The European Research Network TRAPOS - Results and Achievements

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1. Introduction

By the end of 1997 the European Commission had approved the establishment of a new Research Network operating within the framework of the European Commission Training and Mobility of Researchers Programme (TMR). The Network's title was - "Optimisation of Modelling Methods for Traffic Pollution in Streets", with the short acronym - TRAPOS. The Network project was originally scheduled to last for 3 years but after the first two years of work it was decided to seek the permission of the Commission for a 6 month prolongation. This request was granted and the Network is presently scheduled to finish at the end of April 2001.

The TMR Networks have two main objectives:

1. To promote training-through-research, especially of young researchers, within the framework of high quality trans-national collaborative research projects and,
2. To contribute to scientific achievements within a specified research area through co-operative work.

The TRAPOS Network was established and conducted with the aim of contributing efficiently to both of these objectives.

2. Organisation of the Network

The 10 Institutions participating in TRAPOS are as shown in Table 1.1.

Table 1.1 The 10 Institutions participating in the TRAPOS Network.

Institution	Country
National Environmental Research Institute (NERI)	Denmark
University of Surrey (U.Surrey)	United Kingdom
University of Karlsruhe (U.Karlsruhe)	Germany
Swiss Federal Institute of Technology (ETHZ)	Switzerland
Ecole Centrale de Nantes (ECN)	France
Ingenieurbüro Dr.-Ing. Achim Lohmeyer (IBAL)	Germany
Aristotle University of Thessaloniki (LHTEE/AUT)	Greece
Cambridge Environmental Research Consultants Ltd (CERC)	United Kingdom
Netherlands Organisation for Applied Scientific Research (TNO)	The Netherlands
University of Hamburg (MIHU)	Germany

Seven European countries are represented in TRAPOS. The teams belong to universities, research organisations and commercial consulting companies. Their field of research covers different aspects of air pollution modelling, such as: laboratory wind tunnel modelling, field measurements, computational fluid dynamics and regulatory applications of models.

The networks established within the framework of the TMR Programme are obligated to employ a number of young researchers to participate in the activities of the network. The rules of employment of the young researchers are:

– The visiting researchers must be aged 35 years or less at the time of their appointment.

- Visiting researchers must be holders of a doctoral degree or of a degree that qualifies them to embark on a doctoral degree.
- Visiting researchers must be nationals of a Community Member State or a State associated with the Programme (Iceland, Israel, Liechtenstein and Norway).

The economical support provided by the European Commission is awarded to a network in order to allow its participants to co-ordinate their research around a common project and to reinforce their research teams through the temporary appointment of young researchers from a country other than that of the team concerned. The TRAPOS Network was awarded a support of up to 1 500 000 EURO, which was mainly allocated to provide job opportunities and training of at least 22 man-years of young visiting researchers. After initial difficulties with finding suitable candidates, it seems likely that TRAPOS can now fully accomplish the contractual obligations and that the number of young visiting researchers employed will exceed that specified in the contract.

3. Scientific Objectives and Working Methods of TRAPOS

The main scientific objective of TRAPOS is the improvement of modelling tools used for prediction of traffic pollution in urban streets. The activities contributing to these research objectives comprise

- field measurements and analyses of data,
- laboratory (wind tunnel) measurements,
- model evaluation and inter-comparison.

The models in use within TRAPOS cover both advanced CFD models and simpler, parameterised models. Synergy in the work with different types of models ensures scientific quality and the practical applicability of the results.

The work within the TRAPOS Network is closely connected and related to other projects and research activities conducted by the participating teams. The interdisciplinary character of the co-operation between teams representing different fields of experience and working methods ensures efficient utilisation of the results and scientific achievements.

Field measurements and wind-tunnel data were used for evaluation and improvement of mathematical models. Wind-tunnel models were also tested against data from field measurements.

Results from more advanced numerical CFD models were used to improve parameterisation of simpler semi-empirical models.

Design of new field experiments and also wind-tunnel measurements was guided by results from mathematical modelling.

4. The Main Scientific Achievements of TRAPOS

Several presentations during this Conference will deal with particular scientific results or activities directly related to the TRAPOS Network. Therefore, only the main highlights will be mentioned here.

The work within TRAPOS was focused on some selected subjects:

- the influence of traffic movement on turbulence and dispersion of pollutants in streets (Kastner-Klein et al, 2001; Vachon et al, 2001),
- thermal effects on flow modification within street canyons with special regard to low wind speed conditions (Kovar-Panskus et al, 2001a; Louka et al, 2001),
- the sensitivity of the flow and turbulence characteristics to the architecture of the street and its surroundings (Kovar-Panskus et al, 2001b; Kastner-Klein and Rotach 2001; Leitl et al., 2001; Chauvet et al., 2001),
- implementation of pollution models for Environmental Impact Assessment studies with special regard to determination of excidances of limit values of NO_2 and PM_{10} (Gamez et al, 2001),

– dispersion and transformation processes of traffic emitted particles (Gamez et al, 2001; Le Bihan et al, 2001; Wåhlin et al, 2001).

A significant part of the work within TRAPOS was devoted to the inter-comparison and evaluation of models. TRAPOS teams have participated in an international model evaluation study, the so-called "Podbielski Exercise" (Baechlin et al, 2001). Practically from the beginning of the Network activity a comprehensive CFD-model evaluation study was launched (Sahm et al, 2001; Ketzel et al, 2001). Model evaluation is not always a straightforward procedure. Careful examination of the data used for model evaluation is required and their uncertainties and representativeness should be taken into account (Schatzmann et al, 2001; Leitl et al., 2001).

Recently, a comprehensive measuring campaign was performed in a street canyon in Nantes, France. Data from this campaign were used in several TRAPOS studies, such as evaluation of the traffic produced turbulence (Vachon et al, 2001), examination of the effect of differential wall heating on wind circulation (Louka et al, 2001) and for examination of the pollution distribution in the street (Berkowicz et al, 2001).

TRAPOS Participants have also contributed to studies connected with urban scale pollution and data assimilation for urban dispersion modelling (Britter et al, 2001; Ratti et al, 2001).

The scientific achievements of the TRAPOS project were frequently presented at several major Air Pollution conferences and published in the open literature.

5. Networking and Training

The young visiting researchers employed within the TRAPOS are fully integrated within the Network teams and are actively participating in their work. The Network held frequent working meetings and seminars where the results of the joint work were presented and discussed. In order to consolidate the joint work a number of Working Groups was created focusing on the scientific subjects and activities of the Network. These Working Groups, which are led by the young researchers, have now the main responsibility for organisation of the work within TRAPOS. Specially dedicated web-sites, with presentation of the results and conclusions, have been established by several of these groups (http://www.dmu.dk/AtmosphericEnvironment/trapos/wg.htm).

The co-operation established between the TRAPOS teams, and especially between the group of the visiting young scientist, will certainly contribute to strengthening of the European research activities on the subject of traffic pollution and related aspects. The young scientists active within the Network represent the majority of the European Community Member States and there is no doubt that this co-operation will continue after the end of the Network project.

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