activity originated in the country	Billion tonnes-km per year	31	34	38	46	1.8	1.1	1.8	1.5
Road	Billion tonnes-km per year	*22*	*26*	*25*	*30*	*3.4*	*-0.2*	*1.7*	*0.7*
Rail	Billion tonnes-km per year	*4*	*5*	*6*	*7*	*5.5*	*2.1*	*1.7*	*1.9*
Inland navigation	Billion tonnes-km per year	*1*	*1*	*2*	*2*	*3.3*	*3.5*	*2.6*	*3.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*2*	*2*	*5*	*7*	*1.4*	*8.3*	*2.2*	*5.2*
Average freight transport distance	km	65	69	82	85	1.1	1.7	0.3	1.0
Freight transport activity on the national territory	Billion tonnes-km per year	25	31	32	37	5.0	0.1	1.7	0.9
Road	Billion tonnes-km per year	*22*	*26*	*26*	*30*	*3.3*	*-0.2*	*1.7*	*0.8*
Rail	Billion tonnes-km per year	*3*	*4*	*4*	*5*	*6.0*	*0.7*	*1.2*	*1.0*
Inland navigation	Billion tonnes-km per year	*1*	*1*	*1*	*2*	*3.3*	*3.5*	*2.6*	*3.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	6	6	5	6	2.4	-1.6	1.5	-0.1
Trips originated in the country	Million trips per year	4,642	4,414	4,452	4,394	-1.0	0.1	-0.1	0.0
Passenger transport activity originated in the cou	Billion pass-km per year	54	50	56	60	-1.7	1.2	0.8	1.0
Car	Billion pass-km per year	*19*	*17*	*24*	*28*	*-2.0*	*3.1*	*1.6*	*2.4*
Bus	Billion pass-km per year	*27*	*24*	*22*	*21*	*-2.2*	*-0.7*	*-0.6*	*-0.6*
Rail	Billion pass-km per year	*4*	*4*	*5*	*6*	*0.3*	*2.0*	*2.3*	*2.1*
Air (Intra-EU)	Billion pass-km per year	*2*	*2*	*2*	*2*	*0.3*	*1.9*	*1.1*	*1.5*
Slow	Billion pass-km per year	*3*	*3*	*3*	*3*	*1.1*	*0.8*	*0.6*	*0.7*
Average passenger transport distance	km	11.7	11.3	12.6	13.7	-0.7	1.1	0.9	1.0
Passenger transport activity on the national territ	Billion pass-km per year	86	46	52	56	-11.8	1.2	0.8	1.0
Road	Billion pass-km per year	*46*	*42*	*46*	*49*	*-2.1*	*1.1*	*0.6*	*0.8*
Rail	Billion pass-km per year	*4*	*4*	*5*	*6*	*0.3*	*2.0*	*2.2*	*2.1*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	13	12	17	20	-1.8	3.1	1.7	2.4
Motorization rate	cars/1000 inhabitants	341	450	690	962	5.7	4.4	3.4	3.9
ECONOMY INDICATORS									
GDP	Billion Euros 2005	15	16	20	24	0.8	2.1	2.1	2.1
Employment	1000 Persons	4,018	3,681	3,642	3,205	-1.7	-0.1	-1.3	-0.7
Agriculture and fishery	1000 Persons	*495*	*393*	*343*	*334*	*-4.5*	*-1.3*	*-0.3*	*-0.8*
Construction	1000 Persons	*450*	*446*	*490*	*427*	*-0.1*	*0.9*	*-1.4*	*-0.2*
Energy and water	1000 Persons	*69*	*64*	*62*	*67*	*-1.5*	*-0.3*	*0.7*	*0.2*
Industry	1000 Persons	*1,131*	*820*	*869*	*729*	*-6.2*	*0.6*	*-1.7*	*-0.6*
Transport services	1000 Persons	*98*	*90*	*99*	*93*	*-1.8*	*1.0*	*-0.7*	*0.2*
Other services	1000 Persons	*1,776*	*1,869*	*1,779*	*1,556*	*1.0*	*-0.5*	*-1.3*	*-0.9*
Population total	1000 Persons	7,690	7,390	6,817	6,206	-0.8	-0.8	-0.9	-0.9
Labour force	1000 Persons	*4,841*	*4,803*	*4,258*	*3,790*	*-0.2*	*-1.2*	*-1.2*	*-1.2*
Retired (> 65 years)	1000 Persons	*1,412*	*1,382*	*1,486*	*1,467*	*-0.4*	*0.7*	*-0.1*	*0.3*
Transport taxation revenues	Million Euros 2005	866	1,065	1,418	1,665	4.2	2.9	1.6	2.3
Fuel taxes	Million Euros 2005	*844*	*1,015*	*1,159*	*1,371*	*3.8*	*1.3*	*1.7*	*1.5*
Emissions certificate	Million Euros 2005	*0*	*24*	*108*	*115*	*0.0*	*16.4*	*0.6*	*8.2*
Road charges	Million Euros 2005	*21*	*26*	*151*	*179*	*4.3*	*19.0*	*1.7*	*10.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	11	12	13	13	2.8	0.6	0.0	0.3
Share of domestic energy production	%	50	54	59	62	1.9	0.9	0.5	0.7
Final energy demand by source	Million toe per year	22	23	22	21	0.9	-0.2	-0.4	-0.3
Oil	Million toe per year	*5*	*5*	*5*	*5*	*1.0*	*-0.6*	*-0.2*	*-0.4*
Gas	Million toe per year	*3*	*2*	*3*	*3*	*-5.4*	*3.0*	*0.1*	*1.6*
Coal, Nuclear	Million toe per year	*13*	*13*	*9*	*6*	*1.2*	*-3.5*	*-3.6*	*-3.6*
Biomass	Million toe per year	*1*	*1*	*4*	*6*	*8.6*	*12.4*	*3.8*	*8.0*
Other Renewables	Million toe per year	*0*	*1*	*1*	*1*	*9.4*	*5.0*	*2.4*	*3.7*
Final energy demand by consuming sector	Million toe per year	10	10	12	12	1.4	1.3	0.2	0.8
Transport freight	Million toe per year	*1*	*1*	*1*	*1*	*1.6*	*-0.9*	*-1.1*	*-1.0*
Transport passenger	Million toe per year	*2*	*2*	*2*	*2*	*1.6*	*0.0*	*0.5*	*0.3*
Industry	Million toe per year	*4*	*5*	*6*	*6*	*2.4*	*2.8*	*0.0*	*1.4*
Residential and services	Million toe per year	*3*	*3*	*3*	*3*	*-0.1*	*0.3*	*0.7*	*0.5*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.46	0.99	0.99	1.10	16.5	0.0	1.1	0.5
Gasoline price	Euros2005 per litre	1.00	1.32	1.32	1.44	5.7	0.0	0.9	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	4	15	26	1111.7	15.0	5.7	10.2
Share of renewables in electricity	%	13	19	41	55	8.3	8.0	2.8	5.4
Share of renewables in final energy demand	%	11	14	26	35	5.3	5.9	3.1	4.5
Energy intensity of freight transport activity	toe/Million tkm	29	25	21	16	-3.0	-1.8	-2.8	-2.3
Energy intensity of passenger transport activity	toe/Million pkm	21	42	37	36	14.8	-1.2	-0.2	-0.7
Energy intensity of economic activity	toe/Million Euros 2005	630	649	599	496	0.6	-0.8	-1.9	-1.3

iTREN-2030 BU - Bulgaria	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	12	11	12	13	-1.7	0.5	1.3	0.9
Road freight	Million tonnes per year	*3*	*3*	*2*	*2*	*-1.4*	*-3.5*	*-0.8*	*-2.1*
Road passenger	Million tonnes per year	*7*	*5*	*6*	*6*	*-3.6*	*0.8*	*0.8*	*0.8*
Rail freight	Million tonnes per year	*2*	*2*	*3*	*4*	*3.0*	*3.2*	*3.3*	*3.3*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.0*	*1.1*	*1.2*	*1.1*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*3.2*	*3.4*	*2.8*	*3.1*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.0*	*5.3*	*1.1*	*3.2*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.4*	*0.9*	*0.1*	*0.5*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.194	0.158	0.145	0.148	-4.1	-0.8	0.2	-0.3
Road	tonnes/1000 tkm	*0.138*	*0.110*	*0.078*	*0.061*	*-4.5*	*-3.3*	*-2.4*	*-2.9*
Rail	tonnes/1000 tkm	*0.647*	*0.560*	*0.714*	*0.878*	*-2.9*	*2.5*	*2.1*	*2.3*
Inland navigation	tonnes/1000 tkm	*0.087*	*0.087*	*0.086*	*0.088*	*-0.1*	*0.0*	*0.2*	*0.1*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.006*	*0.005*	*0.004*	*0.004*	*-2.4*	*-2.8*	*-1.1*	*-2.0*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.080	0.123	0.119	0.119	9.1	-0.4	0.0	-0.2
Road	tonnes/1000 pkm	*0.143*	*0.132*	*0.129*	*0.132*	*-1.6*	*-0.3*	*0.2*	*0.0*
Rail	tonnes/1000 pkm	*0.014*	*0.013*	*0.012*	*0.011*	*-1.3*	*-0.9*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.191*	*0.185*	*0.168*	*0.152*	*-0.7*	*-1.0*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	49	44	44	55	-2.0	0.0	2.1	1.1
Road freight	1000 Tonnes per year	*8*	*6*	*3*	*2*	*-3.9*	*-8.2*	*-3.1*	*-5.7*
Road passenger	1000 Tonnes per year	*23*	*15*	*8*	*6*	*-7.7*	*-6.0*	*-3.4*	*-4.7*
Rail freight	1000 Tonnes per year	*13*	*17*	*26*	*39*	*5.4*	*4.5*	*4.0*	*4.3*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-1.1*	*0.6*	*0.5*	*0.5*
Inland navigation	1000 Tonnes per year	*1*	*1*	*2*	*3*	*3.2*	*3.4*	*2.8*	*3.1*
Maritime (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-1.4*	*5.0*	*0.7*	*2.8*
Air (Intra-EU)	1000 Tonnes per year	*3*	*4*	*4*	*5*	*0.4*	*1.6*	*0.9*	*1.3*
PM10 Transport emissions	1000 Tonnes per year	3	2	2	2	-6.6	-3.1	0.0	-1.6
Road freight	1000 Tonnes per year	*1*	*0*	*0*	*0*	*-2.2*	*-3.0*	*-0.2*	*-1.6*
Road passenger	1000 Tonnes per year	*3*	*2*	*1*	*1*	*-7.7*	*-3.1*	*0.0*	*-1.5*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	2,641	3,322	4,706	5,969	4.7	3.5	2.4	3.0
Gasoline	1000 vehicles	*1,748*	*1,793*	*2,497*	*3,363*	*0.5*	*3.4*	*3.0*	*3.2*
Diesel	1000 vehicles	*890*	*1,465*	*1,836*	*2,118*	*10.5*	*2.3*	*1.4*	*1.9*
LPG/CNG	1000 vehicles	*0*	*58*	*350*	*441*	*280.3*	*19.6*	*2.3*	*10.6*
Bioethanol	1000 vehicles	*0*	*0*	*12*	*35*	*90.5*	*43.6*	*11.0*	*26.3*
Hybrid	1000 vehicles	*2*	*5*	*10*	*7*	*20.0*	*7.7*	*-3.8*	*1.8*
Electric	1000 vehicles	*0*	*0*	*1*	*3*	*49.8*	*31.5*	*18.1*	*24.6*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*3*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,252*	*1,427*	*1,913*	*2,451*	*2.6*	*3.0*	*2.5*	*2.7*
Gasoline 1400-2000 cc	1000 vehicles	*458*	*344*	*552*	*864*	*-5.6*	*4.8*	*4.6*	*4.7*
Gasoline >2000 cc	1000 vehicles	*38*	*22*	*31*	*48*	*-10.1*	*3.5*	*4.4*	*4.0*
Diesel <2000 cc	1000 vehicles	*2,136*	*1,315*	*1,658*	*1,911*	*-9.3*	*2.4*	*1.4*	*1.9*
Diesel >2000 cc	1000 vehicles	*103*	*151*	*178*	*207*	*8.0*	*1.7*	*1.5*	*1.6*
PreEURO	*1000 vehicles*	*453*	*144*	*0*	*0*	*-20.5*	*-95.9*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*165*	*137*	*0*	*0*	*-3.6*	*-76.8*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*1,122*	*1,065*	*16*	*0*	*-1.0*	*-34.2*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*899*	*889*	*250*	*0*	*-0.2*	*-11.9*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*649*	*462*	*0*	*0.0*	*-3.3*	*-77.3*	*-53.2*
EURO V or later	1000 vehicles	*0*	*374*	*3,604*	*5,481*	*0.0*	*25.4*	*4.3*	*14.4*
Light duty vehicle fleet size	1000 vehicles	241	250	202	235	0.7	-2.1	1.5	-0.3
Gasoline and Diesel	1000 vehicles	*241*	*250*	*201*	*226*	*0.7*	*-2.2*	*1.1*	*-0.5*
Electric	1000 vehicles	*0*	*0*	*1*	*10*	*n.a.*	*n.a.*	*26.6*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	191	83	91	117	-15.4	0.9	2.6	1.8
3.5-7.5 tonnes	1000 vehicles	*33*	*39*	*42*	*54*	*3.5*	*0.8*	*2.5*	*1.7*
7.5-16 tonnes	1000 vehicles	*9*	*10*	*11*	*14*	*3.5*	*0.6*	*2.6*	*1.6*
16-32 tonnes	1000 vehicles	*23*	*28*	*31*	*41*	*4.2*	*1.1*	*2.6*	*1.9*
>32 tonnes	1000 vehicles	*5*	*6*	*7*	*9*	*5.0*	*1.4*	*2.7*	*2.0*
PreEURO	*1000 vehicles*	*82*	*21*	*13*	*0*	*-23.6*	*-4.7*	*-57.1*	*-36.0*
EURO I	1000 vehicles	*30*	*26*	*22*	*3*	*-2.6*	*-1.4*	*-18.2*	*-10.2*
EURO II	1000 vehicles	*21*	*22*	*19*	*12*	*0.9*	*-1.0*	*-4.4*	*-2.7*
EURO III	1000 vehicles	*59*	*1*	*59*	*132*	*-58.8*	*55.8*	*8.3*	*29.9*
EURO IV	1000 vehicles	*0*	*4*	*0*	*0*	*n.a.*	*-26.4*	*-41.2*	*-34.2*
EURO V or later	1000 vehicles	*0*	*3*	*0*	*0*	*n.a.*	*-22.4*	*-35.5*	*-29.3*

iTREN-2030 CY - Cyprus	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	4	4	7	9	0.7	6.2	1.6	3.9
Freight transport activity originated in the country	Billion tonnes-km per year	8	8	18	21	0.6	8.4	1.7	5.0
Road	Billion tonnes-km per year	*2*	*2*	*6*	*7*	*0.2*	*10.1*	*2.2*	*6.1*
Rail	Billion tonnes-km per year	*0*	*0*	*1*	*1*	*3.1*	*6.7*	*1.4*	*4.0*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*5*	*5*	*11*	*13*	*0.5*	*7.7*	*1.4*	*4.5*
Average freight transport distance	km	1,944	1,930	2,364	2,377	-0.1	2.0	0.1	1.0
Freight transport activity on the national territory	Billion tonnes-km per year	0	0	0	0	-4.0	4.3	1.0	2.6
Road	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-4.3*	*4.2*	*0.9*	*2.5*
Rail	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-2.7*	*7.3*	*3.2*	*5.3*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	0	0	0	0	-0.9	2.9	1.4	2.1
Trips originated in the country	Million trips per year	582	611	713	783	1.0	1.6	0.9	1.2
Passenger transport activity originated in the cou	Billion pass-km per year	18	19	23	26	0.5	2.3	1.1	1.7
Car	Billion pass-km per year	*3*	*3*	*4*	*4*	*0.7*	*2.1*	*0.9*	*1.5*
Bus	Billion pass-km per year	*3*	*4*	*4*	*4*	*4.6*	*-0.5*	*0.7*	*0.1*
Rail	Billion pass-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Air (Intra-EU)	Billion pass-km per year	*11*	*10*	*14*	*16*	*-1.0*	*3.3*	*1.2*	*2.2*
Slow	Billion pass-km per year	*1*	*1*	*2*	*2*	*2.1*	*2.3*	*1.5*	*1.9*
Average passenger transport distance	km	31.1	30.4	32.8	33.3	-0.5	0.8	0.2	0.5
Passenger transport activity on the national territ	Billion pass-km per year	2	2	3	3	0.9	1.8	1.0	1.4
Road	Billion pass-km per year	*2*	*2*	*3*	*3*	*1.0*	*1.8*	*1.0*	*1.4*
Rail	Billion pass-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	1	1	2	2	1.0	2.3	1.3	1.8
Motorization rate	cars/1000 inhabitants	442	454	523	509	0.5	1.4	-0.3	0.6
ECONOMY INDICATORS									
GDP	Billion Euros 2005	12	12	13	14	-0.1	1.1	0.7	0.9
Employment	1000 Persons	280	249	280	275	-2.3	1.2	-0.2	0.5
Agriculture and fishery	1000 Persons	*28*	*23*	*19*	*16*	*-4.5*	*-1.9*	*-1.6*	*-1.7*
Construction	1000 Persons	*24*	*20*	*20*	*19*	*-3.5*	*-0.1*	*-0.5*	*-0.3*
Energy and water	1000 Persons	*0*	*0*	*0*	*0*	*-3.1*	*1.5*	*1.7*	*1.6*
Industry	1000 Persons	*43*	*32*	*49*	*60*	*-5.7*	*4.3*	*2.0*	*3.2*
Transport services	1000 Persons	*6*	*5*	*6*	*6*	*-1.6*	*1.4*	*-0.7*	*0.3*
Other services	1000 Persons	*178*	*169*	*186*	*175*	*-1.0*	*0.9*	*-0.6*	*0.2*
Population total	1000 Persons	742	784	865	922	1.1	1.0	0.6	0.8
Labour force	1000 Persons	*482*	*520*	*588*	*607*	*1.5*	*1.2*	*0.3*	*0.8*
Retired (> 65 years)	1000 Persons	*94*	*104*	*137*	*172*	*2.0*	*2.8*	*2.3*	*2.6*
Transport taxation revenues	Million Euros 2005	106	112	164	176	1.1	3.9	0.7	2.3
Fuel taxes	Million Euros 2005	*106*	*105*	*120*	*129*	*-0.3*	*1.3*	*0.8*	*1.0*
Emissions certificate	Million Euros 2005	*0*	*8*	*43*	*44*	*0.0*	*18.9*	*0.3*	*9.2*
Road charges	Million Euros 2005	*0*	*0*	*2*	*2*	*0.0*	*0.0*	*3.9*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

The ITREN-2030 integrated scenario until 2030

iTREN-2030 CY - Cyprus	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	3	2	3	3	-1.5	1.9	0.4	1.1
Road freight	Million tonnes per year	*0*	*0*	*0*	*0*	*-6.6*	*2.1*	*-0.1*	*1.0*
Road passenger	Million tonnes per year	*1*	*1*	*1*	*1*	*-0.4*	*1.0*	*0.5*	*0.7*
Rail freight	Million tonnes per year	-	-	-	-	-	-	-	-
Rail passenger	Million tonnes per year	-	-	-	-	-	-	-	-
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-5.2*	*1.7*	*-1.3*	*0.2*
Air (Intra-EU)	Million tonnes per year	*2*	*2*	*2*	*2*	*-1.8*	*2.3*	*0.3*	*1.3*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.017	0.012	0.007	0.006	-6.8	-5.2	-1.6	-3.4
Road	tonnes/1000 tkm	*0.395*	*0.350*	*0.287*	*0.259*	*-2.4*	*-2.0*	*-1.0*	*-1.5*
Rail	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.193	0.186	0.167	0.155	-0.7	-1.1	-0.8	-0.9
Road	tonnes/1000 pkm	-	-	-	-	-	-	-	-
Rail	tonnes/1000 pkm	-	-	-	-	-	-	-	-
Air	tonnes/1000 pkm	*0.154*	*0.148*	*0.135*	*0.124*	*-0.8*	*-0.9*	*-0.9*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	23	22	29	33	-1.4	3.0	1.2	2.1
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-9.1*	*-1.8*	*-2.5*	*-2.1*
Road passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-6.8*	*-2.3*	*-0.9*	*-1.6*
Rail freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-5.5*	*1.3*	*-1.7*	*-0.2*
Air (Intra-EU)	1000 Tonnes per year	*22*	*21*	*28*	*32*	*-1.0*	*3.1*	*1.2*	*2.2*
PM10 Transport emissions	1000 Tonnes per year	0	0	0	0	-4.4	-1.6	-2.7	-2.1
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-5.7*	*-0.5*	*-1.6*	*-1.1*
Road passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-3.1*	*-2.7*	*-3.9*	*-3.3*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	335	356	452	470	1.2	2.4	0.4	1.4
Gasoline	1000 vehicles	*307*	*325*	*408*	*414*	*1.2*	*2.3*	*0.1*	*1.2*
Diesel	1000 vehicles	*28*	*30*	*35*	*31*	*1.1*	*1.7*	*-1.1*	*0.3*
LPG/CNG	1000 vehicles	*0*	*0*	*1*	*2*	*52.9*	*26.6*	*10.8*	*18.5*
Bioethanol	1000 vehicles	*0*	*0*	*3*	*10*	*24.6*	*33.5*	*12.9*	*22.7*
Hybrid	1000 vehicles	*0*	*1*	*1*	*1*	*20.0*	*10.8*	*-1.6*	*4.4*
Electric	1000 vehicles	*0*	*0*	*4*	*11*	*0.0*	*36.2*	*10.2*	*22.5*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*115*	*123*	*156*	*159*	*1.3*	*2.4*	*0.2*	*1.3*
Gasoline 1400-2000 cc	1000 vehicles	*158*	*167*	*210*	*213*	*1.1*	*2.3*	*0.2*	*1.2*
Gasoline >2000 cc	1000 vehicles	*33*	*35*	*43*	*42*	*0.8*	*2.1*	*-0.1*	*1.0*
Diesel <2000 cc	1000 vehicles	*24*	*26*	*32*	*29*	*1.5*	*2.1*	*-0.8*	*0.6*
Diesel >2000 cc	1000 vehicles	*4*	*4*	*3*	*2*	*-1.0*	*-1.7*	*-4.0*	*-2.9*
PreEURO	*1000 vehicles*	*122*	*94*	*21*	*0*	*-5.1*	*-13.8*	*-44.6*	*-30.9*
EURO I	1000 vehicles	*122*	*119*	*81*	*6*	*-0.6*	*-3.7*	*-22.6*	*-13.7*
EURO II	1000 vehicles	*27*	*26*	*24*	*9*	*-0.6*	*-1.0*	*-9.5*	*-5.3*
EURO III	1000 vehicles	*63*	*73*	*69*	*47*	*2.8*	*-0.5*	*-3.7*	*-2.1*
EURO IV	1000 vehicles	*0*	*32*	*30*	*26*	*0.0*	*-0.5*	*-1.3*	*-0.9*
EURO V or later	1000 vehicles	*0*	*12*	*218*	*357*	*0.0*	*33.9*	*5.1*	*18.6*
Light duty vehicle fleet size	1000 vehicles	0	0	0	0	n.a.	n.a.	n.a.	n.a.
Gasoline and Diesel	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	45	14	22	23	-20.9	4.9	0.4	2.6
3.5-7.5 tonnes	1000 vehicles	*7*	*7*	*11*	*12*	*0.5*	*4.9*	*0.4*	*2.6*
7.5-16 tonnes	1000 vehicles	*2*	*2*	*3*	*3*	*0.4*	*4.9*	*0.4*	*2.6*
16-32 tonnes	1000 vehicles	*4*	*4*	*7*	*7*	*0.4*	*4.9*	*0.4*	*2.7*
>32 tonnes	1000 vehicles	*1*	*1*	*1*	*1*	*0.4*	*4.9*	*0.4*	*2.7*
PreEURO	*1000 vehicles*	*20*	*5*	*3*	*0*	*-23.8*	*-6.5*	*-19.3*	*-13.1*
EURO I	1000 vehicles	*6*	*2*	*2*	*1*	*-22.0*	*-1.2*	*-9.6*	*-5.5*
EURO II	1000 vehicles	*14*	*4*	*4*	*2*	*-21.8*	*-0.5*	*-6.0*	*-3.3*
EURO III	1000 vehicles	*4*	*1*	*1*	*1*	*-22.2*	*0.2*	*-1.8*	*-0.8*
EURO IV	1000 vehicles	*0*	*1*	*1*	*1*	*n.a.*	*0.4*	*-0.6*	*-0.1*
EURO V or later	1000 vehicles	*0*	*0*	*12*	*18*	*n.a.*	*43.8*	*4.5*	*22.6*

iTREN-2030 CZ - Czech Republic	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	510	512	423	448	0.1	-1.9	0.6	-0.7
Freight transport activity originated in the country	Billion tonnes-km per year	56	57	77	89	0.5	3.0	1.5	2.2
Road	Billion tonnes-km per year	*37*	*38*	*46*	*54*	*0.3*	*2.0*	*1.4*	*1.7*
Rail	Billion tonnes-km per year	*18*	*19*	*30*	*35*	*0.9*	*4.7*	*1.6*	*3.1*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-2.5*	*4.5*	*1.1*	*2.8*
Maritime (Intra-EU)	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Average freight transport distance	km	109	111	181	198	0.4	5.0	0.9	2.9
Freight transport activity on the national territory	Billion tonnes-km per year	61	47	56	63	-4.8	1.7	1.2	1.4
Road	Billion tonnes-km per year	*32*	*33*	*35*	*38*	*0.1*	*0.6*	*1.1*	*0.8*
Rail	Billion tonnes-km per year	*15*	*15*	*21*	*25*	*0.3*	*3.7*	*1.3*	*2.5*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-2.5*	*4.5*	*1.1*	*2.8*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	7	8	6	7	1.1	-2.1	0.7	-0.7
Trips originated in the country	Million trips per year	9,224	9,131	9,709	10,044	-0.2	0.6	0.3	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	109	106	122	132	-0.4	1.4	0.8	1.1
Car	Billion pass-km per year	*74*	*70*	*82*	*90*	*-0.8*	*1.6*	*0.9*	*1.2*
Bus	Billion pass-km per year	*11*	*11*	*11*	*10*	*-0.5*	*-0.4*	*-0.6*	*-0.5*
Rail	Billion pass-km per year	*16*	*17*	*19*	*22*	*0.9*	*1.5*	*1.4*	*1.5*
Air (Intra-EU)	Billion pass-km per year	*4*	*4*	*5*	*5*	*-0.2*	*2.1*	*0.3*	*1.2*
Slow	Billion pass-km per year	*4*	*4*	*5*	*5*	*1.6*	*0.9*	*0.7*	*0.8*
Average passenger transport distance	km	11.8	11.7	12.5	13.1	-0.2	0.7	0.5	0.6
Passenger transport activity on the national territ	Billion pass-km per year	114	95	109	118	-3.6	1.3	0.8	1.1
Road	Billion pass-km per year	*82*	*79*	*90*	*96*	*-0.7*	*1.3*	*0.7*	*1.0*
Rail	Billion pass-km per year	*15*	*16*	*18*	*21*	*1.0*	*1.5*	*1.5*	*1.5*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	48	46	56	64	-0.9	2.0	1.3	1.6
Motorization rate	cars/1000 inhabitants	357	370	436	500	0.7	1.7	1.4	1.5
ECONOMY INDICATORS									
GDP	Billion Euros 2005	67	67	86	105	-0.1	2.6	2.0	2.3
Employment	1000 Persons	5,083	4,050	4,690	4,792	-4.4	1.5	0.2	0.8
Agriculture and fishery	1000 Persons	*286*	*222*	*196*	*194*	*-4.9*	*-1.2*	*-0.1*	*-0.7*
Construction	1000 Persons	*374*	*281*	*307*	*321*	*-5.5*	*0.9*	*0.5*	*0.7*
Energy and water	1000 Persons	*17*	*15*	*15*	*16*	*-2.0*	*-0.5*	*0.9*	*0.2*
Industry	1000 Persons	*2,245*	*1,578*	*2,077*	*2,185*	*-6.8*	*2.8*	*0.5*	*1.6*
Transport services	1000 Persons	*310*	*267*	*421*	*459*	*-2.9*	*4.7*	*0.9*	*2.7*
Other services	1000 Persons	*1,852*	*1,685*	*1,674*	*1,616*	*-1.9*	*-0.1*	*-0.4*	*-0.2*
Population total	1000 Persons	10,153	10,091	9,964	9,678	-0.1	-0.1	-0.3	-0.2
Labour force	1000 Persons	*6,832*	*6,900*	*6,555*	*6,340*	*0.2*	*-0.5*	*-0.3*	*-0.4*
Retired (> 65 years)	1000 Persons	*1,332*	*1,397*	*1,770*	*1,822*	*1.0*	*2.4*	*0.3*	*1.3*
Transport taxation revenues	Million Euros 2005	2,211	2,383	2,645	3,088	1.5	1.0	1.6	1.3
Fuel taxes	Million Euros 2005	*1,999*	*1,914*	*1,976*	*2,174*	*-0.9*	*0.3*	*1.0*	*0.6*
Emissions certificate	Million Euros 2005	*0*	*41*	*179*	*183*	*0.0*	*15.8*	*0.2*	*7.8*
Road charges	Million Euros 2005	*212*	*428*	*490*	*731*	*15.1*	*1.3*	*4.1*	*2.7*
ENERGY INDICATORS									
Primary energy production	Million toe per year	33	33	31	30	0.1	-0.5	-0.5	-0.5
Share of domestic energy production	%	70	76	73	70	1.9	-0.4	-0.4	-0.4
Final energy demand by source	Million toe per year	47	43	43	42	-1.7	-0.1	-0.1	-0.1
Oil	Million toe per year	*10*	*10*	*10*	*9*	*0.6*	*-0.6*	*-0.2*	*-0.4*
Gas	Million toe per year	*8*	*6*	*8*	*8*	*-3.6*	*1.8*	*0.1*	*1.0*
Coal, Nuclear	Million toe per year	*28*	*24*	*18*	*17*	*-3.3*	*-2.4*	*-0.7*	*-1.6*
Biomass	Million toe per year	*1*	*2*	*6*	*6*	*9.1*	*10.1*	*0.8*	*5.3*
Other Renewables	Million toe per year	*0*	*1*	*1*	*2*	*25.8*	*4.1*	*2.8*	*3.4*
Final energy demand by consuming sector	Million toe per year	26	25	26	26	-0.6	0.2	0.1	0.2
Transport freight	Million toe per year	*3*	*3*	*3*	*3*	*-1.5*	*0.5*	*-0.4*	*0.0*
Transport passenger	Million toe per year	*3*	*4*	*4*	*4*	*0.6*	*0.5*	*0.8*	*0.7*
Industry	Million toe per year	*10*	*10*	*9*	*9*	*0.0*	*-0.4*	*-0.7*	*-0.5*
Residential and services	Million toe per year	*10*	*9*	*10*	*10*	*-1.4*	*0.6*	*0.7*	*0.7*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.83	1.13	1.13	1.25	6.4	0.0	1.0	0.5
Gasoline price	Euros2005 per litre	0.95	1.26	1.25	1.37	5.9	-0.1	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	1	4	11	16	40.2	10.4	4.3	7.3
Share of renewables in electricity	%	5	17	29	30	24.8	5.9	0.1	3.0
Share of renewables in final energy demand	%	4	9	17	20	14.7	7.2	1.5	4.3
Energy intensity of freight transport activity	toe/Million tkm	51	60	54	46	3.5	-1.1	-1.6	-1.4
Energy intensity of passenger transport activity	toe/Million pkm	30	36	33	34	4.2	-0.8	0.0	-0.4
Energy intensity of economic activity	toe/Million Euros 2005	388	378	300	249	-0.5	-2.3	-1.8	-2.1

iTREN-2030 CZ - Czech Republic	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	18	16	17	18	-1.9	0.1	0.6	0.3
Road freight	Million tonnes per year	*6*	*6*	*5*	*5*	*-1.2*	*-2.0*	*0.1*	*-0.9*
Road passenger	Million tonnes per year	*9*	*8*	*8*	*8*	*-2.8*	*-0.1*	*0.2*	*0.0*
Rail freight	Million tonnes per year	*2*	*2*	*3*	*4*	*-1.0*	*5.6*	*2.5*	*4.1*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.3*	*0.5*	*0.4*	*0.5*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*-3.0*	*4.2*	*0.7*	*2.4*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.4*	*3.7*	*0.6*	*2.2*
Air (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-1.0*	*1.0*	*-0.7*	*0.2*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.132	0.160	0.138	0.136	3.9	-1.5	-0.1	-0.8
Road	tonnes/1000 tkm	*0.194*	*0.182*	*0.141*	*0.128*	*-1.3*	*-2.6*	*-1.0*	*-1.8*
Rail	tonnes/1000 tkm	*0.118*	*0.111*	*0.133*	*0.150*	*-1.3*	*1.9*	*1.2*	*1.5*
Inland navigation	tonnes/1000 tkm	*0.032*	*0.031*	*0.030*	*0.029*	*-0.5*	*-0.3*	*-0.4*	*-0.3*
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.085	0.089	0.078	0.073	0.9	-1.3	-0.7	-1.0
Road	tonnes/1000 pkm	*0.111*	*0.100*	*0.087*	*0.083*	*-2.1*	*-1.4*	*-0.5*	*-0.9*
Rail	tonnes/1000 pkm	*0.018*	*0.016*	*0.015*	*0.013*	*-1.3*	*-1.0*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.170*	*0.163*	*0.148*	*0.134*	*-0.8*	*-1.0*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	70	50	42	42	-6.6	-1.6	0.0	-0.8
Road freight	1000 Tonnes per year	*17*	*13*	*7*	*5*	*-5.1*	*-6.0*	*-3.9*	*-5.0*
Road passenger	1000 Tonnes per year	*33*	*17*	*9*	*8*	*-11.8*	*-6.3*	*-1.4*	*-3.9*
Rail freight	1000 Tonnes per year	*10*	*9*	*14*	*18*	*-1.7*	*4.9*	*2.1*	*3.5*
Rail passenger	1000 Tonnes per year	*2*	*2*	*2*	*2*	*-0.7*	*-0.1*	*-0.5*	*-0.3*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-3.0*	*4.2*	*0.7*	*2.4*
Maritime (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-2.8*	*3.3*	*0.3*	*1.8*
Air (Intra-EU)	1000 Tonnes per year	*8*	*8*	*9*	*9*	*-0.1*	*1.8*	*0.1*	*0.9*
PM10 Transport emissions	1000 Tonnes per year	5	4	3	3	-5.3	-3.1	-1.0	-2.1
Road freight	1000 Tonnes per year	*2*	*1*	*1*	*1*	*-4.2*	*-2.8*	*-0.8*	*-1.8*
Road passenger	1000 Tonnes per year	*3*	*2*	*2*	*2*	*-5.9*	*-3.3*	*-1.2*	*-2.2*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	3,657	3,729	4,344	4,835	0.4	1.5	1.1	1.3
Gasoline	1000 vehicles	*2,800*	*2,573*	*3,019*	*3,451*	*-1.7*	*1.6*	*1.3*	*1.5*
Diesel	1000 vehicles	*851*	*962*	*1,104*	*1,086*	*2.5*	*1.4*	*-0.2*	*0.6*
LPG/CNG	1000 vehicles	*0*	*177*	*134*	*117*	*361.2*	*-2.7*	*-1.4*	*-2.0*
Bioethanol	1000 vehicles	*0*	*1*	*11*	*26*	*54.7*	*35.3*	*8.7*	*21.3*
Hybrid	1000 vehicles	*6*	*17*	*44*	*36*	*21.2*	*10.1*	*-2.1*	*3.8*
Electric	1000 vehicles	*0*	*0*	*32*	*96*	*0.0*	*95.0*	*11.7*	*47.6*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*24*	*0.0*	*0.0*	*155.5*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,925*	*1,825*	*2,146*	*2,343*	*-1.1*	*1.6*	*0.9*	*1.3*
Gasoline 1400-2000 cc	1000 vehicles	*784*	*673*	*781*	*991*	*-3.0*	*1.5*	*2.4*	*2.0*
Gasoline >2000 cc	1000 vehicles	*90*	*74*	*92*	*117*	*-3.9*	*2.1*	*2.4*	*2.3*
Diesel <2000 cc	1000 vehicles	*744*	*857*	*997*	*979*	*2.9*	*1.5*	*-0.2*	*0.7*
Diesel >2000 cc	1000 vehicles	*110*	*105*	*107*	*106*	*-0.8*	*0.2*	*-0.1*	*0.0*
PreEURO	*1000 vehicles*	*850*	*96*	*0*	*0*	*-35.4*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*776*	*548*	*0*	*0*	*-6.7*	*-78.4*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*162*	*143*	*0*	*0*	*-2.4*	*-60.3*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*1,863*	*1,756*	*589*	*0*	*-1.2*	*-10.4*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*718*	*564*	*0*	*0.0*	*-2.4*	*-77.4*	*-53.1*
EURO V or later	1000 vehicles	*0*	*274*	*2,970*	*4,537*	*0.0*	*26.9*	*4.3*	*15.1*
Light duty vehicle fleet size	1000 vehicles	92	89	59	59	-0.7	-4.0	0.0	-2.0
Gasoline and Diesel	1000 vehicles	*92*	*89*	*59*	*57*	*-0.7*	*-4.1*	*-0.3*	*-2.2*
Electric	1000 vehicles	*0*	*0*	*0*	*2*	*n.a.*	*n.a.*	*25.9*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	265	219	246	279	-3.8	1.2	1.3	1.2
3.5-7.5 tonnes	1000 vehicles	*94*	*105*	*117*	*131*	*2.2*	*1.1*	*1.2*	*1.1*
7.5-16 tonnes	1000 vehicles	*25*	*27*	*30*	*34*	*2.0*	*1.0*	*1.2*	*1.1*
16-32 tonnes	1000 vehicles	*64*	*72*	*82*	*94*	*2.3*	*1.3*	*1.4*	*1.3*
>32 tonnes	1000 vehicles	*13*	*15*	*18*	*20*	*2.8*	*1.7*	*1.4*	*1.5*
PreEURO	*1000 vehicles*	*148*	*85*	*35*	*7*	*-10.4*	*-8.4*	*-15.2*	*-11.9*
EURO I	1000 vehicles	*26*	*18*	*15*	*7*	*-6.8*	*-2.1*	*-7.1*	*-4.7*
EURO II	1000 vehicles	*29*	*21*	*18*	*10*	*-6.7*	*-1.6*	*-5.4*	*-3.5*
EURO III	1000 vehicles	*62*	*48*	*43*	*34*	*-5.1*	*-0.9*	*-2.5*	*-1.7*
EURO IV	1000 vehicles	*0*	*39*	*36*	*32*	*n.a.*	*-0.7*	*-1.1*	*-0.9*
EURO V or later	1000 vehicles	*0*	*8*	*99*	*189*	*n.a.*	*29.0*	*6.7*	*17.3*

iTREN-2030 DE - Germany	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	3,434	3,352	3,658	3,864	-0.5	0.9	0.5	0.7
Freight transport activity originated in the country	Billion tonnes-km per year	1,082	510	602	620	-14.0	1.7	0.3	1.0
Road	Billion tonnes-km per year	*301*	*294*	*332*	*341*	*-0.5*	*1.2*	*0.3*	*0.7*
Rail	Billion tonnes-km per year	*99*	*98*	*108*	*108*	*-0.1*	*1.0*	*0.0*	*0.5*
Inland navigation	Billion tonnes-km per year	*48*	*47*	*59*	*62*	*-0.8*	*2.3*	*0.6*	*1.5*
Maritime (Intra-EU)	Billion tonnes-km per year	*83*	*71*	*103*	*109*	*-3.1*	*3.9*	*0.5*	*2.2*
Average freight transport distance	km	315	152	165	160	-13.6	0.8	-0.3	0.3
Freight transport activity on the national territory	Billion tonnes-km per year	551	500	627	671	-1.9	2.3	0.7	1.5
Road	Billion tonnes-km per year	*359*	*344*	*430*	*462*	*-0.8*	*2.3*	*0.7*	*1.5*
Rail	Billion tonnes-km per year	*103*	*101*	*127*	*135*	*-0.4*	*2.4*	*0.6*	*1.5*
Inland navigation	Billion tonnes-km per year	*57*	*55*	*69*	*74*	*-0.8*	*2.3*	*0.6*	*1.5*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	60	59	62	65	-0.2	0.5	0.4	0.5
Trips originated in the country	Million trips per year	84,997	81,867	86,634	87,147	-0.7	0.6	0.1	0.3
Passenger transport activity originated in the cou	Billion pass-km per year	1,166	1,129	1,270	1,302	-0.6	1.2	0.2	0.7
Car	Billion pass-km per year	*866*	*812*	*942*	*967*	*-1.3*	*1.5*	*0.3*	*0.9*
Bus	Billion pass-km per year	*82*	*87*	*69*	*63*	*1.0*	*-2.2*	*-0.9*	*-1.6*
Rail	Billion pass-km per year	*104*	*116*	*123*	*127*	*2.1*	*0.6*	*0.3*	*0.5*
Air (Intra-EU)	Billion pass-km per year	*56*	*56*	*71*	*74*	*0.3*	*2.3*	*0.5*	*1.4*
Slow	Billion pass-km per year	*57*	*58*	*65*	*70*	*0.1*	*1.2*	*0.8*	*1.0*
Average passenger transport distance	km	13.7	13.8	14.7	14.9	0.1	0.6	0.2	0.4
Passenger transport activity on the national territ	Billion pass-km per year	1,092	1,053	1,181	1,208	-0.7	1.2	0.2	0.7
Road	Billion pass-km per year	*983*	*931*	*1,051*	*1,073*	*-1.1*	*1.2*	*0.2*	*0.7*
Rail	Billion pass-km per year	*110*	*122*	*130*	*134*	*2.2*	*0.6*	*0.3*	*0.5*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	503	476	578	611	-1.1	2.0	0.6	1.3
Motorization rate	cars/1000 inhabitants	531	531	591	633	0.0	1.1	0.7	0.9
ECONOMY INDICATORS									
GDP	Billion Euros 2005	2,797	2,813	3,462	3,847	0.1	2.1	1.1	1.6
Employment	1000 Persons	38,329	35,003	36,180	32,935	-1.8	0.3	-0.9	-0.3
Agriculture and fishery	1000 Persons	*870*	*734*	*616*	*539*	*-3.3*	*-1.7*	*-1.3*	*-1.5*
Construction	1000 Persons	*3,229*	*2,761*	*3,212*	*2,923*	*-3.1*	*1.5*	*-0.9*	*0.3*
Energy and water	1000 Persons	*471*	*510*	*517*	*499*	*1.6*	*0.1*	*-0.4*	*-0.1*
Industry	1000 Persons	*7,424*	*5,598*	*5,862*	*5,255*	*-5.5*	*0.5*	*-1.1*	*-0.3*
Transport services	1000 Persons	*1,334*	*1,194*	*1,201*	*1,070*	*-2.2*	*0.1*	*-1.1*	*-0.5*
Other services	1000 Persons	*25,001*	*24,207*	*24,773*	*22,650*	*-0.6*	*0.2*	*-0.9*	*-0.3*
Population total	1000 Persons	82,571	82,669	82,365	81,112	0.0	0.0	-0.2	-0.1
Labour force	1000 Persons	*54,244*	*53,948*	*53,902*	*50,857*	*-0.1*	*0.0*	*-0.6*	*-0.3*
Retired (> 65 years)	1000 Persons	*13,076*	*13,615*	*14,114*	*16,989*	*0.8*	*0.4*	*1.9*	*1.1*
Transport taxation revenues	Million Euros 2005	35,604	33,115	35,046	35,734	-1.4	0.6	0.2	0.4
Fuel taxes	Million Euros 2005	*33,232*	*28,109*	*29,460*	*28,513*	*-3.3*	*0.5*	*-0.3*	*0.1*
Emissions certificate	Million Euros 2005	*0*	*445*	*2,039*	*1,773*	*0.0*	*16.5*	*-1.4*	*7.2*
Road charges	Million Euros 2005	*2,372*	*4,562*	*3,547*	*5,448*	*14.0*	*-2.5*	*4.4*	*0.9*
ENERGY INDICATORS									
Primary energy production	Million toe per year	145	151	133	121	0.7	-1.2	-0.9	-1.1
Share of domestic energy production	%	42	47	43	43	2.3	-0.7	-0.1	-0.4
Final energy demand by source	Million toe per year	349	323	307	281	-1.5	-0.5	-0.9	-0.7
Oil	Million toe per year	*123*	*104*	*88*	*76*	*-3.3*	*-1.6*	*-1.4*	*-1.5*
Gas	Million toe per year	*79*	*75*	*87*	*77*	*-1.1*	*1.6*	*-1.3*	*0.1*
Coal, Nuclear	Million toe per year	*125*	*118*	*84*	*66*	*-1.3*	*-3.3*	*-2.4*	*-2.8*
Biomass	Million toe per year	*17*	*19*	*30*	*37*	*2.4*	*4.5*	*2.1*	*3.3*
Other Renewables	Million toe per year	*5*	*8*	*17*	*25*	*9.3*	*8.3*	*3.5*	*5.9*
Final energy demand by consuming sector	Million toe per year	232	215	214	203	-1.5	0.0	-0.6	-0.3
Transport freight	Million toe per year	*22*	*21*	*20*	*18*	*-1.1*	*-0.2*	*-1.1*	*-0.7*
Transport passenger	Million toe per year	*42*	*40*	*35*	*32*	*-1.0*	*-1.2*	*-1.0*	*-1.1*
Industry	Million toe per year	*58*	*52*	*52*	*49*	*-2.2*	*-0.1*	*-0.6*	*-0.3*
Residential and services	Million toe per year	*110*	*103*	*107*	*104*	*-1.4*	*0.4*	*-0.3*	*0.1*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.97	1.29	1.28	1.42	5.9	-0.1	1.1	0.5
Gasoline price	Euros2005 per litre	1.11	1.43	1.42	1.57	5.1	0.0	1.0	0.5
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	3	5	10	18	7.1	8.4	5.9	7.2
Share of renewables in electricity	%	12	17	32	41	7.0	6.8	2.5	4.6
Share of renewables in final energy demand	%	7	9	15	22	6.3	5.6	3.4	4.5
Energy intensity of freight transport activity	toe/Million tkm	34	36	28	23	1.0	-2.6	-1.8	-2.2
Energy intensity of passenger transport activity	toe/Million pkm	37	36	28	25	-0.4	-2.4	-1.2	-1.8
Energy intensity of economic activity	toe/Million Euros 2005	83	76	62	53	-1.6	-2.1	-1.6	-1.8

iTREN-2030 DE - Germany	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	197	176	177	161	-2.2	0.0	-1.0	-0.5
Road freight	Million tonnes per year	*56*	*54*	*54*	*51*	*-0.6*	*0.0*	*-0.5*	*-0.3*
Road passenger	Million tonnes per year	*123*	*105*	*103*	*90*	*-3.1*	*-0.2*	*-1.3*	*-0.8*
Rail freight	Million tonnes per year	*2*	*2*	*2*	*2*	*-2.7*	*1.6*	*-0.6*	*0.5*
Rail passenger	Million tonnes per year	*2*	*2*	*2*	*2*	*1.2*	*-0.8*	*-1.2*	*-1.0*
Inland navigation	Million tonnes per year	*2*	*2*	*3*	*3*	*-0.9*	*2.3*	*0.7*	*1.5*
Maritime (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-1.9*	*3.3*	*0.1*	*1.7*
Air (Intra-EU)	Million tonnes per year	*10*	*10*	*11*	*11*	*-0.7*	*1.3*	*-0.5*	*0.4*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.096	0.104	0.083	0.074	1.4	-2.2	-1.1	-1.7
Road	tonnes/1000 tkm	*0.155*	*0.157*	*0.125*	*0.111*	*0.2*	*-2.2*	*-1.2*	*-1.7*
Rail	tonnes/1000 tkm	*0.023*	*0.020*	*0.019*	*0.017*	*-2.3*	*-0.8*	*-1.2*	*-1.0*
Inland navigation	tonnes/1000 tkm	*0.037*	*0.037*	*0.037*	*0.037*	*-0.2*	*-0.1*	*0.1*	*0.0*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.014*	*0.015*	*0.014*	*0.014*	*1.3*	*-0.5*	*-0.4*	*-0.5*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.118	0.106	0.093	0.080	-2.2	-1.3	-1.5	-1.4
Road	tonnes/1000 pkm	*0.125*	*0.113*	*0.098*	*0.084*	*-2.1*	*-1.4*	*-1.5*	*-1.5*
Rail	tonnes/1000 pkm	*0.018*	*0.017*	*0.015*	*0.013*	*-1.0*	*-1.4*	*-1.5*	*-1.4*
Air	tonnes/1000 pkm	*0.186*	*0.177*	*0.161*	*0.147*	*-1.0*	*-0.9*	*-0.9*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	795	533	431	389	-7.7	-2.1	-1.0	-1.6
Road freight	1000 Tonnes per year	*195*	*127*	*72*	*48*	*-8.2*	*-5.6*	*-4.0*	*-4.8*
Road passenger	1000 Tonnes per year	*389*	*200*	*108*	*84*	*-12.4*	*-6.0*	*-2.4*	*-4.2*
Rail freight	1000 Tonnes per year	*8*	*6*	*6*	*6*	*-4.1*	*-0.2*	*-0.3*	*-0.2*
Rail passenger	1000 Tonnes per year	*12*	*12*	*11*	*9*	*0.5*	*-1.1*	*-1.6*	*-1.3*
Inland navigation	1000 Tonnes per year	*35*	*34*	*42*	*45*	*-0.9*	*2.3*	*0.7*	*1.5*
Maritime (Intra-EU)	1000 Tonnes per year	*25*	*23*	*30*	*29*	*-2.3*	*2.9*	*-0.3*	*1.3*
Air (Intra-EU)	1000 Tonnes per year	*130*	*131*	*161*	*167*	*0.1*	*2.1*	*0.4*	*1.2*
PM10 Transport emissions	1000 Tonnes per year	55	43	28	24	-5.2	-4.1	-1.5	-2.8
Road freight	1000 Tonnes per year	*18*	*12*	*6*	*5*	*-7.1*	*-6.9*	*-1.9*	*-4.4*
Road passenger	1000 Tonnes per year	*37*	*30*	*22*	*19*	*-4.3*	*-3.1*	*-1.4*	*-2.2*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	43,844	43,934	48,683	51,340	0.0	1.0	0.5	0.8
Gasoline	1000 vehicles	*32,760*	*28,679*	*26,394*	*25,113*	*-2.6*	*-0.8*	*-0.5*	*-0.7*
Diesel	1000 vehicles	*10,662*	*13,457*	*14,007*	*11,325*	*4.8*	*0.4*	*-2.1*	*-0.9*
LPG/CNG	1000 vehicles	*128*	*570*	*1,600*	*1,311*	*34.7*	*10.9*	*-2.0*	*4.3*
Bioethanol	1000 vehicles	*4*	*61*	*501*	*853*	*70.5*	*23.3*	*5.5*	*14.1*
Hybrid	1000 vehicles	*289*	*1,091*	*2,120*	*1,344*	*30.4*	*6.9*	*-4.5*	*1.0*
Electric	1000 vehicles	*0*	*77*	*4,057*	*9,880*	*0.0*	*48.7*	*9.3*	*27.5*
Fuel cells	1000 vehicles	*0*	*0*	*4*	*1,513*	*0.0*	*0.0*	*82.4*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*12,218*	*11,041*	*9,991*	*8,758*	*-2.0*	*-1.0*	*-1.3*	*-1.2*
Gasoline 1400-2000 cc	1000 vehicles	*16,594*	*13,902*	*12,779*	*13,068*	*-3.5*	*-0.8*	*0.2*	*-0.3*
Gasoline >2000 cc	1000 vehicles	*4,251*	*3,736*	*3,623*	*3,286*	*-2.5*	*-0.3*	*-1.0*	*-0.6*
Diesel <2000 cc	1000 vehicles	*7,225*	*9,289*	*9,596*	*7,446*	*5.2*	*0.3*	*-2.5*	*-1.1*
Diesel >2000 cc	1000 vehicles	*3,550*	*4,167*	*4,412*	*3,880*	*3.3*	*0.6*	*-1.3*	*-0.4*
PreEURO	*1000 vehicles*	*4,311*	*1,162*	*20*	*0*	*-23.1*	*-33.4*	*-47.6*	*-40.9*
EURO I	1000 vehicles	*13,611*	*6,510*	*389*	*2*	*-13.7*	*-24.6*	*-39.8*	*-32.6*
EURO II	1000 vehicles	*10,340*	*7,115*	*1,082*	*22*	*-7.2*	*-17.2*	*-32.3*	*-25.1*
EURO III	1000 vehicles	*15,576*	*13,045*	*3,930*	*227*	*-3.5*	*-11.3*	*-24.8*	*-18.3*
EURO IV	1000 vehicles	*0*	*9,136*	*4,308*	*501*	*0.0*	*-7.2*	*-19.4*	*-13.5*
EURO V or later	1000 vehicles	*0*	*5,167*	*30,672*	*35,686*	*0.0*	*19.5*	*1.5*	*10.1*
Light duty vehicle fleet size	1000 vehicles	1,685	1,672	1,703	1,766	-0.2	0.2	0.4	0.3
Gasoline and Diesel	1000 vehicles	*1,685*	*1,672*	*1,683*	*1,649*	*-0.2*	*0.1*	*-0.2*	*-0.1*
Electric	1000 vehicles	*0*	*0*	*20*	*117*	*n.a.*	*n.a.*	*19.5*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	1,606	1,289	1,340	1,371	-4.3	0.4	0.2	0.3
3.5-7.5 tonnes	1000 vehicles	*506*	*527*	*560*	*573*	*0.8*	*0.6*	*0.2*	*0.4*
7.5-16 tonnes	1000 vehicles	*132*	*138*	*147*	*150*	*0.8*	*0.6*	*0.2*	*0.4*
16-32 tonnes	1000 vehicles	*482*	*488*	*493*	*505*	*0.2*	*0.1*	*0.2*	*0.2*
>32 tonnes	1000 vehicles	*134*	*137*	*139*	*143*	*0.3*	*0.2*	*0.2*	*0.2*
PreEURO	*1000 vehicles*	*993*	*517*	*21*	*0*	*-12.2*	*-27.3*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*184*	*142*	*53*	*0*	*-5.0*	*-9.5*	*-81.6*	*-59.1*
EURO II	1000 vehicles	*210*	*165*	*132*	*1*	*-4.7*	*-2.2*	*-37.8*	*-22.0*
EURO III	1000 vehicles	*219*	*225*	*224*	*65*	*0.5*	*-0.1*	*-11.7*	*-6.1*
EURO IV	1000 vehicles	*0*	*215*	*219*	*161*	*n.a.*	*0.2*	*-3.1*	*-1.4*
EURO V or later	1000 vehicles	*0*	*26*	*691*	*1,145*	*n.a.*	*39.0*	*5.2*	*20.9*

iTREN-2030 DK - Denmark	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	143	152	175	192	1.3	1.4	0.9	1.2
Freight transport activity originated in the country	Billion tonnes-km per year	40	39	57	66	-0.6	3.8	1.5	2.7
Road	Billion tonnes-km per year	*24*	*25*	*31*	*35*	*0.7*	*2.3*	*1.3*	*1.8*
Rail	Billion tonnes-km per year	*2*	*2*	*3*	*4*	*-2.0*	*5.8*	*1.9*	*3.8*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*14*	*12*	*22*	*27*	*-2.9*	*6.2*	*1.8*	*4.0*
Average freight transport distance	km	280	255	324	343	-1.9	2.4	0.6	1.5
Freight transport activity on the national territory	Billion tonnes-km per year	30	42	62	71	6.8	3.9	1.4	2.6
Road	Billion tonnes-km per year	*36*	*35*	*49*	*56*	*-0.6*	*3.6*	*1.4*	*2.5*
Rail	Billion tonnes-km per year	*8*	*8*	*13*	*15*	*-1.9*	*5.3*	*1.4*	*3.4*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	4	4	5	6	0.2	1.9	1.1	1.5
Trips originated in the country	Million trips per year	5,052	4,893	5,271	5,380	-0.6	0.7	0.2	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	82	78	93	100	-1.0	1.8	0.7	1.2
Car	Billion pass-km per year	*55*	*52*	*66*	*70*	*-1.2*	*2.4*	*0.6*	*1.5*
Bus	Billion pass-km per year	*11*	*11*	*8*	*8*	*0.6*	*-3.1*	*-1.0*	*-2.0*
Rail	Billion pass-km per year	*4*	*5*	*5*	*6*	*2.5*	*0.4*	*0.9*	*0.7*
Air (Intra-EU)	Billion pass-km per year	*9*	*7*	*11*	*13*	*-4.0*	*4.3*	*2.0*	*3.1*
Slow	Billion pass-km per year	*2*	*2*	*3*	*3*	*1.0*	*1.2*	*1.0*	*1.1*
Average passenger transport distance	km	16.2	16.0	17.7	18.5	-0.3	1.0	0.5	0.8
Passenger transport activity on the national territ	Billion pass-km per year	95	64	74	77	-7.5	1.4	0.4	0.9
Road	Billion pass-km per year	*63*	*60*	*70*	*72*	*-0.9*	*1.5*	*0.4*	*1.0*
Rail	Billion pass-km per year	*4*	*4*	*5*	*5*	*2.3*	*0.3*	*0.7*	*0.5*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	32	31	41	44	-0.9	2.8	0.7	1.7
Motorization rate	cars/1000 inhabitants	355	356	417	448	0.0	1.6	0.7	1.2
ECONOMY INDICATORS									
GDP	Billion Euros 2005	189	190	251	284	0.2	2.8	1.2	2.0
Employment	1000 Persons	2,439	2,288	2,685	2,483	-1.3	1.6	-0.8	0.4
Agriculture and fishery	1000 Persons	*155*	*143*	*147*	*132*	*-1.6*	*0.3*	*-1.1*	*-0.4*
Construction	1000 Persons	*135*	*141*	*166*	*154*	*0.9*	*1.6*	*-0.8*	*0.4*
Energy and water	1000 Persons	*12*	*13*	*15*	*14*	*2.0*	*1.3*	*-0.7*	*0.3*
Industry	1000 Persons	*510*	*435*	*636*	*602*	*-3.1*	*3.9*	*-0.5*	*1.6*
Transport services	1000 Persons	*259*	*229*	*358*	*378*	*-2.4*	*4.6*	*0.5*	*2.5*
Other services	1000 Persons	*1,369*	*1,327*	*1,364*	*1,204*	*-0.6*	*0.3*	*-1.2*	*-0.5*
Population total	1000 Persons	5,414	5,480	5,540	5,539	0.2	0.1	0.0	0.1
Labour force	1000 Persons	*3,441*	*3,434*	*3,417*	*3,371*	*0.0*	*0.0*	*-0.1*	*-0.1*
Retired (> 65 years)	1000 Persons	*777*	*831*	*981*	*1,055*	*1.4*	*1.7*	*0.7*	*1.2*
Transport taxation revenues	Million Euros 2005	1,638	1,442	1,758	1,810	-2.5	2.0	0.3	1.1
Fuel taxes	Million Euros 2005	*1,638*	*1,355*	*1,210*	*1,152*	*-3.7*	*-1.1*	*-0.5*	*-0.8*
Emissions certificate	Million Euros 2005	*0*	*30*	*131*	*114*	*0.0*	*15.8*	*-1.4*	*6.8*
Road charges	Million Euros 2005	*0*	*57*	*417*	*545*	*0.0*	*22.1*	*2.7*	*12.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	30	38	48	42	4.6	2.4	-1.3	0.5
Share of domestic energy production	%	155	178	215	188	2.7	1.9	-1.3	0.3
Final energy demand by source	Million toe per year	19	21	22	22	1.8	0.5	0.0	0.3
Oil	Million toe per year	*8*	*8*	*7*	*6*	*-2.0*	*-0.8*	*-1.1*	*-0.9*
Gas	Million toe per year	*4*	*4*	*5*	*5*	*-2.6*	*3.0*	*-0.7*	*1.2*
Coal, Nuclear	Million toe per year	*4*	*7*	*4*	*3*	*13.4*	*-4.9*	*-3.7*	*-4.3*
Biomass	Million toe per year	*2*	*2*	*5*	*7*	*-1.0*	*8.7*	*3.8*	*6.2*
Other Renewables	Million toe per year	*1*	*1*	*1*	*1*	*-0.2*	*3.8*	*2.1*	*3.0*
Final energy demand by consuming sector	Million toe per year	15	15	16	16	-0.8	0.5	0.0	0.3
Transport freight	Million toe per year	*2*	*2*	*2*	*2*	*0.4*	*0.9*	*-0.4*	*0.2*
Transport passenger	Million toe per year	*3*	*3*	*3*	*3*	*-1.5*	*-0.8*	*-0.7*	*-0.7*
Industry	Million toe per year	*3*	*3*	*3*	*2*	*-1.7*	*-0.8*	*-0.1*	*-0.4*
Residential and services	Million toe per year	*7*	*7*	*8*	*8*	*-0.5*	*1.3*	*0.4*	*0.9*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.87	1.26	1.22	1.37	7.7	-0.3	1.2	0.4
Gasoline price	Euros2005 per litre	1.05	1.42	1.39	1.54	6.1	-0.2	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	2	9	18	1165.2	13.5	7.4	10.4
Share of renewables in electricity	%	31	27	50	67	-2.3	6.3	2.9	4.6
Share of renewables in final energy demand	%	14	14	24	35	-1.0	6.0	3.7	4.8
Energy intensity of freight transport activity	toe/Million tkm	40	34	24	20	-3.5	-3.5	-1.9	-2.7
Energy intensity of passenger transport activity	toe/Million pkm	33	45	35	31	6.1	-2.5	-1.3	-1.9
Energy intensity of economic activity	toe/Million Euros 2005	82	78	62	55	-1.0	-2.3	-1.2	-1.7

iTREN-2030 DK - Denmark	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	12	11	12	11	-2.5	0.7	-0.4	0.1
Road freight	Million tonnes per year	*3*	*3*	*4*	*4*	*-0.2*	*0.5*	*0.6*	*0.5*
Road passenger	Million tonnes per year	*7*	*6*	*6*	*5*	*-3.3*	*0.0*	*-1.6*	*-0.8*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*-6.1*	*3.2*	*0.2*	*1.7*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*1.5*	*-0.8*	*-0.3*	*-0.5*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.0*	*3.6*	*0.2*	*1.9*
Air (Intra-EU)	Million tonnes per year	*2*	*1*	*2*	*2*	*-4.8*	*3.1*	*0.9*	*2.0*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.085	0.068	0.047	0.043	-4.3	-3.5	-0.9	-2.2
Road	tonnes/1000 tkm	*0.097*	*0.099*	*0.073*	*0.068*	*0.4*	*-3.0*	*-0.7*	*-1.9*
Rail	tonnes/1000 tkm	*0.014*	*0.011*	*0.009*	*0.008*	*-4.3*	*-2.0*	*-1.2*	*-1.6*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.017*	*0.017*	*0.014*	*0.012*	*0.9*	*-2.4*	*-1.5*	*-2.0*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.083	0.101	0.090	0.076	4.0	-1.1	-1.6	-1.4
Road	tonnes/1000 pkm	*0.111*	*0.098*	*0.085*	*0.069*	*-2.4*	*-1.5*	*-2.0*	*-1.7*
Rail	tonnes/1000 pkm	*0.021*	*0.021*	*0.018*	*0.017*	*-0.8*	*-1.1*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.177*	*0.170*	*0.152*	*0.137*	*-0.8*	*-1.1*	*-1.0*	*-1.1*
NOx Transport emissions	1000 Tonnes per year	76	56	54	53	-5.8	-0.4	-0.1	-0.3
Road freight	1000 Tonnes per year	*23*	*18*	*10*	*7*	*-4.4*	*-5.4*	*-4.0*	*-4.7*
Road passenger	1000 Tonnes per year	*26*	*15*	*11*	*10*	*-9.9*	*-2.9*	*-1.0*	*-2.0*
Rail freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-5.9*	*2.6*	*0.3*	*1.5*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*0.8*	*-1.1*	*-1.0*	*-1.0*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*5*	*5*	*7*	*6*	*-2.4*	*3.2*	*-0.1*	*1.5*
Air (Intra-EU)	1000 Tonnes per year	*20*	*16*	*23*	*28*	*-3.9*	*3.7*	*1.7*	*2.7*
PM10 Transport emissions	1000 Tonnes per year	3	3	2	2	-4.6	-2.4	-1.0	-1.7
Road freight	1000 Tonnes per year	*1*	*1*	*0*	*0*	*-8.9*	*-5.1*	*-1.6*	*-3.3*
Road passenger	1000 Tonnes per year	*2*	*2*	*2*	*2*	*-3.2*	*-1.8*	*-0.9*	*-1.3*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	1,923	1,952	2,308	2,483	0.3	1.7	0.7	1.2
Gasoline	1000 vehicles	*1,715*	*1,551*	*1,150*	*925*	*-2.0*	*-3.0*	*-2.2*	*-2.6*
Diesel	1000 vehicles	*193*	*297*	*296*	*178*	*9.0*	*0.0*	*-4.9*	*-2.5*
LPG/CNG	1000 vehicles	*2*	*31*	*207*	*176*	*80.8*	*21.1*	*-1.6*	*9.2*
Bioethanol	1000 vehicles	*0*	*1*	*12*	*15*	*43.3*	*27.0*	*2.3*	*14.0*
Hybrid	1000 vehicles	*13*	*33*	*47*	*20*	*19.6*	*3.7*	*-8.2*	*-2.4*
Electric	1000 vehicles	*0*	*39*	*595*	*890*	*187.4*	*31.2*	*4.1*	*16.9*
Fuel cells	1000 vehicles	*0*	*0*	*3*	*278*	*0.0*	*0.0*	*59.8*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*704*	*520*	*325*	*244*	*-5.9*	*-4.6*	*-2.8*	*-3.7*
Gasoline 1400-2000 cc	1000 vehicles	*135*	*957*	*766*	*628*	*48.0*	*-2.2*	*-2.0*	*-2.1*
Gasoline >2000 cc	1000 vehicles	*83*	*74*	*58*	*54*	*-2.3*	*-2.4*	*-0.8*	*-1.6*
Diesel <2000 cc	1000 vehicles	*165*	*269*	*274*	*166*	*10.3*	*0.2*	*-4.9*	*-2.4*
Diesel >2000 cc	1000 vehicles	*28*	*28*	*22*	*13*	*-0.6*	*-2.5*	*-5.3*	*-3.9*
PreEURO	*1000 vehicles*	*157*	*4*	*0*	*0*	*-52.2*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*687*	*307*	*0*	*0*	*-14.9*	*-90.0*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*508*	*446*	*1*	*0*	*-2.6*	*-45.0*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*558*	*521*	*115*	*0*	*-1.4*	*-14.0*	*-96.2*	*-82.0*
EURO IV	1000 vehicles	*0*	*346*	*194*	*0*	*0.0*	*-5.6*	*-66.6*	*-43.8*
EURO V or later	1000 vehicles	*0*	*223*	*1,134*	*1,103*	*0.0*	*17.6*	*-0.3*	*8.3*
Light duty vehicle fleet size	1000 vehicles	46	30	13	12	-8.0	-7.9	-1.2	-4.6
Gasoline and Diesel	1000 vehicles	*46*	*30*	*13*	*11*	*-8.0*	*-7.9*	*-1.7*	*-4.9*
Electric	1000 vehicles	*0*	*0*	*0*	*1*	*n.a.*	*n.a.*	*21.6*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	189	139	141	134	-5.9	0.1	-0.5	-0.2
3.5-7.5 tonnes	1000 vehicles	*65*	*67*	*69*	*66*	*0.5*	*0.4*	*-0.5*	*-0.1*
7.5-16 tonnes	1000 vehicles	*17*	*17*	*18*	*17*	*0.5*	*0.4*	*-0.5*	*-0.1*
16-32 tonnes	1000 vehicles	*45*	*45*	*44*	*41*	*-0.1*	*-0.2*	*-0.6*	*-0.4*
>32 tonnes	1000 vehicles	*10*	*10*	*10*	*9*	*-0.2*	*-0.2*	*-0.6*	*-0.4*
PreEURO	*1000 vehicles*	*50*	*5*	*#WERT!*	*0*	*-37.3*	*#WERT!*	*#WERT!*	*-100.0*
EURO I	1000 vehicles	*36*	*16*	*#WERT!*	*0*	*-14.9*	*#WERT!*	*#WERT!*	*-100.0*
EURO II	1000 vehicles	*59*	*40*	*0*	*0*	*-7.4*	*-39.0*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*44*	*41*	*18*	*0*	*-1.3*	*-7.9*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*32*	*30*	*0*	*n.a.*	*-0.7*	*-59.5*	*-36.6*
EURO V or later	1000 vehicles	*0*	*5*	*93*	*134*	*n.a.*	*34.7*	*3.7*	*18.2*

iTREN-2030 EE - Estonia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	52	51	55	61	-0.5	0.8	1.0	0.9
Freight transport activity originated in the country	Billion tonnes-km per year	15	16	31	41	1.0	7.1	2.8	4.9
Road	Billion tonnes-km per year	*5*	*5*	*10*	*14*	*0.3*	*7.3*	*3.4*	*5.3*
Rail	Billion tonnes-km per year	*7*	*7*	*10*	*12*	*-0.1*	*3.9*	*2.0*	*2.9*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*4*	*4*	*12*	*15*	*3.7*	*10.7*	*2.8*	*6.7*
Average freight transport distance	km	289	311	566	671	1.4	6.2	1.7	3.9
Freight transport activity on the national territory	Billion tonnes-km per year	18	7	8	9	-16.6	1.4	1.2	1.3
Road	Billion tonnes-km per year	*3*	*3*	*4*	*5*	*-0.9*	*2.7*	*1.8*	*2.2*
Rail	Billion tonnes-km per year	*4*	*4*	*4*	*5*	*0.2*	*0.4*	*0.6*	*0.5*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	1	1	1	1	-0.3	0.0	1.0	0.5
Trips originated in the country	Million trips per year	1,455	1,403	1,505	1,544	-0.7	0.7	0.3	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	14	13	15	16	-1.2	1.9	0.5	1.2
Car	Billion pass-km per year	*10*	*9*	*11*	*12*	*-1.5*	*2.3*	*0.5*	*1.4*
Bus	Billion pass-km per year	*3*	*2*	*3*	*3*	*-0.8*	*0.6*	*0.4*	*0.5*
Rail	Billion pass-km per year	*0*	*0*	*0*	*0*	*0.8*	*1.2*	*0.6*	*0.9*
Air (Intra-EU)	Billion pass-km per year	*0*	*0*	*0*	*0*	*-1.5*	*3.9*	*0.2*	*2.1*
Slow	Billion pass-km per year	*1*	*1*	*1*	*1*	*1.2*	*0.8*	*0.6*	*0.7*
Average passenger transport distance	km	9.3	9.1	10.3	10.5	-0.5	1.2	0.2	0.7
Passenger transport activity on the national territ	Billion pass-km per year	8	11	14	14	6.7	1.9	0.5	1.2
Road	Billion pass-km per year	*12*	*11*	*13*	*14*	*-1.3*	*1.9*	*0.5*	*1.2*
Rail	Billion pass-km per year	*0*	*0*	*0*	*0*	*0.8*	*1.2*	*0.6*	*0.9*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	7	7	9	9	-1.4	2.6	0.8	1.7
Motorization rate	cars/1000 inhabitants	403	465	665	791	2.9	3.6	1.8	2.7
ECONOMY INDICATORS									
GDP	Billion Euros 2005	6	6	8	9	0.2	2.8	1.9	2.3
Employment	1000 Persons	719	617	684	656	-3.0	1.0	-0.4	0.3
Agriculture and fishery	1000 Persons	*48*	*35*	*42*	*46*	*-6.3*	*2.0*	*0.9*	*1.4*
Construction	1000 Persons	*41*	*32*	*38*	*39*	*-4.5*	*1.7*	*0.2*	*1.0*
Energy and water	1000 Persons	*83*	*64*	*58*	*48*	*-5.0*	*-0.9*	*-2.0*	*-1.5*
Industry	1000 Persons	*137*	*90*	*145*	*129*	*-8.1*	*4.9*	*-1.1*	*1.8*
Transport services	1000 Persons	*50*	*48*	*74*	*83*	*-0.6*	*4.4*	*1.2*	*2.8*
Other services	1000 Persons	*360*	*348*	*326*	*310*	*-0.7*	*-0.7*	*-0.5*	*-0.6*
Population total	1000 Persons	1,344	1,312	1,253	1,202	-0.5	-0.5	-0.4	-0.4
Labour force	1000 Persons	*803*	*818*	*784*	*778*	*0.4*	*-0.4*	*-0.1*	*-0.2*
Retired (> 65 years)	1000 Persons	*247*	*249*	*233*	*212*	*0.2*	*-0.6*	*-0.9*	*-0.8*
Transport taxation revenues	Million Euros 2005	405	382	511	587	-1.1	2.9	1.4	2.2
Fuel taxes	Million Euros 2005	*405*	*372*	*425*	*457*	*-1.7*	*1.3*	*0.7*	*1.0*
Emissions certificate	Million Euros 2005	*0*	*11*	*55*	*57*	*0.0*	*17.8*	*0.4*	*8.7*
Road charges	Million Euros 2005	*0*	*0*	*31*	*73*	*0.0*	*0.0*	*8.9*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

iTREN-2030 EE - Estonia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	4	4	4	4	-2.1	1.0	0.3	0.7
Road freight	Million tonnes per year	*1*	*1*	*1*	*1*	*-2.0*	*0.1*	*0.9*	*0.5*
Road passenger	Million tonnes per year	*3*	*2*	*3*	*3*	*-2.2*	*1.2*	*-0.1*	*0.5*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*2.2*	*5.3*	*2.3*	*3.8*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.5*	*0.3*	*-0.4*	*0.0*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.2*	*5.5*	*1.4*	*3.4*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.2*	*2.6*	*-0.6*	*1.0*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.065	0.111	0.069	0.062	11.4	-4.7	-1.0	-2.9
Road	tonnes/1000 tkm	*0.404*	*0.383*	*0.299*	*0.274*	*-1.0*	*-2.5*	*-0.9*	*-1.7*
Rail	tonnes/1000 tkm	*0.020*	*0.022*	*0.036*	*0.042*	*2.0*	*4.9*	*1.7*	*3.3*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.008*	*0.006*	*0.004*	*0.003*	*-4.8*	*-4.7*	*-1.4*	*-3.0*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.327	0.214	0.198	0.187	-8.2	-0.7	-0.6	-0.7
Road	tonnes/1000 pkm	*0.232*	*0.221*	*0.205*	*0.194*	*-1.0*	*-0.7*	*-0.6*	*-0.7*
Rail	tonnes/1000 pkm	*0.020*	*0.019*	*0.017*	*0.016*	*-1.3*	*-0.9*	*-0.9*	*-0.9*
Air	tonnes/1000 pkm	*0.152*	*0.147*	*0.130*	*0.119*	*-0.7*	*-1.2*	*-0.9*	*-1.1*
NOx Transport emissions	1000 Tonnes per year	11	7	7	7	-8.1	-0.3	0.2	-0.1
Road freight	1000 Tonnes per year	*2*	*2*	*1*	*1*	*-5.3*	*-4.1*	*-1.7*	*-2.9*
Road passenger	1000 Tonnes per year	*7*	*4*	*2*	*2*	*-12.8*	*-3.8*	*-2.0*	*-2.9*
Rail freight	1000 Tonnes per year	*1*	*1*	*2*	*3*	*2.2*	*5.3*	*2.3*	*3.8*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-0.7*	*-0.5*	*-1.4*	*-1.0*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-1.5*	*5.2*	*1.1*	*3.1*
Air (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-1.1*	*3.0*	*0.3*	*1.6*
PM10 Transport emissions	1000 Tonnes per year	0	0	0	0	-4.7	-1.1	-0.1	-0.6
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-5.4*	*-1.1*	*0.0*	*-0.5*
Road passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-4.1*	*-1.1*	*-0.2*	*-0.7*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	541	610	833	951	2.4	3.2	1.3	2.2
Gasoline	1000 vehicles	*477*	*531*	*721*	*816*	*2.1*	*3.1*	*1.2*	*2.2*
Diesel	1000 vehicles	*59*	*65*	*74*	*70*	*2.3*	*1.2*	*-0.5*	*0.3*
LPG/CNG	1000 vehicles	*0*	*0*	*3*	*7*	*61.0*	*23.1*	*7.5*	*15.0*
Bioethanol	1000 vehicles	*1*	*2*	*10*	*22*	*22.5*	*19.9*	*7.8*	*13.7*
Hybrid	1000 vehicles	*5*	*11*	*23*	*22*	*19.2*	*7.2*	*-0.5*	*3.3*
Electric	1000 vehicles	*0*	*0*	*2*	*5*	*0.0*	*22.5*	*10.4*	*16.3*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*9*	*0.0*	*0.0*	*53.1*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*134*	*150*	*200*	*219*	*2.4*	*2.9*	*0.9*	*1.9*
Gasoline 1400-2000 cc	1000 vehicles	*277*	*307*	*418*	*477*	*2.1*	*3.1*	*1.3*	*2.2*
Gasoline >2000 cc	1000 vehicles	*67*	*73*	*104*	*120*	*1.9*	*3.6*	*1.5*	*2.5*
Diesel <2000 cc	1000 vehicles	*38*	*43*	*47*	*44*	*2.3*	*0.9*	*-0.7*	*0.1*
Diesel >2000 cc	1000 vehicles	*20*	*22*	*27*	*26*	*2.2*	*1.8*	*-0.2*	*0.8*
PreEURO	*1000 vehicles*	*74*	*12*	*0*	*0*	*-30.2*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*8*	*6*	*0*	*0*	*-7.1*	*-95.8*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*48*	*42*	*0*	*0*	*-2.5*	*-51.9*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*406*	*401*	*52*	*0*	*-0.2*	*-18.4*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*97*	*74*	*0*	*0.0*	*-2.6*	*-77.5*	*-53.2*
EURO V or later	1000 vehicles	*0*	*38*	*668*	*887*	*0.0*	*33.1*	*2.9*	*17.0*
Light duty vehicle fleet size	1000 vehicles	24	18	11	11	-5.3	-4.7	0.0	-2.3
Gasoline and Diesel	1000 vehicles	*24*	*18*	*11*	*11*	*-5.3*	*-4.7*	*-0.3*	*-2.5*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*26.2*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	43	26	35	42	-9.8	3.1	1.9	2.5
3.5-7.5 tonnes	1000 vehicles	*11*	*13*	*17*	*20*	*2.7*	*2.9*	*1.8*	*2.4*
7.5-16 tonnes	1000 vehicles	*3*	*3*	*4*	*5*	*2.7*	*2.9*	*1.8*	*2.4*
16-32 tonnes	1000 vehicles	*7*	*8*	*12*	*14*	*3.4*	*3.4*	*2.0*	*2.7*
>32 tonnes	1000 vehicles	*1*	*2*	*2*	*3*	*3.4*	*3.4*	*2.0*	*2.7*
PreEURO	*1000 vehicles*	*25*	*11*	*5*	*1*	*-15.9*	*-8.1*	*-17.7*	*-13.0*
EURO I	1000 vehicles	*3*	*2*	*1*	*1*	*-12.4*	*-1.6*	*-8.8*	*-5.3*
EURO II	1000 vehicles	*3*	*2*	*1*	*1*	*-12.2*	*-0.7*	*-6.0*	*-3.4*
EURO III	1000 vehicles	*12*	*8*	*8*	*6*	*-8.3*	*0.0*	*-3.0*	*-1.5*
EURO IV	1000 vehicles	*0*	*3*	*4*	*3*	*n.a.*	*0.3*	*-1.7*	*-0.7*
EURO V or later	1000 vehicles	*0*	*1*	*16*	*32*	*n.a.*	*33.6*	*6.8*	*19.4*

iTREN-2030 Integrated scenario
ES - Spain

Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	1,051	1,113	1,383	1,604	1.1	2.2	1.5	1.8
Freight transport activity originated in the country	Billion tonnes-km per year	258	260	356	408	0.2	3.2	1.4	2.3
Road	Billion tonnes-km per year	*159*	*164*	*211*	*242*	*0.7*	*2.5*	*1.4*	*2.0*
Rail	Billion tonnes-km per year	*12*	*13*	*17*	*19*	*1.8*	*2.3*	*1.4*	*1.9*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*87*	*82*	*128*	*147*	*-1.1*	*4.5*	*1.4*	*2.9*
Average freight transport distance	km	245	234	257	254	-1.0	1.0	-0.1	0.4
Freight transport activity on the national territory	Billion tonnes-km per year	165	173	219	251	0.9	2.4	1.4	1.9
Road	Billion tonnes-km per year	*153*	*160*	*203*	*232*	*0.9*	*2.4*	*1.4*	*1.9*
Rail	Billion tonnes-km per year	*12*	*13*	*17*	*19*	*1.7*	*2.3*	*1.3*	*1.8*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	24	26	29	33	1.6	1.0	1.2	1.1
Trips originated in the country	Million trips per year	42,606	43,473	47,365	47,574	0.4	0.9	0.0	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	552	565	652	670	0.5	1.4	0.3	0.9
Car	Billion pass-km per year	*395*	*403*	*478*	*493*	*0.4*	*1.7*	*0.3*	*1.0*
Bus	Billion pass-km per year	*53*	*56*	*52*	*51*	*1.0*	*-0.6*	*-0.2*	*-0.4*
Rail	Billion pass-km per year	*23*	*26*	*29*	*30*	*2.5*	*0.8*	*0.6*	*0.7*
Air (Intra-EU)	Billion pass-km per year	*67*	*66*	*77*	*77*	*-0.3*	*1.5*	*0.1*	*0.8*
Slow	Billion pass-km per year	*13*	*14*	*16*	*17*	*1.2*	*1.3*	*0.8*	*1.1*
Average passenger transport distance	km	13.0	13.0	13.8	14.1	0.1	0.6	0.2	0.4
Passenger transport activity on the national territ	Billion pass-km per year	759	482	555	571	-8.7	1.4	0.3	0.9
Road	Billion pass-km per year	*446*	*456*	*527*	*541*	*0.5*	*1.5*	*0.3*	*0.9*
Rail	Billion pass-km per year	*23*	*26*	*28*	*30*	*2.4*	*0.8*	*0.6*	*0.7*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	229	234	290	311	0.5	2.2	0.7	1.4
Motorization rate	cars/1000 inhabitants	380	392	460	492	0.6	1.6	0.7	1.1
ECONOMY INDICATORS									
GDP	Billion Euros 2005	727	727	874	986	0.0	1.9	1.2	1.5
Employment	1000 Persons	15,322	13,671	15,419	15,161	-2.3	1.2	-0.2	0.5
Agriculture and fishery	1000 Persons	*925*	*753*	*677*	*575*	*-4.0*	*-1.1*	*-1.6*	*-1.3*
Construction	1000 Persons	*1,334*	*1,252*	*1,521*	*1,579*	*-1.3*	*2.0*	*0.4*	*1.2*
Energy and water	1000 Persons	*134*	*168*	*199*	*217*	*4.6*	*1.7*	*0.9*	*1.3*
Industry	1000 Persons	*3,274*	*2,628*	*3,389*	*3,355*	*-4.3*	*2.6*	*-0.1*	*1.2*
Transport services	1000 Persons	*602*	*544*	*579*	*533*	*-2.0*	*0.6*	*-0.8*	*-0.1*
Other services	1000 Persons	*9,051*	*8,326*	*9,055*	*8,902*	*-1.7*	*0.8*	*-0.2*	*0.3*
Population total	1000 Persons	43,014	44,404	45,655	45,500	0.6	0.3	0.0	0.1
Labour force	1000 Persons	*28,880*	*29,737*	*29,814*	*28,514*	*0.6*	*0.0*	*-0.4*	*-0.2*
Retired (> 65 years)	1000 Persons	*6,946*	*7,093*	*7,863*	*10,288*	*0.4*	*1.0*	*2.7*	*1.9*
Transport taxation revenues	Million Euros 2005	18,734	18,519	22,241	24,021	-0.2	1.8	0.8	1.3
Fuel taxes	Million Euros 2005	*10,783*	*10,138*	*11,124*	*11,580*	*-1.2*	*0.9*	*0.4*	*0.7*
Emissions certificate	Million Euros 2005	*0*	*297*	*1,456*	*1,394*	*0.0*	*17.2*	*-0.4*	*8.0*
Road charges	Million Euros 2005	*7,951*	*8,083*	*9,661*	*11,047*	*0.3*	*1.8*	*1.3*	*1.6*
ENERGY INDICATORS									
Primary energy production	Million toe per year	33	43	53	59	5.9	2.0	1.0	1.5
Share of domestic energy production	%	22	31	36	38	7.1	1.4	0.6	1.0
Final energy demand by source	Million toe per year	147	139	147	153	-1.2	0.6	0.4	0.5
Oil	Million toe per year	*72*	*61*	*57*	*54*	*-3.4*	*-0.7*	*-0.4*	*-0.5*
Gas	Million toe per year	*30*	*25*	*32*	*34*	*-3.6*	*2.5*	*0.8*	*1.7*
Coal, Nuclear	Million toe per year	*36*	*34*	*27*	*25*	*-1.6*	*-2.1*	*-0.8*	*-1.5*
Biomass	Million toe per year	*6*	*10*	*19*	*24*	*13.0*	*6.6*	*2.3*	*4.4*
Other Renewables	Million toe per year	*4*	*10*	*13*	*16*	*20.3*	*2.4*	*2.3*	*2.3*
Final energy demand by consuming sector	Million toe per year	97	93	96	99	-0.9	0.4	0.3	0.3
Transport freight	Million toe per year	*18*	*17*	*16*	*15*	*-1.2*	*-0.4*	*-0.8*	*-0.6*
Transport passenger	Million toe per year	*22*	*22*	*21*	*21*	*-0.3*	*-0.3*	*0.0*	*-0.1*
Industry	Million toe per year	*30*	*29*	*31*	*32*	*-1.0*	*0.7*	*0.6*	*0.6*
Residential and services	Million toe per year	*27*	*25*	*28*	*30*	*-1.1*	*1.1*	*0.7*	*0.9*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.82	1.12	1.10	1.22	6.3	-0.2	1.1	0.5
Gasoline price	Euros2005 per litre	0.87	1.17	1.15	1.28	5.9	-0.1	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	1	3	8	13	31.5	10.5	5.6	8.0
Share of renewables in electricity	%	17	43	49	50	20.8	1.3	0.3	0.8
Share of renewables in final energy demand	%	8	16	21	26	15.7	2.8	2.0	2.4
Energy intensity of freight transport activity	toe/Million tkm	71	66	47	38	-1.4	-3.4	-2.1	-2.8
Energy intensity of passenger transport activity	toe/Million pkm	27	40	34	33	8.2	-1.7	-0.3	-1.0
Energy intensity of economic activity	toe/Million Euros 2005	134	128	110	101	-0.9	-1.4	-0.9	-1.2

iTREN-2030 ES - Spain	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	110	107	112	108	-0.5	0.4	-0.4	0.0
Road freight	Million tonnes per year	*30*	*31*	*31*	*31*	*0.4*	*0.1*	*0.1*	*0.1*
Road passenger	Million tonnes per year	*67*	*65*	*68*	*65*	*-0.7*	*0.5*	*-0.5*	*0.0*
Rail freight	Million tonnes per year	*0*	*0*	*1*	*1*	*-2.1*	*2.3*	*1.6*	*2.0*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*1.3*	*-0.2*	*-0.5*	*-0.4*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-0.3*	*2.8*	*0.3*	*1.5*
Air (Intra-EU)	Million tonnes per year	*11*	*10*	*11*	*10*	*-1.3*	*0.5*	*-0.9*	*-0.2*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.124	0.125	0.094	0.083	0.1	-2.8	-1.2	-2.0
Road	tonnes/1000 tkm	*0.198*	*0.193*	*0.154*	*0.135*	*-0.5*	*-2.2*	*-1.3*	*-1.8*
Rail	tonnes/1000 tkm	*0.040*	*0.033*	*0.033*	*0.034*	*-3.8*	*0.0*	*0.4*	*0.2*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.006*	*0.007*	*0.006*	*0.005*	*0.7*	*-1.7*	*-1.1*	*-1.4*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.095	0.138	0.126	0.116	7.7	-0.9	-0.8	-0.9
Road	tonnes/1000 pkm	*0.151*	*0.143*	*0.130*	*0.120*	*-1.2*	*-0.9*	*-0.8*	*-0.9*
Rail	tonnes/1000 pkm	*0.014*	*0.013*	*0.012*	*0.011*	*-1.1*	*-1.0*	*-1.1*	*-1.0*
Air	tonnes/1000 pkm	*0.164*	*0.156*	*0.141*	*0.127*	*-1.0*	*-1.1*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	405	308	252	223	-5.4	-2.0	-1.2	-1.6
Road freight	1000 Tonnes per year	*74*	*55*	*32*	*24*	*-5.7*	*-5.2*	*-3.1*	*-4.2*
Road passenger	1000 Tonnes per year	*191*	*116*	*67*	*49*	*-9.4*	*-5.3*	*-3.1*	*-4.2*
Rail freight	1000 Tonnes per year	*3*	*2*	*2*	*2*	*-5.6*	*-2.1*	*-1.0*	*-1.6*
Rail passenger	1000 Tonnes per year	*3*	*3*	*2*	*2*	*0.9*	*-1.0*	*-1.5*	*-1.3*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*12*	*12*	*15*	*15*	*-0.7*	*2.4*	*-0.1*	*1.2*
Air (Intra-EU)	1000 Tonnes per year	*123*	*119*	*134*	*132*	*-0.6*	*1.1*	*-0.1*	*0.5*
PM10 Transport emissions	1000 Tonnes per year	35	28	21	19	-4.2	-2.8	-1.3	-2.1
Road freight	1000 Tonnes per year	*11*	*8*	*6*	*5*	*-5.7*	*-3.4*	*-0.6*	*-2.0*
Road passenger	1000 Tonnes per year	*24*	*20*	*16*	*13*	*-3.5*	*-2.5*	*-1.6*	*-2.1*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	16,527	17,412	21,011	22,407	1.0	1.9	0.6	1.3
Gasoline	1000 vehicles	*9,812*	*8,351*	*7,808*	*8,729*	*-3.2*	*-0.7*	*1.1*	*0.2*
Diesel	1000 vehicles	*6,595*	*8,934*	*12,676*	*13,027*	*6.3*	*3.6*	*0.3*	*1.9*
LPG/CNG	1000 vehicles	*103*	*84*	*347*	*428*	*-4.1*	*15.3*	*2.1*	*8.5*
Bioethanol	1000 vehicles	*0*	*2*	*65*	*142*	*0.0*	*42.3*	*8.1*	*24.0*
Hybrid	1000 vehicles	*16*	*42*	*115*	*61*	*21.1*	*10.7*	*-6.1*	*2.0*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*21*	*0.0*	*0.0*	*104.8*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*5,728*	*4,415*	*3,353*	*3,461*	*-5.1*	*-2.7*	*0.3*	*-1.2*
Gasoline 1400-2000 cc	1000 vehicles	*3,693*	*3,577*	*4,088*	*4,865*	*-0.6*	*1.3*	*1.8*	*1.5*
Gasoline >2000 cc	1000 vehicles	*390*	*358*	*366*	*403*	*-1.7*	*0.2*	*1.0*	*0.6*
Diesel <2000 cc	1000 vehicles	*5,578*	*7,978*	*11,710*	*12,078*	*7.4*	*3.9*	*0.3*	*2.1*
Diesel >2000 cc	1000 vehicles	*1,017*	*956*	*965*	*949*	*-1.2*	*0.1*	*-0.2*	*0.0*
PreEURO	*1000 vehicles*	*4,643*	*1,972*	*74*	*0*	*-15.7*	*-28.0*	*-50.5*	*-40.3*
EURO I	1000 vehicles	*3,296*	*2,293*	*318*	*2*	*-7.0*	*-17.9*	*-40.0*	*-29.8*
EURO II	1000 vehicles	*3,597*	*3,057*	*951*	*28*	*-3.2*	*-11.0*	*-29.8*	*-20.9*
EURO III	1000 vehicles	*4,975*	*4,668*	*2,570*	*277*	*-1.3*	*-5.8*	*-20.0*	*-13.2*
EURO IV	1000 vehicles	*0*	*3,319*	*2,520*	*622*	*0.0*	*-2.7*	*-13.1*	*-8.0*
EURO V or later	1000 vehicles	*0*	*1,975*	*14,050*	*20,826*	*0.0*	*21.7*	*4.0*	*12.5*
Light duty vehicle fleet size	1000 vehicles	3,141	3,390	3,786	4,220	1.5	1.1	1.1	1.1
Gasoline and Diesel	1000 vehicles	*3,141*	*3,390*	*3,748*	*3,979*	*1.5*	*1.0*	*0.6*	*0.8*
Electric	1000 vehicles	*0*	*0*	*39*	*241*	*n.a.*	*n.a.*	*20.1*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	1,187	616	760	839	-12.3	2.1	1.0	1.6
3.5-7.5 tonnes	1000 vehicles	*265*	*296*	*364*	*403*	*2.2*	*2.1*	*1.0*	*1.6*
7.5-16 tonnes	1000 vehicles	*69*	*77*	*95*	*106*	*2.2*	*2.1*	*1.0*	*1.6*
16-32 tonnes	1000 vehicles	*179*	*198*	*242*	*265*	*2.0*	*2.0*	*0.9*	*1.5*
>32 tonnes	1000 vehicles	*39*	*45*	*59*	*65*	*2.7*	*2.7*	*0.9*	*1.8*
PreEURO	*1000 vehicles*	*558*	*162*	*15*	*0*	*-21.9*	*-21.0*	*-55.7*	*-40.8*
EURO I	1000 vehicles	*131*	*57*	*20*	*0*	*-15.2*	*-9.9*	*-43.9*	*-28.9*
EURO II	1000 vehicles	*253*	*117*	*77*	*4*	*-14.2*	*-4.2*	*-25.6*	*-15.6*
EURO III	1000 vehicles	*245*	*148*	*135*	*37*	*-9.6*	*-0.9*	*-12.1*	*-6.6*
EURO IV	1000 vehicles	*0*	*95*	*97*	*54*	*n.a.*	*0.1*	*-5.6*	*-2.8*
EURO V or later	1000 vehicles	*0*	*36*	*416*	*743*	*n.a.*	*27.7*	*6.0*	*16.3*

iTREN-2030 FI - Finland	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	503	516	516	582	0.5	0.0	1.2	0.6
Freight transport activity originated in the country	Billion tonnes-km per year	127	121	169	192	-0.9	3.4	1.2	2.3
Road	Billion tonnes-km per year	*40*	*41*	*44*	*50*	*0.4*	*0.7*	*1.2*	*1.0*
Rail	Billion tonnes-km per year	*8*	*9*	*8*	*9*	*1.8*	*-0.7*	*0.6*	*-0.1*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*79*	*72*	*117*	*133*	*-1.9*	*5.0*	*1.3*	*3.1*
Average freight transport distance	km	253	236	328	329	-1.4	3.4	0.0	1.7
Freight transport activity on the national territory	Billion tonnes-km per year	45	47	49	55	0.9	0.3	1.2	0.8
Road	Billion tonnes-km per year	*36*	*37*	*38*	*44*	*0.7*	*0.2*	*1.3*	*0.8*
Rail	Billion tonnes-km per year	*9*	*10*	*11*	*11*	*1.4*	*0.5*	*0.9*	*0.7*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	9	10	8	9	1.5	-1.1	0.9	-0.1
Trips originated in the country	Million trips per year	6,386	6,203	6,542	6,650	-0.6	0.5	0.2	0.3
Passenger transport activity originated in the cou	Billion pass-km per year	80	78	86	87	-0.7	1.0	0.1	0.6
Car	Billion pass-km per year	*57*	*53*	*61*	*63*	*-1.2*	*1.4*	*0.3*	*0.8*
Bus	Billion pass-km per year	*9*	*10*	*9*	*9*	*1.0*	*-0.5*	*-0.4*	*-0.5*
Rail	Billion pass-km per year	*4*	*4*	*5*	*5*	*1.7*	*0.1*	*0.2*	*0.2*
Air (Intra-EU)	Billion pass-km per year	*8*	*8*	*8*	*7*	*-1.7*	*0.8*	*-1.4*	*-0.3*
Slow	Billion pass-km per year	*2*	*2*	*3*	*3*	*0.9*	*1.0*	*1.0*	*1.0*
Average passenger transport distance	km	12.6	12.5	13.1	13.0	-0.1	0.5	-0.1	0.2
Passenger transport activity on the national territ	Billion pass-km per year	71	69	76	78	-0.7	1.1	0.2	0.6
Road	Billion pass-km per year	*67*	*64*	*72*	*73*	*-0.9*	*1.1*	*0.2*	*0.7*
Rail	Billion pass-km per year	*4*	*4*	*4*	*5*	*1.7*	*0.1*	*0.2*	*0.2*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	35	33	39	41	-1.1	1.7	0.6	1.1
Motorization rate	cars/1000 inhabitants	470	484	576	631	0.6	1.7	0.9	1.3
ECONOMY INDICATORS									
GDP	Billion Euros 2005	182	180	219	252	-0.2	2.0	1.4	1.7
Employment	1000 Persons	2,599	2,282	2,224	2,101	-2.6	-0.3	-0.6	-0.4
Agriculture and fishery	1000 Persons	*265*	*237*	*227*	*201*	*-2.2*	*-0.4*	*-1.2*	*-0.8*
Construction	1000 Persons	*134*	*96*	*93*	*94*	*-6.3*	*-0.4*	*0.1*	*-0.1*
Energy and water	1000 Persons	*36*	*37*	*36*	*34*	*0.5*	*-0.2*	*-0.5*	*-0.4*
Industry	1000 Persons	*470*	*386*	*489*	*504*	*-3.9*	*2.4*	*0.3*	*1.3*
Transport services	1000 Persons	*135*	*128*	*125*	*121*	*-1.0*	*-0.3*	*-0.3*	*-0.3*
Other services	1000 Persons	*1,559*	*1,397*	*1,254*	*1,147*	*-2.2*	*-1.1*	*-0.9*	*-1.0*
Population total	1000 Persons	5,230	5,277	5,390	5,433	0.2	0.2	0.1	0.1
Labour force	1000 Persons	*3,343*	*3,382*	*3,304*	*3,251*	*0.2*	*-0.2*	*-0.2*	*-0.2*
Retired (> 65 years)	1000 Persons	*707*	*730*	*947*	*1,015*	*0.6*	*2.6*	*0.7*	*1.7*
Transport taxation revenues	Million Euros 2005	1,950	1,818	2,052	2,120	-1.4	1.2	0.3	0.8
Fuel taxes	Million Euros 2005	*1,950*	*1,783*	*1,763*	*1,784*	*-1.8*	*-0.1*	*0.1*	*0.0*
Emissions certificate	Million Euros 2005	*0*	*34*	*151*	*139*	*0.0*	*16.0*	*-0.9*	*7.2*
Road charges	Million Euros 2005	*0*	*0*	*138*	*196*	*0.0*	*0.0*	*3.6*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	16	19	19	18	4.3	0.0	-0.8	-0.4
Share of domestic energy production	%	46	52	56	54	2.3	0.8	-0.4	0.2
Final energy demand by source	Million toe per year	34	37	35	33	2.0	-0.8	-0.4	-0.6
Oil	Million toe per year	*11*	*8*	*7*	*7*	*-5.3*	*-1.2*	*-1.0*	*-1.1*
Gas	Million toe per year	*4*	*3*	*5*	*7*	*-1.0*	*4.1*	*2.5*	*3.3*
Coal, Nuclear	Million toe per year	*11*	*17*	*11*	*8*	*9.1*	*-4.6*	*-2.8*	*-3.7*
Biomass	Million toe per year	*7*	*7*	*10*	*10*	*1.1*	*2.6*	*0.3*	*1.4*
Other Renewables	Million toe per year	*1*	*1*	*2*	*2*	*-3.7*	*5.9*	*1.4*	*3.6*
Final energy demand by consuming sector	Million toe per year	25	25	27	27	0.5	0.4	0.0	0.2
Transport freight	Million toe per year	*2*	*2*	*2*	*2*	*-0.6*	*0.8*	*-0.5*	*0.2*
Transport passenger	Million toe per year	*3*	*3*	*3*	*2*	*-1.9*	*-0.9*	*-0.7*	*-0.8*
Industry	Million toe per year	*13*	*14*	*15*	*14*	*1.9*	*0.6*	*-0.1*	*0.3*
Residential and services	Million toe per year	*7*	*7*	*7*	*8*	*-0.7*	*0.6*	*0.5*	*0.6*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.84	1.20	1.16	1.31	7.5	-0.3	1.2	0.4
Gasoline price	Euros2005 per litre	1.07	1.43	1.41	1.56	6.0	-0.2	1.1	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	1	5	12	16	28.3	8.6	3.4	5.9
Share of renewables in electricity	%	27	19	31	33	-7.3	5.1	0.6	2.9
Share of renewables in final energy demand	%	32	28	38	42	-2.6	3.1	1.0	2.0
Energy intensity of freight transport activity	toe/Million tkm	14	14	11	9	0.2	-2.4	-1.8	-2.1
Energy intensity of passenger transport activity	toe/Million pkm	39	37	31	28	-1.1	-1.9	-0.8	-1.3
Energy intensity of economic activity	toe/Million Euros 2005	136	141	121	105	0.7	-1.5	-1.4	-1.4

iTREN-2030 FI - Finland	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	16	15	14	13	-0.6	-0.9	-0.5	-0.7
Road freight	Million tonnes per year	*7*	*7*	*6*	*6*	*1.7*	*-1.8*	*-0.2*	*-1.0*
Road passenger	Million tonnes per year	*7*	*6*	*6*	*6*	*-2.5*	*-0.2*	*-0.7*	*-0.4*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.4*	*1.7*	*1.0*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*0.9*	*-0.7*	*-0.8*	*-0.7*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*0.8*	*1.4*	*0.4*	*0.9*
Air (Intra-EU)	Million tonnes per year	*2*	*1*	*1*	*1*	*-2.7*	*-0.2*	*-2.0*	*-1.1*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.056	0.063	0.039	0.034	2.5	-4.8	-1.4	-3.1
Road	tonnes/1000 tkm	*0.182*	*0.191*	*0.156*	*0.133*	*1.0*	*-2.0*	*-1.6*	*-1.8*
Rail	tonnes/1000 tkm	*0.028*	*0.026*	*0.026*	*0.028*	*-1.4*	*-0.1*	*0.8*	*0.4*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.002*	*0.002*	*0.001*	*0.001*	*2.7*	*-3.5*	*-0.8*	*-2.2*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.112	0.103	0.091	0.083	-1.7	-1.2	-1.0	-1.1
Road	tonnes/1000 pkm	*0.108*	*0.099*	*0.087*	*0.080*	*-1.7*	*-1.3*	*-0.9*	*-1.1*
Rail	tonnes/1000 pkm	*0.017*	*0.016*	*0.015*	*0.013*	*-0.8*	*-0.9*	*-0.9*	*-0.9*
Air	tonnes/1000 pkm	*0.194*	*0.184*	*0.166*	*0.156*	*-1.0*	*-1.0*	*-0.6*	*-0.8*
NOx Transport emissions	1000 Tonnes per year	78	49	35	30	-8.9	-3.2	-1.5	-2.3
Road freight	1000 Tonnes per year	*20*	*12*	*6*	*4*	*-10.1*	*-7.3*	*-3.7*	*-5.5*
Road passenger	1000 Tonnes per year	*35*	*15*	*7*	*6*	*-15.0*	*-7.1*	*-2.9*	*-5.0*
Rail freight	1000 Tonnes per year	*3*	*3*	*3*	*3*	*1.1*	*-1.1*	*1.0*	*0.0*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*0*	*0.3*	*-1.6*	*-1.8*	*-1.7*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*3*	*3*	*4*	*4*	*0.2*	*1.0*	*0.1*	*0.5*
Air (Intra-EU)	1000 Tonnes per year	*16*	*14*	*15*	*14*	*-1.8*	*0.7*	*-1.0*	*-0.2*
PM10 Transport emissions	1000 Tonnes per year	5	4	2	2	-5.5	-4.2	-1.3	-2.7
Road freight	1000 Tonnes per year	*1*	*1*	*0*	*0*	*-6.4*	*-7.3*	*-1.9*	*-4.7*
Road passenger	1000 Tonnes per year	*3*	*3*	*2*	*2*	*-5.1*	*-3.1*	*-1.1*	*-2.1*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	2,458	2,555	3,104	3,430	0.8	2.0	1.0	1.5
Gasoline	1000 vehicles	*2,141*	*2,151*	*2,557*	*2,857*	*0.1*	*1.7*	*1.1*	*1.4*
Diesel	1000 vehicles	*304*	*363*	*405*	*358*	*3.6*	*1.1*	*-1.2*	*-0.1*
LPG/CNG	1000 vehicles	*0*	*10*	*74*	*111*	*0.0*	*22.5*	*4.2*	*13.0*
Bioethanol	1000 vehicles	*0*	*1*	*10*	*20*	*120.1*	*29.0*	*7.3*	*17.7*
Hybrid	1000 vehicles	*12*	*30*	*48*	*27*	*20.1*	*4.7*	*-5.4*	*-0.5*
Electric	1000 vehicles	*0*	*0*	*10*	*38*	*0.0*	*82.2*	*14.7*	*44.6*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*19*	*0.0*	*0.0*	*97.6*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*879*	*687*	*597*	*601*	*-4.8*	*-1.4*	*0.1*	*-0.7*
Gasoline 1400-2000 cc	1000 vehicles	*1,117*	*1,298*	*1,718*	*1,947*	*3.0*	*2.8*	*1.3*	*2.0*
Gasoline >2000 cc	1000 vehicles	*10,349*	*166*	*242*	*308*	*-56.2*	*3.8*	*2.4*	*3.1*
Diesel <2000 cc	1000 vehicles	*45,473*	*273*	*311*	*269*	*-64.1*	*1.3*	*-1.4*	*-0.1*
Diesel >2000 cc	1000 vehicles	*12,115*	*90*	*95*	*89*	*-62.5*	*0.5*	*-0.6*	*-0.1*
PreEURO	*1000 vehicles*	*207*	*12*	*0*	*0*	*-43.0*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*914*	*535*	*0*	*0*	*-10.2*	*-70.4*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*602*	*573*	*24*	*0*	*-1.0*	*-27.0*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*723*	*703*	*375*	*0*	*-0.5*	*-6.1*	*-81.4*	*-58.2*
EURO IV	1000 vehicles	*0*	*419*	*372*	*1*	*0.0*	*-1.2*	*-43.4*	*-25.2*
EURO V or later	1000 vehicles	*0*	*271*	*2,192*	*3,213*	*0.0*	*23.2*	*3.9*	*13.2*
Light duty vehicle fleet size	1000 vehicles	854	841	772	846	-0.3	-0.9	0.9	0.0
Gasoline and Diesel	1000 vehicles	*854*	*841*	*765*	*799*	*-0.3*	*-0.9*	*0.4*	*-0.3*
Electric	1000 vehicles	*0*	*0*	*7*	*47*	*n.a.*	*n.a.*	*21.5*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	117	66	63	64	-10.9	-0.5	0.2	-0.1
3.5-7.5 tonnes	1000 vehicles	*31*	*33*	*31*	*32*	*1.3*	*-0.5*	*0.2*	*-0.1*
7.5-16 tonnes	1000 vehicles	*8*	*9*	*8*	*8*	*1.2*	*-0.5*	*0.2*	*-0.1*
16-32 tonnes	1000 vehicles	*20*	*21*	*19*	*20*	*0.9*	*-0.6*	*0.3*	*-0.2*
>32 tonnes	1000 vehicles	*4*	*4*	*4*	*4*	*1.3*	*-0.4*	*0.3*	*-0.1*
PreEURO	*1000 vehicles*	*58*	*18*	*1*	*0*	*-20.6*	*-25.2*	*-67.3*	*-50.5*
EURO I	1000 vehicles	*16*	*8*	*2*	*0*	*-12.7*	*-12.8*	*-56.1*	*-38.1*
EURO II	1000 vehicles	*21*	*11*	*7*	*0*	*-11.3*	*-4.9*	*-32.4*	*-19.8*
EURO III	1000 vehicles	*22*	*16*	*15*	*3*	*-6.7*	*-0.5*	*-15.2*	*-8.2*
EURO IV	1000 vehicles	*0*	*10*	*10*	*5*	*n.a.*	*0.7*	*-6.8*	*-3.1*
EURO V or later	1000 vehicles	*0*	*3*	*27*	*56*	*n.a.*	*25.8*	*7.4*	*16.2*

iTREN-2030 FR - France	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	2,336	2,397	2,788	2,947	0.5	1.5	0.6	1.0
Freight transport activity originated in the country	Billion tonnes-km per year	403	392	456	451	-0.5	1.5	-0.1	0.7
Road	Billion tonnes-km per year	*257*	*264*	*302*	*305*	*0.6*	*1.3*	*0.1*	*0.7*
Rail	Billion tonnes-km per year	*50*	*49*	*52*	*49*	*-0.4*	*0.6*	*-0.7*	*0.0*
Inland navigation	Billion tonnes-km per year	*10*	*10*	*12*	*12*	*-0.6*	*2.1*	*0.2*	*1.2*
Maritime (Intra-EU)	Billion tonnes-km per year	*86*	*69*	*90*	*86*	*-4.2*	*2.6*	*-0.5*	*1.1*
Average freight transport distance	km	172	164	163	153	-1.0	0.0	-0.6	-0.3
Freight transport activity on the national territory	Billion tonnes-km per year	298	344	418	435	2.9	2.0	0.4	1.2
Road	Billion tonnes-km per year	*286*	*290*	*356*	*374*	*0.3*	*2.1*	*0.5*	*1.3*
Rail	Billion tonnes-km per year	*45*	*44*	*50*	*50*	*-0.1*	*1.3*	*-0.2*	*0.6*
Inland navigation	Billion tonnes-km per year	*9*	*9*	*11*	*11*	*-0.6*	*2.1*	*0.2*	*1.2*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	49	51	55	57	1.0	0.7	0.4	0.5
Trips originated in the country	Million trips per year	58,827	57,674	63,067	65,893	-0.4	0.9	0.4	0.7
Passenger transport activity originated in the cou	Billion pass-km per year	984	956	1,105	1,171	-0.6	1.5	0.6	1.0
Car	Billion pass-km per year	*775*	*725*	*854*	*901*	*-1.3*	*1.7*	*0.5*	*1.1*
Bus	Billion pass-km per year	*59*	*65*	*61*	*63*	*1.9*	*-0.6*	*0.3*	*-0.2*
Rail	Billion pass-km per year	*78*	*96*	*100*	*111*	*4.3*	*0.5*	*1.0*	*0.7*
Air (Intra-EU)	Billion pass-km per year	*42*	*39*	*50*	*52*	*-1.5*	*2.7*	*0.4*	*1.5*
Slow	Billion pass-km per year	*31*	*33*	*39*	*44*	*1.0*	*1.6*	*1.4*	*1.5*
Average passenger transport distance	km	16.7	16.6	17.5	17.8	-0.2	0.5	0.1	0.3
Passenger transport activity on the national territ	Billion pass-km per year	900	875	1,002	1,059	-0.6	1.4	0.6	1.0
Road	Billion pass-km per year	*821*	*778*	*900*	*948*	*-1.1*	*1.5*	*0.5*	*1.0*
Rail	Billion pass-km per year	*79*	*97*	*102*	*112*	*4.1*	*0.5*	*0.9*	*0.7*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	413	391	471	510	-1.1	1.9	0.8	1.3
Motorization rate	cars/1000 inhabitants	452	468	523	556	0.7	1.1	0.6	0.9
ECONOMY INDICATORS									
GDP	Billion Euros 2005	1,790	1,893	2,072	2,160	1.1	0.9	0.4	0.7
Employment	1000 Persons	25,778	23,704	21,491	19,251	-1.7	-1.0	-1.1	-1.0
Agriculture and fishery	1000 Persons	*723*	*622*	*609*	*543*	*-3.0*	*-0.2*	*-1.1*	*-0.7*
Construction	1000 Persons	*1,918*	*1,985*	*1,663*	*1,156*	*0.7*	*-1.8*	*-3.6*	*-2.7*
Energy and water	1000 Persons	*339*	*353*	*351*	*352*	*0.9*	*-0.1*	*0.0*	*0.0*
Industry	1000 Persons	*4,342*	*3,470*	*3,614*	*3,487*	*-4.4*	*0.4*	*-0.4*	*0.0*
Transport services	1000 Persons	*708*	*676*	*631*	*561*	*-0.9*	*-0.7*	*-1.2*	*-0.9*
Other services	1000 Persons	*17,748*	*16,597*	*14,624*	*13,152*	*-1.3*	*-1.3*	*-1.1*	*-1.2*
Population total	1000 Persons	60,440	61,521	63,439	64,980	0.4	0.3	0.2	0.3
Labour force	1000 Persons	*37,119*	*37,996*	*37,674*	*37,650*	*0.5*	*-0.1*	*0.0*	*0.0*
Retired (> 65 years)	1000 Persons	*9,631*	*9,694*	*11,841*	*13,642*	*0.1*	*2.0*	*1.4*	*1.7*
Transport taxation revenues	Million Euros 2005	41,471	38,087	42,186	45,147	-1.7	1.0	0.7	0.9
Fuel taxes	Million Euros 2005	*22,324*	*19,906*	*21,657*	*21,983*	*-2.3*	*0.8*	*0.1*	*0.5*
Emissions certificate	Million Euros 2005	*0*	*383*	*1,870*	*1,766*	*0.0*	*17.2*	*-0.6*	*7.9*
Road charges	Million Euros 2005	*19,148*	*17,798*	*18,658*	*21,398*	*-1.5*	*0.5*	*1.4*	*0.9*
ENERGY INDICATORS									
Primary energy production	Million toe per year	140	145	162	155	0.7	1.1	-0.4	0.3
Share of domestic energy production	%	50	54	63	64	1.4	1.6	0.2	0.9
Final energy demand by source	Million toe per year	281	271	258	242	-0.7	-0.5	-0.6	-0.6
Oil	Million toe per year	*91*	*81*	*67*	*59*	*-2.4*	*-1.8*	*-1.3*	*-1.6*
Gas	Million toe per year	*41*	*33*	*30*	*29*	*-4.5*	*-1.0*	*0.0*	*-0.5*
Coal, Nuclear	Million toe per year	*132*	*134*	*118*	*97*	*0.2*	*-1.3*	*-1.9*	*-1.6*
Biomass	Million toe per year	*12*	*15*	*29*	*37*	*4.2*	*6.8*	*2.5*	*4.6*
Other Renewables	Million toe per year	*5*	*9*	*15*	*20*	*12.0*	*5.0*	*3.3*	*4.1*
Final energy demand by consuming sector	Million toe per year	159	150	141	135	-1.2	-0.6	-0.5	-0.5
Transport freight	Million toe per year	*18*	*17*	*16*	*14*	*-0.8*	*-1.0*	*-1.3*	*-1.1*
Transport passenger	Million toe per year	*34*	*32*	*29*	*27*	*-1.4*	*-1.0*	*-0.8*	*-0.9*
Industry	Million toe per year	*38*	*36*	*34*	*34*	*-1.1*	*-0.5*	*0.1*	*-0.2*
Residential and services	Million toe per year	*69*	*65*	*62*	*60*	*-1.2*	*-0.4*	*-0.4*	*-0.4*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.91	1.23	1.21	1.35	6.2	-0.1	1.1	0.5
Gasoline price	Euros2005 per litre	1.06	1.39	1.38	1.53	5.5	-0.1	1.0	0.5
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	1	4	13	23	35.7	11.2	5.9	8.5
Share of renewables in electricity	%	12	20	35	48	10.0	5.7	3.1	4.4
Share of renewables in final energy demand	%	9	13	21	29	7.1	5.0	3.2	4.0
Energy intensity of freight transport activity	toe/Million tkm	46	42	31	26	-2.2	-3.0	-1.6	-2.3
Energy intensity of passenger transport activity	toe/Million pkm	36	35	28	24	-0.8	-2.4	-1.4	-1.9
Energy intensity of economic activity	toe/Million Euros 2005	89	79	68	62	-2.3	-1.5	-0.9	-1.2

iTREN-2030 FR - France	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	145	134	136	128	-1.6	0.2	-0.6	-0.2
Road freight	Million tonnes per year	*42*	*42*	*39*	*37*	*0.0*	*-0.5*	*-0.8*	*-0.6*
Road passenger	Million tonnes per year	*94*	*83*	*86*	*81*	*-2.3*	*0.3*	*-0.6*	*-0.1*
Rail freight	Million tonnes per year	*1*	*1*	*1*	*1*	*0.1*	*3.2*	*0.5*	*1.8*
Rail passenger	Million tonnes per year	*0*	*1*	*0*	*1*	*3.5*	*-0.2*	*0.2*	*0.0*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.0*	*1.9*	*0.1*	*1.0*
Maritime (Intra-EU)	Million tonnes per year	*1*	*1*	*2*	*2*	*-2.2*	*2.8*	*-0.2*	*1.3*
Air (Intra-EU)	Million tonnes per year	*7*	*6*	*8*	*7*	*-2.2*	*1.8*	*-0.5*	*0.6*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.114	0.106	0.083	0.076	-1.5	-2.4	-1.0	-1.7
Road	tonnes/1000 tkm	*0.145*	*0.143*	*0.111*	*0.098*	*-0.3*	*-2.5*	*-1.2*	*-1.9*
Rail	tonnes/1000 tkm	*0.012*	*0.012*	*0.015*	*0.016*	*0.2*	*1.8*	*0.7*	*1.2*
Inland navigation	tonnes/1000 tkm	*0.040*	*0.039*	*0.038*	*0.038*	*-0.5*	*-0.3*	*-0.1*	*-0.2*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.016*	*0.018*	*0.018*	*0.019*	*2.2*	*0.2*	*0.3*	*0.2*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.108	0.099	0.089	0.080	-1.7	-1.0	-1.1	-1.1
Road	tonnes/1000 pkm	*0.114*	*0.107*	*0.095*	*0.086*	*-1.3*	*-1.1*	*-1.1*	*-1.1*
Rail	tonnes/1000 pkm	*0.005*	*0.005*	*0.005*	*0.005*	*-0.6*	*-0.7*	*-0.7*	*-0.7*
Air	tonnes/1000 pkm	*0.173*	*0.167*	*0.152*	*0.140*	*-0.7*	*-0.9*	*-0.9*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	604	388	311	270	-8.5	-2.2	-1.4	-1.8
Road freight	1000 Tonnes per year	*161*	*104*	*60*	*37*	*-8.5*	*-5.4*	*-4.6*	*-5.0*
Road passenger	1000 Tonnes per year	*306*	*157*	*93*	*71*	*-12.5*	*-5.2*	*-2.6*	*-3.9*
Rail freight	1000 Tonnes per year	*5*	*4*	*4*	*4*	*-2.7*	*-0.1*	*0.3*	*0.1*
Rail passenger	1000 Tonnes per year	*6*	*7*	*7*	*6*	*2.9*	*-1.0*	*-0.9*	*-0.9*
Inland navigation	1000 Tonnes per year	*6*	*6*	*7*	*7*	*-1.0*	*1.9*	*0.1*	*1.0*
Maritime (Intra-EU)	1000 Tonnes per year	*30*	*26*	*33*	*31*	*-2.6*	*2.5*	*-0.5*	*1.0*
Air (Intra-EU)	1000 Tonnes per year	*90*	*84*	*108*	*112*	*-1.4*	*2.6*	*0.4*	*1.5*
PM10 Transport emissions	1000 Tonnes per year	48	37	24	22	-5.4	-4.0	-1.0	-2.5
Road freight	1000 Tonnes per year	*10*	*7*	*4*	*4*	*-7.2*	*-4.2*	*-1.2*	*-2.7*
Road passenger	1000 Tonnes per year	*38*	*30*	*20*	*18*	*-5.0*	*-3.9*	*-1.0*	*-2.5*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	28,297	28,789	33,209	36,153	0.3	1.4	0.9	1.1
Gasoline	1000 vehicles	*14,967*	*11,520*	*11,885*	*14,172*	*-5.1*	*0.3*	*1.8*	*1.0*
Diesel	1000 vehicles	*13,249*	*16,950*	*19,897*	*19,349*	*5.1*	*1.6*	*-0.3*	*0.7*
LPG/CNG	1000 vehicles	*0*	*41*	*278*	*312*	*0.0*	*21.1*	*1.2*	*10.7*
Bioethanol	1000 vehicles	*0*	*11*	*219*	*381*	*219.3*	*34.9*	*5.7*	*19.4*
Hybrid	1000 vehicles	*81*	*260*	*406*	*283*	*26.4*	*4.6*	*-3.6*	*0.4*
Electric	1000 vehicles	*0*	*7*	*525*	*1,173*	*162.4*	*54.1*	*8.4*	*29.2*
Fuel cells	1000 vehicles	*0*	*0*	*1*	*484*	*0.0*	*0.0*	*94.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*8,257*	*6,616*	*6,730*	*7,707*	*-4.3*	*0.2*	*1.4*	*0.8*
Gasoline 1400-2000 cc	1000 vehicles	*404*	*4,469*	*4,763*	*6,147*	*61.7*	*0.6*	*2.6*	*1.6*
Gasoline >2000 cc	1000 vehicles	*45*	*436*	*392*	*319*	*57.7*	*-1.1*	*-2.1*	*-1.6*
Diesel <2000 cc	1000 vehicles	*11,081*	*14,534*	*17,365*	*16,962*	*5.6*	*1.8*	*-0.2*	*0.8*
Diesel >2000 cc	1000 vehicles	*2,168*	*2,417*	*2,532*	*2,387*	*2.2*	*0.5*	*-0.6*	*-0.1*
PreEURO	*1000 vehicles*	*3,022*	*523*	*1*	*0*	*-29.6*	*-47.5*	*-70.6*	*-60.7*
EURO I	1000 vehicles	*5,070*	*1,867*	*20*	*0*	*-18.1*	*-36.5*	*-61.4*	*-50.5*
EURO II	1000 vehicles	*7,875*	*4,526*	*199*	*0*	*-10.5*	*-26.8*	*-51.7*	*-40.5*
EURO III	1000 vehicles	*12,250*	*9,901*	*1,611*	*11*	*-4.2*	*-16.6*	*-39.2*	*-28.8*
EURO IV	1000 vehicles	*0*	*7,296*	*2,634*	*68*	*0.0*	*-9.7*	*-30.6*	*-20.8*
EURO V or later	1000 vehicles	*0*	*4,357*	*27,317*	*33,442*	*0.0*	*20.1*	*2.0*	*10.7*
Light duty vehicle fleet size	1000 vehicles	3,332	3,341	3,771	4,016	0.0	1.2	0.6	0.9
Gasoline and Diesel	1000 vehicles	*3,332*	*3,341*	*3,730*	*3,738*	*0.0*	*1.1*	*0.0*	*0.6*
Electric	1000 vehicles	*0*	*0*	*41*	*277*	*n.a.*	*n.a.*	*21.1*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	1,511	777	907	958	-12.5	1.6	0.5	1.1
3.5-7.5 tonnes	1000 vehicles	*316*	*349*	*419*	*442*	*2.0*	*1.8*	*0.5*	*1.2*
7.5-16 tonnes	1000 vehicles	*83*	*91*	*109*	*115*	*2.0*	*1.8*	*0.5*	*1.2*
16-32 tonnes	1000 vehicles	*255*	*269*	*303*	*320*	*1.0*	*1.2*	*0.6*	*0.9*
>32 tonnes	1000 vehicles	*64*	*68*	*76*	*81*	*1.0*	*1.2*	*0.6*	*0.9*
PreEURO	*1000 vehicles*	*668*	*137*	*0*	*0*	*-27.2*	*-62.1*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*149*	*70*	*1*	*0*	*-14.1*	*-35.2*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*319*	*158*	*63*	*0*	*-13.1*	*-8.8*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*375*	*235*	*226*	*2*	*-9.0*	*-0.4*	*-39.0*	*-22.0*
EURO IV	1000 vehicles	*0*	*130*	*141*	*31*	*n.a.*	*0.8*	*-14.2*	*-7.0*
EURO V or later	1000 vehicles	*0*	*48*	*476*	*926*	*n.a.*	*25.9*	*6.9*	*16.0*

The ITREN-2030 integrated scenario until 2030

iTREN-2030 GR - Greece	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	300	312	468	536	0.8	4.1	1.4	2.7
Freight transport activity originated in the country	Billion tonnes-km per year	90	92	143	164	0.4	4.5	1.4	2.9
Road	Billion tonnes-km per year	*33*	*34*	*51*	*59*	*0.6*	*4.2*	*1.3*	*2.8*
Rail	Billion tonnes-km per year	*1*	*1*	*1*	*1*	*-0.5*	*4.0*	*1.2*	*2.6*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*57*	*58*	*91*	*105*	*0.3*	*4.7*	*1.4*	*3.0*
Average freight transport distance	km	300	295	306	306	-0.4	0.4	0.0	0.2
Freight transport activity on the national territory	Billion tonnes-km per year	34	35	54	61	0.5	4.3	1.3	2.8
Road	Billion tonnes-km per year	*33*	*34*	*52*	*59*	*0.5*	*4.2*	*1.3*	*2.8*
Rail	Billion tonnes-km per year	*1*	*1*	*2*	*2*	*-0.8*	*5.0*	*1.3*	*3.1*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	5	5	7	7	1.3	3.0	1.2	2.1
Trips originated in the country	Million trips per year	12,378	12,564	13,741	13,816	0.3	0.9	0.1	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	115	115	131	135	0.0	1.3	0.2	0.8
Car	Billion pass-km per year	*69*	*69*	*80*	*83*	*0.1*	*1.5*	*0.3*	*0.9*
Bus	Billion pass-km per year	*20*	*20*	*20*	*20*	*0.4*	*0.0*	*-0.1*	*-0.1*
Rail	Billion pass-km per year	*2*	*3*	*3*	*3*	*1.1*	*1.6*	*0.9*	*1.3*
Air (Intra-EU)	Billion pass-km per year	*19*	*18*	*21*	*22*	*-1.5*	*1.9*	*0.1*	*1.0*
Slow	Billion pass-km per year	*5*	*5*	*6*	*7*	*1.2*	*1.7*	*1.0*	*1.3*
Average passenger transport distance	km	9.3	9.2	9.6	9.7	-0.3	0.4	0.2	0.3
Passenger transport activity on the national territ	Billion pass-km per year	93	94	106	109	0.3	1.2	0.2	0.7
Road	Billion pass-km per year	*91*	*92*	*103*	*105*	*0.3*	*1.2*	*0.2*	*0.7*
Rail	Billion pass-km per year	*2*	*3*	*3*	*3*	*1.1*	*1.6*	*0.9*	*1.3*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	44	44	52	55	0.0	1.7	0.6	1.2
Motorization rate	cars/1000 inhabitants	221	222	247	266	0.1	1.1	0.7	0.9
ECONOMY INDICATORS									
GDP	Billion Euros 2005	155	149	160	171	-0.8	0.7	0.7	0.7
Employment	1000 Persons	4,194	3,550	3,398	3,278	-3.3	-0.4	-0.4	-0.4
Agriculture and fishery	1000 Persons	*860*	*751*	*671*	*607*	*-2.7*	*-1.1*	*-1.0*	*-1.1*
Construction	1000 Persons	*318*	*249*	*282*	*289*	*-4.8*	*1.3*	*0.2*	*0.8*
Energy and water	1000 Persons	*61*	*69*	*90*	*101*	*2.4*	*2.7*	*1.1*	*1.9*
Industry	1000 Persons	*711*	*536*	*743*	*765*	*-5.5*	*3.3*	*0.3*	*1.8*
Transport services	1000 Persons	*143*	*131*	*122*	*114*	*-1.8*	*-0.7*	*-0.6*	*-0.7*
Other services	1000 Persons	*2,101*	*1,814*	*1,489*	*1,402*	*-2.9*	*-2.0*	*-0.6*	*-1.3*
Population total	1000 Persons	11,065	11,223	11,444	11,327	0.3	0.2	-0.1	0.0
Labour force	1000 Persons	*7,202*	*7,375*	*7,439*	*7,033*	*0.5*	*0.1*	*-0.6*	*-0.2*
Retired (> 65 years)	1000 Persons	*2,008*	*2,029*	*2,287*	*2,732*	*0.2*	*1.2*	*1.8*	*1.5*
Transport taxation revenues	Million Euros 2005	2,500	2,610	3,444	3,837	0.9	2.8	1.1	1.9
Fuel taxes	Million Euros 2005	*1,233*	*1,202*	*1,377*	*1,464*	*-0.5*	*1.4*	*0.6*	*1.0*
Emissions certificate	Million Euros 2005	*0*	*38*	*183*	*177*	*0.0*	*16.9*	*-0.3*	*8.0*
Road charges	Million Euros 2005	*1,268*	*1,370*	*1,884*	*2,196*	*1.6*	*3.2*	*1.5*	*2.4*
ENERGY INDICATORS									
Primary energy production	Million toe per year	11	13	15	16	2.8	1.2	0.7	1.0
Share of domestic energy production	%	36	42	50	56	3.1	1.7	1.1	1.4
Final energy demand by source	Million toe per year	31	30	29	28	-0.3	-0.5	-0.4	-0.4
Oil	Million toe per year	*18*	*15*	*12*	*11*	*-3.5*	*-1.8*	*-1.4*	*-1.6*
Gas	Million toe per year	*2*	*4*	*4*	*3*	*11.0*	*0.7*	*-1.8*	*-0.6*
Coal, Nuclear	Million toe per year	*9*	*8*	*6*	*6*	*-1.4*	*-3.6*	*0.0*	*-1.8*
Biomass	Million toe per year	*1*	*2*	*4*	*5*	*11.2*	*9.5*	*1.4*	*5.3*
Other Renewables	Million toe per year	*1*	*1*	*2*	*3*	*14.4*	*4.9*	*2.3*	*3.6*
Final energy demand by consuming sector	Million toe per year	21	19	19	18	-1.6	-0.4	-0.3	-0.4
Transport freight	Million toe per year	*3*	*3*	*3*	*3*	*-2.0*	*0.2*	*-0.9*	*-0.3*
Transport passenger	Million toe per year	*5*	*5*	*4*	*4*	*-1.9*	*-1.2*	*-0.8*	*-1.0*
Industry	Million toe per year	*4*	*4*	*4*	*4*	*-0.2*	*0.0*	*0.0*	*0.0*
Residential and services	Million toe per year	*9*	*8*	*8*	*7*	*-2.0*	*-0.5*	*-0.1*	*-0.3*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.79	1.08	1.06	1.18	6.4	-0.2	1.1	0.5
Gasoline price	Euros2005 per litre	0.79	1.09	1.06	1.19	6.6	-0.2	1.1	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	4	10	14	1292.5	10.8	3.3	6.9
Share of renewables in electricity	%	11	22	41	48	14.8	6.3	1.6	3.9
Share of renewables in final energy demand	%	8	13	22	27	11.2	5.6	2.2	3.9
Energy intensity of freight transport activity	toe/Million tkm	36	32	21	17	-2.3	-4.2	-2.2	-3.2
Energy intensity of passenger transport activity	toe/Million pkm	45	41	32	29	-1.9	-2.5	-1.0	-1.7
Energy intensity of economic activity	toe/Million Euros 2005	136	130	116	105	-0.8	-1.1	-1.0	-1.1

iTREN-2030 GR - Greece	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	16	16	16	16	-1.2	0.6	-0.2	0.2
Road freight	Million tonnes per year	*3*	*3*	*4*	*4*	*0.3*	*1.9*	*0.1*	*1.0*
Road passenger	Million tonnes per year	*10*	*9*	*9*	*9*	*-1.5*	*-0.3*	*-0.2*	*-0.2*
Rail freight	Million tonnes per year	*1*	*1*	*1*	*1*	*0.1*	*3.2*	*0.5*	*1.8*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.1*	*0.6*	*-0.2*	*0.2*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*1.3*	*2.4*	*0.0*	*1.2*
Air (Intra-EU)	Million tonnes per year	*3*	*3*	*3*	*3*	*-2.3*	*1.0*	*-0.8*	*0.1*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.042	0.042	0.033	0.029	0.0	-2.3	-1.2	-1.7
Road	tonnes/1000 tkm	*0.088*	*0.087*	*0.069*	*0.061*	*-0.2*	*-2.3*	*-1.2*	*-1.7*
Rail	tonnes/1000 tkm	*0.453*	*0.475*	*0.398*	*0.367*	*0.9*	*-1.8*	*-0.8*	*-1.3*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.006*	*0.006*	*0.005*	*0.004*	*1.0*	*-2.2*	*-1.4*	*-1.8*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.113	0.104	0.091	0.086	-1.7	-1.3	-0.6	-0.9
Road	tonnes/1000 pkm	*0.107*	*0.098*	*0.085*	*0.081*	*-1.8*	*-1.5*	*-0.4*	*-0.9*
Rail	tonnes/1000 pkm	*0.023*	*0.022*	*0.019*	*0.017*	*-1.2*	*-1.1*	*-1.1*	*-1.1*
Air	tonnes/1000 pkm	*0.152*	*0.146*	*0.134*	*0.122*	*-0.8*	*-0.8*	*-1.0*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	93	75	68	62	-4.4	-1.0	-0.8	-0.9
Road freight	1000 Tonnes per year	*15*	*12*	*8*	*5*	*-4.5*	*-4.6*	*-3.8*	*-4.2*
Road passenger	1000 Tonnes per year	*36*	*22*	*11*	*9*	*-9.0*	*-6.5*	*-2.6*	*-4.6*
Rail freight	1000 Tonnes per year	*0*	*0*	*0*	*1*	*0.8*	*5.0*	*2.4*	*3.7*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-0.8*	*-0.2*	*-1.2*	*-0.7*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*8*	*8*	*10*	*9*	*1.1*	*2.1*	*-0.4*	*0.8*
Air (Intra-EU)	1000 Tonnes per year	*34*	*32*	*38*	*38*	*-1.5*	*1.9*	*0.0*	*0.9*
PM10 Transport emissions	1000 Tonnes per year	5	4	3	2	-4.5	-2.5	-2.2	-2.3
Road freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-5.5*	*-2.2*	*-1.1*	*-1.6*
Road passenger	1000 Tonnes per year	*4*	*3*	*2*	*2*	*-4.2*	*-2.6*	*-2.5*	*-2.5*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	2,442	2,488	2,829	3,013	0.4	1.3	0.6	1.0
Gasoline	1000 vehicles	*2,402*	*2,437*	*2,537*	*2,477*	*0.3*	*0.4*	*-0.2*	*0.1*
Diesel	1000 vehicles	*32*	*32*	*32*	*31*	*-0.5*	*0.2*	*-0.4*	*-0.1*
LPG/CNG	1000 vehicles	*7*	*17*	*163*	*236*	*19.2*	*25.0*	*3.8*	*13.9*
Bioethanol	1000 vehicles	*0*	*0*	*3*	*8*	*0.0*	*45.9*	*11.2*	*27.4*
Hybrid	1000 vehicles	*1*	*1*	*5*	*2*	*11.5*	*14.5*	*-8.8*	*2.2*
Electric	1000 vehicles	*0*	*0*	*90*	*255*	*152.2*	*79.8*	*11.0*	*41.3*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*4*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,953*	*1,925*	*1,853*	*1,732*	*-0.3*	*-0.4*	*-0.7*	*-0.5*
Gasoline 1400-2000 cc	1000 vehicles	*404*	*41*	*33*	*29*	*-36.7*	*-2.1*	*-1.5*	*-1.8*
Gasoline >2000 cc	1000 vehicles	*45*	*471*	*650*	*716*	*60.1*	*3.3*	*1.0*	*2.1*
Diesel <2000 cc	1000 vehicles	*21*	*21*	*25*	*25*	*0.5*	*1.4*	*0.1*	*0.7*
Diesel >2000 cc	1000 vehicles	*11*	*10*	*8*	*6*	*-2.5*	*-2.8*	*-2.3*	*-2.5*
PreEURO	*1000 vehicles*	*1,164*	*817*	*131*	*0*	*-6.8*	*-16.7*	*-48.0*	*-34.2*
EURO I	1000 vehicles	*703*	*680*	*420*	*26*	*-0.7*	*-4.7*	*-24.2*	*-15.0*
EURO II	1000 vehicles	*205*	*200*	*168*	*59*	*-0.5*	*-1.8*	*-9.9*	*-5.9*
EURO III	1000 vehicles	*369*	*359*	*314*	*204*	*-0.6*	*-1.3*	*-4.2*	*-2.8*
EURO IV	1000 vehicles	*0*	*266*	*233*	*188*	*0.0*	*-1.3*	*-2.1*	*-1.7*
EURO V or later	1000 vehicles	*0*	*147*	*1,304*	*2,031*	*0.0*	*24.4*	*4.5*	*14.0*
Light duty vehicle fleet size	1000 vehicles	239	225	304	356	-1.1	3.0	1.6	2.3
Gasoline and Diesel	1000 vehicles	*239*	*225*	*301*	*335*	*-1.1*	*2.9*	*1.1*	*2.0*
Electric	1000 vehicles	*0*	*0*	*3*	*21*	*n.a.*	*n.a.*	*21.4*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	461	281	402	464	-9.5	3.7	1.4	2.5
3.5-7.5 tonnes	1000 vehicles	*115*	*138*	*201*	*232*	*3.7*	*3.8*	*1.5*	*2.6*
7.5-16 tonnes	1000 vehicles	*30*	*36*	*52*	*61*	*3.6*	*3.8*	*1.5*	*2.6*
16-32 tonnes	1000 vehicles	*76*	*87*	*120*	*138*	*2.7*	*3.3*	*1.4*	*2.3*
>32 tonnes	1000 vehicles	*17*	*20*	*29*	*33*	*3.1*	*3.6*	*1.4*	*2.5*
PreEURO	*1000 vehicles*	*278*	*117*	*47*	*5*	*-15.9*	*-8.7*	*-20.9*	*-15.0*
EURO I	1000 vehicles	*34*	*18*	*16*	*5*	*-11.8*	*-1.2*	*-10.7*	*-6.1*
EURO II	1000 vehicles	*76*	*41*	*41*	*23*	*-11.4*	*-0.2*	*-5.7*	*-2.9*
EURO III	1000 vehicles	*74*	*51*	*54*	*43*	*-6.9*	*0.4*	*-2.2*	*-0.9*
EURO IV	1000 vehicles	*0*	*40*	*42*	*39*	*n.a.*	*0.6*	*-0.7*	*-0.1*
EURO V or later	1000 vehicles	*0*	*13*	*202*	*349*	*n.a.*	*31.3*	*5.6*	*17.8*

The ITREN-2030 integrated scenario until 2030

iTREN-2030 HU - Hungary	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	333	346	302	298	0.8	-1.4	-0.1	-0.8
Freight transport activity originated in the country	Billion tonnes-km per year	40	41	45	46	0.9	0.8	0.3	0.6
Road	Billion tonnes-km per year	*29*	*31*	*32*	*33*	*0.9*	*0.5*	*0.3*	*0.4*
Rail	Billion tonnes-km per year	*10*	*11*	*13*	*13*	*1.1*	*1.6*	*0.4*	*1.0*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Average freight transport distance	km	119	120	148	155	0.1	2.1	0.5	1.3
Freight transport activity on the national territory	Billion tonnes-km per year	43	46	55	61	1.4	1.9	1.0	1.5
Road	Billion tonnes-km per year	*31*	*32*	*35*	*38*	*0.7*	*1.0*	*0.6*	*0.8*
Rail	Billion tonnes-km per year	*10*	*11*	*15*	*16*	*1.5*	*2.7*	*1.0*	*1.8*
Inland navigation	Billion tonnes-km per year	*1*	*3*	*5*	*7*	*13.2*	*7.5*	*3.4*	*5.4*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	6	7	6	6	1.6	-1.4	0.0	-0.7
Trips originated in the country	Million trips per year	8,279	8,122	8,425	8,571	-0.4	0.4	0.2	0.3
Passenger transport activity originated in the cou	Billion pass-km per year	88	86	96	101	-0.4	1.1	0.5	0.8
Car	Billion pass-km per year	*51*	*50*	*57*	*61*	*-0.5*	*1.4*	*0.7*	*1.1*
Bus	Billion pass-km per year	*19*	*19*	*19*	*20*	*-0.4*	*0.2*	*0.1*	*0.1*
Rail	Billion pass-km per year	*10*	*10*	*11*	*11*	*0.2*	*1.0*	*0.7*	*0.8*
Air (Intra-EU)	Billion pass-km per year	*3*	*3*	*3*	*4*	*-1.9*	*2.1*	*0.4*	*1.3*
Slow	Billion pass-km per year	*4*	*5*	*5*	*5*	*0.9*	*0.7*	*0.6*	*0.7*
Average passenger transport distance	km	10.6	10.6	11.4	11.8	0.0	0.7	0.4	0.6
Passenger transport activity on the national territ	Billion pass-km per year	73	72	80	85	-0.3	1.1	0.5	0.8
Road	Billion pass-km per year	*63*	*62*	*69*	*73*	*-0.4*	*1.1*	*0.5*	*0.8*
Rail	Billion pass-km per year	*10*	*10*	*11*	*12*	*0.3*	*0.9*	*0.7*	*0.8*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	32	32	38	42	-0.3	1.8	1.0	1.4
Motorization rate	cars/1000 inhabitants	278	290	363	454	0.9	2.3	2.3	2.3
ECONOMY INDICATORS									
GDP	Billion Euros 2005	57	57	77	90	0.0	3.1	1.5	2.3
Employment	1000 Persons	4,122	3,344	3,808	3,660	-4.1	1.3	-0.4	0.5
Agriculture and fishery	1000 Persons	*284*	*231*	*214*	*216*	*-4.1*	*-0.8*	*0.1*	*-0.3*
Construction	1000 Persons	*373*	*274*	*236*	*201*	*-6.0*	*-1.5*	*-1.6*	*-1.5*
Energy and water	1000 Persons	*12*	*12*	*12*	*13*	*-1.0*	*0.1*	*0.8*	*0.5*
Industry	1000 Persons	*1,281*	*796*	*1,280*	*1,338*	*-9.1*	*4.9*	*0.4*	*2.6*
Transport services	1000 Persons	*177*	*155*	*179*	*173*	*-2.6*	*1.4*	*-0.4*	*0.5*
Other services	1000 Persons	*1,995*	*1,876*	*1,887*	*1,719*	*-1.2*	*0.1*	*-0.9*	*-0.4*
Population total	1000 Persons	10,100	9,958	9,726	9,469	-0.3	-0.2	-0.3	-0.3
Labour force	1000 Persons	*6,606*	*6,579*	*6,280*	*6,066*	*-0.1*	*-0.5*	*-0.3*	*-0.4*
Retired (> 65 years)	1000 Persons	*1,481*	*1,514*	*1,778*	*1,855*	*0.5*	*1.6*	*0.4*	*1.0*
Transport taxation revenues	Million Euros 2005	3,198	2,994	3,584	3,859	-1.3	1.8	0.7	1.3
Fuel taxes	Million Euros 2005	*2,495*	*2,280*	*2,292*	*2,369*	*-1.8*	*0.1*	*0.3*	*0.2*
Emissions certificate	Million Euros 2005	*0*	*49*	*206*	*199*	*0.0*	*15.4*	*-0.4*	*7.2*
Road charges	Million Euros 2005	*703*	*665*	*1,086*	*1,291*	*-1.1*	*5.0*	*1.7*	*3.4*
ENERGY INDICATORS									
Primary energy production	Million toe per year	11	13	17	18	3.2	2.8	0.3	1.6
Share of domestic energy production	%	41	49	62	65	3.6	2.3	0.4	1.4
Final energy demand by source	Million toe per year	27	26	28	27	-0.3	0.5	-0.1	0.2
Oil	Million toe per year	*7*	*7*	*7*	*7*	*0.9*	*-0.8*	*-0.5*	*-0.6*
Gas	Million toe per year	*12*	*9*	*8*	*7*	*-5.2*	*-1.3*	*-1.1*	*-1.2*
Coal, Nuclear	Million toe per year	*7*	*8*	*7*	*5*	*3.3*	*-1.5*	*-2.2*	*-1.8*
Biomass	Million toe per year	*1*	*2*	*5*	*7*	*9.9*	*10.9*	*3.1*	*6.9*
Other Renewables	Million toe per year	*0*	*0*	*1*	*1*	*38.6*	*21.1*	*3.7*	*12.1*
Final energy demand by consuming sector	Million toe per year	18	17	19	19	-0.9	0.7	0.1	0.4
Transport freight	Million toe per year	*1*	*1*	*1*	*1*	*0.9*	*1.5*	*-0.4*	*0.5*
Transport passenger	Million toe per year	*3*	*4*	*4*	*4*	*1.4*	*1.3*	*1.0*	*1.1*
Industry	Million toe per year	*3*	*3*	*3*	*3*	*-1.3*	*0.0*	*-0.5*	*-0.2*
Residential and services	Million toe per year	*10*	*9*	*10*	*10*	*-1.7*	*0.7*	*0.0*	*0.3*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.87	1.16	1.15	1.27	5.8	-0.1	1.0	0.5
Gasoline price	Euros2005 per litre	0.92	1.20	1.19	1.31	5.5	-0.1	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	6	19	31	1344.3	12.9	4.7	8.7
Share of renewables in electricity	%	5	7	31	41	7.6	16.7	2.8	9.5
Share of renewables in final energy demand	%	5	7	19	26	8.2	10.1	3.5	6.7
Energy intensity of freight transport activity	toe/Million tkm	27	26	25	22	-0.5	-0.4	-1.4	-0.9
Energy intensity of passenger transport activity	toe/Million pkm	44	48	49	51	1.8	0.2	0.4	0.3
Energy intensity of economic activity	toe/Million Euros 2005	319	304	242	211	-0.9	-2.3	-1.4	-1.8

iTREN-2030 HU - Hungary	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	20	19	17	16	-1.2	-1.0	-0.3	-0.7
Road freight	Million tonnes per year	*7*	*7*	*5*	*5*	*0.5*	*-2.9*	*-0.9*	*-1.9*
Road passenger	Million tonnes per year	*12*	*11*	*10*	*10*	*-2.3*	*-0.2*	*-0.3*	*-0.3*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*1*	*1.7*	*3.4*	*5.1*	*4.2*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.9*	*0.0*	*-0.4*	*-0.2*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*16.0*	*7.2*	*3.1*	*5.1*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.9*	*4.2*	*0.5*	*2.3*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.6*	*1.0*	*-0.5*	*0.2*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.172	0.166	0.108	0.095	-0.8	-4.2	-1.3	-2.8
Road	tonnes/1000 tkm	*0.227*	*0.225*	*0.152*	*0.130*	*-0.2*	*-3.9*	*-1.6*	*-2.7*
Rail	tonnes/1000 tkm	*0.023*	*0.024*	*0.025*	*0.037*	*0.2*	*0.7*	*4.0*	*2.4*
Inland navigation	tonnes/1000 tkm	*0.031*	*0.035*	*0.034*	*0.034*	*2.4*	*-0.3*	*-0.3*	*-0.3*
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.165	0.149	0.131	0.121	-1.9	-1.3	-0.8	-1.1
Road	tonnes/1000 pkm	*0.189*	*0.171*	*0.150*	*0.138*	*-1.9*	*-1.3*	*-0.8*	*-1.1*
Rail	tonnes/1000 pkm	*0.014*	*0.013*	*0.012*	*0.011*	*-1.2*	*-0.9*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.155*	*0.150*	*0.135*	*0.122*	*-0.7*	*-1.0*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	67	47	32	29	-7.0	-3.6	-1.2	-2.4
Road freight	1000 Tonnes per year	*24*	*19*	*9*	*5*	*-5.4*	*-7.0*	*-5.0*	*-6.0*
Road passenger	1000 Tonnes per year	*33*	*18*	*10*	*9*	*-11.1*	*-5.6*	*-1.8*	*-3.7*
Rail freight	1000 Tonnes per year	*2*	*2*	*2*	*3*	*1.1*	*2.3*	*2.8*	*2.5*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-1.2*	*-0.8*	*-1.4*	*-1.1*
Inland navigation	1000 Tonnes per year	*1*	*2*	*3*	*4*	*16.0*	*7.2*	*3.1*	*5.1*
Maritime (Intra-EU)	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-2.3*	*3.9*	*0.2*	*2.0*
Air (Intra-EU)	1000 Tonnes per year	*5*	*5*	*5*	*6*	*-1.7*	*1.7*	*0.3*	*1.0*
PM10 Transport emissions	1000 Tonnes per year	3	3	2	2	-5.0	-3.0	-0.9	-1.9
Road freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-3.9*	*-3.5*	*-0.9*	*-2.2*
Road passenger	1000 Tonnes per year	*2*	*2*	*1*	*1*	*-5.6*	*-2.7*	*-0.8*	*-1.8*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	2,803	2,889	3,532	4,301	0.6	2.0	2.0	2.0
Gasoline	1000 vehicles	*2,458*	*2,527*	*2,977*	*3,450*	*0.6*	*1.7*	*1.5*	*1.6*
Diesel	1000 vehicles	*268*	*245*	*237*	*231*	*-1.8*	*-0.3*	*-0.3*	*-0.3*
LPG/CNG	1000 vehicles	*63*	*68*	*83*	*94*	*1.6*	*2.1*	*1.2*	*1.6*
Bioethanol	1000 vehicles	*0*	*0*	*6*	*15*	*98.1*	*34.5*	*10.1*	*21.7*
Hybrid	1000 vehicles	*15*	*48*	*106*	*56*	*26.8*	*8.3*	*-6.2*	*0.8*
Electric	1000 vehicles	*0*	*1*	*123*	*435*	*0.0*	*59.2*	*13.5*	*34.4*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*21*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,733*	*1,871*	*2,227*	*2,535*	*1.5*	*1.8*	*1.3*	*1.5*
Gasoline 1400-2000 cc	1000 vehicles	*633*	*617*	*712*	*867*	*-0.5*	*1.4*	*2.0*	*1.7*
Gasoline >2000 cc	1000 vehicles	*48*	*39*	*38*	*47*	*-4.2*	*-0.2*	*2.3*	*1.0*
Diesel <2000 cc	1000 vehicles	*219*	*205*	*200*	*193*	*-1.3*	*-0.2*	*-0.4*	*-0.3*
Diesel >2000 cc	1000 vehicles	*45*	*40*	*36*	*38*	*-2.5*	*-0.9*	*0.5*	*-0.2*
PreEURO	*1000 vehicles*	*680*	*166*	*0*	*0*	*-24.6*	*-95.9*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*191*	*156*	*0*	*0*	*-3.9*	*-76.7*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*417*	*375*	*3*	*0*	*-2.1*	*-38.7*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*1,390*	*1,374*	*366*	*0*	*-0.2*	*-12.4*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*524*	*378*	*0*	*0.0*	*-3.2*	*-77.6*	*-53.4*
EURO V or later	1000 vehicles	*0*	*177*	*2,467*	*3,681*	*0.0*	*30.2*	*4.1*	*16.4*
Light duty vehicle fleet size	1000 vehicles	711	576	404	369	-4.1	-3.5	-0.9	-2.2
Gasoline and Diesel	1000 vehicles	*711*	*576*	*403*	*354*	*-4.1*	*-3.5*	*-1.3*	*-2.4*
Electric	1000 vehicles	*0*	*0*	*1*	*14*	*n.a.*	*n.a.*	*32.3*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	224	186	236	275	-3.6	2.4	1.5	2.0
3.5-7.5 tonnes	1000 vehicles	*73*	*90*	*114*	*131*	*4.3*	*2.4*	*1.4*	*1.9*
7.5-16 tonnes	1000 vehicles	*19*	*23*	*29*	*33*	*4.0*	*2.2*	*1.5*	*1.8*
16-32 tonnes	1000 vehicles	*49*	*61*	*78*	*93*	*4.4*	*2.5*	*1.7*	*2.1*
>32 tonnes	1000 vehicles	*10*	*12*	*15*	*18*	*4.0*	*2.3*	*1.6*	*1.9*
PreEURO	*1000 vehicles*	*117*	*72*	*41*	*10*	*-9.4*	*-5.5*	*-13.4*	*-9.5*
EURO I	1000 vehicles	*29*	*20*	*17*	*10*	*-7.5*	*-1.2*	*-5.4*	*-3.3*
EURO II	1000 vehicles	*39*	*27*	*24*	*15*	*-7.5*	*-1.0*	*-4.8*	*-2.9*
EURO III	1000 vehicles	*38*	*40*	*39*	*30*	*1.0*	*-0.4*	*-2.4*	*-1.4*
EURO IV	1000 vehicles	*0*	*22*	*22*	*20*	*n.a.*	*-0.2*	*-0.8*	*-0.5*
EURO V or later	1000 vehicles	*0*	*6*	*93*	*190*	*n.a.*	*31.5*	*7.4*	*18.9*

iTREN-2030 IE - Ireland	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	111	121	143	162	1.7	1.7	1.2	1.5
Freight transport activity originated in the country	Billion tonnes-km per year	23	20	31	36	-2.3	4.5	1.2	2.8
Road	Billion tonnes-km per year	*7*	*7*	*9*	*10*	*1.2*	*2.6*	*1.4*	*2.0*
Rail	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*11.6*	*4.0*	*7.7*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*16*	*13*	*23*	*25*	*-3.9*	*5.4*	*1.2*	*3.3*
Average freight transport distance	km	206	169	220	221	-3.9	2.7	0.0	1.4
Freight transport activity on the national territory	Billion tonnes-km per year	4	6	7	9	6.6	2.1	1.5	1.8
Road	Billion tonnes-km per year	*5*	*6*	*7*	*9*	*2.3*	*2.1*	*1.5*	*1.8*
Rail	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-0.7*	*9.2*	*3.6*	*6.4*
Inland navigation	Billion tonnes-km per year	*-1*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	2	2	2	2	3.6	0.8	1.3	1.0
Trips originated in the country	Million trips per year	3,987	4,204	4,926	5,563	1.1	1.6	1.2	1.4
Passenger transport activity originated in the cou	Billion pass-km per year	48	50	63	72	0.7	2.4	1.2	1.8
Car	Billion pass-km per year	*28*	*29*	*39*	*44*	*0.9*	*2.8*	*1.3*	*2.1*
Bus	Billion pass-km per year	*8*	*8*	*8*	*9*	*1.0*	*0.3*	*0.7*	*0.5*
Rail	Billion pass-km per year	*1*	*2*	*2*	*2*	*2.5*	*2.3*	*1.2*	*1.8*
Air (Intra-EU)	Billion pass-km per year	*9*	*9*	*12*	*13*	*-0.7*	*2.7*	*0.9*	*1.8*
Slow	Billion pass-km per year	*2*	*2*	*3*	*4*	*2.3*	*2.3*	*2.3*	*2.3*
Average passenger transport distance	km	12.1	11.9	12.9	12.9	-0.3	0.8	0.0	0.4
Passenger transport activity on the national territ	Billion pass-km per year	36	37	47	53	0.8	2.3	1.2	1.7
Road	Billion pass-km per year	*35*	*36*	*45*	*50*	*0.7*	*2.3*	*1.1*	*1.7*
Rail	Billion pass-km per year	*1*	*2*	*2*	*2*	*2.5*	*2.3*	*1.2*	*1.8*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	17	18	24	28	0.8	3.2	1.4	2.3
Motorization rate	cars/1000 inhabitants	329	350	427	479	1.3	2.0	1.1	1.6
ECONOMY INDICATORS									
GDP	Billion Euros 2005	98	97	128	140	-0.4	2.8	0.9	1.9
Employment	1000 Persons	1,589	1,437	1,717	1,551	-2.0	1.8	-1.0	0.4
Agriculture and fishery	1000 Persons	*145*	*124*	*113*	*93*	*-3.0*	*-1.0*	*-2.0*	*-1.5*
Construction	1000 Persons	*80*	*73*	*74*	*64*	*-1.8*	*0.2*	*-1.5*	*-0.6*
Energy and water	1000 Persons	*21*	*24*	*26*	*24*	*2.6*	*0.7*	*-0.7*	*0.0*
Industry	1000 Persons	*571*	*463*	*776*	*747*	*-4.1*	*5.3*	*-0.4*	*2.4*
Transport services	1000 Persons	*43*	*42*	*50*	*51*	*-0.6*	*1.8*	*0.3*	*1.0*
Other services	1000 Persons	*730*	*711*	*678*	*572*	*-0.5*	*-0.5*	*-1.7*	*-1.1*
Population total	1000 Persons	4,095	4,329	4,753	5,066	1.1	0.9	0.6	0.8
Labour force	1000 Persons	*2,664*	*2,804*	*2,969*	*3,157*	*1.0*	*0.6*	*0.6*	*0.6*
Retired (> 65 years)	1000 Persons	*450*	*475*	*599*	*766*	*1.1*	*2.3*	*2.5*	*2.4*
Transport taxation revenues	Million Euros 2005	1,618	1,932	2,540	2,810	3.6	2.8	1.0	1.9
Fuel taxes	Million Euros 2005	*1,308*	*1,299*	*1,553*	*1,682*	*-0.1*	*1.8*	*0.8*	*1.3*
Emissions certificate	Million Euros 2005	*0*	*29*	*152*	*152*	*0.0*	*18.1*	*0.0*	*8.7*
Road charges	Million Euros 2005	*310*	*604*	*836*	*976*	*14.3*	*3.3*	*1.6*	*2.4*
ENERGY INDICATORS									
Primary energy production	Million toe per year	1	2	5	5	11.4	6.2	0.8	3.5
Share of domestic energy production	%	9	15	25	27	10.1	5.3	0.9	3.1
Final energy demand by source	Million toe per year	16	17	18	18	1.1	0.9	-0.1	0.4
Oil	Million toe per year	*9*	*8*	*8*	*7*	*-3.1*	*-0.2*	*-0.8*	*-0.5*
Gas	Million toe per year	*3*	*3*	*4*	*4*	*-1.9*	*2.4*	*0.1*	*1.2*
Coal, Nuclear	Million toe per year	*2*	*4*	*3*	*2*	*11.2*	*-4.6*	*-2.6*	*-3.6*
Biomass	Million toe per year	*0*	*1*	*3*	*3*	*29.8*	*14.0*	*2.0*	*7.8*
Other Renewables	Million toe per year	*0*	*0*	*1*	*1*	*18.4*	*6.5*	*3.8*	*5.1*
Final energy demand by consuming sector	Million toe per year	12	12	13	13	-0.4	0.9	0.0	0.5
Transport freight	Million toe per year	*1*	*1*	*1*	*1*	*-0.3*	*2.0*	*-1.0*	*0.5*
Transport passenger	Million toe per year	*4*	*4*	*4*	*4*	*0.5*	*-0.2*	*-0.4*	*-0.3*
Industry	Million toe per year	*2*	*2*	*2*	*3*	*-0.5*	*1.1*	*1.0*	*1.1*
Residential and services	Million toe per year	*5*	*5*	*5*	*5*	*-1.2*	*1.5*	*0.1*	*0.8*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.91	1.24	1.22	1.36	6.3	-0.2	1.1	0.4
Gasoline price	Euros2005 per litre	1.02	1.36	1.34	1.48	5.8	-0.2	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	4	12	19	1271.2	11.2	5.1	8.1
Share of renewables in electricity	%	8	19	41	50	18.0	7.9	2.0	4.9
Share of renewables in final energy demand	%	3	7	15	20	18.3	7.7	2.9	5.3
Energy intensity of freight transport activity	toe/Million tkm	46	48	38	31	1.0	-2.3	-2.2	-2.3
Energy intensity of passenger transport activity	toe/Million pkm	89	89	69	59	0.0	-2.6	-1.5	-2.0
Energy intensity of economic activity	toe/Million Euros 2005	123	123	102	93	0.0	-1.9	-0.9	-1.4

iTREN-2030	Integrated scenario								
IE - Ireland									
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	10	10	11	11	-0.2	1.0	0.0	0.5
Road freight	Million tonnes per year	*2*	*2*	*2*	*2*	*2.6*	*0.2*	*-0.5*	*-0.2*
Road passenger	Million tonnes per year	*7*	*7*	*7*	*7*	*-0.7*	*1.1*	*0.2*	*0.6*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*-6.0*	*7.9*	*1.2*	*4.5*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*1.7*	*1.4*	*0.2*	*0.8*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.1*	*3.8*	*0.2*	*2.0*
Air (Intra-EU)	Million tonnes per year	*2*	*1*	*2*	*2*	*-1.6*	*1.5*	*0.1*	*0.8*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.097	0.116	0.079	0.067	3.7	-3.8	-1.7	-2.7
Road	tonnes/1000 tkm	*0.353*	*0.360*	*0.299*	*0.246*	*0.3*	*-1.8*	*-2.0*	*-1.9*
Rail	tonnes/1000 tkm	*n.a.*	*n.a.*	*n.a.*	*n.a.*	*#WERT!*	*#WERT!*	*#WERT!*	*#WERT!*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.002*	*0.002*	*0.002*	*0.002*	*1.8*	*-1.5*	*-0.9*	*-1.2*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.185	0.173	0.155	0.141	-1.3	-1.1	-0.9	-1.0
Road	tonnes/1000 pkm	*0.195*	*0.182*	*0.162*	*0.147*	*-1.4*	*-1.1*	*-1.0*	*-1.1*
Rail	tonnes/1000 pkm	*0.018*	*0.017*	*0.015*	*0.014*	*-0.8*	*-0.9*	*-1.0*	*-0.9*
Air	tonnes/1000 pkm	*0.175*	*0.168*	*0.149*	*0.137*	*-0.9*	*-1.2*	*-0.8*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	38	31	33	35	-3.7	0.7	0.5	0.6
Road freight	1000 Tonnes per year	*2*	*2*	*1*	*1*	*-5.9*	*-2.1*	*-1.2*	*-1.7*
Road passenger	1000 Tonnes per year	*15*	*10*	*7*	*5*	*-8.0*	*-3.8*	*-1.9*	*-2.8*
Rail freight	1000 Tonnes per year	*1*	*1*	*2*	*2*	*-6.0*	*7.9*	*1.2*	*4.5*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*1.0*	*0.7*	*-0.6*	*0.1*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-2.5*	*3.5*	*-0.1*	*1.7*
Air (Intra-EU)	1000 Tonnes per year	*19*	*18*	*22*	*25*	*-0.7*	*2.2*	*1.1*	*1.6*
PM10 Transport emissions	1000 Tonnes per year	2	2	2	2	-3.7	-0.5	0.3	-0.1
Road freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-4.0*	*-1.3*	*-0.1*	*-0.7*
Road passenger	1000 Tonnes per year	*2*	*1*	*1*	*1*	*-3.5*	*-0.1*	*0.5*	*0.2*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	1,348	1,517	2,032	2,427	2.4	3.0	1.8	2.4
Gasoline	1000 vehicles	*1,136*	*1,213*	*1,530*	*1,825*	*1.3*	*2.3*	*1.8*	*2.1*
Diesel	1000 vehicles	*195*	*252*	*314*	*317*	*5.3*	*2.2*	*0.1*	*1.1*
LPG/CNG	1000 vehicles	*0*	*2*	*36*	*85*	*0.0*	*32.9*	*9.0*	*20.4*
Bioethanol	1000 vehicles	*0*	*0*	*7*	*23*	*42.4*	*33.1*	*12.3*	*22.3*
Hybrid	1000 vehicles	*16*	*48*	*121*	*86*	*23.9*	*9.7*	*-3.4*	*2.9*
Electric	1000 vehicles	*1*	*0*	*23*	*76*	*-8.9*	*46.7*	*12.9*	*28.7*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*15*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*779*	*788*	*908*	*1,047*	*0.2*	*1.4*	*1.4*	*1.4*
Gasoline 1400-2000 cc	1000 vehicles	*335*	*403*	*598*	*755*	*3.8*	*4.0*	*2.4*	*3.2*
Gasoline >2000 cc	1000 vehicles	*48*	*22*	*24*	*22*	*-14.1*	*0.9*	*-0.8*	*0.0*
Diesel <2000 cc	1000 vehicles	*219*	*209*	*262*	*263*	*-0.9*	*2.3*	*0.0*	*1.2*
Diesel >2000 cc	1000 vehicles	*45*	*44*	*52*	*54*	*-0.6*	*1.7*	*0.4*	*1.1*
PreEURO	*1000 vehicles*	*680*	*67*	*2*	*0*	*-37.2*	*-30.1*	*-45.6*	*-38.3*
EURO I	1000 vehicles	*191*	*125*	*10*	*0*	*-8.2*	*-22.1*	*-38.1*	*-30.6*
EURO II	1000 vehicles	*417*	*254*	*43*	*1*	*-9.4*	*-16.3*	*-31.5*	*-24.3*
EURO III	1000 vehicles	*1,390*	*463*	*154*	*10*	*-19.7*	*-10.4*	*-23.8*	*-17.4*
EURO IV	1000 vehicles	*0*	*340*	*178*	*24*	*0.0*	*-6.3*	*-18.1*	*-12.4*
EURO V or later	1000 vehicles	*0*	*217*	*1,458*	*2,106*	*0.0*	*21.0*	*3.8*	*12.0*
Light duty vehicle fleet size	1000 vehicles	157	180	205	240	2.8	1.3	1.6	1.5
Gasoline and Diesel	1000 vehicles	*157*	*180*	*202*	*224*	*2.8*	*1.2*	*1.0*	*1.1*
Electric	1000 vehicles	*0*	*0*	*2*	*17*	*n.a.*	*n.a.*	*21.9*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	162	195	285	331	3.7	3.9	1.5	2.7
3.5-7.5 tonnes	1000 vehicles	*83*	*116*	*177*	*205*	*7.1*	*4.3*	*1.5*	*2.9*
7.5-16 tonnes	1000 vehicles	*22*	*30*	*46*	*54*	*7.0*	*4.3*	*1.5*	*2.9*
16-32 tonnes	1000 vehicles	*36*	*41*	*53*	*61*	*3.0*	*2.5*	*1.5*	*2.0*
>32 tonnes	1000 vehicles	*6*	*7*	*9*	*11*	*2.9*	*2.5*	*1.5*	*2.0*
PreEURO	*1000 vehicles*	*75*	*58*	*31*	*9*	*-5.1*	*-6.0*	*-11.7*	*-8.9*
EURO I	1000 vehicles	*19*	*18*	*15*	*8*	*-1.6*	*-1.8*	*-6.5*	*-4.2*
EURO II	1000 vehicles	*40*	*39*	*35*	*23*	*-0.5*	*-0.9*	*-4.4*	*-2.7*
EURO III	1000 vehicles	*29*	*39*	*38*	*29*	*6.2*	*-0.2*	*-2.4*	*-1.3*
EURO IV	1000 vehicles	*0*	*41*	*42*	*37*	*n.a.*	*0.1*	*-1.3*	*-0.6*
EURO V or later	1000 vehicles	*0*	*1*	*124*	*226*	*n.a.*	*59.0*	*6.2*	*29.9*

iTREN-2030 Integrated scenario
IT - Italy

Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	1,352	1,358	1,507	1,579	0.1	1.0	0.5	0.8
Freight transport activity originated in the country	Billion tonnes-km per year	346	348	397	393	0.1	1.3	-0.1	0.6
Road	Billion tonnes-km per year	177	180	202	201	0.4	1.1	0.0	0.5
Rail	Billion tonnes-km per year	18	18	21	21	0.2	1.6	0.0	0.8
Inland navigation	Billion tonnes-km per year	0	0	0	0	0.0	0.0	0.0	0.0
Maritime (Intra-EU)	Billion tonnes-km per year	152	150	174	170	-0.3	1.5	-0.2	0.6
Average freight transport distance	km	256	256	263	249	0.0	0.3	-0.6	-0.2
Freight transport activity on the national territory	Billion tonnes-km per year	206	209	239	241	0.2	1.4	0.1	0.7
Road	Billion tonnes-km per year	180	183	207	208	0.4	1.2	0.1	0.6
Rail	Billion tonnes-km per year	26	25	32	33	-0.8	2.4	0.3	1.3
Inland navigation	Billion tonnes-km per year	0	0	0	0	0.0	0.0	0.0	0.0
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	28	29	30	30	0.9	0.1	0.1	0.1
Trips originated in the country	Million trips per year	59,114	57,744	61,747	64,557	-0.5	0.7	0.4	0.6
Passenger transport activity originated in the cou	Billion pass-km per year	981	933	1,055	1,128	-1.0	1.2	0.7	1.0
Car	Billion pass-km per year	749	690	817	879	-1.6	1.7	0.7	1.2
Bus	Billion pass-km per year	111	118	105	105	1.3	-1.2	-0.1	-0.6
Rail	Billion pass-km per year	55	63	63	70	2.8	0.0	1.1	0.6
Air (Intra-EU)	Billion pass-km per year	38	33	37	37	-2.8	1.1	-0.1	0.5
Slow	Billion pass-km per year	27	29	33	38	1.0	1.4	1.5	1.4
Average passenger transport distance	km	16.6	16.2	17.1	17.5	-0.5	0.6	0.2	0.4
Passenger transport activity on the national territ	Billion pass-km per year	916	872	985	1,052	-1.0	1.2	0.7	0.9
Road	Billion pass-km per year	859	807	920	980	-1.2	1.3	0.6	1.0
Rail	Billion pass-km per year	56	65	65	72	2.8	0.1	1.1	0.6
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	434	400	486	541	-1.6	2.0	1.1	1.5
Motorization rate	cars/1000 inhabitants	596	596	685	765	0.0	1.4	1.1	1.3
ECONOMY INDICATORS									
GDP	Billion Euros 2005	1,243	1,240	1,421	1,509	-0.1	1.4	0.6	1.0
Employment	1000 Persons	25,110	21,270	20,782	18,742	-3.3	-0.2	-1.0	-0.6
Agriculture and fishery	1000 Persons	1,650	1,482	1,308	1,154	-2.1	-1.2	-1.2	-1.2
Construction	1000 Persons	1,848	1,629	1,571	1,391	-2.5	-0.4	-1.2	-0.8
Energy and water	1000 Persons	171	165	154	147	-0.8	-0.7	-0.5	-0.6
Industry	1000 Persons	4,481	3,214	3,932	3,556	-6.4	2.0	-1.0	0.5
Transport services	1000 Persons	889	791	762	682	-2.3	-0.4	-1.1	-0.7
Other services	1000 Persons	16,070	13,990	13,055	11,814	-2.7	-0.7	-1.0	-0.8
Population total	1000 Persons	58,034	58,466	58,367	57,115	0.1	0.0	-0.2	-0.1
Labour force	1000 Persons	37,141	37,260	36,490	35,002	0.1	-0.2	-0.4	-0.3
Retired (> 65 years)	1000 Persons	11,098	11,399	12,172	13,362	0.5	0.7	0.9	0.8
Transport taxation revenues	Million Euros 2005	42,257	37,528	42,412	47,470	-2.3	1.2	1.1	1.2
Fuel taxes	Million Euros 2005	19,706	16,880	16,894	17,612	-3.0	0.0	0.4	0.2
Emissions certificate	Million Euros 2005	0	307	1,379	1,262	0.0	16.2	-0.9	7.3
Road charges	Million Euros 2005	22,550	20,341	24,139	28,595	-2.0	1.7	1.7	1.7
ENERGY INDICATORS									
Primary energy production	Million toe per year	27	37	42	41	6.4	1.4	-0.2	0.6
Share of domestic energy production	%	15	24	28	27	9.4	1.5	-0.2	0.7
Final energy demand by source	Million toe per year	178	155	153	152	-2.7	-0.1	0.0	-0.1
Oil	Million toe per year	80	66	53	45	-3.7	-2.2	-1.6	-1.9
Gas	Million toe per year	71	59	68	73	-3.5	1.5	0.6	1.1
Coal, Nuclear	Million toe per year	16	15	12	10	-1.3	-2.7	-1.5	-2.1
Biomass	Million toe per year	7	6	9	13	-3.6	5.3	2.9	4.1
Other Renewables	Million toe per year	4	9	10	11	16.4	1.7	1.2	1.5
Final energy demand by consuming sector	Million toe per year	134	121	121	119	-2.0	0.0	-0.2	-0.1
Transport freight	Million toe per year	12	12	12	11	-0.8	0.0	-1.1	-0.5
Transport passenger	Million toe per year	34	31	28	25	-1.5	-1.2	-0.9	-1.0
Industry	Million toe per year	41	35	35	36	-2.8	-0.1	0.2	0.1
Residential and services	Million toe per year	48	43	46	47	-2.0	0.7	0.1	0.4
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.98	1.32	1.30	1.44	6.0	-0.1	1.0	0.4
Gasoline price	Euros2005 per litre	1.08	1.41	1.39	1.54	5.5	-0.1	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	1	2	6	13	29.4	11.6	7.2	9.4
Share of renewables in electricity	%	15	32	35	36	16.2	1.1	0.3	0.7
Share of renewables in final energy demand	%	5	9	12	15	14.6	2.7	2.0	2.3
Energy intensity of freight transport activity	toe/Million tkm	35	33	29	26	-0.8	-1.4	-1.1	-1.2
Energy intensity of passenger transport activity	toe/Million pkm	35	35	27	23	-0.4	-2.4	-1.5	-2.0
Energy intensity of economic activity	toe/Million Euros 2005	108	98	85	79	-1.9	-1.4	-0.8	-1.1

iTREN-2030 IT - Italy	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	122	108	105	101	-2.4	-0.3	-0.3	-0.3
Road freight	Million tonnes per year	*21*	*21*	*19*	*17*	*-0.2*	*-1.2*	*-0.9*	*-1.0*
Road passenger	Million tonnes per year	*91*	*78*	*77*	*74*	*-3.0*	*-0.2*	*-0.4*	*-0.3*
Rail freight	Million tonnes per year	*1*	*1*	*2*	*4*	*-0.1*	*5.7*	*7.8*	*6.8*
Rail passenger	Million tonnes per year	*1*	*1*	*1*	*1*	*1.7*	*-1.0*	*0.0*	*-0.5*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*0.4*	*-0.3*	*-1.2*	*-0.8*
Air (Intra-EU)	Million tonnes per year	*7*	*6*	*6*	*5*	*-3.5*	*0.2*	*-1.0*	*-0.4*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.064	0.064	0.051	0.052	-0.2	-2.1	0.2	-1.0
Road	tonnes/1000 tkm	*0.117*	*0.114*	*0.089*	*0.081*	*-0.6*	*-2.4*	*-1.0*	*-1.7*
Rail	tonnes/1000 tkm	*0.040*	*0.041*	*0.057*	*0.116*	*0.7*	*3.3*	*7.5*	*5.3*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.006*	*0.006*	*0.005*	*0.005*	*0.6*	*-1.8*	*-1.0*	*-1.4*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.103	0.094	0.082	0.073	-1.9	-1.4	-1.1	-1.2
Road	tonnes/1000 pkm	*0.106*	*0.097*	*0.084*	*0.075*	*-1.7*	*-1.5*	*-1.1*	*-1.3*
Rail	tonnes/1000 pkm	*0.017*	*0.016*	*0.014*	*0.013*	*-1.0*	*-1.1*	*-1.1*	*-1.1*
Air	tonnes/1000 pkm	*0.173*	*0.167*	*0.153*	*0.139*	*-0.7*	*-0.8*	*-0.9*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	569	362	244	207	-8.6	-3.9	-1.6	-2.8
Road freight	1000 Tonnes per year	*88*	*71*	*36*	*22*	*-4.1*	*-6.7*	*-4.8*	*-5.8*
Road passenger	1000 Tonnes per year	*374*	*194*	*105*	*84*	*-12.3*	*-6.0*	*-2.2*	*-4.1*
Rail freight	1000 Tonnes per year	*2*	*1*	*2*	*4*	*-4.1*	*3.9*	*7.3*	*5.6*
Rail passenger	1000 Tonnes per year	*7*	*8*	*6*	*6*	*1.2*	*-1.7*	*-1.0*	*-1.3*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*20*	*20*	*19*	*16*	*0.0*	*-0.6*	*-1.6*	*-1.1*
Air (Intra-EU)	1000 Tonnes per year	*78*	*68*	*76*	*75*	*-2.6*	*1.1*	*-0.1*	*0.5*
PM10 Transport emissions	1000 Tonnes per year	33	26	19	16	-5.0	-3.1	-1.7	-2.4
Road freight	1000 Tonnes per year	*9*	*6*	*4*	*3*	*-7.1*	*-4.4*	*-1.5*	*-3.0*
Road passenger	1000 Tonnes per year	*25*	*20*	*15*	*12*	*-4.3*	*-2.8*	*-1.8*	*-2.3*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	34,604	34,841	39,991	43,702	0.1	1.4	0.9	1.1
Gasoline	1000 vehicles	*23,254*	*19,258*	*16,159*	*16,938*	*-3.7*	*-1.7*	*0.5*	*-0.6*
Diesel	1000 vehicles	*9,423*	*12,673*	*16,480*	*16,870*	*6.1*	*2.7*	*0.2*	*1.4*
LPG/CNG	1000 vehicles	*1,747*	*2,293*	*3,451*	*2,896*	*5.6*	*4.2*	*-1.7*	*1.2*
Bioethanol	1000 vehicles	*0*	*12*	*253*	*517*	*425.7*	*35.6*	*7.4*	*20.7*
Hybrid	1000 vehicles	*180*	*538*	*903*	*427*	*24.4*	*5.3*	*-7.2*	*-1.1*
Electric	1000 vehicles	*0*	*67*	*2,738*	*5,075*	*0.0*	*45.0*	*6.4*	*24.2*
Fuel cells	1000 vehicles	*0*	*0*	*7*	*979*	*0.0*	*0.0*	*63.2*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*19,192*	*16,056*	*14,116*	*14,765*	*-3.5*	*-1.3*	*0.5*	*-0.4*
Gasoline 1400-2000 cc	1000 vehicles	*4,032*	*2,878*	*1,652*	*1,786*	*-6.5*	*-5.4*	*0.8*	*-2.4*
Gasoline >2000 cc	1000 vehicles	*321*	*324*	*392*	*387*	*0.2*	*1.9*	*-0.1*	*0.9*
Diesel <2000 cc	1000 vehicles	*7,485*	*10,371*	*13,762*	*14,064*	*6.7*	*2.9*	*0.2*	*1.5*
Diesel >2000 cc	1000 vehicles	*2,104*	*2,302*	*2,718*	*2,806*	*1.8*	*1.7*	*0.3*	*1.0*
PreEURO	*1000 vehicles*	*8,952*	*3,424*	*158*	*1*	*-17.5*	*-26.5*	*-41.6*	*-34.5*
EURO I	1000 vehicles	*7,075*	*4,248*	*540*	*8*	*-9.7*	*-18.6*	*-34.0*	*-26.7*
EURO II	1000 vehicles	*7,559*	*5,574*	*1,381*	*60*	*-5.9*	*-13.0*	*-26.9*	*-20.3*
EURO III	1000 vehicles	*10,998*	*9,262*	*3,996*	*453*	*-3.4*	*-8.1*	*-19.6*	*-14.0*
EURO IV	1000 vehicles	*0*	*6,263*	*3,798*	*816*	*0.0*	*-4.9*	*-14.3*	*-9.7*
EURO V or later	1000 vehicles	*0*	*3,160*	*22,765*	*32,469*	*0.0*	*21.8*	*3.6*	*12.4*
Light duty vehicle fleet size	1000 vehicles	975	1,000	1,060	1,121	0.5	0.6	0.6	0.6
Gasoline and Diesel	1000 vehicles	*975*	*1,000*	*1,047*	*1,040*	*0.5*	*0.5*	*-0.1*	*0.2*
Electric	1000 vehicles	*0*	*0*	*12*	*81*	*n.a.*	*n.a.*	*20.5*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	1,553	1,242	1,409	1,466	-4.4	1.3	0.4	0.8
3.5-7.5 tonnes	1000 vehicles	*475*	*523*	*617*	*644*	*1.9*	*1.7*	*0.4*	*1.0*
7.5-16 tonnes	1000 vehicles	*124*	*137*	*161*	*169*	*1.9*	*1.7*	*0.5*	*1.1*
16-32 tonnes	1000 vehicles	*436*	*455*	*493*	*509*	*0.8*	*0.8*	*0.3*	*0.6*
>32 tonnes	1000 vehicles	*122*	*127*	*139*	*144*	*0.8*	*0.9*	*0.4*	*0.6*
PreEURO	*1000 vehicles*	*783*	*333*	*2*	*0*	*-15.7*	*-41.1*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*190*	*141*	*19*	*0*	*-5.7*	*-18.3*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*286*	*220*	*148*	*0*	*-5.2*	*-3.9*	*-63.3*	*-40.6*
EURO III	1000 vehicles	*294*	*287*	*288*	*26*	*-0.5*	*0.0*	*-21.3*	*-11.3*
EURO IV	1000 vehicles	*0*	*232*	*244*	*134*	*n.a.*	*0.5*	*-5.8*	*-2.7*
EURO V or later	1000 vehicles	*0*	*30*	*709*	*1,306*	*n.a.*	*37.4*	*6.3*	*20.8*

iTREN-2030 LT - Lithuania	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	99	102	137	172	0.7	3.0	2.3	2.6
Freight transport activity originated in the country	Billion tonnes-km per year	47	47	84	107	0.1	5.9	2.4	4.1
Road	Billion tonnes-km per year	*15*	*15*	*24*	*32*	*-0.5*	*4.8*	*2.8*	*3.8*
Rail	Billion tonnes-km per year	*9*	*10*	*13*	*16*	*1.0*	*3.1*	*1.8*	*2.5*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*22*	*23*	*47*	*59*	*0.1*	*7.6*	*2.4*	*4.9*
Average freight transport distance	km	477	463	614	619	-0.6	2.9	0.1	1.5
Freight transport activity on the national territory	Billion tonnes-km per year	17	18	25	32	1.3	3.2	2.5	2.8
Road	Billion tonnes-km per year	*10*	*11*	*15*	*20*	*0.6*	*3.6*	*2.9*	*3.2*
Rail	Billion tonnes-km per year	*7*	*8*	*10*	*12*	*2.5*	*2.5*	*1.9*	*2.2*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	2	3	3	4	1.0	1.5	2.4	1.9
Trips originated in the country	Million trips per year	3,584	3,550	3,771	3,817	-0.2	0.6	0.1	0.4
Passenger transport activity originated in the cou	Billion pass-km per year	30	29	35	37	-0.5	1.9	0.5	1.2
Car	Billion pass-km per year	*23*	*22*	*27*	*29*	*-0.7*	*2.1*	*0.6*	*1.4*
Bus	Billion pass-km per year	*3*	*3*	*4*	*4*	*-0.1*	*0.6*	*0.3*	*0.4*
Rail	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.7*	*0.6*	*0.1*	*0.3*
Air (Intra-EU)	Billion pass-km per year	*1*	*1*	*1*	*1*	*-0.3*	*3.4*	*0.8*	*2.1*
Slow	Billion pass-km per year	*2*	*2*	*2*	*2*	*1.3*	*0.7*	*0.4*	*0.5*
Average passenger transport distance	km	8.3	8.2	9.3	9.7	-0.3	1.2	0.4	0.8
Passenger transport activity on the national territ	Billion pass-km per year	26	25	31	32	-0.6	1.8	0.5	1.2
Road	Billion pass-km per year	*25*	*24*	*29*	*31*	*-0.7*	*1.9*	*0.5*	*1.2*
Rail	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.7*	*0.6*	*0.1*	*0.3*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	17	16	21	22	-0.6	2.5	0.8	1.7
Motorization rate	cars/1000 inhabitants	377	423	557	637	2.3	2.8	1.4	2.1
ECONOMY INDICATORS									
GDP	Billion Euros 2005	12	13	18	25	1.1	3.6	3.0	3.3
Employment	1000 Persons	1,915	1,732	1,966	1,910	-2.0	1.3	-0.3	0.5
Agriculture and fishery	1000 Persons	*230*	*180*	*192*	*209*	*-4.8*	*0.6*	*0.9*	*0.8*
Construction	1000 Persons	*171*	*146*	*153*	*161*	*-3.1*	*0.4*	*0.5*	*0.5*
Energy and water	1000 Persons	*5*	*3*	*3*	*3*	*-8.6*	*-0.1*	*-1.7*	*-0.9*
Industry	1000 Persons	*542*	*459*	*564*	*455*	*-3.3*	*2.1*	*-2.1*	*0.0*
Transport services	1000 Persons	*65*	*59*	*88*	*85*	*-2.0*	*4.1*	*-0.3*	*1.9*
Other services	1000 Persons	*903*	*886*	*967*	*998*	*-0.4*	*0.9*	*0.3*	*0.6*
Population total	1000 Persons	3,414	3,342	3,202	3,089	-0.4	-0.4	-0.4	-0.4
Labour force	1000 Persons	*2,104*	*2,143*	*2,113*	*2,002*	*0.4*	*-0.1*	*-0.5*	*-0.3*
Retired (> 65 years)	1000 Persons	*529*	*546*	*550*	*589*	*0.6*	*0.1*	*0.7*	*0.4*
Transport taxation revenues	Million Euros 2005	486	466	657	813	-0.8	3.5	2.1	2.8
Fuel taxes	Million Euros 2005	*486*	*453*	*534*	*589*	*-1.4*	*1.7*	*1.0*	*1.3*
Emissions certificate	Million Euros 2005	*0*	*12*	*63*	*69*	*0.0*	*18.4*	*0.8*	*9.2*
Road charges	Million Euros 2005	*0*	*2*	*60*	*155*	*0.0*	*42.8*	*10.1*	*25.4*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

iTREN-2030 LT - Lithuania	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	5	4	5	5	-1.7	1.2	0.5	0.9
Road freight	Million tonnes per year	*1*	*1*	*1*	*2*	*-1.1*	*1.1*	*1.4*	*1.3*
Road passenger	Million tonnes per year	*3*	*3*	*3*	*3*	*-2.1*	*0.9*	*-0.2*	*0.3*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.2*	*5.5*	*2.3*	*3.9*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.5*	*-0.3*	*-0.9*	*-0.6*
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.0*	*5.0*	*0.9*	*2.9*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.5*	*2.3*	*-0.2*	*1.0*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.041	0.037	0.025	0.023	-1.7	-3.8	-0.9	-2.3
Road	tonnes/1000 tkm	*0.136*	*0.125*	*0.098*	*0.085*	*-1.6*	*-2.4*	*-1.4*	*-1.9*
Rail	tonnes/1000 tkm	*0.024*	*0.020*	*0.026*	*0.027*	*-3.6*	*2.9*	*0.4*	*1.7*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.003*	*0.002*	*0.002*	*0.002*	*-1.1*	*-2.4*	*-1.5*	*-1.9*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.116	0.107	0.098	0.091	-1.5	-0.9	-0.7	-0.8
Road	tonnes/1000 pkm	*0.119*	*0.111*	*0.101*	*0.094*	*-1.4*	*-1.0*	*-0.7*	*-0.8*
Rail	tonnes/1000 pkm	*0.008*	*0.008*	*0.007*	*0.006*	*-1.2*	*-0.9*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.153*	*0.145*	*0.130*	*0.118*	*-1.1*	*-1.0*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	21	13	12	12	-9.9	-0.4	0.0	-0.2
Road freight	1000 Tonnes per year	*6*	*4*	*2*	*2*	*-9.1*	*-4.1*	*-2.9*	*-3.5*
Road passenger	1000 Tonnes per year	*11*	*5*	*3*	*3*	*-15.1*	*-4.0*	*-1.7*	*-2.9*
Rail freight	1000 Tonnes per year	*2*	*2*	*4*	*5*	*-1.2*	*5.5*	*2.3*	*3.9*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-0.9*	*-1.3*	*-2.1*	*-1.7*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*1*	*1*	*2*	*2*	*-1.6*	*4.4*	*0.4*	*2.4*
Air (Intra-EU)	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-0.7*	*3.0*	*0.6*	*1.8*
PM10 Transport emissions	1000 Tonnes per year	1	1	1	1	-4.5	-1.6	-0.1	-0.8
Road freight	1000 Tonnes per year	*1*	*1*	*0*	*0*	*-5.9*	*-1.6*	*0.2*	*-0.7*
Road passenger	1000 Tonnes per year	*1*	*0*	*0*	*0*	*-2.7*	*-1.5*	*-0.4*	*-1.0*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	1,287	1,413	1,782	1,969	1.9	2.3	1.0	1.7
Gasoline	1000 vehicles	*1,165*	*1,278*	*1,608*	*1,759*	*1.9*	*2.3*	*0.9*	*1.6*
Diesel	1000 vehicles	*110*	*121*	*128*	*119*	*2.0*	*0.5*	*-0.7*	*-0.1*
LPG/CNG	1000 vehicles	*12*	*10*	*27*	*43*	*-2.8*	*10.2*	*4.8*	*7.4*
Bioethanol	1000 vehicles	*0*	*0*	*4*	*11*	*40.8*	*32.3*	*9.0*	*20.1*
Hybrid	1000 vehicles	*1*	*3*	*7*	*7*	*28.0*	*8.9*	*0.3*	*4.5*
Electric	1000 vehicles	*0*	*0*	*8*	*28*	*24.8*	*33.3*	*13.0*	*22.7*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*2*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*327*	*361*	*443*	*470*	*2.0*	*2.1*	*0.6*	*1.3*
Gasoline 1400-2000 cc	1000 vehicles	*673*	*737*	*929*	*1,023*	*1.8*	*2.3*	*1.0*	*1.7*
Gasoline >2000 cc	1000 vehicles	*164*	*179*	*237*	*266*	*1.7*	*2.8*	*1.2*	*2.0*
Diesel <2000 cc	1000 vehicles	*72*	*80*	*80*	*74*	*2.0*	*0.1*	*-0.8*	*-0.4*
Diesel >2000 cc	1000 vehicles	*37*	*41*	*47*	*45*	*2.1*	*1.3*	*-0.4*	*0.5*
PreEURO	*1000 vehicles*	*114*	*12*	*0*	*0*	*-36.4*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*7*	*5*	*0*	*0*	*-6.8*	*-95.8*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*22*	*19*	*0*	*0*	*-2.5*	*-52.6*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*1,143*	*1,118*	*128*	*0*	*-0.4*	*-19.5*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*174*	*133*	*0*	*0.0*	*-2.6*	*-77.8*	*-53.5*
EURO V or later	1000 vehicles	*0*	*71*	*1,475*	*1,879*	*0.0*	*35.4*	*2.5*	*17.8*
Light duty vehicle fleet size	1000 vehicles	195	182	134	164	-1.4	-3.0	2.1	-0.5
Gasoline and Diesel	1000 vehicles	*195*	*182*	*133*	*157*	*-1.4*	*-3.1*	*1.7*	*-0.7*
Electric	1000 vehicles	*0*	*0*	*0*	*7*	*n.a.*	*n.a.*	*30.6*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	77	73	93	116	-1.0	2.5	2.3	2.4
3.5-7.5 tonnes	1000 vehicles	*31*	*36*	*45*	*56*	*2.9*	*2.3*	*2.3*	*2.3*
7.5-16 tonnes	1000 vehicles	*8*	*9*	*12*	*15*	*2.9*	*2.3*	*2.3*	*2.3*
16-32 tonnes	1000 vehicles	*20*	*24*	*31*	*39*	*3.6*	*2.8*	*2.2*	*2.5*
>32 tonnes	1000 vehicles	*4*	*4*	*6*	*7*	*3.5*	*2.8*	*2.2*	*2.5*
PreEURO	*1000 vehicles*	*47*	*30*	*11*	*1*	*-8.8*	*-9.2*	*-19.5*	*-14.5*
EURO I	1000 vehicles	*3*	*3*	*2*	*1*	*-5.1*	*-2.6*	*-9.2*	*-6.0*
EURO II	1000 vehicles	*4*	*3*	*3*	*2*	*-4.9*	*-1.5*	*-5.8*	*-3.7*
EURO III	1000 vehicles	*22*	*22*	*20*	*16*	*0.1*	*-0.7*	*-2.6*	*-1.7*
EURO IV	1000 vehicles	*0*	*13*	*13*	*11*	*n.a.*	*-0.5*	*-1.2*	*-0.8*
EURO V or later	1000 vehicles	*0*	*2*	*44*	*86*	*n.a.*	*37.1*	*6.9*	*21.1*

iTREN-2030 LU - Luxembourg	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	224	225	294	350	0.1	2.7	1.8	2.2
Freight transport activity originated in the country	Billion tonnes-km per year	15	15	19	23	0.1	2.7	1.8	2.2
Road	Billion tonnes-km per year	*13*	*13*	*17*	*21*	*0.1*	*2.8*	*1.8*	*2.3*
Rail	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-0.5*	*1.4*	*0.7*	*1.0*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Average freight transport distance	km	65	65	65	65	0.0	0.0	0.0	0.0
Freight transport activity on the national territory	Billion tonnes-km per year	5	5	7	8	0.1	2.7	1.8	2.2
Road	Billion tonnes-km per year	*5*	*5*	*6*	*8*	*0.1*	*2.8*	*1.8*	*2.3*
Rail	Billion tonnes-km per year	*0*	*0*	*1*	*1*	*-0.5*	*1.4*	*0.7*	*1.0*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	1	2	2	2	23.0	1.4	2.6	2.0
Trips originated in the country	Million trips per year	-	-	-	-	-	-	-	-
Passenger transport activity originated in the cou	Billion pass-km per year	-	-	-	-	-	-	-	-
Car	Billion pass-km per year	-	-	-	-	-	-	-	-
Bus	Billion pass-km per year	-	-	-	-	-	-	-	-
Rail	Billion pass-km per year	-	-	-	-	-	-	-	-
Air (Intra-EU)	Billion pass-km per year	-	-	-	-	-	-	-	-
Slow	Billion pass-km per year	-	-	-	-	-	-	-	-
Average passenger transport distance	km	-	-	-	-	-	-	-	-
Passenger transport activity on the national territ	Billion pass-km per year	11	12	15	18	1.3	2.0	2.1	2.1
Road	Billion pass-km per year	*11*	*12*	*15*	*18*	*1.3*	*2.0*	*2.1*	*2.1*
Rail	Billion pass-km per year	*0*	*0*	*0*	*0*	*0.7*	*0.9*	*0.8*	*0.9*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	6	7	8	10	1.4	2.2	2.2	2.2
Motorization rate	cars/1000 inhabitants	654	680	777	890	0.8	1.3	1.4	1.4
ECONOMY INDICATORS									
GDP	Billion Euros 2005	-	-	-	-	-	-	-	-
Employment	1000 Persons	-	-	-	-	-	-	-	-
Agriculture and fishery	1000 Persons	-	-	-	-	-	-	-	-
Construction	1000 Persons	-	-	-	-	-	-	-	-
Energy and water	1000 Persons	-	-	-	-	-	-	-	-
Industry	1000 Persons	-	-	-	-	-	-	-	-
Transport services	1000 Persons	-	-	-	-	-	-	-	-
Other services	1000 Persons	-	-	-	-	-	-	-	-
Population total	1000 Persons	-	-	-	-	-	-	-	-
Labour force	1000 Persons	-	-	-	-	-	-	-	-
Retired (> 65 years)	1000 Persons	-	-	-	-	-	-	-	-
Transport taxation revenues	Million Euros 2005	0	0	0	0	0.0	0.0	0.0	0.0
Fuel taxes	Million Euros 2005	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Emissions certificate	Million Euros 2005	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road charges	Million Euros 2005	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

The ITREN-2030 integrated scenario until 2030

iTREN-2030 LU - Luxembourg	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	0	0	0	0	0.0	0.0	0.0	0.0
Road freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0
Road	tonnes/1000 tkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Rail	tonnes/1000 tkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0
Road	tonnes/1000 pkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Rail	tonnes/1000 pkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Air	tonnes/1000 pkm	-	-	-	-	-	-	-	-
NOx Transport emissions	1000 Tonnes per year	0	0	0	0	0.0	0.0	0.0	0.0
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Air (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
PM10 Transport emissions	1000 Tonnes per year	0	0	0	0	0.0	0.0	0.0	0.0
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	303	325	407	507	1.5	2.3	2.2	2.2
Gasoline	1000 vehicles	*113*	*86*	*121*	*148*	*-5.4*	*3.5*	*2.1*	*2.8*
Diesel	1000 vehicles	*189*	*239*	*286*	*359*	*4.8*	*1.8*	*2.3*	*2.0*
LPG/CNG	1000 vehicles	*0*	*0*	*0*	*0*	*-13.6*	*-0.3*	*1.2*	*0.4*
Bioethanol	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Hybrid	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*45*	*53*	*73*	*93*	*3.3*	*3.3*	*2.4*	*2.8*
Gasoline 1400-2000 cc	1000 vehicles	*49*	*24*	*40*	*51*	*-12.8*	*5.1*	*2.3*	*3.7*
Gasoline >2000 cc	1000 vehicles	*19*	*8*	*7*	*4*	*-15.5*	*-1.1*	*-5.1*	*-3.2*
Diesel <2000 cc	1000 vehicles	*143*	*195*	*240*	*303*	*6.3*	*2.1*	*2.3*	*2.2*
Diesel >2000 cc	1000 vehicles	*46*	*44*	*46*	*56*	*-0.6*	*0.4*	*2.1*	*1.2*
PreEURO	*1000 vehicles*	*0*	*0*	*0*	*0*	*-95.2*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*4*	*0*	*0*	*0*	*-79.7*	*-100.0*	*0.0*	*-100.0*
EURO II	1000 vehicles	*61*	*1*	*0*	*0*	*-52.9*	*-100.0*	*0.0*	*-100.0*
EURO III	1000 vehicles	*238*	*74*	*0*	*0*	*-20.7*	*-73.4*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*137*	*0*	*0*	*0.0*	*-51.5*	*-100.0*	*-100.0*
EURO V or later	1000 vehicles	*0*	*112*	*406*	*507*	*0.0*	*13.7*	*2.2*	*7.8*
Light duty vehicle fleet size	1000 vehicles	0	0	0	0	n.a.	n.a.	n.a.	n.a.
Gasoline and Diesel	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	15	16	21	25	1.5	2.4	1.9	2.1
3.5-7.5 tonnes	1000 vehicles	*7*	*9*	*11*	*13*	*2.9*	*2.4*	*1.9*	*2.1*
7.5-16 tonnes	1000 vehicles	*2*	*2*	*3*	*3*	*2.8*	*2.4*	*1.9*	*2.1*
16-32 tonnes	1000 vehicles	*4*	*5*	*6*	*7*	*2.8*	*2.4*	*1.9*	*2.1*
>32 tonnes	1000 vehicles	*1*	*1*	*1*	*1*	*2.8*	*2.4*	*1.9*	*2.1*
PreEURO	*1000 vehicles*	*4*	*2*	*0*	*0*	*-13.7*	*-19.5*	*-30.9*	*-25.4*
EURO I	1000 vehicles	*2*	*1*	*0*	*0*	*-7.5*	*-13.4*	*-25.5*	*-19.7*
EURO II	1000 vehicles	*4*	*4*	*1*	*0*	*-4.6*	*-9.4*	*-20.1*	*-14.9*
EURO III	1000 vehicles	*4*	*5*	*3*	*1*	*2.2*	*-5.3*	*-14.3*	*-9.9*
EURO IV	1000 vehicles	*0*	*4*	*3*	*1*	*n.a.*	*-2.7*	*-10.2*	*-6.5*
EURO V or later	1000 vehicles	*0*	*1*	*13*	*23*	*n.a.*	*36.5*	*5.9*	*20.2*

iTREN-2030 LV - Latvia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	63	64	80	93	0.4	2.3	1.6	1.9
Freight transport activity originated in the country	Billion tonnes-km per year	20	21	45	57	1.0	7.9	2.5	5.2
Road	Billion tonnes-km per year	*5*	*6*	*9*	*11*	*0.1*	*4.8*	*2.5*	*3.6*
Rail	Billion tonnes-km per year	*10*	*11*	*24*	*31*	*0.9*	*8.4*	*2.5*	*5.4*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*4*	*5*	*12*	*15*	*2.0*	*9.8*	*2.5*	*6.1*
Average freight transport distance	km	316	325	557	611	0.6	5.5	0.9	3.2
Freight transport activity on the national territory	Billion tonnes-km per year	7	8	12	15	1.9	4.7	2.4	3.6
Road	Billion tonnes-km per year	*5*	*5*	*6*	*8*	*-0.7*	*3.5*	*2.6*	*3.0*
Rail	Billion tonnes-km per year	*3*	*3*	*6*	*7*	*-1.0*	*6.4*	*2.2*	*4.3*
Inland navigation	Billion tonnes-km per year	*-1*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	1	1	1	1	0.3	0.2	1.9	1.0
Trips originated in the country	Million trips per year	1,900	1,809	1,870	1,892	-1.0	0.3	0.1	0.2
Passenger transport activity originated in the cou	Billion pass-km per year	16	15	18	18	-1.4	1.7	0.3	1.0
Car	Billion pass-km per year	*10*	*9*	*11*	*11*	*-1.9*	*2.0*	*0.2*	*1.1*
Bus	Billion pass-km per year	*3*	*3*	*3*	*3*	*-1.2*	*0.7*	*0.3*	*0.5*
Rail	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.2*	*1.3*	*0.6*	*1.0*
Air (Intra-EU)	Billion pass-km per year	*1*	*1*	*1*	*1*	*-0.3*	*3.0*	*0.4*	*1.7*
Slow	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.4*	*0.6*	*0.5*	*0.5*
Average passenger transport distance	km	8.6	8.4	9.6	9.8	-0.4	1.3	0.2	0.7
Passenger transport activity on the national territ	Billion pass-km per year	13	12	14	15	-1.5	1.6	0.3	1.0
Road	Billion pass-km per year	*12*	*11*	*13*	*13*	*-1.6*	*1.6*	*0.3*	*1.0*
Rail	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.2*	*1.3*	*0.6*	*1.0*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	7	7	8	9	-1.6	2.3	0.5	1.4
Motorization rate	cars/1000 inhabitants	263	307	417	463	3.1	3.1	1.0	2.1
ECONOMY INDICATORS									
GDP	Billion Euros 2005	9	9	12	15	1.5	2.7	1.9	2.3
Employment	1000 Persons	1,359	1,186	1,193	1,108	-2.7	0.1	-0.7	-0.3
Agriculture and fishery	1000 Persons	*169*	*155*	*120*	*118*	*-1.7*	*-2.5*	*-0.1*	*-1.3*
Construction	1000 Persons	*161*	*102*	*112*	*101*	*-8.7*	*0.9*	*-1.1*	*-0.1*
Energy and water	1000 Persons	*0*	*0*	*0*	*0*	*-3.9*	*-2.8*	*0.3*	*-1.3*
Industry	1000 Persons	*440*	*397*	*435*	*359*	*-2.1*	*0.9*	*-1.9*	*-0.5*
Transport services	1000 Persons	*57*	*52*	*82*	*88*	*-1.7*	*4.6*	*0.7*	*2.6*
Other services	1000 Persons	*531*	*479*	*443*	*441*	*-2.1*	*-0.8*	*0.0*	*-0.4*
Population total	1000 Persons	2,297	2,228	2,115	2,025	-0.6	-0.5	-0.4	-0.5
Labour force	1000 Persons	*1,407*	*1,420*	*1,342*	*1,266*	*0.2*	*-0.6*	*-0.6*	*-0.6*
Retired (> 65 years)	1000 Persons	*415*	*425*	*415*	*427*	*0.5*	*-0.2*	*0.3*	*0.0*
Transport taxation revenues	Million Euros 2005	908	306	421	498	-19.5	3.2	1.7	2.5
Fuel taxes	Million Euros 2005	*908*	*298*	*340*	*367*	*-20.0*	*1.3*	*0.8*	*1.0*
Emissions certificate	Million Euros 2005	*0*	*9*	*45*	*47*	*0.0*	*18.0*	*0.4*	*8.9*
Road charges	Million Euros 2005	*0*	*0*	*35*	*84*	*0.0*	*0.0*	*9.1*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

iTREN-2030 LV - Latvia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	3	3	4	4	-2.2	1.4	0.5	1.0
Road freight	Million tonnes per year	1	1	1	1	-1.5	0.6	1.4	1.0
Road passenger	Million tonnes per year	2	2	2	2	-2.6	1.0	-0.3	0.4
Rail freight	Million tonnes per year	0	0	0	0	-3.0	8.2	2.3	5.2
Rail passenger	Million tonnes per year	0	0	0	0	-0.9	0.4	-0.3	0.0
Inland navigation	Million tonnes per year	0	0	0	0	0.0	0.0	0.0	0.0
Maritime (Intra-EU)	Million tonnes per year	0	0	0	0	-1.6	4.6	0.6	2.6
Air (Intra-EU)	Million tonnes per year	0	0	0	0	-1.1	1.7	-0.5	0.6
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.109	0.091	0.058	0.053	-3.6	-4.4	-0.9	-2.6
Road	tonnes/1000 tkm	0.207	0.199	0.151	0.134	-0.8	-2.7	-1.2	-2.0
Rail	tonnes/1000 tkm	0.058	0.052	0.061	0.062	-2.0	1.7	0.1	0.9
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	0.010	0.009	0.005	0.004	-3.5	-4.7	-1.9	-3.3
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.166	0.157	0.147	0.139	-1.1	-0.7	-0.6	-0.6
Road	tonnes/1000 pkm	0.180	0.172	0.161	0.152	-1.0	-0.7	-0.5	-0.6
Rail	tonnes/1000 pkm	0.008	0.007	0.007	0.006	-1.1	-0.9	-1.0	-0.9
Air	tonnes/1000 pkm	0.200	0.192	0.170	0.155	-0.7	-1.2	-0.9	-1.1
NOx Transport emissions	1000 Tonnes per year	16	9	11	12	-10.7	1.8	0.7	1.2
Road freight	1000 Tonnes per year	3	2	1	1	-12.7	-3.4	-1.9	-2.6
Road passenger	1000 Tonnes per year	8	3	2	2	-16.6	-4.5	-2.4	-3.5
Rail freight	1000 Tonnes per year	3	2	5	7	-3.0	8.2	2.3	5.2
Rail passenger	1000 Tonnes per year	0	0	0	0	-1.3	-0.5	-1.5	-1.0
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	1	1	1	1	-2.0	4.2	0.2	2.2
Air (Intra-EU)	1000 Tonnes per year	1	1	1	1	-0.1	2.0	0.4	1.2
PM10 Transport emissions	1000 Tonnes per year	1	1	1	1	-5.6	-2.0	-0.5	-1.2
Road freight	1000 Tonnes per year	0	0	0	0	-5.7	-2.4	0.1	-1.2
Road passenger	1000 Tonnes per year	0	0	0	0	-5.5	-1.5	-1.0	-1.2
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	605	685	883	938	2.5	2.6	0.6	1.6
Gasoline	1000 vehicles	547	624	796	821	2.7	2.5	0.3	1.4
Diesel	1000 vehicles	52	60	64	56	2.8	0.7	-1.3	-0.3
LPG/CNG	1000 vehicles	5	1	17	32	-28.2	32.0	6.6	18.6
Bioethanol	1000 vehicles	0	0	5	19	47.1	36.8	13.4	24.6
Hybrid	1000 vehicles	0	0	0	0	27.2	4.1	-1.6	1.2
Electric	1000 vehicles	0	0	1	3	0.0	30.5	17.9	24.0
Fuel cells	1000 vehicles	0	0	0	6	0.0	0.0	139.6	0.0
Gasoline <1400 cc	*1000 vehicles*	152	175	218	219	2.8	2.2	0.0	1.1
Gasoline 1400-2000 cc	1000 vehicles	317	360	460	478	2.6	2.5	0.4	1.4
Gasoline >2000 cc	1000 vehicles	78	89	117	124	2.5	2.8	0.5	1.7
Diesel <2000 cc	1000 vehicles	34	39	40	35	2.8	0.3	-1.5	-0.6
Diesel >2000 cc	1000 vehicles	18	21	24	21	2.8	1.5	-1.0	0.2
PreEURO	*1000 vehicles*	74	10	0	0	-33.3	-100.0	0.0	-100.0
EURO I	1000 vehicles	5	4	0	0	-6.7	-100.0	0.0	-100.0
EURO II	1000 vehicles	16	14	0	0	-2.3	-52.6	-100.0	-100.0
EURO III	1000 vehicles	510	524	59	0	0.5	-19.7	-100.0	-100.0
EURO IV	1000 vehicles	0	95	72	0	0.0	-2.7	-77.6	-53.3
EURO V or later	1000 vehicles	0	38	729	877	0.0	34.4	1.9	17.0
Light duty vehicle fleet size	1000 vehicles	278	269	235	268	-0.6	-1.3	1.3	0.0
Gasoline and Diesel	1000 vehicles	278	269	234	259	-0.6	-1.4	1.0	-0.2
Electric	1000 vehicles	0	0	1	9	n.a.	n.a.	25.1	n.a.
Heavy duty vehicle fleet size	1000 vehicles	89	59	71	88	-7.9	1.8	2.2	2.0
3.5-7.5 tonnes	1000 vehicles	26	29	34	43	2.6	1.6	2.2	1.9
7.5-16 tonnes	1000 vehicles	7	8	9	11	2.5	1.6	2.2	1.9
16-32 tonnes	1000 vehicles	16	19	23	29	3.1	2.1	2.2	2.2
>32 tonnes	1000 vehicles	3	3	4	5	3.1	2.1	2.2	2.1
PreEURO	*1000 vehicles*	44	18	6	1	-16.9	-9.5	-19.8	-14.8
EURO I	1000 vehicles	4	2	1	0	-13.8	-3.3	-10.2	-6.8
EURO II	1000 vehicles	4	2	1	1	-13.5	-2.2	-6.8	-4.5
EURO III	1000 vehicles	38	26	22	15	-7.6	-1.4	-3.6	-2.5
EURO IV	1000 vehicles	0	9	8	6	n.a.	-1.2	-2.3	-1.8
EURO V or later	1000 vehicles	0	4	31	64	n.a.	24.4	7.5	15.6

iTREN-2030 MT - Malta	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	1	2	2	3	1.6	3.2	2.5	2.8
Freight transport activity originated in the country	Billion tonnes-km per year	0	0	1	1	-2.7	6.1	1.6	3.8
Road	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-3.0*	*7.4*	*2.3*	*4.8*
Rail	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*9.0*	*-1.8*	*-1.6*	*-1.7*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-2.1*	*3.9*	*0.1*	*2.0*
Average freight transport distance	km	237	191	252	232	-4.2	2.8	-0.8	1.0
Freight transport activity on the national territory	Billion tonnes-km per year	0	0	1	1	0.0	7.1	2.7	4.9
Road	Billion tonnes-km per year	*0*	*0*	*1*	*1*	*-2.4*	*7.1*	*2.7*	*4.9*
Rail	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-3.8*	*6.2*	*2.4*	*4.3*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	0	0	0	0	-1.2	5.3	2.6	4.0
Trips originated in the country	Million trips per year	296	303	351	382	0.5	1.5	0.8	1.2
Passenger transport activity originated in the cou	Billion pass-km per year	8	8	10	12	0.1	2.6	1.6	2.1
Car	Billion pass-km per year	*2*	*2*	*2*	*3*	*0.7*	*2.5*	*1.5*	*2.0*
Bus	Billion pass-km per year	*1*	*1*	*1*	*1*	*2.8*	*-0.9*	*-0.1*	*-0.5*
Rail	Billion pass-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Air (Intra-EU)	Billion pass-km per year	*4*	*4*	*6*	*7*	*-0.8*	*3.3*	*1.9*	*2.6*
Slow	Billion pass-km per year	*1*	*1*	*1*	*1*	*1.7*	*1.9*	*1.2*	*1.5*
Average passenger transport distance	km	25.5	25.0	28.0	30.2	-0.4	1.1	0.8	0.9
Passenger transport activity on the national territ	Billion pass-km per year	2	2	3	3	1.0	2.0	1.3	1.7
Road	Billion pass-km per year	*2*	*2*	*3*	*3*	*1.0*	*2.0*	*1.3*	*1.7*
Rail	Billion pass-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	1	1	1	2	1.1	2.8	1.8	2.3
Motorization rate	cars/1000 inhabitants	488	491	500	495	0.1	0.2	-0.1	0.0
ECONOMY INDICATORS									
GDP	Billion Euros 2005	5	5	7	9	0.8	3.4	3.0	3.2
Employment	1000 Persons	57	55	56	57	-0.8	0.3	0.1	0.2
Agriculture and fishery	1000 Persons	*4*	*3*	*3*	*3*	*-1.0*	*-1.2*	*0.6*	*-0.3*
Construction	1000 Persons	*3*	*3*	*3*	*3*	*-0.3*	*-0.7*	*0.4*	*-0.2*
Energy and water	1000 Persons	*0*	*0*	*0*	*0*	*-2.5*	*-1.3*	*0.8*	*-0.3*
Industry	1000 Persons	*8*	*7*	*7*	*7*	*-1.2*	*-0.8*	*0.5*	*-0.2*
Transport services	1000 Persons	*21*	*19*	*23*	*22*	*-1.8*	*1.8*	*-0.4*	*0.7*
Other services	1000 Persons	*22*	*22*	*21*	*22*	*0.3*	*-0.5*	*0.3*	*-0.1*
Population total	1000 Persons	404	421	455	477	0.8	0.8	0.5	0.6
Labour force	1000 Persons	*250*	*259*	*290*	*306*	*0.7*	*1.1*	*0.6*	*0.8*
Retired (> 65 years)	1000 Persons	*70*	*78*	*85*	*87*	*2.1*	*0.9*	*0.2*	*0.6*
Transport taxation revenues	Million Euros 2005	232	239	160	105	0.5	-3.9	-4.1	-4.0
Fuel taxes	Million Euros 2005	*232*	*230*	*125*	*72*	*-0.2*	*-5.9*	*-5.4*	*-5.6*
Emissions certificate	Million Euros 2005	*0*	*9*	*29*	*21*	*0.0*	*12.2*	*-3.1*	*4.2*
Road charges	Million Euros 2005	*0*	*0*	*6*	*12*	*0.0*	*0.0*	*7.7*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

iTREN-2030 Integrated scenario
MT - Malta

Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	3	3	2	2	-1.1	-3.1	-1.6	-2.3
Road freight	Million tonnes per year	-	-	-	-	-	-	-	-
Road passenger	Million tonnes per year	*2*	*2*	*1*	*1*	*-0.9*	*-5.2*	*-3.3*	*-4.2*
Rail freight	Million tonnes per year	-	-	-	-	-	-	-	-
Rail passenger	Million tonnes per year	-	-	-	-	-	-	-	-
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.9*	*4.9*	*1.5*	*3.2*
Air (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-1.7*	*2.1*	*0.7*	*1.4*
CO2 intensity of freight transport activity	tonnes/1000 tkm	1.405	0.029	0.025	0.024	-54.0	-1.3	-0.7	-1.0
Road	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Rail	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.679	0.451	0.246	0.175	-7.9	-5.9	-3.3	-4.6
Road	tonnes/1000 pkm	-	-	-	-	-	-	-	-
Rail	tonnes/1000 pkm	-	-	-	-	-	-	-	-
Air	tonnes/1000 pkm	*0.151*	*0.145*	*0.129*	*0.114*	*-0.9*	*-1.1*	*-1.2*	*-1.2*
NOx Transport emissions	1000 Tonnes per year	10	10	12	13	-1.6	1.9	1.0	1.5
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Road passenger	1000 Tonnes per year	*2*	*1*	*1*	*1*	*-4.5*	*-6.3*	*-3.7*	*-5.0*
Rail freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*1*	*-2.2*	*4.6*	*1.1*	*2.8*
Air (Intra-EU)	1000 Tonnes per year	*8*	*8*	*10*	*12*	*-1.0*	*2.8*	*1.3*	*2.0*
PM10 Transport emissions	1000 Tonnes per year	0	0	0	0	-6.9	-3.5	-1.7	-2.6
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-10.9*	*-4.2*	*-1.1*	*-2.7*
Road passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-4.4*	*-3.1*	*-2.0*	*-2.5*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	197	207	227	236	0.9	1.0	0.4	0.7
Gasoline	1000 vehicles	*160*	*156*	*61*	*2*	*-0.6*	*-9.0*	*-29.8*	*-20.1*
Diesel	1000 vehicles	*35*	*30*	*9*	*0*	*-2.9*	*-11.5*	*-30.9*	*-21.8*
LPG/CNG	1000 vehicles	*0*	*8*	*25*	*8*	*332.8*	*12.6*	*-11.5*	*-0.2*
Bioethanol	1000 vehicles	*0*	*0*	*1*	*1*	*23.7*	*12.2*	*4.1*	*8.1*
Hybrid	1000 vehicles	*1*	*5*	*11*	*2*	*28.2*	*9.1*	*-14.3*	*-3.3*
Electric	1000 vehicles	*0*	*8*	*120*	*223*	*110.5*	*32.0*	*6.4*	*18.5*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*127*	*123*	*47*	*1*	*-0.6*	*-9.2*	*-29.9*	*-20.3*
Gasoline 1400-2000 cc	1000 vehicles	*31*	*31*	*13*	*0*	*-0.2*	*-8.3*	*-29.3*	*-19.5*
Gasoline >2000 cc	1000 vehicles	*2*	*2*	*1*	*0*	*-0.9*	*-9.1*	*-30.3*	*-20.4*
Diesel <2000 cc	1000 vehicles	*32*	*28*	*9*	*0*	*-2.4*	*-11.1*	*-30.8*	*-21.6*
Diesel >2000 cc	1000 vehicles	*3*	*2*	*0*	*0*	*-7.8*	*-16.4*	*-31.8*	*-24.5*
PreEURO	*1000 vehicles*	*46*	*19*	*0*	*0*	*-16.6*	*-31.9*	*-58.4*	*-46.8*
EURO I	1000 vehicles	*53*	*31*	*1*	*0*	*-10.2*	*-26.4*	*-53.9*	*-41.8*
EURO II	1000 vehicles	*38*	*28*	*3*	*0*	*-6.3*	*-21.0*	*-48.7*	*-36.4*
EURO III	1000 vehicles	*58*	*44*	*7*	*0*	*-5.6*	*-16.8*	*-43.9*	*-31.7*
EURO IV	1000 vehicles	*0*	*41*	*9*	*0*	*0.0*	*-13.6*	*-39.8*	*-27.9*
EURO V or later	1000 vehicles	*0*	*24*	*49*	*2*	*0.0*	*7.1*	*-27.7*	*-12.0*
Light duty vehicle fleet size	1000 vehicles	0	0	0	0	n.a.	n.a.	n.a.	n.a.
Gasoline and Diesel	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*n.a.*	*n.a.*	*n.a.*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	34	29	37	38	-2.8	2.4	0.1	1.2
3.5-7.5 tonnes	1000 vehicles	*25*	*23*	*29*	*29*	*-1.3*	*2.3*	*0.1*	*1.2*
7.5-16 tonnes	1000 vehicles	*1*	*1*	*2*	*2*	*-1.3*	*2.3*	*0.1*	*1.2*
16-32 tonnes	1000 vehicles	*4*	*4*	*5*	*5*	*-1.0*	*2.9*	*0.1*	*1.5*
>32 tonnes	1000 vehicles	*1*	*1*	*1*	*1*	*-1.0*	*3.1*	*0.1*	*1.6*
PreEURO	*1000 vehicles*	*16*	*9*	*3*	*0*	*-11.3*	*-9.0*	*-21.4*	*-15.4*
EURO I	1000 vehicles	*5*	*1*	*1*	*0*	*-31.3*	*-2.7*	*-12.0*	*-7.5*
EURO II	1000 vehicles	*9*	*1*	*1*	*0*	*-36.8*	*-1.6*	*-8.7*	*-5.2*
EURO III	1000 vehicles	*4*	*13*	*12*	*7*	*25.6*	*-0.8*	*-5.6*	*-3.2*
EURO IV	1000 vehicles	*0*	*5*	*4*	*3*	*n.a.*	*-0.6*	*-4.3*	*-2.5*
EURO V or later	1000 vehicles	*0*	*2*	*16*	*27*	*n.a.*	*25.2*	*5.3*	*14.8*

iTREN-2030 NL - The Netherlands	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	823	865	812	889	1.0	-0.6	0.9	0.1
Freight transport activity originated in the country	Billion tonnes-km per year	237	220	287	306	-1.5	2.7	0.6	1.7
Road	Billion tonnes-km per year	*56*	*58*	*63*	*71*	*0.6*	*0.9*	*1.1*	*1.0*
Rail	Billion tonnes-km per year	*32*	*32*	*39*	*41*	*0.1*	*1.9*	*0.6*	*1.2*
Inland navigation	Billion tonnes-km per year	*52*	*45*	*51*	*49*	*-2.8*	*1.4*	*-0.4*	*0.5*
Maritime (Intra-EU)	Billion tonnes-km per year	*98*	*85*	*134*	*145*	*-2.7*	*4.6*	*0.8*	*2.7*
Average freight transport distance	km	288	254	354	344	-2.5	3.4	-0.3	1.5
Freight transport activity on the national territory	Billion tonnes-km per year	95	95	96	100	0.1	0.1	0.3	0.2
Road	Billion tonnes-km per year	*43*	*47*	*44*	*49*	*1.7*	*-0.5*	*1.0*	*0.2*
Rail	Billion tonnes-km per year	*15*	*17*	*16*	*17*	*2.3*	*-0.6*	*0.2*	*-0.2*
Inland navigation	Billion tonnes-km per year	*36*	*32*	*36*	*35*	*-2.8*	*1.4*	*-0.4*	*0.5*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	10	12	9	9	3.1	-2.9	0.7	-1.1
Trips originated in the country	Million trips per year	17,908	17,778	19,228	19,918	-0.1	0.8	0.4	0.6
Passenger transport activity originated in the cou	Billion pass-km per year	228	225	264	280	-0.2	1.6	0.6	1.1
Car	Billion pass-km per year	*169*	*164*	*196*	*209*	*-0.6*	*1.8*	*0.6*	*1.2*
Bus	Billion pass-km per year	*11*	*11*	*9*	*9*	*0.6*	*-1.6*	*-0.8*	*-1.2*
Rail	Billion pass-km per year	*18*	*21*	*22*	*25*	*3.1*	*0.6*	*1.0*	*0.8*
Air (Intra-EU)	Billion pass-km per year	*15*	*14*	*18*	*19*	*-1.6*	*2.4*	*0.2*	*1.3*
Slow	Billion pass-km per year	*14*	*15*	*17*	*19*	*1.1*	*1.4*	*1.2*	*1.3*
Average passenger transport distance	km	12.7	12.7	13.7	14.1	-0.1	0.8	0.3	0.5
Passenger transport activity on the national territ	Billion pass-km per year	176	174	202	213	-0.2	1.5	0.5	1.0
Road	Billion pass-km per year	*160*	*156*	*183*	*192*	*-0.6*	*1.6*	*0.5*	*1.1*
Rail	Billion pass-km per year	*15*	*18*	*19*	*21*	*3.2*	*0.6*	*1.0*	*0.8*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	86	84	104	113	-0.6	2.2	0.8	1.5
Motorization rate	cars/1000 inhabitants	396	386	427	447	-0.5	1.0	0.5	0.7
ECONOMY INDICATORS									
GDP	Billion Euros 2005	498	510	619	710	0.5	2.0	1.4	1.7
Employment	1000 Persons	7,453	6,631	6,800	6,364	-2.3	0.3	-0.7	-0.2
Agriculture and fishery	1000 Persons	*292*	*240*	*217*	*179*	*-3.8*	*-1.0*	*-1.9*	*-1.5*
Construction	1000 Persons	*299*	*241*	*228*	*197*	*-4.2*	*-0.6*	*-1.5*	*-1.0*
Energy and water	1000 Persons	*46*	*43*	*45*	*44*	*-1.6*	*0.4*	*-0.1*	*0.2*
Industry	1000 Persons	*1,157*	*825*	*956*	*855*	*-6.5*	*1.5*	*-1.1*	*0.2*
Transport services	1000 Persons	*311*	*265*	*310*	*295*	*-3.1*	*1.6*	*-0.5*	*0.5*
Other services	1000 Persons	*5,348*	*5,017*	*5,044*	*4,793*	*-1.3*	*0.1*	*-0.5*	*-0.2*
Population total	1000 Persons	16,366	16,723	17,204	17,509	0.4	0.3	0.2	0.2
Labour force	1000 Persons	*10,440*	*10,548*	*10,355*	*10,088*	*0.2*	*-0.2*	*-0.3*	*-0.2*
Retired (> 65 years)	1000 Persons	*2,437*	*2,630*	*3,384*	*4,109*	*1.5*	*2.6*	*2.0*	*2.3*
Transport taxation revenues	Million Euros 2005	4,657	4,371	4,798	4,995	-1.3	0.9	0.4	0.7
Fuel taxes	Million Euros 2005	*4,657*	*4,269*	*4,288*	*4,256*	*-1.7*	*0.0*	*-0.1*	*0.0*
Emissions certificate	Million Euros 2005	*0*	*75*	*329*	*289*	*0.0*	*15.9*	*-1.3*	*7.0*
Road charges	Million Euros 2005	*0*	*26*	*181*	*450*	*0.0*	*21.3*	*9.5*	*15.3*
ENERGY INDICATORS									
Primary energy production	Million toe per year	63	57	70	72	-2.0	2.1	0.3	1.2
Share of domestic energy production	%	78	73	94	100	-1.3	2.5	0.6	1.6
Final energy demand by source	Million toe per year	80	77	74	72	-0.8	-0.4	-0.2	-0.3
Oil	Million toe per year	*33*	*30*	*25*	*23*	*-2.0*	*-1.6*	*-1.0*	*-1.3*
Gas	Million toe per year	*35*	*32*	*30*	*25*	*-2.2*	*-0.6*	*-1.5*	*-1.1*
Coal, Nuclear	Million toe per year	*9*	*13*	*12*	*12*	*7.7*	*-1.4*	*0.1*	*-0.6*
Biomass	Million toe per year	*3*	*2*	*6*	*10*	*-5.1*	*10.9*	*5.4*	*8.1*
Other Renewables	Million toe per year	*0*	*1*	*2*	*3*	*21.5*	*12.9*	*4.0*	*8.4*
Final energy demand by consuming sector	Million toe per year	54	51	50	49	-1.1	-0.1	-0.2	-0.1
Transport freight	Million toe per year	*4*	*4*	*4*	*4*	*-1.3*	*0.8*	*-0.4*	*0.2*
Transport passenger	Million toe per year	*11*	*11*	*10*	*10*	*-1.3*	*-0.6*	*-0.3*	*-0.5*
Industry	Million toe per year	*16*	*14*	*13*	*12*	*-2.3*	*-1.0*	*-0.7*	*-0.8*
Residential and services	Million toe per year	*22*	*22*	*23*	*23*	*-0.2*	*0.5*	*0.2*	*0.3*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.91	1.25	1.23	1.37	6.6	-0.2	1.1	0.4
Gasoline price	Euros2005 per litre	1.24	1.59	1.58	1.74	5.1	-0.1	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	2	5	8	1384.3	9.1	4.1	6.6
Share of renewables in electricity	%	8	7	24	37	-0.4	12.3	4.5	8.3
Share of renewables in final energy demand	%	3	3	9	16	3.6	11.5	5.7	8.6
Energy intensity of freight transport activity	toe/Million tkm	23	23	19	17	0.0	-1.6	-1.0	-1.3
Energy intensity of passenger transport activity	toe/Million pkm	60	57	46	42	-1.0	-2.2	-0.8	-1.5
Energy intensity of economic activity	toe/Million Euros 2005	107	99	81	69	-1.6	-2.0	-1.6	-1.8

iTREN-2030
NL - The Netherlands

Variable	Unit	Absolute values 2005	2010	2020	2030	Average annual % change '05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	31	29	27	25	-1.4	-0.5	-0.9	-0.7
Road freight	Million tonnes per year	*8*	*8*	*6*	*6*	*1.4*	*-3.1*	*-0.6*	*-1.8*
Road passenger	Million tonnes per year	*18*	*16*	*16*	*14*	*-2.3*	*0.1*	*-1.1*	*-0.5*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*-3.8*	*-0.3*	*1.1*	*0.4*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*2.1*	*-0.1*	*0.2*	*0.1*
Inland navigation	Million tonnes per year	*2*	*1*	*2*	*2*	*-3.3*	*1.0*	*-0.6*	*0.2*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.3*	*2.5*	*-0.4*	*1.1*
Air (Intra-EU)	Million tonnes per year	*3*	*3*	*3*	*3*	*-2.4*	*1.5*	*-0.8*	*0.3*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.050	0.054	0.034	0.031	1.8	-4.5	-1.1	-2.8
Road	tonnes/1000 tkm	*0.175*	*0.173*	*0.134*	*0.115*	*-0.2*	*-2.5*	*-1.5*	*-2.0*
Rail	tonnes/1000 tkm	*0.006*	*0.004*	*0.005*	*0.005*	*-6.0*	*0.3*	*0.8*	*0.6*
Inland navigation	tonnes/1000 tkm	*0.048*	*0.046*	*0.045*	*0.044*	*-0.5*	*-0.4*	*-0.2*	*-0.3*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.003*	*0.003*	*0.002*	*0.002*	*0.4*	*-2.0*	*-1.1*	*-1.6*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.110	0.100	0.087	0.075	-2.0	-1.3	-1.6	-1.4
Road	tonnes/1000 pkm	*0.112*	*0.102*	*0.088*	*0.075*	*-1.8*	*-1.5*	*-1.6*	*-1.6*
Rail	tonnes/1000 pkm	*0.016*	*0.015*	*0.014*	*0.013*	*-1.0*	*-0.7*	*-0.8*	*-0.7*
Air	tonnes/1000 pkm	*0.183*	*0.175*	*0.160*	*0.145*	*-0.9*	*-0.9*	*-0.9*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	139	106	101	94	-5.2	-0.6	-0.7	-0.6
Road freight	1000 Tonnes per year	*19*	*15*	*7*	*5*	*-4.1*	*-7.4*	*-3.4*	*-5.4*
Road passenger	1000 Tonnes per year	*47*	*26*	*17*	*14*	*-11.0*	*-4.5*	*-1.8*	*-3.1*
Rail freight	1000 Tonnes per year	*0*	*0*	*0*	*1*	*-3.7*	*1.2*	*1.9*	*1.5*
Rail passenger	1000 Tonnes per year	*2*	*2*	*2*	*2*	*2.1*	*-0.7*	*-0.5*	*-0.6*
Inland navigation	1000 Tonnes per year	*29*	*24*	*27*	*25*	*-3.3*	*1.0*	*-0.6*	*0.2*
Maritime (Intra-EU)	1000 Tonnes per year	*6*	*5*	*6*	*6*	*-2.8*	*2.1*	*-0.8*	*0.7*
Air (Intra-EU)	1000 Tonnes per year	*36*	*34*	*42*	*42*	*-1.6*	*2.2*	*0.1*	*1.2*
PM10 Transport emissions	1000 Tonnes per year	10	8	5	5	-4.4	-3.3	-0.8	-2.1
Road freight	1000 Tonnes per year	*3*	*2*	*1*	*1*	*-8.5*	*-6.2*	*-1.5*	*-3.9*
Road passenger	1000 Tonnes per year	*7*	*6*	*4*	*4*	*-2.7*	*-2.5*	*-0.7*	*-1.6*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	6,486	6,452	7,347	7,826	-0.1	1.3	0.6	1.0
Gasoline	1000 vehicles	*4,553*	*4,191*	*4,519*	*4,215*	*-1.6*	*0.8*	*-0.7*	*0.0*
Diesel	1000 vehicles	*1,258*	*1,555*	*1,436*	*1,029*	*4.3*	*-0.8*	*-3.3*	*-2.0*
LPG/CNG	1000 vehicles	*637*	*533*	*350*	*506*	*-3.5*	*-4.1*	*3.7*	*-0.3*
Bioethanol	1000 vehicles	*1*	*9*	*82*	*133*	*69.5*	*24.2*	*4.9*	*14.1*
Hybrid	1000 vehicles	*37*	*120*	*233*	*143*	*26.2*	*6.9*	*-4.8*	*0.9*
Electric	1000 vehicles	*0*	*43*	*720*	*1,332*	*172.9*	*32.6*	*6.3*	*18.8*
Fuel cells	1000 vehicles	*0*	*0*	*6*	*468*	*0.0*	*0.0*	*54.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*2,339*	*2,072*	*2,111*	*1,791*	*-2.4*	*0.2*	*-1.6*	*-0.7*
Gasoline 1400-2000 cc	1000 vehicles	*1,949*	*1,871*	*2,113*	*2,122*	*-0.8*	*1.2*	*0.0*	*0.6*
Gasoline >2000 cc	1000 vehicles	*264*	*249*	*294*	*302*	*-1.1*	*1.7*	*0.3*	*1.0*
Diesel <2000 cc	1000 vehicles	*1,003*	*1,292*	*1,207*	*856*	*5.2*	*-0.7*	*-3.4*	*-2.0*
Diesel >2000 cc	1000 vehicles	*255*	*263*	*229*	*173*	*0.6*	*-1.4*	*-2.7*	*-2.1*
PreEURO	*1000 vehicles*	*138*	*0*	*0*	*0*	*-80.8*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*1,619*	*135*	*0*	*0*	*-39.1*	*-100.0*	*0.0*	*-100.0*
EURO II	1000 vehicles	*1,987*	*1,203*	*0*	*0*	*-9.6*	*-91.2*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*2,704*	*2,322*	*51*	*0*	*-3.0*	*-31.8*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*1,339*	*521*	*0*	*0.0*	*-9.0*	*-100.0*	*-100.0*
EURO V or later	1000 vehicles	*0*	*748*	*5,382*	*5,245*	*0.0*	*21.8*	*-0.3*	*10.2*
Light duty vehicle fleet size	1000 vehicles	386	421	348	376	1.8	-1.9	0.8	-0.6
Gasoline and Diesel	1000 vehicles	*386*	*421*	*344*	*349*	*1.8*	*-2.0*	*0.2*	*-0.9*
Electric	1000 vehicles	*0*	*0*	*4*	*27*	*n.a.*	*n.a.*	*21.2*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	564	588	508	482	0.8	-1.5	-0.5	-1.0
3.5-7.5 tonnes	1000 vehicles	*238*	*253*	*224*	*213*	*1.2*	*-1.2*	*-0.5*	*-0.9*
7.5-16 tonnes	1000 vehicles	*62*	*66*	*58*	*56*	*1.2*	*-1.2*	*-0.5*	*-0.8*
16-32 tonnes	1000 vehicles	*208*	*214*	*179*	*169*	*0.5*	*-1.8*	*-0.5*	*-1.2*
>32 tonnes	1000 vehicles	*55*	*56*	*47*	*44*	*0.5*	*-1.8*	*-0.5*	*-1.1*
PreEURO	*1000 vehicles*	*133*	*12*	*0*	*0*	*-37.8*	*-100.0*	*n.a.*	*-100.0*
EURO I	1000 vehicles	*114*	*53*	*0*	*0*	*-14.2*	*-85.2*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*166*	*143*	*1*	*0*	*-3.0*	*-38.6*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*152*	*191*	*62*	*0*	*4.7*	*-10.6*	*-85.0*	*-63.4*
EURO IV	1000 vehicles	*0*	*164*	*133*	*0*	*n.a.*	*-2.1*	*-53.9*	*-32.8*
EURO V or later	1000 vehicles	*0*	*25*	*312*	*482*	*n.a.*	*28.9*	*4.5*	*16.0*

iTREN-2030 PL - Poland	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	1,049	1,213	1,544	1,920	2.9	2.4	2.2	2.3
Freight transport activity originated in the country	Billion tonnes-km per year	229	242	387	481	1.2	4.8	2.2	3.5
Road	Billion tonnes-km per year	*113*	*121*	*190*	*246*	*1.3*	*4.6*	*2.6*	*3.6*
Rail	Billion tonnes-km per year	*58*	*66*	*95*	*117*	*2.6*	*3.8*	*2.1*	*2.9*
Inland navigation	Billion tonnes-km per year	*1*	*1*	*1*	*1*	*2.5*	*5.1*	*2.4*	*3.7*
Maritime (Intra-EU)	Billion tonnes-km per year	*57*	*55*	*100*	*117*	*-0.9*	*6.2*	*1.6*	*3.9*
Average freight transport distance	km	218	200	251	251	-1.7	2.3	0.0	1.1
Freight transport activity on the national territory	Billion tonnes-km per year	155	172	259	327	2.1	4.2	2.4	3.3
Road	Billion tonnes-km per year	*102*	*110*	*168*	*216*	*1.7*	*4.3*	*2.5*	*3.4*
Rail	Billion tonnes-km per year	*53*	*61*	*90*	*111*	*3.0*	*3.9*	*2.1*	*3.0*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*1*	*1*	*2.5*	*5.1*	*2.4*	*3.7*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	16	18	23	29	2.5	2.3	2.3	2.3
Trips originated in the country	Million trips per year	28,616	28,232	30,044	30,982	-0.3	0.6	0.3	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	253	251	297	316	-0.2	1.7	0.6	1.2
Car	Billion pass-km per year	*172*	*171*	*217*	*236*	*-0.2*	*2.4*	*0.8*	*1.6*
Bus	Billion pass-km per year	*31*	*29*	*27*	*25*	*-0.9*	*-0.9*	*-0.6*	*-0.7*
Rail	Billion pass-km per year	*30*	*30*	*30*	*30*	*-0.1*	*0.1*	*0.2*	*0.1*
Air (Intra-EU)	Billion pass-km per year	*3*	*3*	*4*	*4*	*-0.7*	*2.7*	*1.1*	*1.9*
Slow	Billion pass-km per year	*17*	*18*	*19*	*20*	*0.8*	*0.5*	*0.6*	*0.5*
Average passenger transport distance	km	8.9	8.9	9.9	10.2	0.1	1.1	0.3	0.7
Passenger transport activity on the national territ	Billion pass-km per year	234	231	276	293	-0.3	1.8	0.6	1.2
Road	Billion pass-km per year	*204*	*201*	*245*	*262*	*-0.3*	*2.0*	*0.7*	*1.3*
Rail	Billion pass-km per year	*30*	*30*	*30*	*31*	*-0.1*	*0.1*	*0.2*	*0.1*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	123	123	167	185	0.1	3.1	1.1	2.1
Motorization rate	cars/1000 inhabitants	307	328	425	486	1.3	2.6	1.4	2.0
ECONOMY INDICATORS									
GDP	Billion Euros 2005	189	209	327	453	2.0	4.6	3.3	3.9
Employment	1000 Persons	17,507	16,475	21,019	20,994	-1.2	2.5	0.0	1.2
Agriculture and fishery	1000 Persons	*2,446*	*1,645*	*1,627*	*1,552*	*-7.6*	*-0.1*	*-0.5*	*-0.3*
Construction	1000 Persons	*2,019*	*2,033*	*2,725*	*2,674*	*0.1*	*3.0*	*-0.2*	*1.4*
Energy and water	1000 Persons	*31*	*34*	*32*	*33*	*1.5*	*-0.4*	*0.1*	*-0.2*
Industry	1000 Persons	*4,959*	*4,421*	*5,362*	*5,008*	*-2.3*	*1.9*	*-0.7*	*0.6*
Transport services	1000 Persons	*515*	*470*	*650*	*632*	*-1.8*	*3.3*	*-0.3*	*1.5*
Other services	1000 Persons	*7,536*	*7,872*	*10,622*	*11,096*	*0.9*	*3.0*	*0.4*	*1.7*
Population total	1000 Persons	38,355	37,860	37,208	36,377	-0.3	-0.2	-0.2	-0.2
Labour force	1000 Persons	*25,078*	*25,806*	*24,603*	*22,671*	*0.6*	*-0.5*	*-0.8*	*-0.6*
Retired (> 65 years)	1000 Persons	*4,660*	*4,554*	*6,064*	*7,360*	*-0.5*	*2.9*	*2.0*	*2.4*
Transport taxation revenues	Million Euros 2005	9,312	10,433	11,909	13,944	2.3	1.3	1.6	1.5
Fuel taxes	Million Euros 2005	*3,159*	*3,183*	*3,569*	*4,079*	*0.2*	*1.2*	*1.3*	*1.2*
Emissions certificate	Million Euros 2005	*0*	*73*	*359*	*377*	*0.0*	*17.2*	*0.5*	*8.6*
Road charges	Million Euros 2005	*6,153*	*7,176*	*7,981*	*9,487*	*3.1*	*1.1*	*1.7*	*1.4*
ENERGY INDICATORS									
Primary energy production	Million toe per year	69	82	72	70	3.4	-1.2	-0.3	-0.8
Share of domestic energy production	%	72	78	67	62	1.5	-1.5	-0.8	-1.1
Final energy demand by source	Million toe per year	96	105	108	113	1.9	0.3	0.5	0.4
Oil	Million toe per year	*23*	*23*	*24*	*24*	*0.0*	*0.5*	*0.0*	*0.2*
Gas	Million toe per year	*12*	*11*	*23*	*29*	*-1.7*	*7.2*	*2.5*	*4.8*
Coal, Nuclear	Million toe per year	*56*	*62*	*33*	*29*	*2.1*	*-6.0*	*-1.4*	*-3.7*
Biomass	Million toe per year	*5*	*8*	*24*	*25*	*12.2*	*10.9*	*0.6*	*5.6*
Other Renewables	Million toe per year	*0*	*1*	*4*	*6*	*23.7*	*15.8*	*3.8*	*9.7*
Final energy demand by consuming sector	Million toe per year	58	61	72	80	0.9	1.8	1.0	1.4
Transport freight	Million toe per year	*4*	*4*	*4*	*4*	*0.1*	*1.1*	*0.0*	*0.5*
Transport passenger	Million toe per year	*9*	*11*	*13*	*17*	*3.4*	*2.5*	*2.2*	*2.4*
Industry	Million toe per year	*17*	*19*	*18*	*15*	*1.4*	*-0.3*	*-1.6*	*-1.0*
Residential and services	Million toe per year	*28*	*28*	*36*	*44*	*-0.1*	*2.8*	*1.9*	*2.3*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.79	1.11	1.09	1.22	6.9	-0.1	1.1	0.5
Gasoline price	Euros2005 per litre	0.90	1.21	1.18	1.31	6.1	-0.3	1.1	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	8	20	31	132.3	10.3	4.3	7.2
Share of renewables in electricity	%	4	10	45	46	19.8	16.4	0.1	8.0
Share of renewables in final energy demand	%	8	11	25	27	7.5	8.2	0.9	4.5
Energy intensity of freight transport activity	toe/Million tkm	18	17	12	9	-1.3	-3.4	-2.2	-2.8
Energy intensity of passenger transport activity	toe/Million pkm	38	45	48	56	3.6	0.7	1.6	1.1
Energy intensity of economic activity	toe/Million Euros 2005	307	291	221	177	-1.1	-2.7	-2.2	-2.4

The ITREN-2030 integrated scenario until 2030

iTREN-2030 PL - Poland	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	34	33	38	42	-0.5	1.5	0.9	1.2
Road freight	Million tonnes per year	*10*	*10*	*11*	*13*	*1.2*	*0.9*	*1.6*	*1.2*
Road passenger	Million tonnes per year	*17*	*15*	*18*	*18*	*-2.0*	*1.4*	*0.1*	*0.7*
Rail freight	Million tonnes per year	*5*	*6*	*8*	*9*	*1.3*	*3.2*	*1.8*	*2.5*
Rail passenger	Million tonnes per year	*1*	*1*	*1*	*1*	*-1.4*	*-0.8*	*-0.8*	*-0.8*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*2.9*	*5.3*	*2.6*	*3.9*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.7*	*4.8*	*0.8*	*2.8*
Air (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-1.6*	*1.4*	*0.1*	*0.8*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.072	0.072	0.054	0.052	-0.2	-2.8	-0.5	-1.6
Road	tonnes/1000 tkm	*0.096*	*0.094*	*0.067*	*0.062*	*-0.5*	*-3.3*	*-0.9*	*-2.1*
Rail	tonnes/1000 tkm	*0.100*	*0.092*	*0.086*	*0.084*	*-1.7*	*-0.7*	*-0.2*	*-0.5*
Inland navigation	tonnes/1000 tkm	*0.029*	*0.029*	*0.030*	*0.030*	*0.4*	*0.2*	*0.2*	*0.2*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.004*	*0.004*	*0.004*	*0.003*	*0.2*	*-1.4*	*-0.8*	*-1.1*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.077	0.071	0.067	0.064	-1.7	-0.5	-0.5	-0.5
Road	tonnes/1000 pkm	*0.083*	*0.076*	*0.072*	*0.068*	*-1.8*	*-0.6*	*-0.5*	*-0.6*
Rail	tonnes/1000 pkm	*0.025*	*0.023*	*0.021*	*0.019*	*-1.2*	*-0.8*	*-0.9*	*-0.9*
Air	tonnes/1000 pkm	*0.175*	*0.168*	*0.148*	*0.134*	*-0.9*	*-1.2*	*-1.0*	*-1.1*
NOx Transport emissions	1000 Tonnes per year	199	145	118	114	-6.1	-2.0	-0.4	-1.2
Road freight	1000 Tonnes per year	*78*	*62*	*37*	*26*	*-4.3*	*-5.2*	*-3.3*	*-4.3*
Road passenger	1000 Tonnes per year	*83*	*45*	*32*	*29*	*-11.4*	*-3.4*	*-1.1*	*-2.2*
Rail freight	1000 Tonnes per year	*22*	*22*	*31*	*40*	*0.2*	*3.4*	*2.6*	*3.0*
Rail passenger	1000 Tonnes per year	*4*	*4*	*3*	*3*	*-1.5*	*-1.6*	*-1.8*	*-1.7*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*2.9*	*5.3*	*2.6*	*3.9*
Maritime (Intra-EU)	1000 Tonnes per year	*5*	*5*	*7*	*8*	*-1.1*	*4.3*	*0.3*	*2.3*
Air (Intra-EU)	1000 Tonnes per year	*7*	*6*	*8*	*8*	*-0.9*	*2.0*	*0.9*	*1.5*
PM10 Transport emissions	1000 Tonnes per year	11	9	7	7	-5.2	-1.6	-0.5	-1.0
Road freight	1000 Tonnes per year	*5*	*3*	*3*	*3*	*-5.6*	*-1.6*	*-0.1*	*-0.8*
Road passenger	1000 Tonnes per year	*7*	*5*	*4*	*4*	*-5.0*	*-1.6*	*-0.8*	*-1.2*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	11,788	12,413	15,809	17,690	1.0	2.4	1.1	1.8
Gasoline	1000 vehicles	*9,808*	*9,281*	*10,117*	*9,396*	*-1.1*	*0.9*	*-0.7*	*0.1*
Diesel	1000 vehicles	*949*	*890*	*814*	*640*	*-1.3*	*-0.9*	*-2.4*	*-1.6*
LPG/CNG	1000 vehicles	*982*	*1,981*	*2,103*	*2,340*	*15.1*	*0.6*	*1.1*	*0.8*
Bioethanol	1000 vehicles	*0*	*5*	*132*	*377*	*0.0*	*37.7*	*11.1*	*23.7*
Hybrid	1000 vehicles	*50*	*168*	*400*	*204*	*27.6*	*9.1*	*-6.5*	*1.0*
Electric	1000 vehicles	*0*	*89*	*2,245*	*4,635*	*208.6*	*38.1*	*7.5*	*21.9*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*99*	*0.0*	*0.0*	*194.6*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*6,123*	*5,800*	*6,168*	*5,549*	*-1.1*	*0.6*	*-1.1*	*-0.2*
Gasoline 1400-2000 cc	1000 vehicles	*3,370*	*3,209*	*3,647*	*3,538*	*-1.0*	*1.3*	*-0.3*	*0.5*
Gasoline >2000 cc	1000 vehicles	*315*	*272*	*302*	*309*	*-2.9*	*1.1*	*0.2*	*0.6*
Diesel <2000 cc	1000 vehicles	*741*	*700*	*640*	*492*	*-1.1*	*-0.9*	*-2.6*	*-1.7*
Diesel >2000 cc	1000 vehicles	*208*	*189*	*174*	*148*	*-1.9*	*-0.9*	*-1.6*	*-1.2*
PreEURO	*1000 vehicles*	*3,070*	*545*	*0*	*0*	*-29.2*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*514*	*299*	*0*	*0*	*-10.3*	*-95.5*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*1,830*	*1,357*	*1*	*0*	*-5.8*	*-52.4*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*6,324*	*5,241*	*1,169*	*0*	*-3.7*	*-13.9*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*1,977*	*1,317*	*0*	*0.0*	*-4.0*	*-77.8*	*-53.8*
EURO V or later	1000 vehicles	*0*	*752*	*8,444*	*10,036*	*0.0*	*27.4*	*1.7*	*13.8*
Light duty vehicle fleet size	1000 vehicles	1,054	1,111	1,110	1,284	1.1	0.0	1.5	0.7
Gasoline and Diesel	1000 vehicles	*1,054*	*1,111*	*1,107*	*1,234*	*1.1*	*0.0*	*1.1*	*0.5*
Electric	1000 vehicles	*0*	*0*	*3*	*50*	*n.a.*	*n.a.*	*33.1*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	1,072	855	1,097	1,374	-4.4	2.5	2.3	2.4
3.5-7.5 tonnes	1000 vehicles	*359*	*422*	*532*	*664*	*3.3*	*2.3*	*2.2*	*2.3*
7.5-16 tonnes	1000 vehicles	*94*	*110*	*138*	*172*	*3.2*	*2.3*	*2.2*	*2.3*
16-32 tonnes	1000 vehicles	*226*	*273*	*360*	*454*	*3.9*	*2.8*	*2.3*	*2.6*
>32 tonnes	1000 vehicles	*41*	*50*	*67*	*84*	*4.1*	*2.9*	*2.4*	*2.7*
PreEURO	*1000 vehicles*	*637*	*357*	*169*	*28*	*-10.9*	*-7.2*	*-16.6*	*-12.0*
EURO I	1000 vehicles	*106*	*67*	*53*	*24*	*-8.8*	*-2.3*	*-7.7*	*-5.1*
EURO II	1000 vehicles	*110*	*70*	*61*	*37*	*-8.6*	*-1.4*	*-4.9*	*-3.2*
EURO III	1000 vehicles	*219*	*188*	*174*	*142*	*-3.0*	*-0.8*	*-2.0*	*-1.4*
EURO IV	1000 vehicles	*0*	*139*	*132*	*123*	*n.a.*	*-0.5*	*-0.7*	*-0.6*
EURO V or later	1000 vehicles	*0*	*34*	*508*	*1,021*	*n.a.*	*31.2*	*7.2*	*18.6*

iTREN-2030 PT - Portugal	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	329	360	463	527	1.8	2.6	1.3	1.9
Freight transport activity originated in the country	Billion tonnes-km per year	55	57	77	85	0.6	3.1	1.0	2.0
Road	Billion tonnes-km per year	*30*	*33*	*44*	*49*	*1.8*	*2.8*	*1.2*	*2.0*
Rail	Billion tonnes-km per year	*3*	*4*	*4*	*5*	*3.1*	*1.7*	*0.8*	*1.2*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*22*	*20*	*29*	*31*	*-1.6*	*3.7*	*0.6*	*2.2*
Average freight transport distance	km	169	159	167	161	-1.2	0.5	-0.3	0.1
Freight transport activity on the national territory	Billion tonnes-km per year	32	36	47	53	2.8	2.5	1.2	1.9
Road	Billion tonnes-km per year	*29*	*33*	*42*	*48*	*2.1*	*2.6*	*1.2*	*1.9*
Rail	Billion tonnes-km per year	*3*	*4*	*4*	*5*	*3.1*	*1.7*	*0.8*	*1.2*
Inland navigation	Billion tonnes-km per year	*-1*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	6	6	8	8	2.5	1.5	1.1	1.3
Trips originated in the country	Million trips per year	10,061	9,902	10,911	11,204	-0.3	1.0	0.3	0.6
Passenger transport activity originated in the cou	Billion pass-km per year	113	107	125	130	-1.0	1.5	0.5	1.0
Car	Billion pass-km per year	*77*	*71*	*83*	*86*	*-1.6*	*1.6*	*0.4*	*1.0*
Bus	Billion pass-km per year	*14*	*15*	*17*	*17*	*1.1*	*0.9*	*0.4*	*0.6*
Rail	Billion pass-km per year	*5*	*6*	*6*	*7*	*2.1*	*1.0*	*1.1*	*1.0*
Air (Intra-EU)	Billion pass-km per year	*11*	*10*	*12*	*12*	*-2.3*	*1.9*	*0.2*	*1.0*
Slow	Billion pass-km per year	*6*	*6*	*7*	*8*	*0.8*	*1.5*	*1.1*	*1.3*
Average passenger transport distance	km	11.2	10.8	11.4	11.6	-0.7	0.5	0.2	0.4
Passenger transport activity on the national territ	Billion pass-km per year	99	94	109	114	-0.9	1.5	0.4	0.9
Road	Billion pass-km per year	*94*	*88*	*103*	*107*	*-1.1*	*1.5*	*0.4*	*0.9*
Rail	Billion pass-km per year	*5*	*6*	*7*	*7*	*2.2*	*1.0*	*1.1*	*1.0*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	53	50	60	65	-1.5	1.9	0.8	1.3
Motorization rate	cars/1000 inhabitants	234	225	253	268	-0.8	1.2	0.5	0.9
ECONOMY INDICATORS									
GDP	Billion Euros 2005	142	143	181	210	0.2	2.4	1.5	1.9
Employment	1000 Persons	5,349	4,348	4,557	4,548	-4.1	0.5	0.0	0.2
Agriculture and fishery	1000 Persons	*465*	*435*	*377*	*331*	*-1.3*	*-1.4*	*-1.3*	*-1.3*
Construction	1000 Persons	*613*	*461*	*442*	*443*	*-5.5*	*-0.4*	*0.0*	*-0.2*
Energy and water	1000 Persons	*58*	*64*	*80*	*92*	*1.9*	*2.3*	*1.4*	*1.9*
Industry	1000 Persons	*1,319*	*902*	*1,081*	*1,005*	*-7.3*	*1.8*	*-0.7*	*0.5*
Transport services	1000 Persons	*125*	*113*	*117*	*108*	*-2.0*	*0.4*	*-0.8*	*-0.2*
Other services	1000 Persons	*2,769*	*2,374*	*2,459*	*2,569*	*-3.0*	*0.4*	*0.4*	*0.4*
Population total	1000 Persons	10,533	10,667	10,760	10,686	0.3	0.1	-0.1	0.0
Labour force	1000 Persons	*6,894*	*7,050*	*7,180*	*6,973*	*0.4*	*0.2*	*-0.3*	*-0.1*
Retired (> 65 years)	1000 Persons	*1,548*	*1,539*	*1,647*	*1,994*	*-0.1*	*0.7*	*1.9*	*1.3*
Transport taxation revenues	Million Euros 2005	4,846	4,509	5,291	5,893	-1.4	1.6	1.1	1.3
Fuel taxes	Million Euros 2005	*2,093*	*1,947*	*2,110*	*2,254*	*-1.4*	*0.8*	*0.7*	*0.7*
Emissions certificate	Million Euros 2005	*0*	*45*	*217*	*216*	*0.0*	*17.1*	*-0.1*	*8.2*
Road charges	Million Euros 2005	*2,753*	*2,517*	*2,963*	*3,423*	*-1.8*	*1.6*	*1.5*	*1.5*
ENERGY INDICATORS									
Primary energy production	Million toe per year	4	7	8	10	12.1	2.2	1.5	1.8
Share of domestic energy production	%	14	28	33	36	14.6	1.6	0.9	1.3
Final energy demand by source	Million toe per year	27	24	25	27	-2.1	0.6	0.5	0.5
Oil	Million toe per year	*16*	*11*	*10*	*9*	*-6.5*	*-1.1*	*-0.9*	*-1.0*
Gas	Million toe per year	*4*	*4*	*4*	*4*	*-0.5*	*0.8*	*-0.9*	*0.0*
Coal, Nuclear	Million toe per year	*4*	*3*	*3*	*3*	*-1.9*	*-2.0*	*1.6*	*-0.2*
Biomass	Million toe per year	*3*	*3*	*6*	*7*	*2.9*	*5.0*	*2.6*	*3.8*
Other Renewables	Million toe per year	*1*	*2*	*3*	*4*	*30.6*	*2.4*	*1.4*	*1.9*
Final energy demand by consuming sector	Million toe per year	19	17	18	18	-2.1	0.2	0.2	0.2
Transport freight	Million toe per year	*1*	*1*	*1*	*1*	*-1.4*	*0.3*	*-0.9*	*-0.3*
Transport passenger	Million toe per year	*6*	*6*	*5*	*5*	*-1.9*	*-1.0*	*-0.8*	*-0.9*
Industry	Million toe per year	*6*	*5*	*5*	*5*	*-4.0*	*0.0*	*0.7*	*0.3*
Residential and services	Million toe per year	*6*	*6*	*6*	*7*	*-0.5*	*1.5*	*0.7*	*1.1*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.83	1.18	1.17	1.30	7.3	-0.1	1.0	0.5
Gasoline price	Euros2005 per litre	1.08	1.51	1.49	1.64	7.1	-0.2	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	5	10	19	1477.4	8.3	6.2	7.2
Share of renewables in electricity	%	17	51	61	63	24.8	1.8	0.4	1.1
Share of renewables in final energy demand	%	16	27	35	40	10.7	2.4	1.5	1.9
Energy intensity of freight transport activity	toe/Million tkm	26	23	17	15	-2.5	-2.6	-1.8	-2.2
Energy intensity of passenger transport activity	toe/Million pkm	56	54	42	37	-0.8	-2.5	-1.3	-1.9
Energy intensity of economic activity	toe/Million Euros 2005	136	122	98	86	-2.2	-2.1	-1.3	-1.7

iTREN-2030	Integrated scenario								
PT - Portugal									
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	18	17	18	17	-1.1	0.4	-0.2	0.1
Road freight	Million tonnes per year	*5*	*5*	*5*	*5*	*2.0*	*0.3*	*0.1*	*0.2*
Road passenger	Million tonnes per year	*11*	*10*	*10*	*10*	*-2.3*	*0.4*	*-0.3*	*0.1*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.6*	*0.5*	*0.8*	*0.6*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*1.1*	*-0.1*	*0.0*	*0.0*
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*1.1*	*2.0*	*0.1*	*1.0*
Air (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-3.1*	*1.0*	*-0.8*	*0.1*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.091	0.095	0.073	0.068	0.9	-2.5	-0.8	-1.7
Road	tonnes/1000 tkm	*0.159*	*0.158*	*0.126*	*0.114*	*0.0*	*-2.2*	*-1.1*	*-1.7*
Rail	tonnes/1000 tkm	*0.041*	*0.036*	*0.032*	*0.032*	*-2.4*	*-1.2*	*0.0*	*-0.6*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.004*	*0.004*	*0.003*	*0.003*	*2.7*	*-1.7*	*-0.5*	*-1.1*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.117	0.109	0.099	0.092	-1.3	-1.0	-0.7	-0.9
Road	tonnes/1000 pkm	*0.121*	*0.114*	*0.102*	*0.096*	*-1.1*	*-1.1*	*-0.7*	*-0.9*
Rail	tonnes/1000 pkm	*0.016*	*0.015*	*0.014*	*0.012*	*-1.0*	*-1.0*	*-1.1*	*-1.0*
Air	tonnes/1000 pkm	*0.133*	*0.128*	*0.117*	*0.106*	*-0.8*	*-0.9*	*-1.0*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	85	51	39	34	-9.6	-2.7	-1.4	-2.1
Road freight	1000 Tonnes per year	*19*	*12*	*7*	*5*	*-9.1*	*-5.3*	*-3.4*	*-4.4*
Road passenger	1000 Tonnes per year	*48*	*23*	*13*	*10*	*-13.7*	*-5.6*	*-2.9*	*-4.3*
Rail freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-0.4*	*-0.8*	*0.9*	*0.0*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*0.6*	*-0.8*	*-1.0*	*-0.9*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*2*	*2*	*2*	*2*	*0.4*	*1.6*	*-0.3*	*0.7*
Air (Intra-EU)	1000 Tonnes per year	*14*	*13*	*15*	*15*	*-2.2*	*1.8*	*0.0*	*0.9*
PM10 Transport emissions	1000 Tonnes per year	5	4	3	3	-4.6	-2.7	-2.0	-2.4
Road freight	1000 Tonnes per year	*2*	*1*	*1*	*1*	*-5.9*	*-4.2*	*-2.2*	*-3.2*
Road passenger	1000 Tonnes per year	*3*	*3*	*2*	*2*	*-3.8*	*-2.1*	*-1.9*	*-2.0*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	2,464	2,403	2,725	2,859	-0.5	1.3	0.5	0.9
Gasoline	1000 vehicles	*1,842*	*1,316*	*1,031*	*1,164*	*-6.5*	*-2.4*	*1.2*	*-0.6*
Diesel	1000 vehicles	*616*	*1,020*	*1,548*	*1,463*	*10.6*	*4.3*	*-0.6*	*1.8*
LPG/CNG	1000 vehicles	*0*	*55*	*92*	*134*	*0.0*	*5.2*	*3.9*	*4.5*
Bioethanol	1000 vehicles	*0*	*0*	*18*	*50*	*93.8*	*51.1*	*10.8*	*29.4*
Hybrid	1000 vehicles	*5*	*12*	*37*	*29*	*16.7*	*12.1*	*-2.4*	*4.6*
Electric	1000 vehicles	*0*	*0*	*0*	*1*	*0.0*	*37.2*	*16.6*	*26.5*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*18*	*0.0*	*0.0*	*87.5*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,343*	*1,075*	*894*	*984*	*-4.4*	*-1.8*	*1.0*	*-0.4*
Gasoline 1400-2000 cc	1000 vehicles	*440*	*219*	*128*	*170*	*-13.0*	*-5.3*	*2.9*	*-1.3*
Gasoline >2000 cc	1000 vehicles	*59*	*21*	*9*	*10*	*-18.2*	*-7.9*	*0.8*	*-3.6*
Diesel <2000 cc	1000 vehicles	*387*	*830*	*1,260*	*1,159*	*16.5*	*4.3*	*-0.8*	*1.7*
Diesel >2000 cc	1000 vehicles	*141*	*190*	*288*	*304*	*6.1*	*4.2*	*0.6*	*2.4*
PreEURO	*1000 vehicles*	*436*	*17*	*0*	*0*	*-47.9*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*718*	*311*	*0*	*0*	*-15.4*	*-96.0*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*518*	*453*	*0*	*0*	*-2.6*	*-52.1*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*787*	*746*	*195*	*0*	*-1.0*	*-12.6*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*524*	*403*	*0*	*0.0*	*-2.6*	*-77.2*	*-52.9*
EURO V or later	1000 vehicles	*0*	*285*	*1,981*	*2,627*	*0.0*	*21.4*	*2.9*	*11.7*
Light duty vehicle fleet size	1000 vehicles	903	1,000	1,221	1,388	2.1	2.0	1.3	1.7
Gasoline and Diesel	1000 vehicles	*903*	*1,000*	*1,210*	*1,316*	*2.1*	*1.9*	*0.8*	*1.4*
Electric	1000 vehicles	*0*	*0*	*12*	*72*	*n.a.*	*n.a.*	*20.0*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	583	509	601	632	-2.7	1.7	0.5	1.1
3.5-7.5 tonnes	1000 vehicles	*213*	*242*	*292*	*308*	*2.6*	*1.9*	*0.5*	*1.2*
7.5-16 tonnes	1000 vehicles	*56*	*63*	*76*	*80*	*2.5*	*1.9*	*0.5*	*1.2*
16-32 tonnes	1000 vehicles	*152*	*165*	*187*	*196*	*1.7*	*1.3*	*0.5*	*0.9*
>32 tonnes	1000 vehicles	*36*	*39*	*46*	*48*	*1.9*	*1.5*	*0.5*	*1.0*
PreEURO	*1000 vehicles*	*382*	*257*	*130*	*24*	*-7.6*	*-6.6*	*-15.6*	*-11.2*
EURO I	1000 vehicles	*70*	*55*	*46*	*19*	*-4.8*	*-1.7*	*-8.5*	*-5.2*
EURO II	1000 vehicles	*65*	*52*	*49*	*30*	*-4.4*	*-0.6*	*-4.8*	*-2.7*
EURO III	1000 vehicles	*66*	*68*	*68*	*55*	*0.6*	*0.1*	*-2.1*	*-1.0*
EURO IV	1000 vehicles	*0*	*69*	*71*	*65*	*n.a.*	*0.3*	*-0.9*	*-0.3*
EURO V or later	1000 vehicles	*0*	*8*	*236*	*438*	*n.a.*	*39.8*	*6.4*	*21.9*

iTREN-2030 RO - Romania	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	247	244	236	267	-0.2	-0.3	1.2	0.5
Freight transport activity originated in the country	Billion tonnes-km per year	139	159	214	265	2.8	3.0	2.2	2.6
Road	Billion tonnes-km per year	*37*	*40*	*45*	*54*	*1.5*	*1.3*	*1.8*	*1.6*
Rail	Billion tonnes-km per year	*23*	*27*	*29*	*32*	*3.0*	*0.7*	*1.1*	*0.9*
Inland navigation	Billion tonnes-km per year	*56*	*70*	*91*	*119*	*4.6*	*2.6*	*2.7*	*2.7*
Maritime (Intra-EU)	Billion tonnes-km per year	*23*	*23*	*49*	*60*	*-0.1*	*7.8*	*2.1*	*4.9*
Average freight transport distance	km	563	654	904	990	3.0	3.3	0.9	2.1
Freight transport activity on the national territory	Billion tonnes-km per year	58	68	68	78	3.0	0.0	1.4	0.7
Road	Billion tonnes-km per year	*31*	*34*	*33*	*37*	*2.2*	*-0.4*	*1.2*	*0.4*
Rail	Billion tonnes-km per year	*19*	*23*	*21*	*23*	*3.6*	*-0.6*	*0.8*	*0.1*
Inland navigation	Billion tonnes-km per year	*9*	*11*	*14*	*18*	*4.6*	*2.6*	*2.7*	*2.7*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	5	5	4	4	1.4	-2.2	1.0	-0.6
Trips originated in the country	Million trips per year	14,146	13,796	14,076	14,096	-0.5	0.2	0.0	0.1
Passenger transport activity originated in the cou	Billion pass-km per year	103	95	106	113	-1.6	1.1	0.6	0.9
Car	Billion pass-km per year	*37*	*34*	*41*	*46*	*-1.8*	*2.1*	*1.0*	*1.5*
Bus	Billion pass-km per year	*29*	*25*	*23*	*22*	*-2.9*	*-0.8*	*-0.8*	*-0.8*
Rail	Billion pass-km per year	*21*	*20*	*24*	*27*	*-1.1*	*1.6*	*1.4*	*1.5*
Air (Intra-EU)	Billion pass-km per year	*2*	*2*	*2*	*2*	*-0.6*	*1.9*	*0.5*	*1.2*
Slow	Billion pass-km per year	*14*	*14*	*16*	*16*	*0.8*	*0.8*	*0.5*	*0.6*
Average passenger transport distance	km	7.3	6.9	7.5	8.0	-1.1	0.9	0.6	0.7
Passenger transport activity on the national territ	Billion pass-km per year	88	79	88	95	-2.0	1.1	0.7	0.9
Road	Billion pass-km per year	*66*	*59*	*65*	*67*	*-2.3*	*0.9*	*0.4*	*0.7*
Rail	Billion pass-km per year	*21*	*20*	*24*	*27*	*-1.1*	*1.6*	*1.4*	*1.5*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	23	22	27	31	-1.6	2.3	1.4	1.8
Motorization rate	cars/1000 inhabitants	184	251	410	562	6.4	5.0	3.2	4.1
ECONOMY INDICATORS									
GDP	Billion Euros 2005	34	34	45	57	-0.3	2.9	2.3	2.6
Employment	1000 Persons	8,263	6,754	7,833	8,186	-4.0	1.5	0.4	1.0
Agriculture and fishery	1000 Persons	*2,701*	*2,133*	*2,010*	*2,073*	*-4.6*	*-0.6*	*0.3*	*-0.1*
Construction	1000 Persons	*318*	*225*	*478*	*569*	*-6.7*	*7.8*	*1.8*	*4.7*
Energy and water	1000 Persons	*140*	*135*	*138*	*155*	*-0.8*	*0.2*	*1.2*	*0.7*
Industry	1000 Persons	*3,292*	*2,563*	*3,202*	*3,203*	*-4.9*	*2.3*	*0.0*	*1.1*
Transport services	1000 Persons	*272*	*243*	*352*	*375*	*-2.2*	*3.8*	*0.6*	*2.2*
Other services	1000 Persons	*1,540*	*1,455*	*1,654*	*1,811*	*-1.1*	*1.3*	*0.9*	*1.1*
Population total	1000 Persons	21,916	21,427	20,374	19,342	-0.5	-0.5	-0.5	-0.5
Labour force	1000 Persons	*14,004*	*14,308*	*13,348*	*12,472*	*0.4*	*-0.7*	*-0.7*	*-0.7*
Retired (> 65 years)	1000 Persons	*3,215*	*3,172*	*3,528*	*3,796*	*-0.3*	*1.1*	*0.7*	*0.9*
Transport taxation revenues	Million Euros 2005	1,072	1,210	1,766	2,001	2.5	3.8	1.3	2.5
Fuel taxes	Million Euros 2005	*947*	*1,077*	*1,211*	*1,399*	*2.6*	*1.2*	*1.5*	*1.3*
Emissions certificate	Million Euros 2005	*0*	*22*	*98*	*102*	*0.0*	*16.0*	*0.4*	*7.9*
Road charges	Million Euros 2005	*124*	*111*	*457*	*500*	*-2.2*	*15.2*	*0.9*	*7.8*
ENERGY INDICATORS									
Primary energy production	Million toe per year	28	35	43	49	5.0	2.1	1.2	1.6
Share of domestic energy production	%	72	94	116	130	5.5	2.1	1.2	1.7
Final energy demand by source	Million toe per year	38	37	37	37	-0.5	-0.1	0.0	0.0
Oil	Million toe per year	*9*	*9*	*9*	*9*	*1.2*	*-0.4*	*0.1*	*-0.1*
Gas	Million toe per year	*14*	*11*	*11*	*9*	*-5.2*	*0.3*	*-1.6*	*-0.6*
Coal, Nuclear	Million toe per year	*11*	*11*	*8*	*6*	*1.7*	*-3.7*	*-2.0*	*-2.8*
Biomass	Million toe per year	*4*	*4*	*7*	*9*	*3.0*	*5.3*	*3.2*	*4.3*
Other Renewables	Million toe per year	*2*	*2*	*2*	*3*	*1.9*	*2.6*	*1.9*	*2.3*
Final energy demand by consuming sector	Million toe per year	25	25	26	27	0.5	0.4	0.1	0.2
Transport freight	Million toe per year	*2*	*2*	*2*	*2*	*0.6*	*-0.6*	*-0.6*	*-0.6*
Transport passenger	Million toe per year	*3*	*3*	*3*	*4*	*1.0*	*1.2*	*1.6*	*1.4*
Industry	Million toe per year	*10*	*11*	*11*	*10*	*1.0*	*0.0*	*-0.4*	*-0.2*
Residential and services	Million toe per year	*10*	*10*	*10*	*10*	*-0.3*	*0.7*	*0.3*	*0.5*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.46	0.98	0.98	1.09	16.2	0.0	1.0	0.5
Gasoline price	Euros2005 per litre	1.00	1.31	1.31	1.43	5.5	0.0	0.9	0.4
Biofuels price	Euros2005 per eeccf	0.67	1.17	1.27	1.43	11.9	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	2	9	13	1159.9	14.0	4.0	8.9
Share of renewables in electricity	%	37	40	51	63	1.3	2.5	2.2	2.3
Share of renewables in final energy demand	%	20	22	29	36	1.6	2.9	2.3	2.6
Energy intensity of freight transport activity	toe/Million tkm	24	23	17	13	-1.5	-3.0	-2.2	-2.6
Energy intensity of passenger transport activity	toe/Million pkm	32	37	38	41	3.0	0.1	0.9	0.5
Energy intensity of economic activity	toe/Million Euros 2005	718	746	582	470	0.8	-2.5	-2.1	-2.3

iTREN-2030	Integrated scenario								
RO - Romania									
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	10	9	8	9	-2.0	-0.5	0.3	-0.1
Road freight	Million tonnes per year	*2*	*2*	*1*	*1*	*0.4*	*-3.7*	*-0.2*	*-2.0*
Road passenger	Million tonnes per year	*7*	*6*	*6*	*6*	*-3.5*	*0.2*	*0.3*	*0.2*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*0.9*	*-1.5*	*0.0*	*-0.8*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-2.3*	*0.7*	*0.3*	*0.5*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*19.3*	*1.5*	*2.7*	*2.1*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*0.2*	*6.4*	*1.5*	*3.9*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.1*	*1.0*	*-0.4*	*0.3*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.028	0.028	0.017	0.015	-0.2	-4.8	-1.2	-3.0
Road	tonnes/1000 tkm	*0.059*	*0.054*	*0.039*	*0.034*	*-1.8*	*-3.2*	*-1.4*	*-2.3*
Rail	tonnes/1000 tkm	*0.017*	*0.015*	*0.014*	*0.012*	*-2.6*	*-0.9*	*-0.9*	*-0.9*
Inland navigation	tonnes/1000 tkm	*0.015*	*0.030*	*0.027*	*0.027*	*14.1*	*-1.1*	*0.0*	*-0.6*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.001*	*0.001*	*0.001*	*0.001*	*0.2*	*-1.3*	*-0.6*	*-0.9*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.084	0.079	0.072	0.069	-1.4	-0.9	-0.4	-0.7
Road	tonnes/1000 pkm	*0.104*	*0.098*	*0.091*	*0.090*	*-1.3*	*-0.8*	*-0.1*	*-0.4*
Rail	tonnes/1000 pkm	*0.013*	*0.012*	*0.011*	*0.010*	*-1.2*	*-0.9*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.189*	*0.184*	*0.168*	*0.152*	*-0.5*	*-0.9*	*-1.0*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	71	45	31	29	-8.7	-3.5	-0.8	-2.2
Road freight	1000 Tonnes per year	*19*	*12*	*5*	*3*	*-7.7*	*-8.9*	*-5.1*	*-7.0*
Road passenger	1000 Tonnes per year	*39*	*17*	*9*	*6*	*-15.9*	*-6.3*	*-3.5*	*-4.9*
Rail freight	1000 Tonnes per year	*3*	*3*	*3*	*3*	*2.8*	*-0.4*	*0.4*	*0.0*
Rail passenger	1000 Tonnes per year	*3*	*2*	*2*	*2*	*-2.2*	*0.0*	*-0.5*	*-0.2*
Inland navigation	1000 Tonnes per year	*2*	*5*	*6*	*8*	*19.3*	*1.5*	*2.7*	*2.1*
Maritime (Intra-EU)	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-0.3*	*6.1*	*1.2*	*3.6*
Air (Intra-EU)	1000 Tonnes per year	*4*	*4*	*5*	*5*	*-0.3*	*1.7*	*0.4*	*1.0*
PM10 Transport emissions	1000 Tonnes per year	3	4	3	4	2.1	-0.9	1.5	0.3
Road freight	1000 Tonnes per year	*1*	*2*	*2*	*2*	*6.8*	*0.3*	*2.3*	*1.3*
Road passenger	1000 Tonnes per year	*2*	*2*	*2*	*2*	*-0.8*	*-1.9*	*0.6*	*-0.6*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	4,029	5,383	8,358	10,876	6.0	4.5	2.7	3.6
Gasoline	1000 vehicles	*2,696*	*2,944*	*4,605*	*6,184*	*1.8*	*4.6*	*3.0*	*3.8*
Diesel	1000 vehicles	*1,330*	*2,347*	*3,302*	*3,824*	*12.0*	*3.5*	*1.5*	*2.5*
LPG/CNG	1000 vehicles	*0*	*80*	*354*	*638*	*278.5*	*16.1*	*6.1*	*10.9*
Bioethanol	1000 vehicles	*0*	*3*	*75*	*209*	*280.8*	*38.9*	*10.8*	*24.1*
Hybrid	1000 vehicles	*3*	*9*	*23*	*14*	*26.4*	*9.4*	*-4.5*	*2.2*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*35.6*	*24.1*	*29.7*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*7*	*0.0*	*0.0*	*0.0*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,944*	*2,353*	*3,555*	*4,559*	*3.9*	*4.2*	*2.5*	*3.4*
Gasoline 1400-2000 cc	1000 vehicles	*701*	*560*	*1,005*	*1,556*	*-4.4*	*6.0*	*4.5*	*5.2*
Gasoline >2000 cc	1000 vehicles	*51*	*31*	*45*	*69*	*-9.5*	*3.9*	*4.3*	*4.1*
Diesel <2000 cc	1000 vehicles	*1,175*	*2,113*	*2,996*	*3,467*	*12.5*	*3.5*	*1.5*	*2.5*
Diesel >2000 cc	1000 vehicles	*155*	*234*	*306*	*358*	*8.6*	*2.7*	*1.6*	*2.2*
PreEURO	*1000 vehicles*	*797*	*254*	*0*	*0*	*-20.4*	*-95.8*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*290*	*242*	*0*	*0*	*-3.5*	*-76.8*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*1,954*	*1,749*	*27*	*0*	*-2.2*	*-34.1*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*985*	*1,320*	*362*	*0*	*6.0*	*-12.1*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*1,050*	*769*	*0*	*0.0*	*-3.1*	*-77.3*	*-53.1*
EURO V or later	1000 vehicles	*0*	*676*	*6,749*	*10,009*	*0.0*	*25.9*	*4.0*	*14.4*
Light duty vehicle fleet size	1000 vehicles	365	307	208	208	-3.4	-3.8	0.0	-1.9
Gasoline and Diesel	1000 vehicles	*365*	*307*	*207*	*200*	*-3.4*	*-3.9*	*-0.3*	*-2.1*
Electric	1000 vehicles	*0*	*0*	*1*	*8*	*n.a.*	*n.a.*	*26.9*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	605	978	1,473	2,192	10.1	4.2	4.1	4.1
3.5-7.5 tonnes	1000 vehicles	*202*	*462*	*694*	*1,033*	*18.0*	*4.1*	*4.1*	*4.1*
7.5-16 tonnes	1000 vehicles	*53*	*121*	*181*	*269*	*18.0*	*4.1*	*4.1*	*4.1*
16-32 tonnes	1000 vehicles	*138*	*326*	*493*	*733*	*18.7*	*4.2*	*4.1*	*4.1*
>32 tonnes	1000 vehicles	*28*	*69*	*105*	*157*	*19.5*	*4.3*	*4.1*	*4.2*
PreEURO	*1000 vehicles*	*230*	*140*	*74*	*19*	*-9.5*	*-6.1*	*-12.8*	*-9.5*
EURO I	1000 vehicles	*43*	*31*	*28*	*16*	*-6.5*	*-1.0*	*-5.5*	*-3.3*
EURO II	1000 vehicles	*85*	*56*	*53*	*34*	*-8.1*	*-0.7*	*-4.3*	*-2.5*
EURO III	1000 vehicles	*247*	*565*	*556*	*447*	*18.0*	*-0.1*	*-2.2*	*-1.2*
EURO IV	1000 vehicles	*0*	*159*	*161*	*150*	*n.a.*	*0.1*	*-0.7*	*-0.3*
EURO V or later	1000 vehicles	*0*	*29*	*601*	*1,526*	*n.a.*	*35.6*	*9.8*	*22.0*

iTREN-2030 SE - Sweden	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	381	396	386	445	0.8	-0.3	1.4	0.6
Freight transport activity originated in the country	Billion tonnes-km per year	106	96	123	135	-2.0	2.6	0.9	1.8
Road	Billion tonnes-km per year	*49*	*47*	*54*	*60*	*-0.9*	*1.4*	*1.1*	*1.2*
Rail	Billion tonnes-km per year	*23*	*20*	*25*	*26*	*-2.6*	*2.2*	*0.5*	*1.3*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*34*	*28*	*44*	*49*	*-3.3*	*4.6*	*1.0*	*2.8*
Average freight transport distance	km	278	241	320	304	-2.8	2.9	-0.5	1.2
Freight transport activity on the national territory	Billion tonnes-km per year	85	81	111	130	-0.9	3.2	1.6	2.4
Road	Billion tonnes-km per year	*63*	*61*	*82*	*96*	*-0.9*	*3.1*	*1.7*	*2.4*
Rail	Billion tonnes-km per year	*21*	*20*	*29*	*34*	*-0.7*	*3.6*	*1.5*	*2.5*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	9	9	10	11	0.3	0.6	1.4	1.0
Trips originated in the country	Million trips per year	10,252	10,004	11,016	11,829	-0.5	1.0	0.7	0.8
Passenger transport activity originated in the cou	Billion pass-km per year	137	129	158	178	-1.1	2.1	1.2	1.6
Car	Billion pass-km per year	*96*	*89*	*110*	*124*	*-1.6*	*2.2*	*1.2*	*1.7*
Bus	Billion pass-km per year	*12*	*12*	*11*	*11*	*0.9*	*-0.8*	*-0.3*	*-0.6*
Rail	Billion pass-km per year	*10*	*12*	*13*	*15*	*2.6*	*1.1*	*1.3*	*1.2*
Air (Intra-EU)	Billion pass-km per year	*14*	*12*	*18*	*22*	*-3.4*	*4.5*	*1.9*	*3.2*
Slow	Billion pass-km per year	*5*	*5*	*6*	*7*	*1.3*	*1.5*	*1.6*	*1.6*
Average passenger transport distance	km	13.3	12.9	14.4	15.1	-0.6	1.1	0.5	0.8
Passenger transport activity on the national territ	Billion pass-km per year	120	114	136	152	-1.0	1.8	1.1	1.4
Road	Billion pass-km per year	*109*	*102*	*123*	*136*	*-1.4*	*1.9*	*1.0*	*1.5*
Rail	Billion pass-km per year	*10*	*12*	*13*	*15*	*2.6*	*1.2*	*1.3*	*1.2*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	59	54	69	80	-1.6	2.4	1.4	1.9
Motorization rate	cars/1000 inhabitants	522	530	623	681	0.3	1.6	0.9	1.3
ECONOMY INDICATORS									
GDP	Billion Euros 2005	314	312	379	434	-0.1	2.0	1.4	1.7
Employment	1000 Persons	4,315	3,849	3,959	3,879	-2.3	0.3	-0.2	0.0
Agriculture and fishery	1000 Persons	*101*	*107*	*86*	*77*	*1.2*	*-2.1*	*-1.1*	*-1.6*
Construction	1000 Persons	*277*	*243*	*211*	*186*	*-2.5*	*-1.4*	*-1.2*	*-1.3*
Energy and water	1000 Persons	*36*	*34*	*29*	*25*	*-1.3*	*-1.6*	*-1.3*	*-1.4*
Industry	1000 Persons	*1,077*	*942*	*1,196*	*1,276*	*-2.7*	*2.4*	*0.6*	*1.5*
Transport services	1000 Persons	*247*	*206*	*308*	*319*	*-3.6*	*4.1*	*0.4*	*2.2*
Other services	1000 Persons	*2,577*	*2,317*	*2,130*	*1,996*	*-2.1*	*-0.8*	*-0.6*	*-0.7*
Population total	1000 Persons	9,013	9,156	9,556	9,896	0.3	0.4	0.3	0.4
Labour force	1000 Persons	*5,642*	*5,769*	*5,871*	*6,073*	*0.4*	*0.2*	*0.3*	*0.3*
Retired (> 65 years)	1000 Persons	*1,431*	*1,503*	*1,729*	*1,822*	*1.0*	*1.4*	*0.5*	*1.0*
Transport taxation revenues	Million Euros 2005	3,721	3,466	4,556	4,928	-1.4	2.8	0.8	1.8
Fuel taxes	Million Euros 2005	*3,721*	*3,333*	*3,658*	*3,780*	*-2.2*	*0.9*	*0.3*	*0.6*
Emissions certificate	Million Euros 2005	*0*	*59*	*285*	*268*	*0.0*	*17.1*	*-0.6*	*7.9*
Road charges	Million Euros 2005	*0*	*75*	*612*	*879*	*0.0*	*23.4*	*3.7*	*13.1*
ENERGY INDICATORS									
Primary energy production	Million toe per year	33	30	26	22	-1.6	-1.5	-1.8	-1.7
Share of domestic energy production	%	64	64	61	53	-0.1	-0.4	-1.4	-0.9
Final energy demand by source	Million toe per year	52	48	43	41	-1.6	-1.1	-0.4	-0.8
Oil	Million toe per year	*15*	*12*	*12*	*11*	*-4.3*	*-0.5*	*-0.5*	*-0.5*
Gas	Million toe per year	*1*	*1*	*1*	*1*	*6.0*	*-3.8*	*3.4*	*-0.2*
Coal, Nuclear	Million toe per year	*22*	*21*	*8*	*3*	*-0.4*	*-9.3*	*-10.8*	*-10.1*
Biomass	Million toe per year	*7*	*7*	*14*	*18*	*-0.7*	*7.0*	*2.3*	*4.6*
Other Renewables	Million toe per year	*6*	*6*	*8*	*8*	*-1.6*	*3.0*	*0.5*	*1.7*
Final energy demand by consuming sector	Million toe per year	34	31	31	31	-1.5	0.0	0.0	0.0
Transport freight	Million toe per year	*3*	*3*	*4*	*3*	*-0.5*	*0.9*	*-0.4*	*0.3*
Transport passenger	Million toe per year	*5*	*5*	*5*	*5*	*-0.7*	*-0.8*	*-0.5*	*-0.6*
Industry	Million toe per year	*12*	*12*	*12*	*12*	*-1.5*	*-0.1*	*0.0*	*0.0*
Residential and services	Million toe per year	*12*	*11*	*11*	*11*	*-2.2*	*0.1*	*0.2*	*0.1*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.94	1.39	1.34	1.51	8.1	-0.4	1.2	0.4
Gasoline price	Euros2005 per litre	1.03	1.42	1.38	1.54	6.6	-0.3	1.1	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	3	3	6	12	0.9	7.9	6.9	7.4
Share of renewables in electricity	%	54	53	86	96	-0.5	4.9	1.2	3.0
Share of renewables in final energy demand	%	36	39	59	65	1.2	4.3	1.0	2.7
Energy intensity of freight transport activity	toe/Million tkm	28	29	23	19	1.1	-2.6	-1.8	-2.2
Energy intensity of passenger transport activity	toe/Million pkm	40	41	31	26	0.5	-2.8	-1.6	-2.2
Energy intensity of economic activity	toe/Million Euros 2005	107	100	82	71	-1.4	-1.9	-1.4	-1.7

iTREN-2030 SE - Sweden	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	27	24	24	23	-2.2	0.1	-0.4	-0.2
Road freight	Million tonnes per year	*9*	*9*	*9*	*9*	*-0.2*	*-0.4*	*0.4*	*0.0*
Road passenger	Million tonnes per year	*15*	*13*	*12*	*10*	*-3.2*	*-0.5*	*-1.6*	*-1.0*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*1*	*-0.9*	*9.5*	*8.2*	*8.9*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*1.6*	*0.1*	*0.2*	*0.1*
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*1*	*1*	*-1.8*	*3.8*	*0.4*	*2.1*
Air (Intra-EU)	Million tonnes per year	*2*	*2*	*3*	*3*	*-4.0*	*3.2*	*0.8*	*2.0*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.081	0.086	0.061	0.056	1.3	-3.4	-0.7	-2.1
Road	tonnes/1000 tkm	*0.142*	*0.147*	*0.105*	*0.093*	*0.7*	*-3.3*	*-1.2*	*-2.3*
Rail	tonnes/1000 tkm	*0.005*	*0.005*	*0.008*	*0.016*	*-0.2*	*5.8*	*6.6*	*6.2*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.013*	*0.014*	*0.013*	*0.012*	*1.6*	*-0.7*	*-0.6*	*-0.7*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.131	0.118	0.097	0.077	-2.1	-1.9	-2.3	-2.1
Road	tonnes/1000 pkm	*0.137*	*0.125*	*0.099*	*0.076*	*-1.9*	*-2.3*	*-2.7*	*-2.5*
Rail	tonnes/1000 pkm	*0.008*	*0.007*	*0.006*	*0.006*	*-0.9*	*-1.0*	*-1.1*	*-1.1*
Air	tonnes/1000 pkm	*0.179*	*0.173*	*0.154*	*0.139*	*-0.6*	*-1.2*	*-1.0*	*-1.1*
NOx Transport emissions	1000 Tonnes per year	135	84	79	78	-9.2	-0.5	-0.1	-0.3
Road freight	1000 Tonnes per year	*39*	*23*	*14*	*10*	*-9.7*	*-4.7*	*-3.7*	*-4.2*
Road passenger	1000 Tonnes per year	*54*	*24*	*12*	*9*	*-15.4*	*-6.2*	*-3.0*	*-4.6*
Rail freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-3.3*	*-0.8*	*1.2*	*0.2*
Rail passenger	1000 Tonnes per year	*2*	*2*	*1*	*1*	*0.9*	*-0.7*	*-0.9*	*-0.8*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*10*	*9*	*12*	*12*	*-2.2*	*3.4*	*0.0*	*1.7*
Air (Intra-EU)	1000 Tonnes per year	*30*	*26*	*38*	*45*	*-3.2*	*4.1*	*1.7*	*2.9*
PM10 Transport emissions	1000 Tonnes per year	4	4	3	3	-3.8	-1.7	-0.4	-1.0
Road freight	1000 Tonnes per year	*1*	*1*	*1*	*0*	*-7.1*	*-5.2*	*-0.9*	*-3.1*
Road passenger	1000 Tonnes per year	*3*	*3*	*3*	*2*	*-2.5*	*-0.8*	*-0.2*	*-0.5*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	4,707	4,851	5,950	6,739	0.6	2.1	1.3	1.7
Gasoline	1000 vehicles	*4,353*	*4,208*	*4,311*	*4,079*	*-0.7*	*0.2*	*-0.6*	*-0.2*
Diesel	1000 vehicles	*263*	*378*	*482*	*381*	*7.5*	*2.5*	*-2.3*	*0.0*
LPG/CNG	1000 vehicles	*0*	*43*	*250*	*295*	*0.0*	*19.4*	*1.7*	*10.2*
Bioethanol	1000 vehicles	*39*	*88*	*257*	*320*	*17.9*	*11.3*	*2.2*	*6.7*
Hybrid	1000 vehicles	*53*	*131*	*279*	*237*	*19.6*	*7.9*	*-1.6*	*3.0*
Electric	1000 vehicles	*0*	*4*	*370*	*1,137*	*277.6*	*57.9*	*11.9*	*32.9*
Fuel cells	1000 vehicles	*0*	*0*	*1*	*290*	*0.0*	*0.0*	*75.5*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*977*	*771*	*729*	*643*	*-4.6*	*-0.6*	*-1.3*	*-0.9*
Gasoline 1400-2000 cc	1000 vehicles	*2,421*	*2,375*	*2,360*	*2,224*	*-0.4*	*-0.1*	*-0.6*	*-0.3*
Gasoline >2000 cc	1000 vehicles	*955*	*1,062*	*1,222*	*1,212*	*2.1*	*1.4*	*-0.1*	*0.7*
Diesel <2000 cc	1000 vehicles	*166*	*251*	*327*	*246*	*8.6*	*2.7*	*-2.8*	*-0.1*
Diesel >2000 cc	1000 vehicles	*96*	*127*	*155*	*135*	*5.7*	*2.0*	*-1.4*	*0.3*
PreEURO	*1000 vehicles*	*410*	*10*	*0*	*0*	*-52.5*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*1,536*	*795*	*0*	*0*	*-12.4*	*-84.0*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*1,267*	*1,134*	*10*	*0*	*-2.2*	*-37.9*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*1,401*	*1,302*	*446*	*0*	*-1.5*	*-10.2*	*-92.6*	*-74.2*
EURO IV	1000 vehicles	*0*	*831*	*613*	*0*	*0.0*	*-3.0*	*-58.7*	*-36.7*
EURO V or later	1000 vehicles	*0*	*515*	*3,725*	*4,460*	*0.0*	*21.9*	*1.8*	*11.4*
Light duty vehicle fleet size	1000 vehicles	891	929	822	924	0.8	-1.2	1.2	0.0
Gasoline and Diesel	1000 vehicles	*891*	*929*	*814*	*878*	*0.8*	*-1.3*	*0.8*	*-0.3*
Electric	1000 vehicles	*0*	*0*	*8*	*47*	*n.a.*	*n.a.*	*19.5*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	158	97	94	103	-9.3	-0.3	1.0	0.3
3.5-7.5 tonnes	1000 vehicles	*44*	*46*	*45*	*49*	*0.7*	*-0.3*	*0.9*	*0.3*
7.5-16 tonnes	1000 vehicles	*12*	*12*	*12*	*13*	*0.6*	*-0.2*	*0.9*	*0.3*
16-32 tonnes	1000 vehicles	*31*	*32*	*31*	*34*	*0.5*	*-0.3*	*1.0*	*0.3*
>32 tonnes	1000 vehicles	*7*	*7*	*7*	*7*	*0.5*	*-0.3*	*1.0*	*0.4*
PreEURO	*1000 vehicles*	*77*	*24*	*0*	*0*	*-20.8*	*-47.1*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*18*	*10*	*1*	*0*	*-10.3*	*-23.2*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*30*	*18*	*10*	*0*	*-9.7*	*-5.5*	*-72.7*	*-49.2*
EURO III	1000 vehicles	*33*	*25*	*24*	*1*	*-5.3*	*-0.4*	*-25.9*	*-14.1*
EURO IV	1000 vehicles	*0*	*15*	*16*	*7*	*n.a.*	*0.2*	*-7.7*	*-3.8*
EURO V or later	1000 vehicles	*0*	*4*	*43*	*95*	*n.a.*	*26.4*	*8.2*	*16.9*

iTREN-2030 SI - Slovenia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	124	141	169	200	2.5	1.8	1.7	1.8
Freight transport activity originated in the country	Billion tonnes-km per year	15	16	22	26	1.4	3.1	1.9	2.5
Road	Billion tonnes-km per year	*9*	*10*	*13*	*16*	*1.4*	*3.1*	*2.1*	*2.6*
Rail	Billion tonnes-km per year	*4*	*4*	*5*	*6*	*3.2*	*1.8*	*1.3*	*1.5*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*2*	*2*	*3*	*4*	*-2.5*	*5.9*	*2.1*	*4.0*
Average freight transport distance	km	120	114	129	132	-1.1	1.3	0.2	0.8
Freight transport activity on the national territory	Billion tonnes-km per year	13	14	18	22	2.1	2.8	2.0	2.4
Road	Billion tonnes-km per year	*9*	*10*	*14*	*17*	*1.4*	*3.3*	*2.2*	*2.8*
Rail	Billion tonnes-km per year	*3*	*4*	*5*	*5*	*4.0*	*1.5*	*1.2*	*1.3*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	2	3	3	3	2.5	1.4	1.6	1.5
Trips originated in the country	Million trips per year	2,082	2,003	2,133	2,163	-0.8	0.6	0.1	0.4
Passenger transport activity originated in the cou	Billion pass-km per year	23	22	26	27	-1.0	1.5	0.3	0.9
Car	Billion pass-km per year	*19*	*18*	*21*	*22*	*-1.3*	*1.7*	*0.3*	*1.0*
Bus	Billion pass-km per year	*2*	*2*	*2*	*2*	*0.3*	*0.1*	*0.1*	*0.1*
Rail	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.8*	*0.2*	*0.0*	*0.1*
Air (Intra-EU)	Billion pass-km per year	*0*	*0*	*1*	*1*	*0.4*	*4.2*	*1.1*	*2.6*
Slow	Billion pass-km per year	*1*	*1*	*1*	*1*	*1.0*	*0.8*	*0.6*	*0.7*
Average passenger transport distance	km	11.2	11.1	12.0	12.3	-0.2	0.8	0.2	0.5
Passenger transport activity on the national territ	Billion pass-km per year	19	19	21	22	-0.8	1.4	0.4	0.9
Road	Billion pass-km per year	*18*	*17*	*20*	*21*	*-0.9*	*1.4*	*0.4*	*0.9*
Rail	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.8*	*0.2*	*0.0*	*0.1*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	11	10	13	14	-0.8	2.0	0.7	1.4
Motorization rate	cars/1000 inhabitants	473	518	609	712	1.8	1.6	1.6	1.6
ECONOMY INDICATORS									
GDP	Billion Euros 2005	31	33	47	58	1.3	3.5	2.1	2.8
Employment	1000 Persons	1,129	967	1,011	920	-3.0	0.4	-0.9	-0.3
Agriculture and fishery	1000 Persons	*139*	*105*	*107*	*110*	*-5.5*	*0.2*	*0.3*	*0.3*
Construction	1000 Persons	*71*	*78*	*91*	*94*	*1.9*	*1.5*	*0.3*	*0.9*
Energy and water	1000 Persons	*1*	*1*	*1*	*1*	*-2.8*	*-0.8*	*0.5*	*-0.1*
Industry	1000 Persons	*275*	*187*	*196*	*176*	*-7.4*	*0.5*	*-1.0*	*-0.3*
Transport services	1000 Persons	*33*	*32*	*38*	*37*	*-0.8*	*1.6*	*-0.3*	*0.7*
Other services	1000 Persons	*610*	*565*	*579*	*503*	*-1.5*	*0.3*	*-1.4*	*-0.6*
Population total	1000 Persons	1,998	2,012	2,020	2,000	0.1	0.0	-0.1	0.0
Labour force	1000 Persons	*1,340*	*1,375*	*1,362*	*1,313*	*0.5*	*-0.1*	*-0.4*	*-0.2*
Retired (> 65 years)	1000 Persons	*290*	*306*	*359*	*422*	*1.1*	*1.6*	*1.6*	*1.6*
Transport taxation revenues	Million Euros 2005	1,104	1,198	1,499	1,647	1.7	2.3	0.9	1.6
Fuel taxes	Million Euros 2005	*721*	*795*	*896*	*967*	*2.0*	*1.2*	*0.8*	*1.0*
Emissions certificate	Million Euros 2005	*0*	*25*	*128*	*134*	*0.0*	*17.7*	*0.5*	*8.7*
Road charges	Million Euros 2005	*383*	*378*	*475*	*547*	*-0.3*	*2.3*	*1.4*	*1.9*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

iTREN-2030 SI - Slovenia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	8	9	9	10	1.0	0.6	0.7	0.7
Road freight	Million tonnes per year	*6*	*6*	*6*	*7*	*1.7*	*0.1*	*0.9*	*0.5*
Road passenger	Million tonnes per year	*2*	*2*	*3*	*3*	*-0.7*	*1.5*	*-0.2*	*0.7*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	*6.9*	*4.7*	*3.4*	*4.1*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.3*	*-0.6*	*-0.9*	*-0.8*
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.8*	*4.7*	*0.7*	*2.7*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.8*	*2.8*	*0.1*	*1.4*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.386	0.391	0.292	0.266	0.3	-2.9	-0.9	-1.9
Road	tonnes/1000 tkm	*0.606*	*0.614*	*0.450*	*0.397*	*0.3*	*-3.1*	*-1.2*	*-2.2*
Rail	tonnes/1000 tkm	*0.022*	*0.026*	*0.035*	*0.044*	*2.8*	*3.1*	*2.2*	*2.7*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.016*	*0.017*	*0.015*	*0.013*	*0.6*	*-1.1*	*-1.3*	*-1.2*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.123	0.123	0.124	0.118	0.1	0.1	-0.5	-0.2
Road	tonnes/1000 pkm	*0.128*	*0.129*	*0.131*	*0.124*	*0.2*	*0.1*	*-0.5*	*-0.2*
Rail	tonnes/1000 pkm	*0.011*	*0.011*	*0.010*	*0.009*	*-1.1*	*-0.8*	*-0.9*	*-0.9*
Air	tonnes/1000 pkm	*0.151*	*0.142*	*0.124*	*0.112*	*-1.2*	*-1.4*	*-1.0*	*-1.2*
NOx Transport emissions	1000 Tonnes per year	23	16	11	10	-7.3	-3.1	-1.5	-2.3
Road freight	1000 Tonnes per year	*12*	*9*	*6*	*5*	*-5.0*	*-3.4*	*-2.6*	*-3.0*
Road passenger	1000 Tonnes per year	*9*	*5*	*3*	*2*	*-12.3*	*-6.4*	*-2.0*	*-4.2*
Rail freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-0.2*	*3.8*	*2.5*	*3.1*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.5*	*-1.5*	*-2.0*	*-1.7*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-2.3*	*4.4*	*0.4*	*2.4*
Air (Intra-EU)	1000 Tonnes per year	*0*	*0*	*1*	*1*	*0.1*	*3.2*	*0.8*	*2.0*
PM10 Transport emissions	1000 Tonnes per year	1	1	1	1	-3.5	-2.6	-1.5	-2.0
Road freight	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-4.3*	*-4.4*	*-2.0*	*-3.2*
Road passenger	1000 Tonnes per year	*1*	*1*	*1*	*0*	*-3.0*	*-1.7*	*-1.3*	*-1.5*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	946	1,043	1,230	1,424	2.0	1.7	1.5	1.6
Gasoline	1000 vehicles	*869*	*947*	*1,102*	*1,285*	*1.7*	*1.5*	*1.6*	*1.5*
Diesel	1000 vehicles	*75*	*91*	*107*	*109*	*3.9*	*1.7*	*0.1*	*0.9*
LPG/CNG	1000 vehicles	*1*	*3*	*5*	*6*	*20.6*	*4.7*	*1.0*	*2.8*
Bioethanol	1000 vehicles	*0*	*1*	*10*	*14*	*21.6*	*26.5*	*4.0*	*14.7*
Hybrid	1000 vehicles	*0*	*0*	*1*	*1*	*16.9*	*13.9*	*-1.9*	*5.7*
Electric	1000 vehicles	*0*	*0*	*5*	*9*	*123.5*	*29.2*	*5.4*	*16.7*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*1*	*0.0*	*0.0*	*81.7*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*539*	*582*	*679*	*754*	*1.6*	*1.6*	*1.0*	*1.3*
Gasoline 1400-2000 cc	1000 vehicles	*310*	*346*	*399*	*499*	*2.2*	*1.4*	*2.3*	*1.9*
Gasoline >2000 cc	1000 vehicles	*21*	*20*	*23*	*33*	*-0.7*	*1.7*	*3.3*	*2.5*
Diesel <2000 cc	1000 vehicles	*65*	*78*	*91*	*90*	*3.7*	*1.6*	*-0.1*	*0.7*
Diesel >2000 cc	1000 vehicles	*10*	*13*	*16*	*19*	*5.2*	*2.6*	*1.3*	*2.0*
PreEURO	*1000 vehicles*	*242*	*36*	*0*	*0*	*-31.7*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*128*	*82*	*0*	*0*	*-8.6*	*-95.7*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*210*	*184*	*0*	*0*	*-2.6*	*-64.1*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*364*	*426*	*87*	*0*	*3.2*	*-14.7*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*205*	*158*	*0*	*0.0*	*-2.6*	*-77.2*	*-52.9*
EURO V or later	1000 vehicles	*0*	*106*	*965*	*1,394*	*0.0*	*24.8*	*3.7*	*13.8*
Light duty vehicle fleet size	1000 vehicles	280	312	339	386	2.2	0.8	1.3	1.1
Gasoline and Diesel	1000 vehicles	*280*	*312*	*337*	*370*	*2.2*	*0.8*	*0.9*	*0.9*
Electric	1000 vehicles	*0*	*0*	*1*	*16*	*n.a.*	*n.a.*	*27.7*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	52	24	23	29	-14.1	-0.5	2.3	0.9
3.5-7.5 tonnes	1000 vehicles	*11*	*11*	*10*	*13*	*-0.1*	*-0.9*	*2.3*	*0.7*
7.5-16 tonnes	1000 vehicles	*3*	*3*	*3*	*3*	*-0.3*	*-1.1*	*2.4*	*0.6*
16-32 tonnes	1000 vehicles	*8*	*8*	*8*	*10*	*0.6*	*-0.1*	*2.3*	*1.1*
>32 tonnes	1000 vehicles	*2*	*2*	*2*	*3*	*1.5*	*0.8*	*2.3*	*1.5*
PreEURO	*1000 vehicles*	*20*	*8*	*4*	*1*	*-17.3*	*-6.8*	*-13.8*	*-10.4*
EURO I	1000 vehicles	*13*	*6*	*4*	*2*	*-15.6*	*-2.9*	*-6.6*	*-4.8*
EURO II	1000 vehicles	*10*	*4*	*4*	*2*	*-15.5*	*-2.3*	*-4.5*	*-3.4*
EURO III	1000 vehicles	*8*	*4*	*4*	*3*	*-12.9*	*-1.6*	*-1.8*	*-1.7*
EURO IV	1000 vehicles	*0*	*1*	*1*	*1*	*n.a.*	*-1.3*	*-0.1*	*-0.7*
EURO V or later	1000 vehicles	*0*	*1*	*7*	*20*	*n.a.*	*22.7*	*11.3*	*16.9*

iTREN-2030 SK - Slovakia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	144	162	169	193	2.4	0.4	1.4	0.9
Freight transport activity originated in the country	Billion tonnes-km per year	26	28	35	40	1.5	2.2	1.3	1.8
Road	Billion tonnes-km per year	*16*	*19*	*22*	*25*	*2.8*	*1.5*	*1.6*	*1.5*
Rail	Billion tonnes-km per year	*10*	*10*	*14*	*15*	*-0.6*	*3.4*	*0.9*	*2.2*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*1.9*	*6.3*	*2.5*	*4.4*
Maritime (Intra-EU)	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Average freight transport distance	km	183	175	210	209	-0.9	1.8	0.0	0.9
Freight transport activity on the national territory	Billion tonnes-km per year	23	26	34	40	2.5	2.5	1.8	2.1
Road	Billion tonnes-km per year	*15*	*18*	*21*	*25*	*3.3*	*1.6*	*1.8*	*1.7*
Rail	Billion tonnes-km per year	*8*	*8*	*12*	*14*	*0.9*	*3.9*	*1.6*	*2.8*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*1*	*1*	*1.9*	*6.3*	*2.5*	*4.4*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	3	4	3	4	4.1	-0.7	1.2	0.3
Trips originated in the country	Million trips per year	4,622	4,536	4,810	4,973	-0.4	0.6	0.3	0.5
Passenger transport activity originated in the cou	Billion pass-km per year	44	44	51	55	0.0	1.4	0.8	1.1
Car	Billion pass-km per year	*30*	*30*	*36*	*40*	*-0.3*	*1.9*	*1.1*	*1.5*
Bus	Billion pass-km per year	*8*	*8*	*8*	*8*	*0.2*	*-0.2*	*-0.2*	*-0.2*
Rail	Billion pass-km per year	*4*	*4*	*4*	*5*	*1.1*	*0.9*	*0.7*	*0.8*
Air (Intra-EU)	Billion pass-km per year	*0*	*0*	*0*	*0*	*-2.5*	*3.1*	*1.4*	*2.3*
Slow	Billion pass-km per year	*2*	*2*	*2*	*3*	*1.1*	*0.9*	*0.8*	*0.9*
Average passenger transport distance	km	9.6	9.8	10.6	11.1	0.3	0.8	0.5	0.6
Passenger transport activity on the national territ	Billion pass-km per year	41	41	47	51	-0.1	1.4	0.8	1.1
Road	Billion pass-km per year	*38*	*37*	*43*	*47*	*-0.2*	*1.5*	*0.8*	*1.1*
Rail	Billion pass-km per year	*4*	*4*	*4*	*4*	*1.0*	*0.9*	*0.8*	*0.8*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	21	21	26	31	-0.2	2.4	1.4	1.9
Motorization rate	cars/1000 inhabitants	268	274	332	403	0.4	1.9	2.0	1.9
ECONOMY INDICATORS									
GDP	Billion Euros 2005	24	26	36	46	1.7	3.3	2.4	2.8
Employment	1000 Persons	2,748	2,573	2,834	2,878	-1.3	1.0	0.2	0.6
Agriculture and fishery	1000 Persons	*245*	*215*	*183*	*172*	*-2.6*	*-1.6*	*-0.6*	*-1.1*
Construction	1000 Persons	*305*	*279*	*333*	*373*	*-1.8*	*1.8*	*1.1*	*1.5*
Energy and water	1000 Persons	*5*	*5*	*5*	*5*	*-1.8*	*0.2*	*0.5*	*0.4*
Industry	1000 Persons	*858*	*675*	*796*	*752*	*-4.7*	*1.7*	*-0.6*	*0.5*
Transport services	1000 Persons	*91*	*84*	*106*	*110*	*-1.5*	*2.3*	*0.4*	*1.3*
Other services	1000 Persons	*1,245*	*1,315*	*1,412*	*1,467*	*1.1*	*0.7*	*0.4*	*0.5*
Population total	1000 Persons	5,371	5,341	5,274	5,163	-0.1	-0.1	-0.2	-0.2
Labour force	1000 Persons	*3,522*	*3,645*	*3,571*	*3,360*	*0.7*	*-0.2*	*-0.6*	*-0.4*
Retired (> 65 years)	1000 Persons	*644*	*664*	*858*	*1,022*	*0.6*	*2.6*	*1.8*	*2.2*
Transport taxation revenues	Million Euros 2005	1,047	1,050	1,387	1,653	0.1	2.8	1.8	2.3
Fuel taxes	Million Euros 2005	*946*	*934*	*1,037*	*1,170*	*-0.2*	*1.1*	*1.2*	*1.1*
Emissions certificate	Million Euros 2005	*0*	*18*	*83*	*84*	*0.0*	*16.7*	*0.1*	*8.1*
Road charges	Million Euros 2005	*101*	*98*	*267*	*400*	*-0.6*	*10.5*	*4.1*	*7.3*
ENERGY INDICATORS									
Primary energy production	Million toe per year	7	8	9	9	3.1	1.2	-0.6	0.3
Share of domestic energy production	%	37	42	44	42	2.7	0.5	-0.4	0.0
Final energy demand by source	Million toe per year	19	19	21	20	0.3	0.7	-0.2	0.3
Oil	Million toe per year	*3*	*4*	*4*	*4*	*1.1*	*0.7*	*0.6*	*0.7*
Gas	Million toe per year	*5*	*4*	*5*	*4*	*-7.6*	*2.3*	*-0.7*	*0.8*
Coal, Nuclear	Million toe per year	*9*	*10*	*8*	*7*	*1.9*	*-2.3*	*-1.3*	*-1.8*
Biomass	Million toe per year	*0*	*1*	*3*	*4*	*20.6*	*11.5*	*1.4*	*6.4*
Other Renewables	Million toe per year	*0*	*1*	*1*	*1*	*11.3*	*4.2*	*1.3*	*2.7*
Final energy demand by consuming sector	Million toe per year	11	12	13	13	2.7	0.9	0.0	0.5
Transport freight	Million toe per year	*1*	*1*	*1*	*1*	*1.4*	*1.3*	*-0.3*	*0.5*
Transport passenger	Million toe per year	*1*	*1*	*1*	*2*	*1.9*	*1.6*	*1.5*	*1.6*
Industry	Million toe per year	*5*	*6*	*6*	*6*	*5.8*	*0.5*	*-1.3*	*-0.4*
Residential and services	Million toe per year	*4*	*4*	*5*	*5*	*-0.7*	*1.3*	*1.0*	*1.2*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	0.87	1.15	1.16	1.28	5.9	0.1	0.9	0.5
Gasoline price	Euros2005 per litre	0.91	1.22	1.21	1.33	5.9	0.0	0.9	0.5
Biofuels price	Euros2005 per eeccf	0.71	1.21	1.29	1.43	11.2	0.6	1.0	0.8
Renewables energy sources on transport demand	%	0	5	15	19	1057.5	11.8	2.4	7.0
Share of renewables in electricity	%	17	24	41	45	7.8	5.3	1.1	3.2
Share of renewables in final energy demand	%	7	12	23	27	12.2	6.6	1.3	3.9
Energy intensity of freight transport activity	toe/Million tkm	25	24	21	17	-1.1	-1.1	-2.0	-1.5
Energy intensity of passenger transport activity	toe/Million pkm	25	28	29	31	2.0	0.2	0.7	0.4
Energy intensity of economic activity	toe/Million Euros 2005	440	461	367	290	0.9	-2.3	-2.3	-2.3

iTREN-2030 SK - Slovakia	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	8	8	8	9	-0.8	1.0	0.8	0.9
Road freight	Million tonnes per year	*2*	*2*	*1*	*2*	*1.8*	*-2.0*	*0.4*	*-0.8*
Road passenger	Million tonnes per year	*5*	*4*	*5*	*5*	*-2.4*	*0.5*	*0.0*	*0.3*
Rail freight	Million tonnes per year	*1*	*1*	*2*	*3*	*2.7*	*5.9*	*2.6*	*4.2*
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*-0.3*	*0.0*	*-0.3*	*-0.1*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*2.1*	*6.4*	*2.3*	*4.3*
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.3*	*4.7*	*0.8*	*2.7*
Air (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-3.2*	*1.9*	*0.2*	*1.0*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.114	0.112	0.103	0.103	-0.4	-0.8	0.0	-0.4
Road	tonnes/1000 tkm	*0.110*	*0.102*	*0.071*	*0.061*	*-1.5*	*-3.6*	*-1.4*	*-2.5*
Rail	tonnes/1000 tkm	*0.123*	*0.135*	*0.162*	*0.180*	*1.8*	*1.9*	*1.0*	*1.5*
Inland navigation	tonnes/1000 tkm	*0.030*	*0.030*	*0.030*	*0.030*	*0.2*	*0.1*	*-0.2*	*-0.1*
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.124	0.110	0.101	0.093	-2.3	-0.9	-0.8	-0.9
Road	tonnes/1000 pkm	*0.134*	*0.120*	*0.109*	*0.101*	*-2.2*	*-1.0*	*-0.8*	*-0.9*
Rail	tonnes/1000 pkm	*0.013*	*0.012*	*0.011*	*0.010*	*-1.4*	*-0.9*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.147*	*0.142*	*0.126*	*0.112*	*-0.7*	*-1.2*	*-1.1*	*-1.2*
NOx Transport emissions	1000 Tonnes per year	39	29	27	29	-5.3	-0.8	0.8	0.0
Road freight	1000 Tonnes per year	*13*	*10*	*5*	*3*	*-4.4*	*-7.3*	*-4.6*	*-6.0*
Road passenger	1000 Tonnes per year	*17*	*9*	*5*	*4*	*-11.0*	*-5.8*	*-1.8*	*-3.8*
Rail freight	1000 Tonnes per year	*8*	*9*	*16*	*21*	*1.8*	*6.1*	*2.7*	*4.4*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-0.6*	*-0.8*	*-1.3*	*-1.1*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*2.1*	*6.4*	*2.3*	*4.3*
Maritime (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-1.6*	*4.3*	*0.4*	*2.3*
Air (Intra-EU)	1000 Tonnes per year	*0*	*0*	*0*	*0*	*-2.2*	*2.4*	*0.9*	*1.6*
PM10 Transport emissions	1000 Tonnes per year	2	1	1	1	-6.2	-2.7	-0.2	-1.4
Road freight	1000 Tonnes per year	*1*	*1*	*0*	*0*	*-3.4*	*-3.1*	*-0.3*	*-1.7*
Road passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-7.6*	*-2.4*	*-0.1*	*-1.3*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	1,442	1,464	1,753	2,083	0.3	1.8	1.7	1.8
Gasoline	1000 vehicles	*1,287*	*1,279*	*1,452*	*1,680*	*-0.1*	*1.3*	*1.5*	*1.4*
Diesel	1000 vehicles	*142*	*148*	*159*	*159*	*0.7*	*0.7*	*0.0*	*0.4*
LPG/CNG	1000 vehicles	*0*	*4*	*34*	*50*	*124.2*	*22.9*	*3.8*	*12.9*
Bioethanol	1000 vehicles	*0*	*0*	*6*	*16*	*37.2*	*32.2*	*9.7*	*20.4*
Hybrid	1000 vehicles	*12*	*32*	*78*	*63*	*21.3*	*9.4*	*-2.0*	*3.5*
Electric	1000 vehicles	*0*	*2*	*24*	*57*	*129.5*	*29.2*	*9.1*	*18.7*
Fuel cells	1000 vehicles	*0*	*0*	*0*	*58*	*0.0*	*0.0*	*108.3*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*803*	*782*	*880*	*990*	*-0.5*	*1.2*	*1.2*	*1.2*
Gasoline 1400-2000 cc	1000 vehicles	*466*	*477*	*547*	*658*	*0.5*	*1.4*	*1.9*	*1.6*
Gasoline >2000 cc	1000 vehicles	*18*	*20*	*25*	*31*	*1.7*	*2.2*	*2.2*	*2.2*
Diesel <2000 cc	1000 vehicles	*127*	*131*	*139*	*138*	*0.6*	*0.6*	*-0.1*	*0.3*
Diesel >2000 cc	1000 vehicles	*15*	*17*	*19*	*21*	*1.7*	*1.6*	*0.6*	*1.1*
PreEURO	*1000 vehicles*	*219*	*32*	*0*	*0*	*-32.0*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*228*	*172*	*0*	*0*	*-5.4*	*-77.9*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*56*	*51*	*0*	*0*	*-2.0*	*-60.6*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*927*	*879*	*120*	*0*	*-1.1*	*-18.1*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*202*	*148*	*0*	*0.0*	*-3.0*	*-77.3*	*-53.1*
EURO V or later	1000 vehicles	*0*	*91*	*1,343*	*1,838*	*0.0*	*30.9*	*3.2*	*16.2*
Light duty vehicle fleet size	1000 vehicles	408	450	390	433	2.0	-1.4	1.1	-0.2
Gasoline and Diesel	1000 vehicles	*408*	*450*	*388*	*417*	*2.0*	*-1.5*	*0.7*	*-0.4*
Electric	1000 vehicles	*0*	*0*	*1*	*16*	*n.a.*	*n.a.*	*27.4*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	161	150	167	215	-1.4	1.1	2.5	1.8
3.5-7.5 tonnes	1000 vehicles	*96*	*113*	*124*	*157*	*3.4*	*0.9*	*2.4*	*1.6*
7.5-16 tonnes	1000 vehicles	*9*	*11*	*13*	*17*	*4.5*	*1.6*	*2.5*	*2.1*
16-32 tonnes	1000 vehicles	*18*	*24*	*28*	*38*	*5.0*	*1.8*	*3.0*	*2.4*
>32 tonnes	1000 vehicles	*1*	*2*	*2*	*3*	*4.6*	*1.7*	*3.1*	*2.4*
PreEURO	*1000 vehicles*	*100*	*63*	*29*	*6*	*-8.7*	*-7.4*	*-15.3*	*-11.5*
EURO I	1000 vehicles	*8*	*6*	*5*	*3*	*-5.6*	*-1.8*	*-6.7*	*-4.3*
EURO II	1000 vehicles	*11*	*8*	*7*	*4*	*-5.5*	*-1.3*	*-4.9*	*-3.1*
EURO III	1000 vehicles	*42*	*39*	*37*	*29*	*-1.1*	*-0.7*	*-2.3*	*-1.5*
EURO IV	1000 vehicles	*0*	*26*	*25*	*23*	*n.a.*	*-0.4*	*-0.8*	*-0.6*
EURO V or later	1000 vehicles	*0*	*7*	*64*	*150*	*n.a.*	*25.2*	*8.9*	*16.8*

iTREN-2030 UK - United Kingdom	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	2,334	2,350	2,574	2,881	0.1	0.9	1.1	1.0
Freight transport activity originated in the country	Billion tonnes-km per year	367	365	445	471	-0.1	2.0	0.6	1.3
Road	Billion tonnes-km per year	*180*	*194*	*202*	*212*	*1.5*	*0.4*	*0.5*	*0.5*
Rail	Billion tonnes-km per year	*11*	*12*	*11*	*10*	*3.5*	*-1.2*	*-1.1*	*-1.1*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*177*	*159*	*232*	*248*	*-2.1*	*3.9*	*0.7*	*2.3*
Average freight transport distance	km	157	155	173	163	-0.2	1.1	-0.6	0.3
Freight transport activity on the national territory	Billion tonnes-km per year	186	202	207	216	1.7	0.2	0.4	0.3
Road	Billion tonnes-km per year	*175*	*190*	*196*	*206*	*1.6*	*0.3*	*0.5*	*0.4*
Rail	Billion tonnes-km per year	*10*	*12*	*11*	*10*	*3.5*	*-1.3*	*-1.1*	*-1.2*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	42	47	44	47	2.1	-0.6	0.6	0.0
Trips originated in the country	Million UKips per year	65,891	64,503	69,496	72,013	-0.4	0.7	0.4	0.6
Passenger transport activity originated in the cou	Billion pass-km per year	909	865	1,001	1,060	-1.0	1.5	0.6	1.0
Car	Billion pass-km per year	*675*	*617*	*724*	*760*	*-1.8*	*1.6*	*0.5*	*1.0*
Bus	Billion pass-km per year	*53*	*61*	*54*	*52*	*2.8*	*-1.2*	*-0.3*	*-0.8*
Rail	Billion pass-km per year	*62*	*76*	*92*	*109*	*4.2*	*1.9*	*1.6*	*1.8*
Air (Intra-EU)	Billion pass-km per year	*84*	*74*	*89*	*93*	*-2.6*	*1.9*	*0.4*	*1.2*
Slow	Billion pass-km per year	*34*	*36*	*41*	*47*	*1.1*	*1.3*	*1.2*	*1.3*
Average passenger transport distance	km	13.8	13.4	14.4	14.7	-0.6	0.7	0.2	0.5
Passenger transport activity on the national territ	Billion pass-km per year	792	756	873	923	-0.9	1.4	0.6	1.0
Road	Billion pass-km per year	*729*	*679*	*780*	*814*	*-1.4*	*1.4*	*0.4*	*0.9*
Rail	Billion pass-km per year	*63*	*77*	*93*	*109*	*4.2*	*1.9*	*1.6*	*1.8*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	408	372	452	486	-1.8	2.0	0.7	1.4
Motorization rate	cars/1000 inhabitants	433	441	503	529	0.3	1.3	0.5	0.9
ECONOMY INDICATORS									
GDP	Billion Euros 2005	1,370	1,409	1,748	2,058	0.6	2.2	1.6	1.9
Employment	1000 Persons	29,418	25,978	27,587	26,836	-2.5	0.6	-0.3	0.2
Agriculture and fishery	1000 Persons	*1,651*	*1,812*	*1,548*	*1,383*	*1.9*	*-1.6*	*-1.1*	*-1.3*
Construction	1000 Persons	*1,708*	*1,448*	*1,722*	*1,657*	*-3.2*	*1.7*	*-0.4*	*0.7*
Energy and water	1000 Persons	*790*	*855*	*914*	*933*	*1.6*	*0.7*	*0.2*	*0.4*
Industry	1000 Persons	*7,146*	*4,984*	*5,141*	*4,844*	*-7.0*	*0.3*	*-0.6*	*-0.1*
Transport services	1000 Persons	*1,022*	*986*	*1,001*	*986*	*-0.7*	*0.1*	*-0.2*	*0.0*
Other services	1000 Persons	*17,101*	*15,892*	*17,261*	*17,033*	*-1.5*	*0.8*	*-0.1*	*0.3*
Population total	1000 Persons	59,987	61,040	62,817	64,215	0.3	0.3	0.2	0.3
Labour force	1000 Persons	*37,766*	*38,914*	*39,674*	*39,320*	*0.6*	*0.2*	*-0.1*	*0.1*
Retired (> 65 years)	1000 Persons	*8,911*	*8,980*	*10,138*	*12,056*	*0.2*	*1.2*	*1.7*	*1.5*
Transport taxation revenues	Million Euros 2005	31,789	27,817	31,188	31,484	-2.6	1.2	0.1	0.6
Fuel taxes	Million Euros 2005	*31,789*	*27,464*	*28,753*	*28,260*	*-2.9*	*0.5*	*-0.2*	*0.1*
Emissions certificate	Million Euros 2005	*0*	*354*	*1,645*	*1,491*	*0.0*	*16.6*	*-1.0*	*7.5*
Road charges	Million Euros 2005	*0*	*0*	*789*	*1,733*	*0.0*	*0.0*	*8.2*	*0.0*
ENERGY INDICATORS									
Primary energy production	Million toe per year	206	193	144	100	-1.3	-2.9	-3.6	-3.2
Share of domestic energy production	%	88	90	68	47	0.3	-2.7	-3.7	-3.2
Final energy demand by source	Million toe per year	234	216	211	214	-1.6	-0.2	0.1	-0.1
Oil	Million toe per year	*84*	*75*	*69*	*65*	*-2.3*	*-0.8*	*-0.6*	*-0.7*
Gas	Million toe per year	*85*	*73*	*85*	*84*	*-3.0*	*1.4*	*0.0*	*0.7*
Coal, Nuclear	Million toe per year	*60*	*57*	*39*	*36*	*-1.1*	*-3.8*	*-0.8*	*-2.3*
Biomass	Million toe per year	*4*	*8*	*14*	*19*	*16.9*	*5.8*	*3.6*	*4.7*
Other Renewables	Million toe per year	*1*	*3*	*5*	*9*	*26.3*	*6.3*	*5.0*	*5.7*
Final energy demand by consuming sector	Million toe per year	155	141	138	137	-1.9	-0.2	-0.1	-0.1
Transport freight	Million toe per year	*15*	*15*	*15*	*13*	*0.0*	*-0.1*	*-1.1*	*-0.6*
Transport passenger	Million toe per year	*42*	*38*	*36*	*34*	*-1.7*	*-0.7*	*-0.4*	*-0.6*
Industry	Million toe per year	*33*	*27*	*25*	*25*	*-4.1*	*-0.7*	*0.0*	*-0.3*
Residential and services	Million toe per year	*65*	*61*	*62*	*64*	*-1.4*	*0.3*	*0.3*	*0.3*
Oil price	Euros2005 per barrel	44	92	77	89	15.9	-1.7	1.4	-0.1
Gas price	Euros2005 per boe	22	36	28	35	9.9	-2.3	2.0	-0.1
Diesel price	Euros2005 per litre	1.20	1.58	1.56	1.74	5.6	-0.1	1.1	0.5
Gasoline price	Euros2005 per litre	1.23	1.62	1.59	1.76	5.6	-0.2	1.0	0.4
Biofuels price	Euros2005 per eeccf	0.66	1.18	1.27	1.43	12.2	0.8	1.2	1.0
Renewables energy sources on transport demand	%	0	3	7	13	155.4	7.5	6.4	6.9
Share of renewables in electricity	%	5	11	18	24	17.2	4.9	3.0	4.0
Share of renewables in final energy demand	%	2	4	8	12	20.9	6.1	4.6	5.3
Energy intensity of freight transport activity	toe/Million tkm	41	41	34	28	0.1	-2.0	-1.6	-1.8
Energy intensity of passenger transport activity	toe/Million pkm	48	46	37	34	-0.6	-2.2	-1.0	-1.6
Energy intensity of economic activity	toe/Million Euros 2005	113	100	79	67	-2.5	-2.3	-1.7	-2.0

iTREN-2030 Integrated scenario
UK - United Kingdom

Variable	Unit	Absolute values 2005	2010	2020	2030	Average annual % change '05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	157	139	133	119	-2.4	-0.5	-1.1	-0.8
Road freight	Million tonnes per year	*39*	*39*	*31*	*26*	*0.3*	*-2.5*	*-1.7*	*-2.1*
Road passenger	Million tonnes per year	*101*	*85*	*85*	*77*	*-3.5*	*0.0*	*-1.0*	*-0.5*
Rail freight	Million tonnes per year	*1*	*1*	*1*	*1*	*1.9*	*0.9*	*0.5*	*0.7*
Rail passenger	Million tonnes per year	*1*	*1*	*1*	*1*	*3.2*	*1.0*	*0.6*	*0.8*
Inland navigation	Million tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Million tonnes per year	*1*	*1*	*1*	*1*	*-1.3*	*1.9*	*-0.4*	*0.8*
Air (Intra-EU)	Million tonnes per year	*15*	*13*	*14*	*13*	*-3.4*	*0.9*	*-0.5*	*0.2*
CO2 intensity of freight transport activity	tonnes/1000 tkm	0.111	0.114	0.074	0.059	0.4	-4.2	-2.2	-3.2
Road	tonnes/1000 tkm	*0.222*	*0.208*	*0.156*	*0.125*	*-1.3*	*-2.8*	*-2.2*	*-2.5*
Rail	tonnes/1000 tkm	*0.063*	*0.058*	*0.073*	*0.086*	*-1.6*	*2.3*	*1.7*	*2.0*
Inland navigation	tonnes/1000 tkm	*0.000*	*0.000*	*0.000*	*0.000*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	tonnes/1000 tkm	*0.005*	*0.005*	*0.004*	*0.004*	*0.9*	*-1.9*	*-1.1*	*-1.5*
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.133	0.119	0.104	0.090	-2.3	-1.3	-1.5	-1.4
Road	tonnes/1000 pkm	*0.138*	*0.124*	*0.109*	*0.094*	*-2.1*	*-1.3*	*-1.4*	*-1.4*
Rail	tonnes/1000 pkm	*0.016*	*0.015*	*0.014*	*0.012*	*-0.9*	*-0.9*	*-1.0*	*-0.9*
Air	tonnes/1000 pkm	*0.179*	*0.172*	*0.156*	*0.142*	*-0.8*	*-1.0*	*-1.0*	*-1.0*
NOx Transport emissions	1000 Tonnes per year	535	386	353	338	-6.3	-0.9	-0.4	-0.7
Road freight	1000 Tonnes per year	*68*	*55*	*28*	*20*	*-4.2*	*-6.5*	*-3.6*	*-5.0*
Road passenger	1000 Tonnes per year	*238*	*122*	*82*	*70*	*-12.4*	*-3.9*	*-1.6*	*-2.7*
Rail freight	1000 Tonnes per year	*9*	*10*	*12*	*12*	*2.2*	*0.9*	*0.5*	*0.7*
Rail passenger	1000 Tonnes per year	*14*	*16*	*16*	*16*	*2.5*	*0.4*	*-0.3*	*0.0*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*19*	*18*	*20*	*19*	*-1.6*	*1.5*	*-0.8*	*0.3*
Air (Intra-EU)	1000 Tonnes per year	*187*	*164*	*194*	*201*	*-2.5*	*1.7*	*0.3*	*1.0*
PM10 Transport emissions	1000 Tonnes per year	37	32	25	24	-3.1	-2.6	-0.3	-1.5
Road freight	1000 Tonnes per year	*7*	*5*	*4*	*4*	*-5.9*	*-4.0*	*0.0*	*-2.0*
Road passenger	1000 Tonnes per year	*30*	*27*	*21*	*20*	*-2.4*	*-2.3*	*-0.4*	*-1.4*
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	25,984	26,894	31,578	33,992	0.7	1.6	0.7	1.2
Gasoline	1000 vehicles	*20,885*	*18,562*	*20,412*	*22,599*	*-2.3*	*1.0*	*1.0*	*1.0*
Diesel	1000 vehicles	*5,020*	*7,906*	*9,609*	*8,498*	*9.5*	*2.0*	*-1.2*	*0.4*
LPG/CNG	1000 vehicles	*0*	*124*	*273*	*302*	*0.0*	*8.2*	*1.0*	*4.5*
Bioethanol	1000 vehicles	*0*	*7*	*121*	*189*	*122.2*	*32.9*	*4.6*	*17.9*
Hybrid	1000 vehicles	*80*	*282*	*443*	*315*	*28.8*	*4.6*	*-3.3*	*0.6*
Electric	1000 vehicles	*0*	*13*	*708*	*1,532*	*205.4*	*49.6*	*8.0*	*27.1*
Fuel cells	1000 vehicles	*0*	*0*	*13*	*557*	*0.0*	*0.0*	*45.1*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*9,146*	*9,012*	*10,686*	*11,425*	*-0.3*	*1.7*	*0.7*	*1.2*
Gasoline 1400-2000 cc	1000 vehicles	*9,790*	*8,007*	*8,370*	*10,000*	*-3.9*	*0.4*	*1.8*	*1.1*
Gasoline >2000 cc	1000 vehicles	*1,948*	*1,543*	*1,357*	*1,173*	*-4.6*	*-1.3*	*-1.4*	*-1.4*
Diesel <2000 cc	1000 vehicles	*3,932*	*6,569*	*8,257*	*7,369*	*10.8*	*2.3*	*-1.1*	*0.6*
Diesel >2000 cc	1000 vehicles	*1,948*	*1,337*	*1,351*	*1,129*	*-7.3*	*0.1*	*-1.8*	*-0.8*
PreEURO	*1000 vehicles*	*2,225*	*272*	*0*	*0*	*-34.3*	*-56.6*	*-82.2*	*-72.2*
EURO I	1000 vehicles	*4,827*	*1,463*	*4*	*0*	*-21.2*	*-44.1*	*-73.0*	*-61.1*
EURO II	1000 vehicles	*7,346*	*3,994*	*89*	*0*	*-11.5*	*-31.6*	*-62.0*	*-49.0*
EURO III	1000 vehicles	*11,506*	*8,949*	*998*	*2*	*-4.9*	*-19.7*	*-47.5*	*-35.1*
EURO IV	1000 vehicles	*0*	*7,242*	*2,187*	*22*	*0.0*	*-11.3*	*-37.0*	*-25.2*
EURO V or later	1000 vehicles	*0*	*4,548*	*26,742*	*31,074*	*0.0*	*19.4*	*1.5*	*10.1*
Light duty vehicle fleet size	1000 vehicles	2,061	2,193	2,254	2,469	1.2	0.3	0.9	0.6
Gasoline and Diesel	1000 vehicles	*2,061*	*2,193*	*2,230*	*2,306*	*1.2*	*0.2*	*0.3*	*0.3*
Electric	1000 vehicles	*0*	*0*	*24*	*162*	*0.0*	*0.0*	*21.0*	*0.0*
Heavy duty vehicle fleet size	1000 vehicles	1,119	690	743	792	-9.2	0.8	0.6	0.7
3.5-7.5 tonnes	1000 vehicles	*299*	*344*	*380*	*406*	*2.9*	*1.0*	*0.7*	*0.8*
7.5-16 tonnes	1000 vehicles	*78*	*90*	*99*	*106*	*2.8*	*1.0*	*0.7*	*0.8*
16-32 tonnes	1000 vehicles	*192*	*211*	*218*	*230*	*1.9*	*0.3*	*0.6*	*0.4*
>32 tonnes	1000 vehicles	*41*	*45*	*46*	*49*	*1.9*	*0.3*	*0.6*	*0.5*
PreEURO	*1000 vehicles*	*97*	*0*	*0*	*0*	*-76.0*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*175*	*6*	*0*	*0*	*-48.7*	*-100.0*	*0.0*	*-100.0*
EURO II	1000 vehicles	*455*	*157*	*0*	*0*	*-19.2*	*-100.0*	*0.0*	*-100.0*
EURO III	1000 vehicles	*392*	*277*	*8*	*0*	*-6.7*	*-29.9*	*-100.0*	*-100.0*
EURO IV	1000 vehicles	*0*	*174*	*84*	*0*	*0.0*	*-7.1*	*-100.0*	*-100.0*
EURO V or later	1000 vehicles	*0*	*76*	*652*	*792*	*0.0*	*24.0*	*2.0*	*12.5*

iTREN-2030 CH - Switzerland	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	348	379	352	387	1.7	-0.7	1.0	0.1
Freight transport activity originated in the country	Billion tonnes-km per year	32	36	41	48	1.9	1.6	1.5	1.5
Road	Billion tonnes-km per year	*24*	*26*	*32*	*37*	*1.7*	*1.9*	*1.6*	*1.7*
Rail	Billion tonnes-km per year	*8*	*9*	*10*	*11*	*2.5*	*0.5*	*1.4*	*0.9*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Average freight transport distance	km	93	94	118	125	0.2	2.3	0.5	1.4
Freight transport activity on the national territory	Billion tonnes-km per year	32	42	50	56	5.5	1.7	1.2	1.4
Road	Billion tonnes-km per year	*30*	*31*	*37*	*42*	*0.3*	*2.1*	*1.2*	*1.6*
Rail	Billion tonnes-km per year	*11*	*12*	*12*	*14*	*0.7*	*0.7*	*1.0*	*0.8*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*-100.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	7	8	8	9	2.2	0.3	1.1	0.7
Trips originated in the country	Million trips per year	8,426	8,190	8,748	8,771	-0.6	0.7	0.0	0.3
Passenger transport activity originated in the cou	Billion pass-km per year	126	120	135	139	-0.9	1.2	0.2	0.7
Car	Billion pass-km per year	*93*	*88*	*99*	*100*	*-1.1*	*1.2*	*0.1*	*0.6*
Bus	Billion pass-km per year	*4*	*4*	*2*	*1*	*-0.4*	*-6.9*	*-3.5*	*-5.2*
Rail	Billion pass-km per year	*14*	*15*	*17*	*19*	*1.2*	*1.5*	*1.1*	*1.3*
Air (Intra-EU)	Billion pass-km per year	*12*	*10*	*13*	*13*	*-2.8*	*2.3*	*0.4*	*1.4*
Slow	Billion pass-km per year	*4*	*4*	*4*	*5*	*1.0*	*1.6*	*1.3*	*1.4*
Average passenger transport distance	km	15.0	14.7	15.5	15.8	-0.4	0.5	0.2	0.4
Passenger transport activity on the national territ	Billion pass-km per year	149	116	130	133	-4.8	1.1	0.2	0.7
Road	Billion pass-km per year	*110*	*105*	*117*	*118*	*-1.0*	*1.1*	*0.1*	*0.6*
Rail	Billion pass-km per year	*10*	*11*	*13*	*15*	*1.8*	*1.6*	*1.3*	*1.4*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	62	59	69	72	-0.9	1.6	0.4	1.0
Motorization rate	cars/1000 inhabitants	470	541	627	716	2.9	1.5	1.3	1.4
ECONOMY INDICATORS									
GDP	Billion Euros 2005	345	348	442	497	0.1	2.4	1.2	1.8
Employment	1000 Persons	4,567	3,609	3,922	3,520	-4.6	0.8	-1.1	-0.1
Agriculture and fishery	1000 Persons	*211*	*185*	*174*	*154*	*-2.6*	*-0.6*	*-1.2*	*-0.9*
Construction	1000 Persons	*328*	*133*	*261*	*216*	*-16.5*	*7.0*	*-1.9*	*2.5*
Energy and water	1000 Persons	*34*	*38*	*44*	*48*	*2.2*	*1.5*	*0.8*	*1.2*
Industry	1000 Persons	*937*	*602*	*802*	*743*	*-8.5*	*2.9*	*-0.8*	*1.1*
Transport services	1000 Persons	*208*	*181*	*176*	*163*	*-2.8*	*-0.3*	*-0.8*	*-0.5*
Other services	1000 Persons	*2,849*	*2,470*	*2,465*	*2,196*	*-2.8*	*0.0*	*-1.1*	*-0.6*
Population total	1000 Persons	7,395	7,495	7,489	7,319	0.3	0.0	-0.2	-0.1
Labour force	1000 Persons	*4,730*	*4,737*	*4,595*	*4,296*	*0.0*	*-0.3*	*-0.7*	*-0.5*
Retired (> 65 years)	1000 Persons	*1,268*	*1,398*	*1,643*	*1,883*	*2.0*	*1.6*	*1.4*	*1.5*
Transport taxation revenues	Million Euros 2005	5,077	4,616	4,612	4,753	-1.9	0.0	0.3	0.1
Fuel taxes	Million Euros 2005	*4,295*	*3,894*	*4,031*	*4,048*	*-1.9*	*0.3*	*0.0*	*0.2*
Emissions certificate	Million Euros 2005	*0*	*66*	*308*	*290*	*0.0*	*16.6*	*-0.6*	*7.7*
Road charges	Million Euros 2005	*782*	*655*	*274*	*415*	*-3.5*	*-8.4*	*4.3*	*-2.3*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

The ITREN-2030 integrated scenario until 2030

iTREN-2030 CH - Switzerland	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO2 Transport emissions (Intra-EU)	Million tonnes per year	26	23	22	21	-2.2	-0.4	-0.8	-0.6
Road freight	Million tonnes per year	*6*	*6*	*5*	*6*	*0.3*	*-0.6*	*0.2*	*-0.2*
Road passenger	Million tonnes per year	*18*	*16*	*15*	*13*	*-2.9*	*-0.6*	*-1.3*	*-0.9*
Rail freight	Million tonnes per year	-	-	-	-	-	-	-	-
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*1.0*	*0.6*	*0.3*	*0.5*
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	-	-	-	-	-	-	-	-
Air (Intra-EU)	Million tonnes per year	*2*	*2*	*2*	*2*	*-3.7*	*1.4*	*-0.5*	*0.4*
CO2 intensity of freight transport activity	tonnes/1000 tkm	#WERT!	0.139	0.111	0.101	#####	-2.2	-1.0	-1.6
Road	tonnes/1000 tkm	*0.189*	*0.189*	*0.146*	*0.131*	*0.0*	*-2.6*	*-1.0*	*-1.8*
Rail	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	-	-	-	-	-	-	-	-
CO2 intensity of passenger transport activity	tonnes/1000 pkm	0.127	0.139	0.119	0.102	1.8	-1.6	-1.5	-1.5
Road	tonnes/1000 pkm	*0.165*	*0.150*	*0.127*	*0.110*	*-1.9*	*-1.6*	*-1.4*	*-1.5*
Rail	tonnes/1000 pkm	*0.004*	*0.004*	*0.004*	*0.003*	*-0.8*	*-0.9*	*-1.0*	*-1.0*
Air	tonnes/1000 pkm	*0.183*	*0.176*	*0.160*	*0.146*	*-0.9*	*-0.9*	*-0.9*	*-0.9*
NOx Transport emissions	1000 Tonnes per year	95	67	57	51	-6.8	-1.6	-1.0	-1.3
Road freight	1000 Tonnes per year	*27*	*20*	*11*	*7*	*-5.5*	*-5.7*	*-4.1*	*-4.9*
Road passenger	1000 Tonnes per year	*37*	*19*	*12*	*9*	*-12.2*	*-5.0*	*-2.5*	*-3.8*
Rail freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-4.7*	*5.2*	*1.8*	*3.5*
Rail passenger	1000 Tonnes per year	*1*	*1*	*1*	*1*	*0.4*	*-0.2*	*-0.7*	*-0.5*
Inland navigation	1000 Tonnes per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	1000 Tonnes per year	*2*	*2*	*2*	*2*	*-3.5*	*1.7*	*-1.1*	*0.3*
Air (Intra-EU)	1000 Tonnes per year	*28*	*24*	*30*	*31*	*-2.9*	*2.2*	*0.3*	*1.2*
PM10 Transport emissions	1000 Tonnes per year	-	-	-	-	-	-	-	-
Road freight	1000 Tonnes per year	-	-	-	-	-	-	-	-
Road passenger	1000 Tonnes per year	-	-	-	-	-	-	-	-
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	3,812	4,054	4,696	5,240	1.2	1.5	1.1	1.3
Gasoline	1000 vehicles	*2,933*	*2,675*	*2,533*	*2,527*	*-1.8*	*-0.5*	*0.0*	*-0.3*
Diesel	1000 vehicles	*853*	*751*	*942*	*837*	*-2.5*	*2.3*	*-1.2*	*0.5*
LPG/CNG	1000 vehicles	*14*	*39*	*125*	*142*	*22.5*	*12.4*	*1.3*	*6.7*
Bioethanol	1000 vehicles	*2*	*14*	*58*	*81*	*51.9*	*15.5*	*3.4*	*9.2*
Hybrid	1000 vehicles	*9*	*31*	*59*	*41*	*27.4*	*6.5*	*-3.6*	*1.3*
Electric	1000 vehicles	*0*	*17*	*209*	*417*	*144.9*	*28.6*	*7.2*	*17.4*
Fuel cells	1000 vehicles	*0*	*0*	*2*	*128*	*0.0*	*0.0*	*53.2*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*1,849*	*685*	*663*	*595*	*-18.0*	*-0.3*	*-1.1*	*-0.7*
Gasoline 1400-2000 cc	1000 vehicles	*823*	*1,380*	*1,291*	*1,364*	*10.9*	*-0.7*	*0.6*	*-0.1*
Gasoline >2000 cc	1000 vehicles	*262*	*610*	*579*	*568*	*18.4*	*-0.5*	*-0.2*	*-0.4*
Diesel <2000 cc	1000 vehicles	*693*	*465*	*557*	*447*	*-7.7*	*1.8*	*-2.2*	*-0.2*
Diesel >2000 cc	1000 vehicles	*160*	*286*	*384*	*390*	*12.3*	*3.0*	*0.1*	*1.6*
PreEURO	*1000 vehicles*	*398*	*11*	*0*	*0*	*-50.9*	*-56.0*	*-87.8*	*-76.8*
EURO I	1000 vehicles	*835*	*244*	*2*	*0*	*-21.8*	*-39.1*	*-77.1*	*-62.7*
EURO II	1000 vehicles	*909*	*660*	*46*	*0*	*-6.2*	*-23.4*	*-63.6*	*-47.2*
EURO III	1000 vehicles	*1,400*	*1,008*	*424*	*1*	*-6.3*	*-8.3*	*-44.4*	*-28.6*
EURO IV	1000 vehicles	*270*	*785*	*870*	*20*	*23.8*	*1.0*	*-31.3*	*-16.7*
EURO V or later	1000 vehicles	*0*	*716*	*2,133*	*3,343*	*0.0*	*11.5*	*4.6*	*8.0*
Light duty vehicle fleet size	1000 vehicles	1,163	1,202	905	958	0.7	-2.8	0.6	-1.1
Gasoline and Diesel	1000 vehicles	*1,163*	*1,202*	*899*	*909*	*0.7*	*-2.9*	*0.1*	*-1.4*
Electric	1000 vehicles	*0*	*0*	*6*	*48*	*n.a.*	*n.a.*	*23.3*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	64	71	78	84	2.2	0.9	0.7	0.8
3.5-7.5 tonnes	1000 vehicles	*27*	*30*	*33*	*36*	*2.3*	*1.0*	*0.7*	*0.8*
7.5-16 tonnes	1000 vehicles	*7*	*8*	*9*	*9*	*2.3*	*1.0*	*0.7*	*0.9*
16-32 tonnes	1000 vehicles	*24*	*26*	*29*	*31*	*2.0*	*0.8*	*0.8*	*0.8*
>32 tonnes	1000 vehicles	*6*	*7*	*7*	*8*	*1.9*	*0.8*	*0.8*	*0.8*
PreEURO	*1000 vehicles*	*23*	*4*	*0*	*0*	*-31.2*	*-28.1*	*-40.1*	*-34.4*
EURO I	1000 vehicles	*15*	*4*	*0*	*0*	*-24.7*	*-21.9*	*-35.4*	*-29.0*
EURO II	1000 vehicles	*50*	*15*	*2*	*0*	*-21.0*	*-16.9*	*-29.9*	*-23.7*
EURO III	1000 vehicles	*47*	*24*	*8*	*1*	*-12.7*	*-10.8*	*-23.3*	*-17.3*
EURO IV	1000 vehicles		*17*	*8*	*1*	*n.a.*	*-6.6*	*-18.6*	*-12.8*
EURO V or later	1000 vehicles		*8*	*59*	*82*	*n.a.*	*21.6*	*3.4*	*12.1*

iTREN-2030 NO - Norway	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
TRANSPORT INDICATORS									
Tonnes originated in the country	Million tonnes per year	293	313	430	522	1.3	3.2	2.0	2.6
Freight transport activity originated in the country	Billion tonnes-km per year	169	151	274	334	-2.2	6.1	2.0	4.0
Road	Billion tonnes-km per year	*84*	*72*	*138*	*173*	*-2.9*	*6.7*	*2.3*	*4.4*
Rail	Billion tonnes-km per year	*23*	*22*	*38*	*45*	*-0.5*	*5.6*	*1.8*	*3.7*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Maritime (Intra-EU)	Billion tonnes-km per year	*62*	*57*	*98*	*116*	*-1.8*	*5.6*	*1.6*	*3.6*
Average freight transport distance	km	575	484	638	639	-3.4	2.8	0.0	1.4
Freight transport activity on the national territory	Billion tonnes-km per year	28	25	45	58	-2.2	6.0	2.6	4.3
Road	Billion tonnes-km per year	*23*	*21*	*37*	*49*	*-2.5*	*6.1*	*2.8*	*4.4*
Rail	Billion tonnes-km per year	*5*	*5*	*8*	*9*	*-1.0*	*5.4*	*1.6*	*3.5*
Inland navigation	Billion tonnes-km per year	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Freight road vehicles-km on the national territory	Billion vehicles-km per yea	3	3	5	6	-1.5	4.9	3.3	4.1
Trips originated in the country	Million trips per year	4,022	4,023	4,329	4,543	0.0	0.7	0.5	0.6
Passenger transport activity originated in the cou	Billion pass-km per year	82	84	95	104	0.3	1.3	0.9	1.1
Car	Billion pass-km per year	*61*	*62*	*74*	*82*	*0.6*	*1.8*	*1.0*	*1.4*
Bus	Billion pass-km per year	*8*	*7*	*5*	*3*	*-1.1*	*-4.5*	*-3.5*	*-4.0*
Rail	Billion pass-km per year	*2*	*3*	*3*	*4*	*5.6*	*1.7*	*2.3*	*2.0*
Air (Intra-EU)	Billion pass-km per year	*11*	*10*	*12*	*12*	*-1.5*	*1.8*	*0.6*	*1.2*
Slow	Billion pass-km per year	*1*	*1*	*1*	*1*	*0.8*	*1.3*	*1.3*	*1.3*
Average passenger transport distance	km	20.4	20.8	22.0	22.9	0.3	0.6	0.4	0.5
Passenger transport activity on the national territ	Billion pass-km per year	70	72	82	89	0.6	1.3	0.9	1.1
Road	Billion pass-km per year	*68*	*69*	*78*	*85*	*0.4*	*1.2*	*0.8*	*1.0*
Rail	Billion pass-km per year	*2*	*3*	*3*	*4*	*5.7*	*1.7*	*2.3*	*2.0*
Passenger road vehicles-km on the national territ	Billion vehicles-km per yea	36	37	46	52	0.8	2.1	1.3	1.7
Motorization rate	cars/1000 inhabitants	467	472	477	491	0.2	0.1	0.3	0.2
ECONOMY INDICATORS									
GDP	Billion Euros 2005	190	202	283	344	1.2	3.4	2.0	2.7
Employment	1000 Persons	2,797	2,562	2,799	2,665	-1.7	0.9	-0.5	0.2
Agriculture and fishery	1000 Persons	*183*	*191*	*174*	*165*	*0.9*	*-0.9*	*-0.5*	*-0.7*
Construction	1000 Persons	*136*	*109*	*99*	*83*	*-4.3*	*-1.0*	*-1.8*	*-1.4*
Energy and water	1000 Persons	*1*	*1*	*0*	*0*	*-2.4*	*-3.3*	*-2.3*	*-2.8*
Industry	1000 Persons	*493*	*426*	*547*	*512*	*-2.9*	*2.5*	*-0.7*	*0.9*
Transport services	1000 Persons	*235*	*199*	*270*	*263*	*-3.3*	*3.1*	*-0.2*	*1.4*
Other services	1000 Persons	*1,749*	*1,636*	*1,708*	*1,642*	*-1.3*	*0.4*	*-0.4*	*0.0*
Population total	1000 Persons	4,597	4,664	4,756	4,888	0.3	0.2	0.3	0.2
Labour force	1000 Persons	*2,870*	*2,929*	*2,932*	*2,909*	*0.4*	*0.0*	*-0.1*	*0.0*
Retired (> 65 years)	1000 Persons	*681*	*702*	*871*	*1,036*	*0.6*	*2.2*	*1.8*	*2.0*
Transport taxation revenues	Million Euros 2005	4,559	4,348	5,310	6,065	-0.9	2.0	1.3	1.7
Fuel taxes	Million Euros 2005	*3,956*	*3,724*	*4,411*	*5,027*	*-1.2*	*1.7*	*1.3*	*1.5*
Emissions certificate	Million Euros 2005	*0*	*65*	*351*	*384*	*0.0*	*18.3*	*0.9*	*9.3*
Road charges	Million Euros 2005	*603*	*558*	*549*	*654*	*-1.5*	*-0.2*	*1.8*	*0.8*
ENERGY INDICATORS									
Primary energy production	Million toe per year	-	-	-	-	-	-	-	-
Share of domestic energy production	%	-	-	-	-	-	-	-	-
Final energy demand by source	Million toe per year	-	-	-	-	-	-	-	-
Oil	Million toe per year	-	-	-	-	-	-	-	-
Gas	Million toe per year	-	-	-	-	-	-	-	-
Coal, Nuclear	Million toe per year	-	-	-	-	-	-	-	-
Biomass	Million toe per year	-	-	-	-	-	-	-	-
Other Renewables	Million toe per year	-	-	-	-	-	-	-	-
Final energy demand by consuming sector	Million toe per year	-	-	-	-	-	-	-	-
Transport freight	Million toe per year	-	-	-	-	-	-	-	-
Transport passenger	Million toe per year	-	-	-	-	-	-	-	-
Industry	Million toe per year	-	-	-	-	-	-	-	-
Residential and services	Million toe per year	-	-	-	-	-	-	-	-
Oil price	Euros2005 per barrel	-	-	-	-	-	-	-	-
Gas price	Euros2005 per boe	-	-	-	-	-	-	-	-
Diesel price	Euros2005 per litre	-	-	-	-	-	-	-	-
Gasoline price	Euros2005 per litre	-	-	-	-	-	-	-	-
Biofuels price	Euros2005 per eeccf	-	-	-	-	-	-	-	-
Renewables energy sources on transport demand	%	-	-	-	-	-	-	-	-
Share of renewables in electricity	%	-	-	-	-	-	-	-	-
Share of renewables in final energy demand	%	-	-	-	-	-	-	-	-
Energy intensity of freight transport activity	toe/Million tkm	-	-	-	-	-	-	-	-
Energy intensity of passenger transport activity	toe/Million pkm	-	-	-	-	-	-	-	-
Energy intensity of economic activity	toe/Million Euros 2005	-	-	-	-	-	-	-	-

iTREN-2030 NO - Norway	Integrated scenario								
Variable	Unit	Absolute values				Average annual % change			
		2005	2010	2020	2030	'05-'10	'10-'20	'20-'30	'10-'30
ENVIRONMENTAL INDICATORS									
CO_2 Transport emissions (Intra-EU)	Million tonnes per year	25	24	26	28	-1.2	1.1	0.6	0.8
Road freight	Million tonnes per year	*7*	*6*	*9*	*11*	*-2.0*	*3.3*	*1.9*	*2.6*
Road passenger	Million tonnes per year	*16*	*15*	*15*	*15*	*-0.8*	*0.0*	*-0.2*	*-0.1*
Rail freight	Million tonnes per year	*0*	*0*	*0*	*0*	-	-	-	-
Rail passenger	Million tonnes per year	*0*	*0*	*0*	*0*	*5.0*	*0.7*	*1.2*	*1.0*
Inland navigation	Million tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	Million tonnes per year	*0*	*0*	*0*	*0*	*-1.7*	*3.7*	*0.2*	*1.9*
Air (Intra-EU)	Million tonnes per year	*2*	*2*	*2*	*2*	*-2.3*	*0.9*	*-0.3*	*0.3*
CO_2 intensity of freight transport activity	tonnes/1000 tkm	0.079	0.079	0.062	0.062	-0.1	-2.3	0.0	-1.2
Road	tonnes/1000 tkm	*0.299*	*0.307*	*0.234*	*0.215*	*0.5*	*-2.7*	*-0.8*	*-1.8*
Rail	tonnes/1000 tkm	*0.011*	*0.010*	*0.010*	*0.010*	*-3.0*	*0.2*	*0.1*	*0.2*
Inland navigation	tonnes/1000 tkm	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	tonnes/1000 tkm	*0.001*	*0.001*	*0.001*	*0.001*	*0.1*	*-1.9*	*-1.4*	*-1.6*
CO_2 intensity of passenger transport activity	tonnes/1000 pkm	0.222	0.208	0.185	0.167	-1.3	-1.2	-1.0	-1.1
Road	tonnes/1000 pkm	*0.233*	*0.220*	*0.195*	*0.177*	*-1.2*	*-1.2*	*-1.0*	*-1.1*
Rail	tonnes/1000 pkm	*0.006*	*0.006*	*0.006*	*0.005*	*-0.6*	*-1.0*	*-1.1*	*-1.0*
Air	tonnes/1000 pkm	*0.191*	*0.183*	*0.167*	*0.152*	*-0.8*	*-0.9*	*-0.9*	*-0.9*
NO_x Transport emissions	1000 Tonnes per year	73	56	52	51	-5.4	-0.6	-0.3	-0.4
Road freight	1000 Tonnes per year	*15*	*11*	*9*	*8*	*-6.6*	*-1.4*	*-1.3*	*-1.3*
Road passenger	1000 Tonnes per year	*30*	*18*	*11*	*9*	*-9.6*	*-4.8*	*-1.7*	*-3.3*
Rail freight	1000 Tonnes per year	*1*	*1*	*1*	*1*	*-4.7*	*5.2*	*1.8*	*3.5*
Rail passenger	1000 Tonnes per year	*0*	*0*	*0*	*0*	*4.3*	*-0.2*	*0.1*	*-0.1*
Inland navigation	1000 Tonnes per year	-	-	-	-	-	-	-	-
Maritime (Intra-EU)	1000 Tonnes per year	*2*	*2*	*3*	*3*	*-2.1*	*3.3*	*-0.2*	*1.5*
Air (Intra-EU)	1000 Tonnes per year	*26*	*24*	*28*	*29*	*-1.6*	*1.7*	*0.5*	*1.1*
PM10 Transport emissions	1000 Tonnes per year	-	-	-	-	-	-	-	-
Road freight	1000 Tonnes per year	-	-	-	-	-	-	-	-
Road passenger	1000 Tonnes per year	-	-	-	-	-	-	-	-
VEHICLE FLEET INDICATORS									
Car fleet size	1000 vehicles	2,147	2,202	2,267	2,401	0.5	0.3	0.6	0.4
Gasoline	1000 vehicles	*1,747*	*1,944*	*2,113*	*2,594*	*2.2*	*0.8*	*2.1*	*1.5*
Diesel	1000 vehicles	*391*	*456*	*807*	*872*	*3.1*	*5.9*	*0.8*	*3.3*
LPG/CNG	1000 vehicles	*2*	*3*	*19*	*36*	*10.0*	*19.7*	*6.3*	*12.8*
Bioethanol	1000 vehicles	*0*	*3*	*34*	*68*	*113.2*	*29.0*	*7.1*	*17.5*
Hybrid	1000 vehicles	*7*	*15*	*27*	*22*	*17.0*	*6.5*	*-2.3*	*2.0*
Electric	1000 vehicles	*0*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*0.0*
Fuel cells	1000 vehicles	*0*	*0*	*2*	*35*	*0.0*	*0.0*	*36.6*	*0.0*
Gasoline <1400 cc	*1000 vehicles*	*410*	*720*	*898*	*975*	*11.9*	*2.2*	*0.8*	*1.5*
Gasoline 1400-2000 cc	1000 vehicles	*1,177*	*1,130*	*1,133*	*1,495*	*-0.8*	*0.0*	*2.8*	*1.4*
Gasoline >2000 cc	1000 vehicles	*160*	*94*	*82*	*124*	*-10.2*	*-1.3*	*4.1*	*1.4*
Diesel <2000 cc	1000 vehicles	*264*	*386*	*682*	*706*	*7.9*	*5.9*	*0.3*	*3.1*
Diesel >2000 cc	1000 vehicles	*126*	*70*	*126*	*167*	*-11.1*	*6.0*	*2.9*	*4.4*
PreEURO	*1000 vehicles*	*310*	*14*	*0*	*0*	*-46.4*	*-100.0*	*0.0*	*-100.0*
EURO I	1000 vehicles	*478*	*350*	*0*	*0*	*-6.0*	*-81.7*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*536*	*660*	*18*	*0*	*4.3*	*-30.2*	*-100.0*	*-100.0*
EURO III	1000 vehicles	*703*	*660*	*740*	*0*	*-1.3*	*1.1*	*-91.4*	*-70.5*
EURO IV	1000 vehicles	*120*	*367*	*843*	*0*	*25.1*	*8.7*	*-52.6*	*-28.3*
EURO V or later	1000 vehicles	*0*	*350*	*1,320*	*3,466*	*0.0*	*14.2*	*10.1*	*12.2*
Light duty vehicle fleet size	1000 vehicles	47	33	28	46	-6.6	-1.9	5.2	1.6
Gasoline and Diesel	1000 vehicles	*47*	*33*	*27*	*43*	*-6.6*	*-2.0*	*4.8*	*1.3*
Electric	1000 vehicles	*0*	*0*	*0*	*3*	*n.a.*	*n.a.*	*23.2*	*n.a.*
Heavy duty vehicle fleet size	1000 vehicles	70	72	105	125	0.7	3.9	1.7	2.8
3.5-7.5 tonnes	1000 vehicles	*33*	*34*	*50*	*59*	*0.8*	*3.9*	*1.7*	*2.8*
7.5-16 tonnes	1000 vehicles	*9*	*9*	*13*	*15*	*0.8*	*3.9*	*1.7*	*2.8*
16-32 tonnes	1000 vehicles	*23*	*24*	*35*	*42*	*0.6*	*3.8*	*1.9*	*2.8*
>32 tonnes	1000 vehicles	*5*	*5*	*7*	*9*	*0.5*	*3.8*	*1.9*	*2.8*
PreEURO	*1000 vehicles*	*35*	*14*	*0*	*0*	*-17.2*	*-49.4*	*-100.0*	*-100.0*
EURO I	1000 vehicles	*10*	*8*	*1*	*0*	*-5.8*	*-22.9*	*-100.0*	*-100.0*
EURO II	1000 vehicles	*21*	*16*	*9*	*0*	*-5.2*	*-5.9*	*-72.9*	*-49.5*
EURO III	1000 vehicles	*23*	*22*	*20*	*1*	*-1.0*	*-0.8*	*-26.5*	*-14.6*
EURO IV	1000 vehicles		*12*	*11*	*4*	*n.a.*	*-0.2*	*-8.9*	*-4.7*
EURO V or later	1000 vehicles		*1*	*64*	*120*	*n.a.*	*50.8*	*6.4*	*26.7*

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