Linking European Transport Models

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1 Introduction

The following paper is based on research carried out in the project „Policy Support Tools for Transport Issues“. The objective of the project was to contribute to the in-house capacity of the European Commission in terms of operational models and tools to support transport policy. The work focused on the further development of strategic transport models that are already available to the Commission services, notably models that have been developed under 4th and 5th FP projects, and their integration into the current activities of the Joint Research Centre – Institute for Prospective Technological Studies (JRC-IPTS) on transport issues.

The project examined the main characteristics of each model and identified their main strengths and weaknesses in addressing specific policy issues. It compared their data requirements and output, and validated their results through a comparison of their projections with official statistics. The analysis suggested that a combination of the various models allows an integrated analysis of several complex policy issues. The model developer team consisting of TNO Inro, RAND Europe, IWW (Institut für Wirtschaftspolitik und Wirtschaftsforschung) and WSP agreed on a methodology to analyse five main policy areas and defined the operational procedure. The resulting ‘blueprints’ form the basis for a policy support tool able to capture many direct and indirect impacts of transport and provide useful information for impact assessment in the field of EU transport policy.

2 Models analysed

The seven models that were analysed in the project were selected on the basis of their relevance to EU level transport policy issues and their availability for further applications by JRC-IPTS. Three of the models (POLES, ASTRA, GEM-E3) are already used by JRC-IPTS in the analysis of transport, energy and macro-economic issues. TRENDS will be maintained in the future by JRC-IPTS and is considered as a complimentary tool to the existing set of in-house models. The remaining three models (EXPEDITE, SCENES, TREMOVE) are frequently used by DG TREN and DG ENV for the analysis of transport policy measures.

TREMOVE is a model that simulates the impact of policy measures relating to transport technologies and provides projections as regards the environmental impact of transport. It does not estimate transport demand, that is an exogenous input, but concentrates on the analysis of the economic factors that influence the market share of each vehicle and fuel type. The model has been developed to support the policy assessment process within the framework of the second European Auto-Oil Programme[1].

TRENDS is a tool that provides a range of indicators concerning environmental pressure caused by transport. These indicators are calculated directly from the activity levels and reflect the potential change in the state of the environment, or the risk of specific environmental impacts which any changes in policy might have. Its strength lies in the underlying COPERT database, a detailed description of emission factors for the majority of transport technologies. Transport demand is exogenous for TRENDS; as a standalone application it should therefore be considered as a conversion tool of COPERT emission factors into total emissions per country. Coupled with a detailed transport demand model, however, it could provide reliable projections as regards the future level of transport emissions.

EXPEDITE is a tool that has been built as an extension of several national (disaggregate) transport models. Its aim is to predict passenger and freight transport demand and it provides projections per population segment, travel mode, travel purpose and distance class for the whole EU. EXPEDITE does not include a transport network, but has been calibrated using the SCENES network allocation. Although the approach used in EXPEDITE may be less accurate for the countries where no national model was available, it still provides rather reliable results at EU level as regards total transport volumes. The focus of the passenger transport model is on short and medium distance trips (up to 160 km).

SCENES is a strategic European multi-modal passenger and freight forecasting model, covering 23 EU countries at NUTS 2 level. It uses a detailed European transport network for assignment. The freight model is based on a complex regional economic model (REM), using input-output techniques. The passenger model uses a more standard trip generation mechanism. The base year for both models is 1995 and forecasts have been produced within the SCENES project for the 2020 horizon. SCENES is one of the few transport network models available at EU level and its network allocation provides input to several other transport models. It is nevertheless becoming outdated, since an update of both the transport network and base year data is long due.

ASTRA has been developed from the start as an assessment tool of the long-term impacts of the European transport policy with respect to the economic, environmental and social implications. The model applies a system dynamics methodology and follows an integrated modelling approach that covers transport, economic, regional development, trade, technological and environmental modelling. Its main advantage is its ability to analyse the direct and indirect impacts of transport policy measures taking into account the interactions with other sectors of the economy. The fact that the scope of the model is large, however, implies that the depth of the analysis of specific transport issues and the reliability of the projections vary according to the level of detail.

POLES is a simulation model for the long-term development of energy markets at global level. It provides detailed scenarios for worldwide energy consumption and GHG emissions and evaluates emission control policies and RTD strategies. The model allows the assessment of Marginal Abatement Costs for CO_2 emissions and the simulation of emission trading systems, and includes feedback mechanisms to capture the impact of changing fuel prices on international energy supply and demand. POLES encompasses an extensive transport module that has been designed to capture energy related issues of transport. It is therefore a reliable model for the analysis of the energy dimension of transport technologies but, lacking a representation of the transport networks, is not suitable for the analysis of transport flows below the macroscopic level.

GEM-E3 is not a transport model, although it covers issues that are of high interest to transport policy. GEM-E3 is a General Equilibrium Model designed to analyse market instruments for energy-related environmental policies, such as taxes, subsidies, regulations, pollution permits etc., at a degree of detail that is sufficient for national, sectoral and Europe-wide policy evaluation. Being in principle a macro-economic model, it is best suited for the assessment of the distributional consequences of programmes and policies, including social equity, employment and cohesion targets. In the context of this project, it has been considered as a reliable model for the provision of projections as regards economic growth and employment, variables that most transport models use as exogenous input.

Each of the models has been developed in order to analyse specific issues and – consequently – has its own advantages and disadvantages (see table below) as regards its suitability to address specific transport issues.

Table 1: Strengths and weaknesses of models analysed.

	Strengths	**Weaknesses**
TREMOVE	Modular structure by country	The use of a simplified technology for nine EU countries out of 15
TRENDS	Harmonised indicators of environmental impacts of transport	Limited value for policy forecasts
EXPEDITE	Meta-model simplifies	Lacks an explicit origin-

	simulation and policy analysis; outcomes for many population segments, also on their consumer surplus	destination matrix and networks
SCENES	Allocation to European transport network, multimodal	Lacking detail outside EU-15
ASTRA	Integrated approach, indirect impacts	Limited geographical detail, lack of transport network
POLES	Fuel markets and technology introduction modelling	Lacks sufficient detail for an in-depth analysis of transport issues
GEM-E3	Interactions between economic sectors and simulation of changing structure of the economy	Inherits the main weakness of general equilibrium modelling family, i.e. it assumes that the economy reaches equilibrium

3 Development of blueprints for linking models

The models analysed are all fairly sophisticated, large and usually non-linear systems. The development of each model has taken several years. A formal merger of two or more models into a common model would also be a major multi-year project (if possible at all), and was clearly outside the scope of the project[2]. Also in recent years, many researchers have given up the idea of including many aspects in great detail in one and the same model system. Very large and complex models would result that completely lack transparency. The trend is towards models that specialize in treating certain aspects in detail, or models that cover a broad range of aspects at a high level of abstraction.

As concluded in the previous chapter each of the different models as described in this project have their own strong and weak sides. By linking two or more models, we try to benefit from the strong sides of the models, and get around the weaker sides. 'Linking' here means that the outputs of one model are used as inputs of another: the models are applied in a particular sequence. In some cases this sequence may be seen as representing the behavioural reactions to a policy measure over time (e.g. transport reacts first to a transport policy measure, land use reacts later), in other cases the sequence is just a heuristic device to get the overall long term outcome (following an iterative procedure).

In linking models in this way, we should be aware of the differences in the nature of the models. Especially important in application here is the difference between dynamic models and long-term equilibrium models. The dynamic models (ASTRA, TREMOVE, POLES) are applied in annual or quarterly steps, in which the outcomes of a period t are affected by those of period t-1 (and possibly further lags). These models have also been calibrated to represent behaviour over time. The other models can be regarded as long-term equilibrium models, although not all of them have included formal market mechanisms. What distinguishes these models from the dynamic models is that they have been estimated on cross-sectional data. If an input variable, representing a policy measure, in these models changes, the model gives the new equilibrium situation. How long it will take before this equilibrium will be reached, is usually not given by these models. In general one might say that this depends on the type of behavioural reaction (several of which are included in each transport model system). Changes of route or departure time, after the implementation of a policy, may be regarded as a short-term reaction (most of the effect taking place within a year). Mode choice reactions may take somewhat more time to reach a new equilibrium. Changes in distribution (destination choice), especially for commuting, will probably take several years, as will changes in the number and the type of car(s). Changes in land use (reaching not just equilibrium on the transport markets, but also on the land market and between markets) and the regional economy will take even longer. Because of this long-term equilibrium nature of the models, it does not make sense to apply models such as SCENES on an annual basis, unless one would only use the (multi-modal) assignment part. These models can only be used for large time steps (e.g. 5-10 years apart). Another, more practical, reason for not applying models such as SCENES using one-year simulation steps is the run time of the model: the time required would exceed one month.

Some experience with ‘lining’ models (in the sense of using one model’s outputs as another model’s inputs) has already been obtained in recent research projects:

- ASTRA and VACLAV have been used in combination (to get traffic estimates consistent with ASTRA, but for a more detailed zoning system, and with assignment to explicit transport networks).
- For freight, EXPEDITE uses outputs (O-D matrices) from SCENES and NEAC.
- ASTRA has been linked to GEM-E3 in order to simulate the impacts of productivity growth on economic development.
- There is an on-going project in which SCENES will be linked to TREMOVE to provide transport demand projections to the latter.
- In the SUMMA project, EXPEDITE and TREMOVE will be combined.
- In IASON, the SASI model for regional development has been linked to the spatial computable general equilibrium model CGEurope.
- In the TIPMAC project the E3ME model is linked to the SCENES model.

All these examples concern linking only two models, or three at most. This goes to show the complexity of even linking models by linking outputs and inputs.

Combinations of models which are feasible are linking long-run equilibrium models in terms of their forecasts for 2020 (e.g. for different geographical areas, or the emission factors from one model and the transport demand from another model). A long-run equilibrium model and a dynamic model can be combined for instance by running the former for 2010 (for the transport reactions) and then run the dynamic model with these transport inputs for the period 2010-2020. Another example would be to use the dynamic model for 10 or 20 consecutive years and insert the outputs for the final year in the assignment part of a cross-sectional traffic model. Linking two dynamic models (e.g. TREMOVE and ASTRA) by inserting each model's output into the other model for each period, would run the risk of entering into an uncontrollable loop.

In linking models by using one model's outputs as another model's inputs, inconsistencies can arise. First a number of conversions (dimension, currency, price level, spatial aggregation) may be required before the output of model A can be read in by model B. But more fundamentally, model B may be capable of producing this input itself, and model A may be capable of producing the output of model B itself. In other words, in a combination of models, some outcomes of the models are overwritten and some other model outputs are ignored. This is simply an unavoidable consequence of overlaps between models. To some degree this problem could be solved by the re-calibration of one model, to reproduce the results of another model, as closely as possible, but this is outside the scope of this project. The main issue for this project is a proper selection of models: to use the outcomes from the model that is best suited to produce those specific outputs. Results from other models on the same aspect are not used, because these models are judged to be less suited for this aspect. Similarly, the chosen model for this aspect will not be the chosen model for other aspects. On these aspects its outcomes will be overwritten or will not be used.

4 Coverage of transport policy issues

Taking the strengths and weaknesses of each model into account, the project investigated the scope of the application of the models, either on a standalone basis or as a combination of more than one model. The analysis identified 17 transport research issues for which the available tools can be applied. Since the focus of the project was on policy support at EU level, a more detailed analysis was carried out as regards the feasibility of applying a combination of models to address the main EU policy priorities. Five policy issues where the tools could significantly contribute to the analysis were identified:
1. Fuel and carbon taxes and pricing principles;
2. Energy policies and emission standards;
3. Intermodality;
4. Networks / Trans-European Networks; and
5. Economic policies / Environmental assessment.

The liberalization of the railways is an important topic at the EU level. However we have decided not to include this policy issue in this project. The reason for this is that such specific questions, which are dealing with institutional reforms, are very difficult to include in transport models. Models are only valid within their institutional context and are in many cases not suitable for questions which are dealing with alterations.

5 Blueprints

By using the strengths and weaknesses of each model, it is possible to explore the possibilities of a combined application of the models. The general linkage possibilities can be seen in figure 1. It is apparent that, although each model has a clear role in terms of the issues it covers, an integrated analysis would involve the application of at least two models. On the other hand, not all models would be necessary for a comprehensive analysis, since several alternative paths for the simulation of the same policy issue can be used.

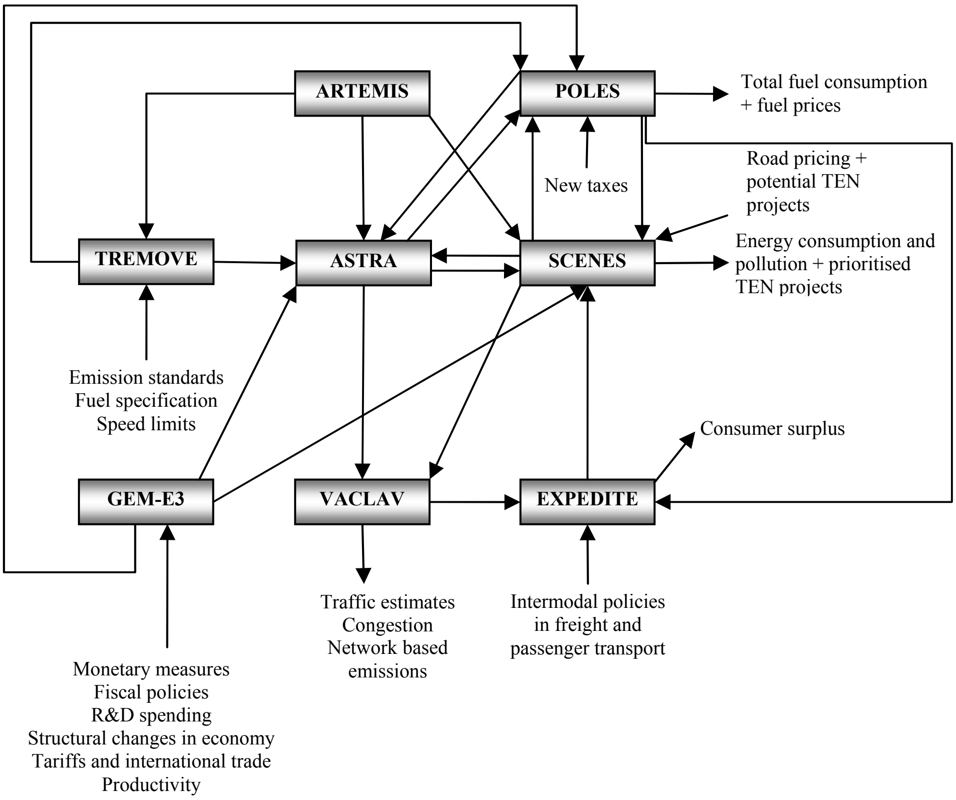

Figure 1: General model linkage possibilities.

The project elaborated on the operational methodology for the analysis of the five main areas that have been identified as important at an EU level. For each area, the developer team agreed on a 'blueprint', a diagram describing the simulation process, including the order in which the models are run, the main input variables, data exchanges and output variables. The simulation path depends on the formulation of the policy issue, so a different combination is proposed for each type of issue.

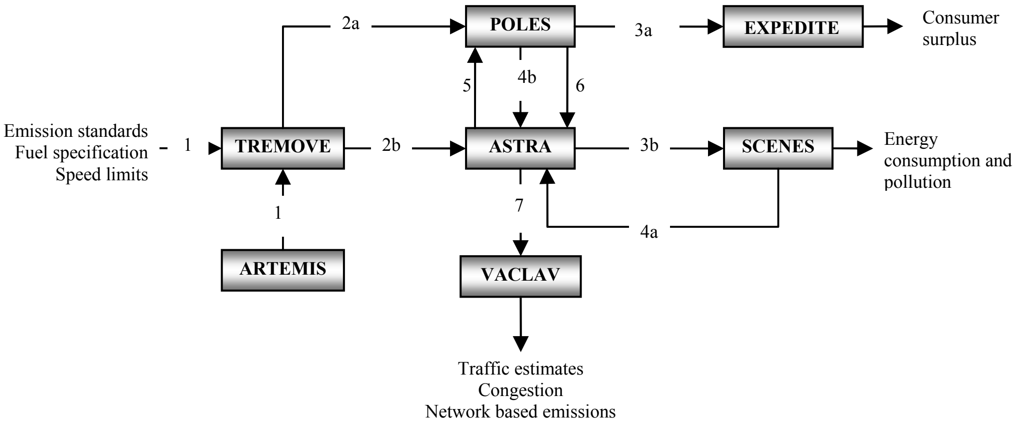

Figure 2: Example of operational 'blueprint' for analysis of impacts of energy policies and emission standards.

In the example of figure 2, the 'blueprint' for the analysis of the impact of energy policies and emission standards describes the operational procedure to analyse impacts on transport. One of the targets mentioned in the White Paper is that in 2020 a 20% share of substitute fuels is to be attained. A proposal is made for a directive setting a minimum % for consumption of bio fuels, which should attain 6% in 2010 and 20% in 2020. Further the White Paper stimulates demand by experimentation by supporting programs that aim at clean car technology. This is amongst others supported by research programs (FP6) from the Commission. In 1998 about 28% of all CO2 emissions, the leading greenhouse gas, can be related to transport activities. About 98% of energy consumption in the transport sector is oil related (accounting for 67 % of final demand for oil). Reducing this dependency is stimulated by the use of alternative fuels. One of the measures is providing tax reductions for alternative fuels. In figure 3 it is shown that the Commission expects a decrease in road pollution towards 2020. Besides tax measures also other restrictions such as the gradual tightening of motor vehicle emission standards by the Commission should reduce air pollution.

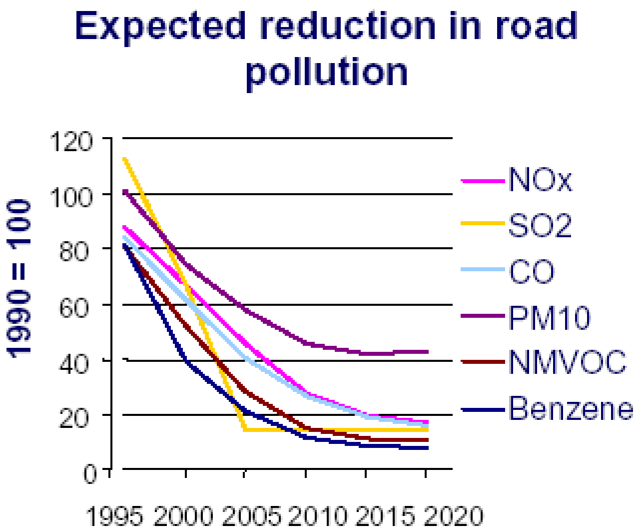

Figure 3: Expected reduction in road pollution.

The main purpose of modelling is to evaluate the effect of policy measures on emissions as well as the welfare costs of these policies. The changes in volume of transport, modal choice and vehicle choice (size & technology) for passenger as well as for freight transport should be analysed.

TREMOVE is the model to start with if it is necessary to assess the effects of energy policies and emission standards. By using the several models (as studied in this project) it is possible to assess the influence of emission standards, fuel specifications and speed limits on:
- Total fuel consumption;
- Energy consumption and pollution;
- Traffic estimates;
- Congestion; and
- Network based emissions (will be developed).

To conduct this assessment it is necessary to carry out at maximum seven steps. These steps have been represented in the next figure and table.

Step	Model	Input	Calculation / estimation	Output
1	TREMOVE	- Emission standards - Fuel specification - Speed limits - **ARTEMIS:** emission factors	- Fuel efficiency - Emission factors - Fuel use - Emission of each pollutant	% change of traffic demand by mode
2a	POLES	**TREMOVE:** % change of traffic demand by mode	Fuel consumption per technology and type of use	- Total fuel consumption - Fuel prices (next year)
2b	ASTRA	**TREMOVE**: % change of traffic demand by mode	- Fuel consumption - Car ownership	- Transport demand - Car ownership
3a	EXPEDITE	- **POLES**: Fuel prices (for each country, annual basis, %-change) - **POLES**: Registrations (annual basis)	- Change in transport volume for passenger and freight transport - Change in modal split for passenger and freight transport	- Number of pkm and tkm generated in each NUTS II zone by population segment - Consumer surplus by population segment (e.g. income groups)
3b	SCENES	**ASTRA**: Car	Modal split /	Energy

		ownership and transport demand	allocation to network	consumption and pollution by network mode and link type by country by broad commodity type / purpose
4a	ASTRA	**SCENES**: traffic estimates (only 2010, 2020)	- New generalised costs - Fuel consumption, emissions	Potential outputs: - GDP - Employment - Income - Car-ownership - Transport Demand - Modal-split - Accessibility - Emissions
4b	ASTRA	**POLES**: Fuel prices (next year)	New generalised costs	Potential outputs: - GDP - Employment - Income - Car-ownership - Transport Demand - Modal-split - Accessibility - Emissions
5	POLES	**ASTRA**: Transport demand	- Supply / demand (next year) - Fuel prices (next year)	- Supply / demand (next year) - Fuel prices (next year)
6	ASTRA	**POLES**: Fuel prices (next year)	New generalised costs	Potential outputs: - GDP - Employment - Income - Car-ownership - Transport Demand - Modal-split - Accessibility - Emissions
7	VACLAV	**ASTRA**: Transport demand	Modal split / allocation to network	- Traffic estimates - Congestion - Network based emissions

In the first step the influence of emission standards, fuel specification and speed limits on traffic demand will be established. ARTEMIS is developing emission specific functions for all modes and therefore the emission factors could be transferred to TREMOVE.

In the next step, the impact on total fuel consumption and economy caused by a change of traffic demand will be established. POLES is the appropriate model to calculate the impact on total fuel consumption because it is a simulation model for the development of long-term energy supply and demand scenarios for the different regions of the world. The relationship TREMOVE – ASTRA is necessary if the influence of emission standards, fuel specification and speed limits on the economy should be established. If it is necessary to calculate the impact of fuel price changes (caused through e.g. new emission standards) on economy, TREMOVE, POLES and ASTRA (step 1, 2a and 4b) should be used. The SCENES model makes it possible to differentiate the energy consumption and pollution by network mode and link types.

It is likely that the impact of emission standards and fuel specifications on energy prices will be substantial. Therefore, the loop with the POLES model (5 and 6 in the above figure and table) is probably of great importance.

Step 4a and 7 are will give the impact on the economy and congestion of the energy policy and emission standards. As in all other blueprints it should be stressed that it is not necessary that all steps are conducted.

It should be noted that the blueprint exercise as has been conducted in this study is mainly a theoretical exercise. It is necessary to work out at least one of the blueprints in a case study. Preferably the blueprint on *Energy policies and emission standards* as described above should be worked out in a follow-up project. The reason for this is that energy policies and emission standards will become more important in the (near) future at an EU level (see one of the targets mentioned in the White Paper that is indicating that in 2020 a 20% share of substitute fuels is to be attained). Further this blueprint is an interdisciplinary case as it is dealing with price forming on energy markets. Finally, this blueprint is less risky in terms of political sensitivity[3] compared to the blueprints in which network models play a more important role.

6 Comparison of model projections

Based on the main exogenous inputs and the main outputs a list of variables which are the same in the different models has been specified. From this list of 16 overlapping variables the nine most crucial variables have been chosen and were compared with each other. These variables are:

- GDP (Gross Domestic Product)
- Population
- Passenger kilometres (if possible by mode)
- Freight tonne kilometres (if possible by mode)
- Passenger vehicle kilometres (if possible by mode)
- Freight vehicle kilometres (if possible by mode)
- Vehicle stock
- Car ownership

- Emissions

In the table below an overview of the data elements that can be compared between the models is provided. Also it indicated whether it concerns input, output data or whether it is from observed statistics (EUROSTAT).

Table 2: Overview of data elements that were compared.

	TREMOVE	TRENDS	EXPEDITE	SCENES	ASTRA	POLES	EUROSTAT
GDP	-	-	I	I	O	I	B
Population	-	-	I	I	O	I	B
Passenger kilometres	-	-	O	O	O	O	B
Freight tonne kilometres	-	-	O	O	O	O	B
Passenger vehicle kilometres	I/O*	O	O	O	O	O	-
Freight vehicle kilometres	I/O*	O	O	O	O	O	-
Car ownership	-	-	I	I	O	O	B
Vehicle stock	O	-	I	I	O	O	B
Emission	O	-	-	O	O	O	-

NB: - means not available, I: exogenous input, O: output, B: base data from statistical recording.
* TREMOVE uses total vehicle kilometres as input and divides this over the modes.

This paper will not present all comparisons of data elements. Only data comparisons of GDP, freight tonne kilometres and passenger vehicle kilometres will be presented.

6.1 GDP

Figure 4 presents the GDP for 1995 as used in different models. In general one can see that there is convergence on the level of GDP for most countries. A few countries show differing input for the models, notably Italy, Spain and UK. It is POLES that is for these countries on the high end. In figure 5 the growth of GDP as assumed in different base case scenarios in the models is shown. As it can be seen the assumed growth patterns between countries differ substantially (a difference of 20% in a period of 25 years means a difference in 0.7% yearly growth). It is interesting to see that ASTRA, which produces the growth of GDP endogenously, is for most countries in line with other models, except for Ireland, Denmark, Finland and Germany. For Accession Countries EXPEDITE assumes considerable higher growth than SCENS and POLES. It is important to bear in mind that for EXPEDITE, SCENES and POLES the GDP is exogenously determined input for the model, while for ASTRA this is endogenously determined.

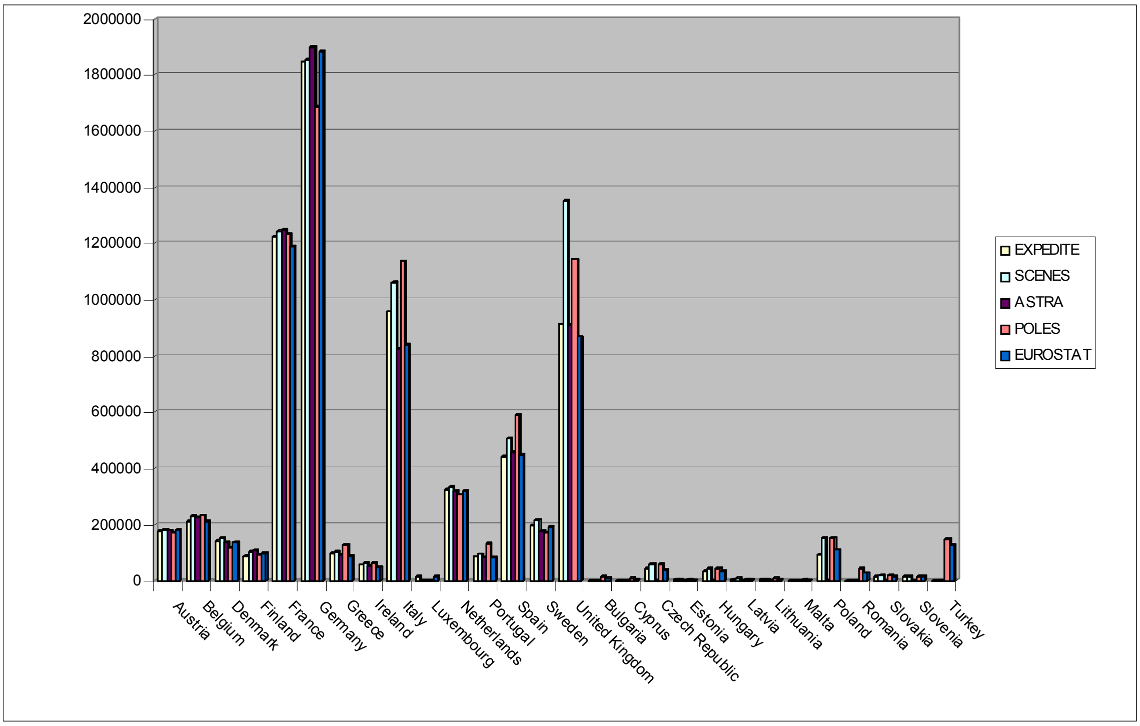

Figure 4: GDP 1995 (mln. EURO/ECU 1995).

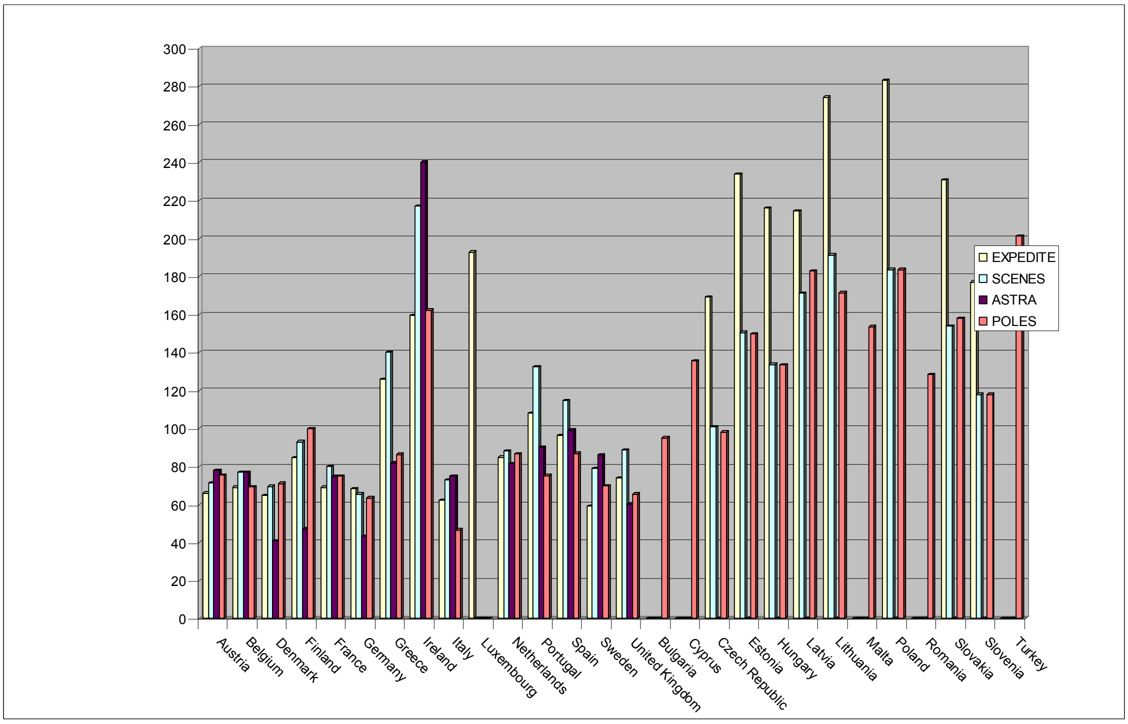

Figure 5: GDP 1995 – 2020 (% increase).

6.2 *Freight tonne kilometres*

In figure 6 the volume of tonne kilometres is given for road, rail and inland waterways together for 1995. The TRENDS model has significant higher values for tonne kilometres than the other models. The EXPEDITE, SCENES and ASTRA cluster around the value of EUROSTAT. It should be noted that for Accession Countries, SCENES only provide tonne kilometres for movements to or from the Western European Countries but not for the domestic traffic within the country. EXPEDITE uses the values as reported by NEAC for Accession Countries.

In figure 7 the projections are given for the period 1995 – 2020. It can be observed that for most countries ASTRA provided the highest projections and TRENDS the lowest. SCENES in its turn provides higher growth rates than EXPEDITE.

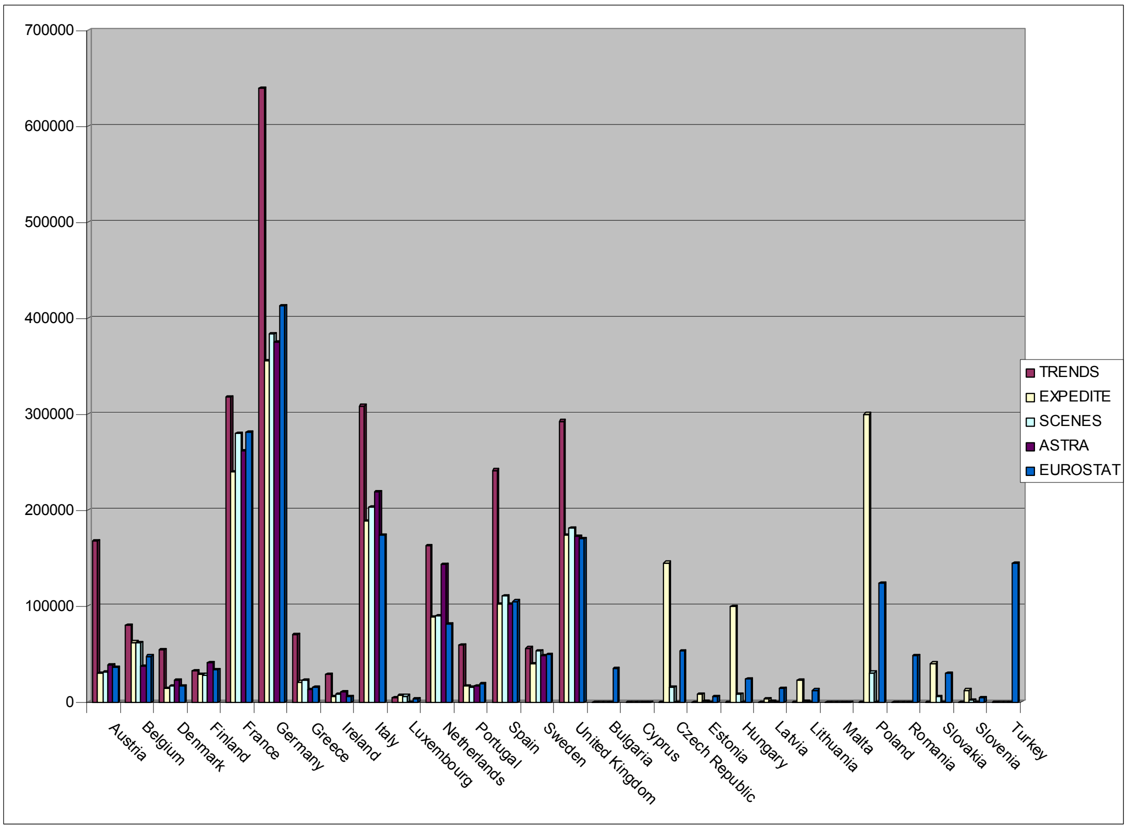

Figure 6: Freight tonne km 1995 (mln.; road, rail, iww tkm combined together).

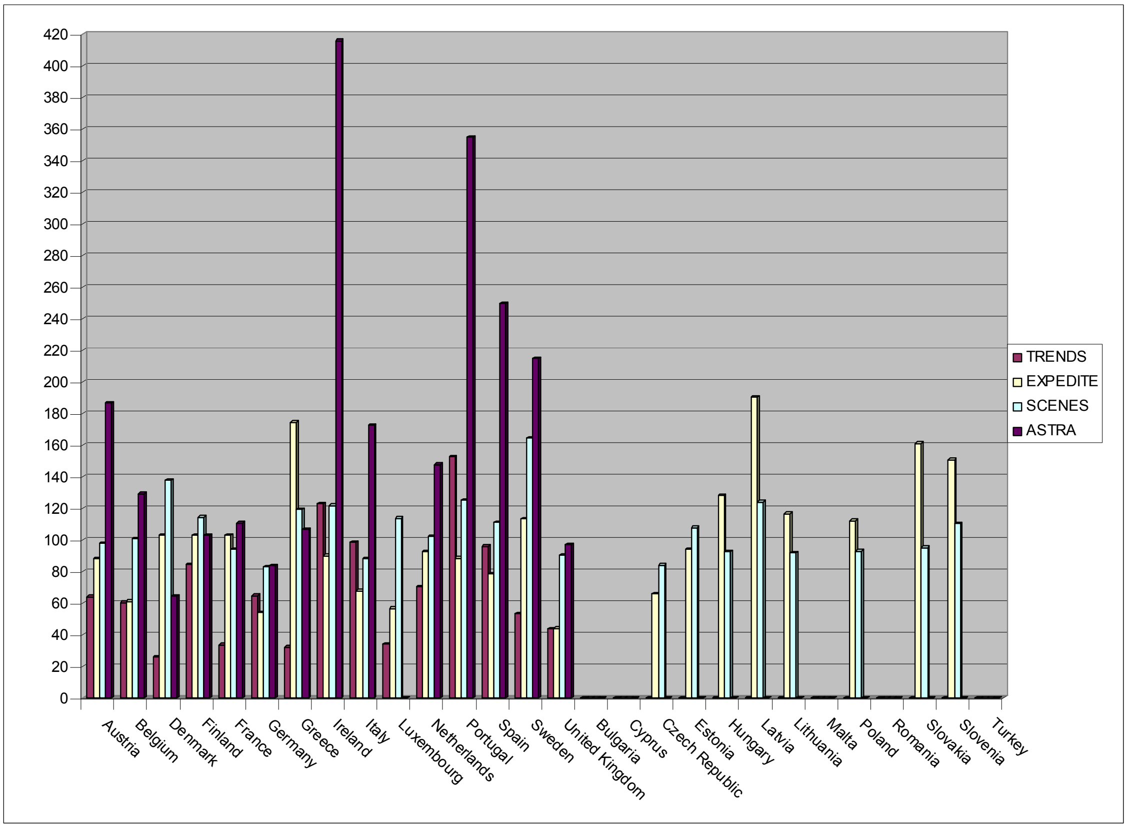

Figure 7: % growth freight tonne km 1995 – 2020 (road, rail, iww combined together).

6.3 Passenger vehicle kilometres

In figure 8 (EU member states) and 9 (Accession Countries) a comparison is made for 1995 model inputs for passenger transport in terms of vehicle kilometres of private car. The 1995 data shows more or less comparable inputs with some variance for the larger countries (France, Germany, Italy, UK and Spain). For all countries the POLES model is on the lower level end compared to other models.

Figure 10 shows the growth in the period 1995 – 2020; POLES, TRENDS and TREMOVE show higher growth rates for the vehicle kilometres than other models. This is remarkable since these three models are not very detailed transport models designed for providing detailed forecasts through time. In general the occupancy rate does not vary much, so vehicle kilometre and passenger kilometre projections should be similar. The growth rates projected by most of the models are comparable except for the ASTRA model where kilometre projections are significantly higher than passenger kilometre projections.

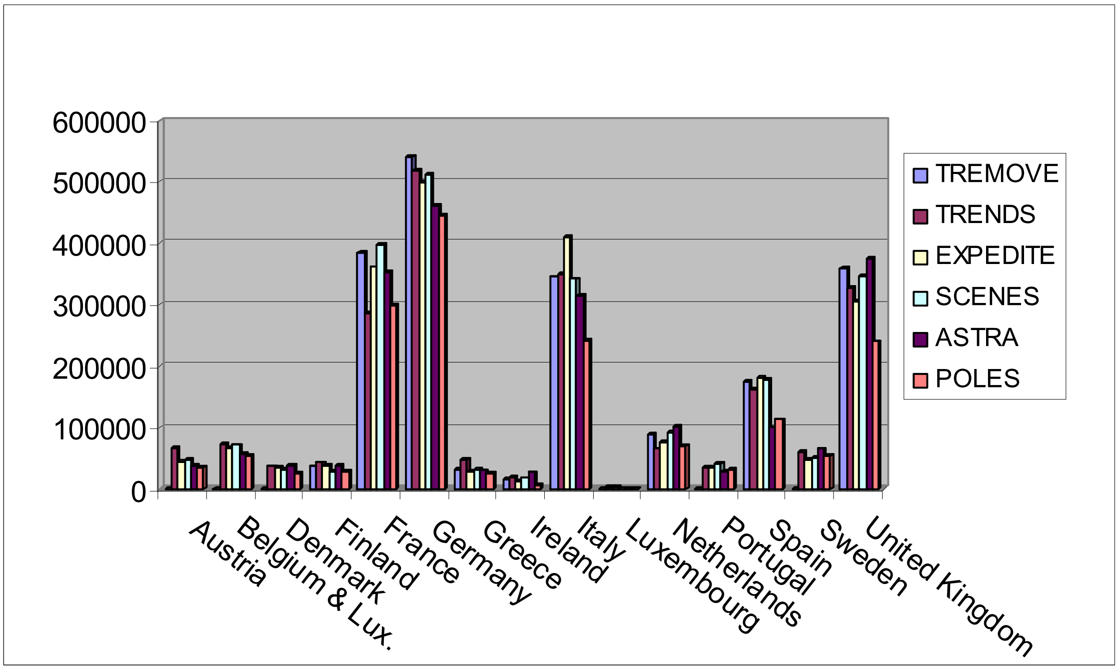

Figure 8: Passenger vehicle km 1995 (mln. ; only car).

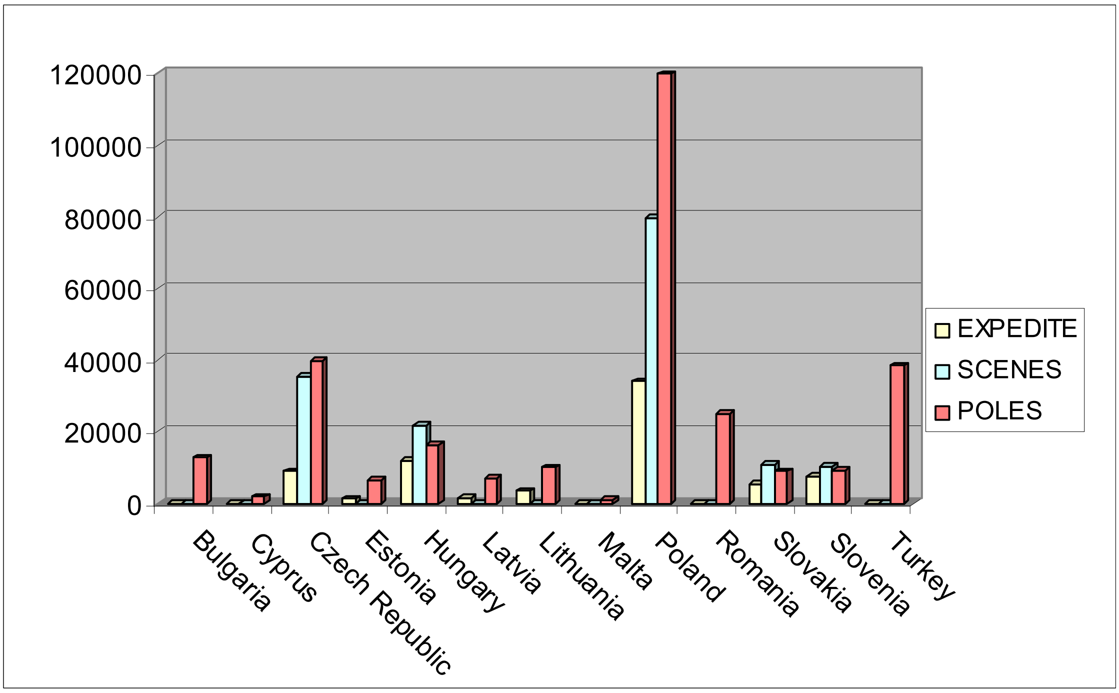

Figure 9: Passenger vehicle km 1995 (mln. ; only car).

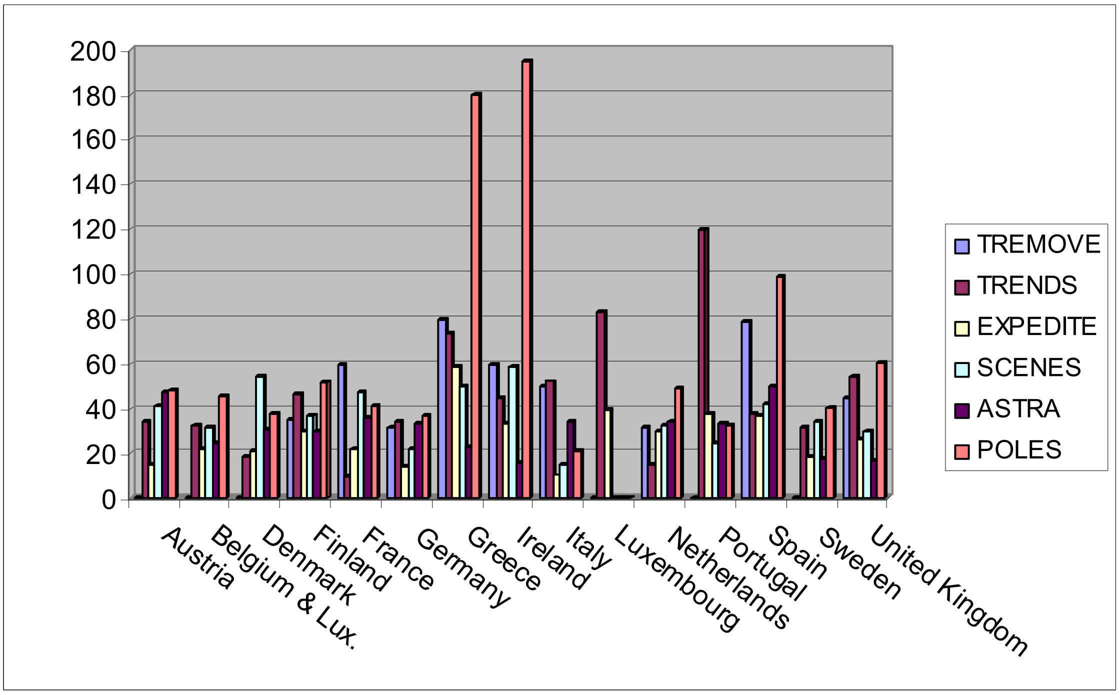

Figure 10: % growth passenger vehicle km Car 1995 – 2020.

7 Conclusions

The analysis carried out in this project provides evidence that the application of the available models at EU level can provide additional policy support tools. Even though each model has been developed independently in order to address specific issues, the seven models analysed cover between them the main requirements for support of EU transport policy. Apart from the analysis of the main transport issues and the direct impacts of policy measures on transport volumes, the models allow an integrated analysis that encompasses most indirect impacts of transport. In terms of impact assessment, the model combinations potentially allow (if this is really possible was outside the scope of this study):

- The identification of the types of environmental, economic and social impacts;
- The identification of distributive effects, 'winners' and 'losers';
- The measurement of impacts in qualitative, quantitative and, where appropriate, money terms;
- The comparison of impact in terms of cost-effectiveness, cost-benefit and multi-criteria analysis;
- The consideration of risks and uncertainties inherent in policy choices; and
- The assessment of the medium to long term impacts of Trans-European Networks.

From the scientific point of view, the project has also contributed to the improvement of available tools. It has assisted the various model development teams in identifying their common data needs and has facilitated the exchange of results and information. Most importantly, it has carried out a preliminary evaluation of the models as policy support tools and has validated their results for selected variables. The analysis suggests that, in principle, the combination of the seven models covered meets the main criteria for good practice of assessment techniques:

- Transparency: the estimation of the impacts of policy measures related to transport using the available models is clear, at least to other developers of models. The publication of additional reports and/or peer reviewed articles would certainly help in improving the policy makers' understanding of their principles, their strengths and their limitations.
- Reproducible results: the convergence of the results of the various models suggests that the main modelling methodologies applied lead to reproducible results; the main problem lies in the use of different data, a factor that explains a large part of the differences between their results.
- Robustness: using different methods or assumptions to estimate impacts leads to comparable results. The comparison of the results of the different models suggests that at least the identification of trends is reliable, since most projections tend to coincide. Differences have been mainly found for small countries, or where data availability was limited.

Improvements are still necessary however. Models are constantly improved, but the limited availability of published statistics hinders their further development, their possibilities for cooperation and the possibilities for an objective evaluation of their results. A possible solution to this problem would be the development of a common information system that would provide all models with the same input data, allow them to exchange information and publish their results. Therefore the ETIS project is a first starting point for this as it is describing the methodology used to come from a data collection set of several (European) databases to the developed reference database.

It can also be argued that a distributed model development and maintenance is preferable to the centralised development of a single model covering all issues. Experience in this and other projects show that cooperation between models is feasible, and that the healthy competition between independent developer teams leads to mutual improvements. It seems therefore that investment in smaller, flexible and specialised models can bring better results than concentrating all efforts in attempting to develop a global model.

Cooperation with model developers and authorities at national, regional and local level would also improve the quality of European models and their acceptability as policy support tools. The provision of harmonized statistics at national level is fundamental for the reliable simulation of transport in each country; a linkage with national models –where available- would also probably improve the accuracy of projections. The exchange of best practices between modellers and analysts is also desirable, especially with respect to the new EU member states.

The conclusions that could be drawn from this study are based on a fruitful and professional cooperation between the project partners. During the project the partners had a useful workshop in which, in a very open and informal way, debates had been organised to identify possibilities to answer multiple policy issues with existing transport models. Experience of the project shows that model developers speak “the same language” and are able to communicate with each other. In fact all felt that this was one of the very few times that one could discuss in a focused way about models and model results, and this has led to an exchange of experiences. In addition, a workshop with the European Commission was organised. Finally, a representative of the project team had attended a meeting of the ETIS project, in which he has presented the preliminary results of this study. From this presentation it became clear that also the members of the ETIS project were intrigued by the idea of linking European transport models and providing data linkages, instead of having one “mother of all models” that is covering all aspects.

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Notes

[1] The aims of the European Auto-Oil II Programme (AOP II) were to make am assessment of the future trends in emissions and air quality and establish a consistent framework within which different policy options to reduce emissions can be assessed using the principles of cost-effectiveness, sound science and transparency; and to provide a foundation (in terms of data and modelling tools) for the transition towards longer term air quality studies covering all emission sources. More information is available at: http://europa.eu.int/comm/environment/autooil/index.htm.

[2] Also see the discussion on this in chapter 4 of IASON deliverable 4: Development of a methodology for the assessment of network effects in transport networks, IASON Consortium, 2003.

[3] If one focuses on networks there is usually a strong involvement of national authorities at a detailed level, so if one small error occurs member states loose their confidence quickly, therefore a blueprint at an aggregated level is a better example to start with.