HEAVEN

Healthier Environment through Abatement of Vehicle Emission and Noise

Funding: European (5th RTD Framework Programme)
Duration: Jan 2000 - Mar 2003
Status: Complete with results

Background & policy context:

Air pollution and noise are major problems, especially in Europe’s cities. A considerable part of this pollution is due to traffic; therefore a better knowledge of the impact of traffic on pollution is crucial. Today cities use traffic demand management strategies without having a precise view of the impact of these different strategies on the environment.

IST’s HEAVEN project aimed to develop a generic architecture for a decision support system to combine near-real time traffic information and environmental monitoring based on (often proprietary) systems already installed.

Objectives:

The project’s high-level goal was to develop and to demonstrate a decision support system (DSS) which can evaluate the environmental effects (air quality and noise quality - both emissions and dispersion forecasting) of Transportation Demand Management Strategies (TDMS) in large urban areas.

This demonstration in large urban areas provides a concrete sustainable development perspective and will improve the quality of life in European cities by reducing transport-related noise and air pollutant emissions through the innovative combination of efficient TDMS and integrated environmental Information Society Technologies (IST).

This high-level goal has been translated into a concise set of high-level project objectives:

- improve the basis for decision-making through integrated and real time information on key pollution factors;
- inform key actors (including the public) on the state of air and noise pollution levels and their effects on health;
- investigate the data needs of health experts and the implementation of a valid data exchange platform with health authorities;
- identify the concrete benefits of these measures for sustainable urban development and the quality of life in cities;
- generate commercial value out of the project;
- draw conclusions for the implementation of local noise and air quality action plans.

Methodology:

The HEAVEN consortium selected an approach for the development and demonstration of the DSS which took account of the complexity of the project.

Starting point was the development of an overall system concept. HEAVEN DSS combines near real-time traffic flow information into emission and dispersion models so as to determine the contribution of mobile sources to air quality and noise. In order to estimate emissions based on current traffic levels and on planned demand management scenarios, the system can operate on-line, based on current traffic and environmental information, and off-line, based on planned traffic and environmental conditions and pre-defined TDMS.

This stage was followed by an extensive user need analysis which provided substantial input to the
system development. Already at the early stage of the project the user groups have been approached to
analyse the user requirements relating to the use of systems, data needs, requirements for technical
system performance, user friendliness, possible soft- and hardware restrictions and legal issues. The
main tool for performing the user needs analysis was a three-part questionnaire.

The subsequent system verification proved that the system worked as designed. HEAVEN verification
was based on a common verification concept necessitating that indicators are measured in the same
way, or at least yield comparable results across the sites. A list of common verification indicators, which
took account of the main processes, data flows and data stores of the DSS have been defined. The
indicators were grouped into the three main themes of verification:

- testing physical functioning of the system;
- preliminary user acceptance;
- accuracy of roadside modelling and monitoring.

A large scale demonstration of the HEAVEN DSS in the six project sites (Berlin, Rome, Paris, Prague,
Rotterdam and Leicester) took place in the last year of project lifetime and was concluded by an overall
evaluation. The large-scale demonstration had the overall objectives to:

- test the HEAVEN DSS under real-life conditions;
- provide the basis for evaluating the benefits all stakeholders can gain;
- use the system to assess the environmental impacts of Traffic Demand Management Strategies by
  means of the HEAVEN DSS.

The HEAVEN application sites were central to the success of the project since they demon

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**Partners:**

**Czech Republic:**
City Development Authority of Prague URM; Institute of Transportation Engineering UDI; Czech
Hydrometeorological Institute CHMU

**France:**
Airparif; Ville de Paris VP; Carte Blanche Conseil CBC; DREIF/SIER; MERCUR

**Germany:**
Senatsverwaltung für Stadtentwicklung; IVU Traffic Technologies AG; European Academy for the Urban
Environment EA.UE; B&SU

**Italy:**
Società Trasporti Automobilistici S.p.A (STA); Mizar Automazione S.p.A.; Elsag S.p.A; Rome Municipality
Environmental Dept. X

**Sweden:**
Swedish Meteorological & Hydrological Institute (SMHI)

**The Netherlands:**
City of Rotterdam; DCMR Environmental Protection Agency; Netherlands Organisation for Applied
Scientific Research TNO; Goudappel Coffeng GC

**United Kingdom:**
Leicester City Council LCC; Institute for Transport Studies (ITS), University of Leeds

**Organisation:** Società Trasporti Automobilistici S.p.A (STA)

**Address:** Via Ostiense 131/L

**Zipcode:** 00154

**City:** Rome

**Contact country:** Italy

**Telephone:** (+39) 06 571 18 216

**Fax Number:** (+39) 06 571 18 547
Key Results:

The main achievement of the HEAVEN project is clearly the development and successful demonstration and evaluation of the HEAVEN DSS and its application under real-life conditions. The HEAVEN DSS makes use of use a variety of existing infrastructure (e.g. traffic- and air quality monitoring networks), software tools (traffic and environmental models) and integrates them by means of IST technologies. The HEAVEN DSS is an integrated, modular system which supports “tactical” and “strategic” decisions. Through the application of the HEAVEN DSS it is possible for cities to:

- obtain a near real time description of the traffic and environmental situation in urban agglomerations;
- assess the environmental efficiency of already implemented Traffic Demand Management Strategies;
- perform extensive scenario calculation and assess the environmental efficiency of Traffic Demand Management Strategies prior to their costly implementation;
- inform professional users and the public in near real time about the traffic and environmental situation;
- assist cities in identifying compliance with the EU Directives associated with Air and Noise Quality Review and Assessment procedures;
- assist decision makers in formulating policies with public participation.

The HEAVEN DSS provides a concrete sustainability perspective and will improve the quality of life in European cities by reducing transport-related noise and air pollution. The HEAVEN DSS supports European cities in implementing existing and forthcoming EU legislation on air quality and noise.

In addition to the system development and demonstration the HEAVEN DSS has been applied under real-life conditions in the project cities Berlin, Leicester, Paris, Prague, Rome and Rotterdam. The environmental impacts of already implemented traffic measures have been assessed. Furthermore the HEAVEN DSS was used for extensive scenario calculations where the environmental efficiency of various Traffic Demand Management Strategies has been assessed prior to their costly implementation. The traffic measures which have been considered in the framework of the project comprise for example changes of the vehicle fleet, access restrictions, speed limits, park-and-ride scheme and changes to the street network.

Through the development of the HEAVEN DSS concept and the implementation of the

Technical Implications

None

Policy implications

Based upon the experiences in the HEAVEN project to implement measures reducing air and noise emissions by urban traffic, it is recommended:

1. To inter-compare models used to assess the contribution of traffic to urban air and noise quality. In general, member states apply nationally developed models. There is lack of information on the quality of the performances of these models, for example on accuracy, spatial and time scale. Hence, there may be differences between the various member states on the quality of the models to assess compliance with EU-regulations.
2. To improve emission factors for air pollution caused by urban traffic. In general, vehicle emission factors are based upon EU-standardised test-cycle. However, urban traffic is characterised by stagnation, “stop-and-go” driving and cold start conditions, which results emission factors that differ substantially from those derived from standardised tests. Hence, application of more realistic emission factors is especially relevant in an urban environment.
3. To inter-compare and further develop public information approaches regarding the impact of noise and air pollution caused by urban traffic. In order to inform the public, thereby also increasing public awareness, the impact of traffic on air quality and noise nuisance in urban areas can be communicated in various ways to the general public. The information may be available on a web site or in the more standard media. It may relate to excesses information only, but it may also include recommendations on preferred behaviour by the public. There is a need to compare the various approaches in the different member states in order to improve the effectiveness of the communication.
4. To integrate information on air pollution, noise and safety. Presently, the impact on air quality, noise nuisance and safety aspects road transport are reported and managed separately. In an urban environment, traffic is a major contributor to all three aspects and hence, controlling air pollution by traffic measures may also favourably affect noise nuisance and external safety. Although HEAVEN made progress to consider air quality and noise in an integrated way, there is a need to further integrate these issues, especially safety.
To inter-compare the effectiveness of various traffic measures. In various member states, different traffic measures are implemented to reduce air pollution and noise impact caused by traffic

Documents:
- Final Report (Final report)

STRIA Roadmaps: Network and traffic management systems
Transport mode: Road transport
Transport sectors: Passenger transport, Freight transport
Transport policies: Decarbonisation, Societal/Economic issues, Environmental/Emissions
Geo-spatial type: Urban