PROJECT

ASTRA

Assessment of Transport Strategies

**Funding:** European (4th RTD Framework Programme)  
**Duration:** Oct 1997 - Jan 2000  
**Status:** Complete with results

**Background & policy context:**

The transport sector forms a complex system. Some of the major driving forces act over the long term, such as decisions on land-use and infrastructure or changes in lifestyle, while other determinants such as prices can affect demand, modal split and route choice in the short and medium term. Moreover, changes in the transport system affect, and are affected by other complex socio-economic systems such as employment. Ideally, transport policy-making should take account of these inter-relations and long-term effects. However, it is often easier to use a partial model in which many variables are treated as constants or exogenous factors. Few tools can handle the complexity of real systems - one of these is known as system dynamics.

**Objectives:**

The aim of the ASTRA project was to develop a system dynamics tool capable of analysing the long-term effects of the EU’s Common Transport Policy, not only for the transport system but also for the most important connected systems. The tool was also intended to support the comparison of developments over time, not just the static comparison of outcomes in some horizon year (which has been common practice in transport assessments).

**Related Projects:**

- COMMUTE - Common methodology for multi-modal transport environmental impact assessment.
- EUNET-SASI - Socio-economic and spatial impacts of transport infrastructure investments and transport systems.
- STREAMS - Strategic transport research for European Member States.
- TENASSESS - Policy assessment of TEN and Common Transport Policy.
- TRENEN II STRAN - Models for transport, environment and energy.

**Parent Programmes:**

FP4-TRANSPORT - Specific research, technological development and demonstration programme in the field of transport, 1994-1998

**Institute type:** Public institution  
**Institute name:** European Commission; Directorate-General for Energy and Transport (DG TREN; formerly DG VII)  
**Funding type:** Public (EU)

**Partners:**

NA  
Institut fur Wirtschaftspolitik und Wirtschaftsforschung (IWW) Universitat  

**Organisation:** Karlsruhe
ASTRA developed a system dynamics modelling platform integrating four sub-models (covering macro-economic activity, regional economics and land-use, transport demand and environmental impacts). The interfaces between the sub-models allow feedback loops to be established, thereby capturing the inter-relations between variables. Output indicators include traffic volumes, vehicle numbers, environmental impacts, and economic, social and employment indicators. Forecasts are produced from a base year of 1996 to a time horizon of 2026. Important attributes include short run-times for some types of policy test, and the ability to simulate the gradual introduction of a policy measure.

The ASTRA model was demonstrated by simulating the effects of five policy packages (each consisting of sets of policy measures) and also a more comprehensive set of measures. The scenarios addressed policy decisions in the fields of taxation, construction of the Trans-European Transport Network, mitigation of air pollution and safety improvement. As an example of the system dynamics approach, the simulations considered different ways of spending the revenue from increased taxation - either for a reduction in labour costs or for construction of new transport infrastructure.

Overall, the fully integrated set of measures produced the best results across the range of economic, environmental and employment indicators. Other significant points from the policy analysis were as follows:

- None of the tested packages were able to meet the Kyoto requirements for abatement of greenhouse gas emissions.
- No further significant improvement could be identified for road accidents.
- Air transport growth would be significant in all scenarios, and in some cases would counterbalance most of the environmental benefits of policies giving a reduction in road transport.
- The effects of the policy packages on the economy change the average annual GDP growth rate by 0.2% at most between the 'best' and 'worst' policy options.

Policy implications

ASTRA has shown that the system dynamics methodology allows for a long-term assessment of the wider socio-economic and environmental impacts of transport policy packages, and provides inherently consistent indicators to enable a direct assessment by the policy-maker. Moreover, the methodology is available in an operational software model for policy assessment on a European scale. This can be used to forecast the ‘what-if’ consequences of planned policies, or be run in a ‘backcasting’ mode to identify measures that will achieve a desired end-state.

Documents:
- astra.pdf (Final report)

STRIA Roadmaps: Other specified
Transport mode: Multimodal transport
Transport policies: Decarbonisation, Societal/Economic issues