

ASSESSMENT OF TRANSPORT STRATEGIES (ASTRA)

CLIENT: *European Commission DG VII (Transport), IV Framework Programme for Transport*

YEAR: *1997 - 2000*

DESCRIPTION OF ACTIVITIES

The ASTRA project is part of the research studies awarded by EC Directorate General VII - Transport - in the IV Framework Research Programme. The project objective was the development of a tool to analyse the long-term effect of the EU Common Transport Policy (CTP).

In the ASTRA modelling approach, mobility prediction is the result of a complex interaction process among four different components: transport, economy, land-use and environment. The tool is then capable to illustrate the reciprocal influences among transport and ecological and socio-economic systems, providing useful insights into the question of whether transport policies are really moving towards sustainability.

Passenger and freight mobility is analysed taking into account its impact in terms of ecological and social burdens (emissions, fatalities, generalised costs, ecc.), as well as its consequences in the economic performances of the EU countries.

But in ASTRA, links are bi-directional, which means that feed-back effects are simulated showing how modifications in the economic performances might reinforce (or alternatively dampen) the transport development.

A reference scenario (2000-2026) was developed and the ASTRA model was subsequently used to test several policy packages. The reference scenario was constructed with a projection of past and current trends of key variables to the desired time horizon. The implemented policy packages were:

- *Environmental legislation and safety,*
- *Increased fuel tax plus reduction of labour costs,*
- *Balanced fuel tax plus reduction of labour costs,*
- *Increase in fuel taxation and investment in TEN (with two options: Rail-TEN or All-TEN projects)*
- *Combined policy package (incorporating elements of the previous four packages).*

For the assessment of the policy packages, the ASTRA model offers a great variety of general indicators - GDP, employment, private consumption, tax revenues, transport performance (pkm and tkm), modal shift, vehicle fleet development, transport *life cycle effects*,

traffic emissions, fuel consumption, etc. - as well as a specific indicators like investments on vehicles for a certain mode of transport, externalities of NO_x emissions, etc.

The ASTRA System Dynamics Model

Transport policy assessment approaches have to be capable of reflecting highly interrelated systems as well as of measuring long-term changes taking into account the effect of shorter term cycles.

Based on state-of-the-art models in the four fields of macroeconomics, regional economics and land use, transport and environment a System Dynamics Model (according to the concept which was originally developed by Jay Forrester) was developed that links the driving elements of the four models into one integrated model, which was implemented with the standard VENSIM software package.

The four real systems are:

- *Transport system (TRA)* as a basis for modelling transport infrastructure and traffic volumes.
- *Regional economics and land use system (REM)* because of the relationships between regional development (business, housing), transport and environment.
- *Macroeconomic system (MAC)* to integrate national or continental level influences into the model.
- *Environmental system (ENV)* because of the relationships with the transport system and the importance for the national welfare position.

The STREAMS model, which forecasts passenger and freight demand in the EU15 up to 2020, was used to identify the key relationships for the transport (TRA) and regional economic and land use (REM) modules for both passenger and freight modelling elements.

The MAC module is based on the macroeconomic model within the ESCOT model, which was developed as part of the Environmentally Sustainable Transport (EST) project for the OECD.

The ENV module is based on two models, one developed for the German Federal Environmental Agency

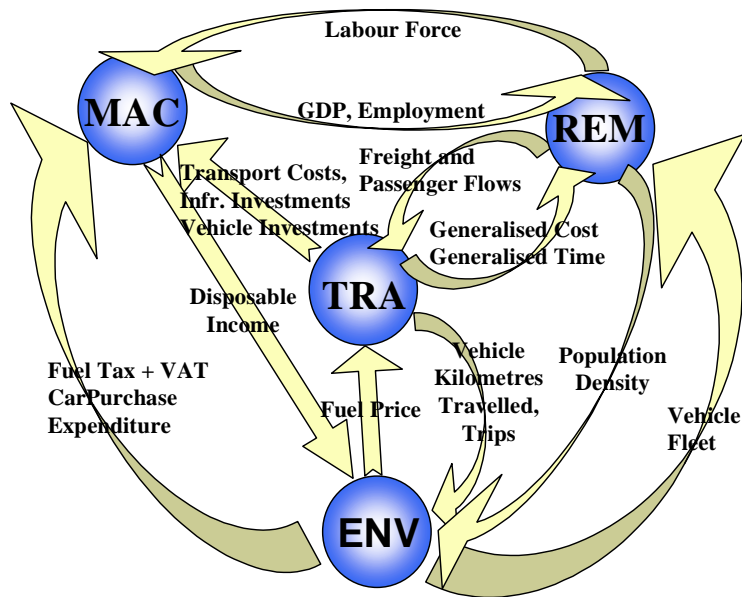
called UBA and another for the European Centre for Infrastructure Studies - ECIS.

The Consortium

The international consortium was led by IWW Institut

für Wirtschaftspolitik und Wirtschaftsforschung Universität Karlsruhe (DE). The other partners were TRT Trasporti e Territorio, ME&P Marcial Echenique & Partners (UK) and CEBR Centre for Economics and Business Research (UK).

Major feedback loops in ASTRA System Dynamics Model



Yearly transport CO₂ emissions in EU15 countries

