



Summary of projects and results from topic
Environment, energy and transport

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Environment, Energy and Transport

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1. INTRODUCTION AND METHODOLOGY

This report has been compiled by **ENEA – Ente per le Nuove tecnologie, l'Energia e l'Ambiente** to summarise the conclusions of the activities undertaken on the key topic **Environment, Energy and Transport** as part of Work Package 2 of the PORTAL project.

1.1 Methodology

To find the information on the selected projects included in the related databases and in this report the following sources have been used:

- Web sites of the European Union (e.g. CORDIS) as well as web sites of the specific projects;
- Interviews with ENEA experts involved into the mentioned projects;
- Documentation of these projects (reports) available from ENEA;
- Via the project co-ordinator (e.i. Mr. Joumard of INRETS) or an Italian partner (e.g. ISIS for CANTIQUE) by E-mail and by phone.

Problems encountered

The problems we encountered were of three types:

- difficulties in contacting some persons (e.g. the co-ordinator of the CENTAUR project at Barcelona Tecnologia), due to an incorrect e-mail address and/or because they were absent during this period;
- limited availability of the persons contacted to spend time answering all our questions, during the interviews, or for finding and giving us the requested documents;
- difficulties in focusing the main results of some of the selected projects which should be transferred to LEI in the next step of the project, and should become the main subjects of the training modules.

As far as this last point is concerned, it is possible that, after the preliminary design of the training modules, it will be necessary to go more in depth with the selection of the project materials to be used for training and/or to search for some specific project outputs, in order to complete the training modules with subjects not sufficiently covered by the selected materials.

2. ENVIRONMENT, ENERGY AND TRANSPORT

2.1 Description of the key-topic “Environment, Energy and Transport”

The key-topic “Environment, Energy and Transport” is focused on the relationship between the local and regional urban transport, energy consumption and the related environmental impacts. Road transport is the transport mode mainly involved, but a specific subtopic will cover urban rail transport.

The following subjects will be covered:

- a. Methodologies for estimating pollutant emissions and energy consumption from road transport;
- b. Main parameters influencing pollutant emissions and energy consumption;
- c. Emission models and related software packages;
- d. Inventory methods and life cycle emissions;
- e. Emissions from non-road urban transports;
- f. Reducing emissions and energy consumption: new technologies;
- g. Reducing emissions and energy consumption: non-technical measures;
- h. Environmental impact assessment and future transport scenarios.

The key topic Environment, Energy and Transport is directly linked with the following others key-topics:

- “Mobility management”, “Urban freight transport” and “Economics and pricing” as far as the traffic demand and the traffic characteristics are concerned;
- “Modelling and data analysis” as far as the mobility, emission, energy consumption and air pollutant dispersion models are concerned;
- the downstream key-topic in the impact chain, covering the air pollutant effects on the human health and on the environment.

Therefore an overlap could be with all of them.

To cover the above mentioned subjects the following twelve projects have been selected:

- COST 319 ACTION & MEET - Methodologies for Estimating Air Pollutant Emission from Transport/ Future Vehicles and Life Cycle Emissions;

- COMMUTE - Common Methodology for Multimodal Transport Environmental Impact Assessment;
- ARTEMIS - Assessment of Road Transport Emission Models and Inventory Systems;
- JUPITER 1&2 - Joint Urban Project In Transport Energy Reduction;
- REGIT - Energy-saving through integrated Management of Traffic;
- CENTAUR - Clean and Efficient New Transport Approach for Urban Rationalisation;
- FLEETS - Friendly Low Energy and Environmental Transport System;
- CANTIQUÉ - Concerted Action on Non Technical measures and their Impact on air Quality and Emissions;
- UTOPIA - Urban Transport Options for Propulsion systems and Instruments for Analysis;
- FANTASIE - Assessment of new technologies and environmental issues;
- ENIGMATIC - European Network on Integration of New Generation Mobility And Transport Innovative Concepts;

The 12 above mentioned projects are subdivided into four groups:

- the first group covers the subjects from a) to e);
- the second group cover the subject f);
- the subject g) is covered mainly by the CANTIQUÉ project;
- the subject h) is covered by the last three projects and by the COMMUTE project too.

A short description of each project is done in the following paragraphs.

2.2 Results of COST 319 action and the MEET project

At the beginning of our activity we realised that it was not convenient to separate the COST 319 action from the MEET project, which is a part of it. Moreover, at least in this phase of our work, it is probably better to extend the analysis to the whole COST 319 action, instead of limiting the investigation to the Working Group 4 (Future Vehicle and Life Cycle Emissions) outcomes: reports of COST 319 action could be useful also for other subtopics.

The objectives of COST 319 are to co-ordinate research activities in the field of direct or indirect emissions of regulated and unregulated pollutants as well as fuel consumption or energy use by transport modes, i.e.:

- to analyse the methods applied and the results obtained,
- to make a synthesis of the available data and to develop appropriate tools,
- to co-ordinate research.

For the first time the 4 transport modes (road, rail, air and sea) are considered together, as well as all levels of calculation, from local and instantaneous emissions to world-wide estimation.

To fulfil these objectives, the COST 319-action "estimation of pollutant emissions from transport" was launched in May, 1993 for a period of 4 years and then 5.5 years, i.e. till October 1998. It prolongs the work done in the frame of CORINAIR and COPERT, some years ago for the European Environmental Agency.

The wide field covered by the action, as well as the large number of experts involved (more than 80 from 24 countries), imposed the formation of four main working groups, specialised in:

- Road emission factors and functions: quantification of emission rates per unit of activity and studies of the factors that influence them (engine maps, instantaneous vehicle emissions, hot and cold average vehicle emissions, evaporation, alternative fuels, new vehicle technologies, life cycle emissions),
- Road traffic characteristics: the operation of the road transport sector and how it is affected by technical, social, policy and economic factors (traffic management, driving behaviour, traffic composition, factor analysis and models of mobility),
- Road inventory tools: study and evaluation of procedures to assess road transport's environmental impacts (bottom-up and top-down approaches),
- Non-road transport: emission factors, traffic characteristics and inventory tools specific to non-road transport (rail, sea and air transport).

Each main group has been further divided into sub-groups intended to meet when necessary: 22 sub-groups were working.

The research analysed by the action is very numerous and is usually funded by national bodies, and sometimes by international ones. As a lot of synthesis is needed for complying with the objectives of the action, a specific project covering the action

programme was being carried out by 16 of the participants. The European Commission, under the transport RTD program as part of the 4th framework program, is funding this project.

The 3 main objectives of the project, called “*Methodologies for Estimating Air Pollutant Emissions from Transport*” (MEET), are:

- To provide a set of data and models, allowing various users of the project to calculate the pollutant emissions and the fuel or energy consumption of the various transport modes at the strategic level.
- To provide a comprehensive method of calculation using the set of data and models.
- To make sure that this comprehensive method corresponds to the requirements of the potential users in terms of accuracy, simplicity and input data availability.

The project is now complete. It covers a large part of the action programme, but does not cover the engine emission maps, nor the mobility (factor analysis and models), and develops only written methodologies, but no software package.

Results of the project

The results obtained allow the development of a set of methodologies accepted by most of the European experts, which are presented here. The use of common methods to evaluate emissions and energy consumption levels all over Europe, and possibly more widely, will make the different studies and assessments comparable. Simultaneously the actions undertaken allow the participating laboratories to compare and co-ordinate their research methods, and the European countries to co-ordinate their research programs in order to fill in the knowledge gap.

Contact person and experts

The contact person is Mr. Robert Joumard of INRETS, while possible guest lecturers are:

Mr. Z. Samaras (Aristotle Univ. Thessaloniki), Mr. M. Kalivoda (consultant), Mr. E. Negrenti (ENEA), Mr. O.H.Koskinen (Finland - Ministry of Transport & Communication), Mr. P. Sturm (Univ. of Graz), Mr. S.C. Sorenson (Univ. of Denmark), Mr. WEBER (TUV Rheinland), Mr. Liam Donovan (Limerick Univ.), Mr. J. Hickman (TRL – U.K.), Mr. R. C. Rijkeboer (TNO – NL), Mr. R. Mayet (European Commission), as well as many others.

Materials

In the frame of the COST 319 action and the MEET project - which is a part of it - a great number of reports were made, each of them being a synthesis of the European knowledge available, expressing a common opinion of the involved scientific circles. These reports are public and readable at the INRETS web site and also partially at the ULB-CEESSE website; some of them are available directly as PDF files, other are available by email from the author.

Two reports and a file present an overview of the work done:

- The final inventory methodologies with all the necessary data concerning the emission factors and the traffic characteristics are presented in the final MEET report. The corresponding data are transferable from a specific file. The report and the data file allow any user to carry out an inventory.
- The aims of the final COST report are quite different: it discusses the available data, their accuracy, it presents the synthesis methods and the assumptions; it should be considered as a scientific report, especially useful for those interested in the building of methods of estimation of pollutant emissions from transport, rather than for users. In addition the report presents the scientific and user network, and finally the further research needs in the field covered by the action.

A lot of technical or specialised reports are presented, focussed on specific points, either for the road emission factors, the road traffic characteristics, or for the road and non-road emission tools. The methods developed for calculating pollutant emissions and considered as the state of the art by the COST action, cover all the possible applications and all the users' needs. They range from calculations at a microscopic scale (for a single vehicle, or for a street) to a macroscopic calculation (regional, national and global levels) through the inventory of an urban transport network.

The field of application covered in these reports is wide and is liable to be of interest to most specialists and experts in the transport-related emission field.

In our opinion the materials of these two projects are an useful scientific background to design the training modules and to produce the teaching/learning materials which should cover the mentioned subjects.

The final report on COST 319 “*Estimation of pollutant emissions from transport*” could also be a useful handbook for self-learning.

There are no demonstration sites for study visits. Four important Universities (AUTH, DTU, TUG and ULB) as well as many Research Institutions were involved in the projects.

Sites for study visits

None.

2.3 Results of the COMMUTE project

COMMUTE (*Common Methodology for Multimodal Transport Environmental Impact Assessment*) was a research project that ran from 1996 to 1999 within the Strategic Research strand of the European Commission Fourth Framework Transport RTD programme. It addressed the definition of a methodology for strategic

assessment of the environmental impacts of transport policy options. The methodology was intended to be primarily applicable to policy decision-making at the European level and to cover road, rail, air and waterborne transport modes.

Computer software that embodies the main aspects of the methodology was developed and demonstrated within the COMMUTE project.

The main COMMUTE project objectives were as follows:

- To define a methodology for strategic assessment of the environmental impacts of transport policy options, to support transport policy decision making at the European level.
- To develop computer software that embodied the main aspects of the methodology and could present the results to users.
- To demonstrate the use of the main aspects of the methodology and the computer software; in particular in the context of a pilot strategic environmental assessment of the impacts on energy consumption, primary pollutant emissions and safety of plans for the Trans-European Transport Network (TEN-T).

Results of the project

COMMUTE delivered two main end products:

- The COMMUTE methodology for Strategic Environmental Assessment (SEA) of transport policies, plans and programmes (PPPs), comprising:
 - A Framework for SEA covering the basic methodological requirements for SEA of multi-modal transport actions and guidelines on integration methods
 - Detailed impact assessment methods for some core impacts such as air pollution emissions, energy consumption, noise and safety
- The COMMUTE software tool allowing assessment of air pollution emissions, energy consumption, noise and safety impacts.

The COMMUTE software tool was validated against other comparable data sets, and was demonstrated, particularly through the pilot SEA of plans for the Trans-European Transport Network (TEN-T).

Contact person and experts

The contact person is Mr. H.J. Heich of TUV Rheinland (Koln – Germany). Possible guest lecturers are: Mr. I. Mc Crae (TRL – U.K.), Mr. V. Himanen (VTT – Finland), Mr. I. Flindell (Southampton Univ.), Mr. M. Tight (Leeds Univ.), Mrs. M. Partidario (Lisbon Univ.), Mrs. B. Lejeune (INRETS), Mrs. S. Toffolo (CSST – Italy) and Mrs. M.P Valentini of ENEA.

Materials

The materials of the project consist of four intermediate reports, corresponding to the main project work packages and containing a detailed description of the methodology

and the software developed the final report summarising the whole project activity and of the computer programme.

The final report, together with the computer programme, which is needed for demonstration and didactic applications, could be useful for the training modules.

The reports are public, while the computer programme is subject to a license.

Sites for study visits

None.

2.4 Results of the ARTEMIS project

The ARTEMIS (*Assessment of Road Transport Emission Models and Inventory Systems*) project proposes to develop an improved emission model for road transport based on a harmonised methodology for national and regional inventories and forecasts. Starting points are two well known models (COPERT, HANDBOOK EMISSION FACTORS) which will be merged. A thematic network will accompany the model development with representatives of the EU, the member states and other stakeholders. The model will also include new emission measurements of passenger cars, LDV and HDV which will be provided by other projects within the 5th FP. ARTEMIS will perform complementary data collection of traffic characteristics in EU and non - EU countries and analyse the driving behaviour in different European cities. The new emission model will be validated by street tunnel measurements and will be applied for different scenarios. The model will be distributed as a software tool to be used by different user groups.

Results of the project

The results obtained allow the development of a set of methodologies accepted by most of the European experts. The use of common methods to evaluate emissions and energy consumption levels all over Europe and possibly more widely will make the different studies and assessments comparable. Simultaneously the actions undertaken will allow the comparison of the research methods of different laboratories, and allow European countries to co-ordinate their research programs in order to fill in the knowledge gap.

Contact person and experts

The contact person is Mr. J. Hickman of TRL (Transport Research Laboratory – U.K.).

Possible guest lecturers are: Mr. Z. Samaras and Mr. N. Kyriakis (Aristotle Univ. Thessaloniki), Mr. P. Sturm (Univ. of Graz), Mr. R. C. Rijkeboer (TNO – NL), I. Mc Crae (TRL – U.K.), Mr. M. Rapone (IM – CNR – Italy), Mr. M. Keller (INFRAS – CH) and Mr. I. Pollak (KTI- HU).

Materials

A number of deliverables were produced and are useful for the PORTAL goals, in particular: *Final results on the accuracy of passenger car emission measurements*, *Final report on passenger car emission factor models* and *Sensitivity of emission estimates to road traffic parameters* by INRETS; *Best practice guide for vehicle emission measurements* by TRL; *Effects of local traffic conditions on road vehicle emissions* by LU and TRL; *Collected data and resulting methodology for rail emissions* by DTU, *Future trends affecting rail emissions* by TRL .

Sites for study visits

The roller test bench laboratories involved in the project could be used for study visits.

2.5 Results of the JUPITER1 project

JUPITER (*Joint Urban Project in Transport Energy Reduction*) was a major transport and energy initiative promoted by cities and industrial partners in seven member states of the European Community. The main aim of JUPITER was to demonstrate the potential for energy reductions and environmental improvements in urban areas by :

- Implementing a range of integrated transportation policies aimed at increasing the use of public transport and reducing the use of private transport;
- Introducing new, fuel-efficient public transport vehicles;
- Experimenting with the use of alternative fuel technologies.

The cities participating in Jupiter were Aalborg (Denmark), Bilbao (Spain), Florence (Italy), Gent (Belgium), Liverpool (United Kingdom) and Patra (Greece). In each city, a major demonstration project is implemented. All of the projects achieved substantial energy savings in their local area.

The six cities have implemented a variety of improvements to their public transport systems in combination with traffic restriction measures. The projects demonstrated combinations of measures designed to encourage the use of public transport and discourage the use of private cars, thereby reducing energy consumption and emissions. The main measures implemented were :

- The introduction of new public transport vehicles providing a more user-friendly passenger environment (involving, in most cases, low-floor buses).
- The introduction of state-of-the art passenger information systems.
- The development of new or improved transport interchanges.
- The introduction of bus priority measures combined with restrictions on private car traffic.
- The integration of urban traffic management control systems.

In addition to these main activities, each city implemented other complementary measures. In particular, the cities of Aalborg, Bilbao and Florence have introduced

alternative fuels in bus fleets. The city demonstration projects were substantial in scale and have a high local profile.

The evaluation activities were also a key element of JUPITER, and covered :

- a thorough assessment of the results of each demonstration project;
- an extrapolation of the results, where relevant, from the demonstration corridor to the whole city;
- a comparative European assessment, to consider the influence of city size, structure and location on energy and environmental impacts. (Cities in JUPITER are widely spread and represent a range of European city types).

Results of the project

The measures have all been implemented. A common evaluation methodology of the project impacts has also been implemented. This included a specially developed model (JET) to quantify the energy and emissions impacts of the measures. The work provides a valuable insight into the potential for improving the transport-energy-environment problem through pro-active, positive public transport measures combined with efficient traffic management and other measures, as well as investment in clean fuel technologies.

Contact person and experts

See below “Jupiter 2”

Materials

In the prospect of PORTAL goals a number of useful deliverables and working papers were issued by the JUPITER Consortium, in particular: "European assessment methodology", "Detailed System design", "Final system specification", "Evaluation and assessment" and "JUPITER Final Report"

Sites for study visits

See below “Jupiter 2”

2.6 Results of the JUPITER2 project

The specific objectives of *JUPITER 2 (Joint Urban Project in Transport Energy Reduction 2)* were:

- to implement large scale projects in eight European cities, each integrating aspects of city planning and infrastructure provision, optimisation of use of transport infrastructure, innovative vehicle technologies and clean fuels, with the aim of demonstrating viable strategies for energy-saving and environmental improvement;

- to achieve the minimum standards of a 20% reduction in energy consumption and pollutant emissions, at each demonstration site;
- to evaluate the impacts of the demonstration projects using common methods and tools, and to advance the state of the art in this field;
- to use the experiences of implementing the demonstration projects and the expertise within the consortium to develop practical guidelines to encourage the implementation of energy-efficient transport and land-use policies, which could be used by other cities;
- to promote the concept of the energy-efficient city and the role of the *Jupiter* initiative.

Each project incorporated a range of new vehicles and clean fuels integrated with innovative transport management measures to optimise the use of the infrastructure. Each city project took place within the context of strategies to increase the use of environmentally-friendly transport modes at the expense of private motorised transport.

During the course of the project, the consortium invested in 100 new buses and 20 vehicles of other types, powered by a range of alternative fuels. This investment was accompanied by measures designed to influence the modal split in favour of public transport, walking and cycling, including telematics technologies, traffic regulation schemes, integration of residential/commercial/business functions and promotion of intermodality.

The main technical activities are described below:

- ***Vehicles and Fuels:*** about 100 new buses and 20 new vehicles of other types have been included in the demonstration projects. Other vehicles incorporated included refuse lorries and local authority vehicle fleets. A range of alternative fuels have been implemented. In some cities, the used technologies were already known. In other cases, investigations have been undertaken at the start of the project to determine the most appropriate vehicle technologies and fuels to be used in the local circumstances, using on-the-road tests, desk research, and state of the art reviews, before choosing the technologies for demonstration.
- ***Transport Management:*** a wide range of systems have been implemented under this heading. These included: new telematics technologies incorporating advanced traffic control techniques, vehicle location systems and fleet management; passenger information systems; the development of new integrated payment systems; a mobility management centre and traffic regulation schemes.
- ***Land-Use and Mobility Planning:*** all of the demonstration cities in *JUPITER-2* had long-term strategic plans to restrict accesses.

Results of the project

JUPITER-2 successfully implemented large-scale demonstration projects integrating new vehicle and fuel technologies, transport management measures and Land-use/infrastructure schemes in seven cities across Europe. On the basis of the JUPITER

experiences specific guidelines and recommendations have been set to help other cities' decision makers and technical teams to effectively introduce new measures and technologies aimed at reducing energy consumption and pollutant emissions. New measures and technology concerns three main areas, namely: vehicles and fuels, Land-use and mobility planning and traffic management and control

Contact person and experts

The main contact is TRANSPORT & TRAVEL RESEARCH LTD (Mr. David Blackledge, Mr. Jo Baker or Mr. Alan Lewis), while possible guest lecturers are Mr. Antonino Genovese of ENEA and Mr. Dirk Engels of TRITEL.

Materials

Four JUPITER2 publications are worthwhile sources in the prospect of PORTAL goals, namely: "Vehicles and fuels - Guidelines and recommendations", "Transport Management - Guidelines and recommendations", "Land use & Mobility Management - Guidelines and recommendations" and JUPITER-2 Final Report.

Sites for study visits

In our opinion, the most interesting demonstration sites for study visits are Merseyside (Leeds) and Florence, both for CNG buses and electric vehicles.

2.7 Results of the REGIT project

The REGIT (*Energy Saving through Integrated Management of Traffic*) project had the purpose of decreasing energy consumption due to traffic, and as consequence air and noise emissions, through traffic fluidisation and its reduction because of increased operations, efficiency and attractiveness of public transport and of creation of pedestrian areas.

The project objectives were in summary:

- the definition of a limit for environmental capacity in order to reduce impacts;
- the realisation of a series of functions capable of controlling public and private vehicle flows in relationship with this limit capacity.

A decrease of gaseous emissions of the order of 50% in respect with the previous situation and a reduction of private traffic in favour of public transport of at least 10% per year occurred. The consequent saving was estimated in 76,680,000 km veic/yr, implying a saving in economical terms of about 1,5 Billion Liras.

The core of the project was the maximum valorisation of the potential synergies between the different information sources. The system functions were in essence:

- automatic localisation, monitoring and scheduling of transport vehicles;
- management of on-call bus service;
- management of public and private traffic from an operational centre, assigning priority to public transport at controlled intersections, real-time analysis of the state of the control system with indirect reconstruction through an expert system of the non controlled portion of the system;
- dynamic system for user information;
- traffic management in relation to atmospheric pollution levels

Results of the project

The main result of the project was the implementation of a traffic supervisor system able to integrate different control sub-systems operating in the city of Terni and to provide information about traffic situations, energy consumption, pollutant emissions and levels. The supervisor is designed to help organisations responsible for different aspects of urban transport system to evaluate potential energy saving and environmental impacts coming from the implementation of transport management and planning measures.

Contact person and experts

The contact person is Mr Antonio Mattucci of ENEA and a possible guest lecturer, as far as the system software is concerned, is Mr. G. Righetti of D'Appolonia S.p.A..

Materials

As regards the PORTAL goals the final report of the project is a worthwhile source to get information on the characteristics and functions of the supervisor.

Sites for study visits

The city of Terni could be a site for study visits, concerning not only the UTC system, but also the bus fleet control system (AVL-AVM) and the hybrid vehicles fleet for public transport (see also below the project FLEETS).

2.8 Results of the CENTAUR project

CENTAUR (*Clean and Efficient New Transport Approach for Urban Rationalisation*) was a THERMIE Integrated Quality Targeted Project constituting a follow-up of a previous THERMIE Targeted Project, ANTARES.

The objective of the CENTAUR Project was to contribute to the rationalisation of the use of urban transport with the final aim of diminishing the negative impact on environmental conditions produced by the use of motorised transport means.

To do so, efforts were targeted upon a main focus, which in turn is an intermediate double objective: the introduction of environmentally friendly transport vehicles and the coherent implementation of measures for a modal change from private cars towards increased use of public and other collective transport.

The cities participating in the project were: Barcelona (ES), Bologna (IT), Bristol (UK), Dublin (IE), Graz (AT), Las Palmas (ES), Leipzig (DE), Napoli (IT), Toulouse (FR).

Within the CENTAUR project, a global, overall, action strategy was planned, to allow the realisation of this objective. This was, first of all, to improve collective transport by using vehicles that in their own right represent a reduction of energy consumption and pollutant emissions, secondly to implement innovative equipment and systems for the management of urban mobility (public and private transport), and finally, to achieve the integration of this new transport approach and the urban land use policies and the regional planning.

Direct effects of this demonstration project which were expected to be quantified were:

- pollutant emissions, energy consumption levels and acoustic pollution levels reductions
- urban road relief with consequent improvement of the impacts in energy and environmental management of the urban mobility as well as better road safety in terms of a decrease in accident rates.

Innovation was present in the CENTAUR project at all action levels. First, the demonstration of the technology in the urban transport fleet was highlighted :

- new technologies for improved operation, maintenance and energy/emissions management in Collective Transport (C.T. includes public and other collective transport modes) vehicles.
- vehicles with non-standard power supply: electric systems (bus and taxis) hybrids with batteries, CNG fuelled, biofuels,...

Second, innovative technologies and systems have been used for implementing specific cases of new policies. They can be grouped as follows:

- integrated systems for Park & Ride (P & R) or CT modal change areas management by using innovative payment means and with real-time information transmission to users and drivers about CT services and road congestion.
- centralised tools for traffic and pollution monitoring.
- traffic lights macro-regulation and CT service prioritisation systems.
- CT vehicle monitoring systems.
- equipment for CT service improvement, pricing and ticketing systems, real time information.

At the planning and infrastructures provision level, a new approach was studied in what refers to demonstrated urban transport management policies for the CENTAUR cities.

Results of the project

Demonstration of this urban transport operation scheme during 2 years was expected to allow on the one hand, the determination of real benefits - in energy and environmental terms - derived from the use of these innovative systems and equipment and, on the other, the evaluation of their operations and their interaction with citizens.

In the first case, and through the use of a standardised methodology for all cities and aiming to obtain useful results for evaluating the impact of these systems and equipment in other applications, the following environmental impacts were planned to be quantified :

- vehicles energy consumption and comparison for application zones;
- vehicles pollutant emissions and comparison for applications zones: CO₂, CO, NO_x, HC, SO_x, PM;
- acoustic pollution;
- user and social acceptance for the innovative measures.

We obtained information (only from the internet website) that the first results have been already produced and most of the measures have already been implemented and many of them are being evaluated.

Contact person and experts

The contact person is Mr. Simon Hayes of Barcelona Tecnologia S.A.

Materials

No information about the deliverables and/or the project reports are available on the web site. Moreover we did not manage to reach the project coordinator (BARCELONA TECNOLOGIA SA) to get some information about the actual project status and produced materials. Therefore up to now we are not in position to express an opinion about the project materials which can be used for the training modules: this point should be a matter of further investigation in WP4.

Sites for study visits

The site of Bologna (Italy) could be proposed for a study visit concerning the demonstration of the hybrid buses, which have been evaluated also in the UTOPIA project.

2.9 Results of the FLEETS project

FLEETS (*Friendly Low Energy and Environmental Transport Systems*) was a project of the public transport system of the city of Terni (Umbria-Italy). DG XVII of the European Commission funded it under the THERMIE programme. The Project started in January 1996 and will end in September 1999.

FLEETS had two main aims; one is the reduction of public transport system environmental impact, the other is the improvement of traffic management and mobility control system of Terni.

The FLEETS consortium was composed of ATC Terni, ENEA, Comune di Terni, Regione Umbria, Altra, Baren, TTR and IT Ingegneria dei Trasporti.

The measures implemented in the projects were: Hybrid buses, electrostatic self-cleaning mufflers, vegetal origin fuel (biofuel), satellite vehicle localisation and monitoring systems (AVL), priority to public transport means at road intersection, traffic and environment condition monitoring systems.

Measurement and monitoring have been performed during the project using the REGIT system, already installed in Terni, and some other additional on-board devices to measure, in the real conditions, fuel consumption, pollution and number of passengers on board.

The measures adopted have been integrated with the already existing tools for the urban mobility management: Urban Traffic Control system (UTC) and Automatic Vehicle Localisation and monitoring (AVL).

Results of the project

The efficacy of the measures adopted in Terni has been tested from the technical point of view, with on-line measurement of consumption and pollution produced, from the social point of view with surveys of the population, and from the company management point of view.

The relevant impacts under these three elements are:

- the ***energetic and environmental impact*** : the evaluation of benefits obtainable at the urban level, mainly with regard to the reduction of energy consumption and pollutant emissions, through the application of measures to improve public transport performance.
- the social and transport impact : the impact of the FLEETS project on the perception of the environmental problem by the inhabitants of Terni and on their acceptance of the measurements was assessed by means of surveys.
- the impact on company management.

The work accomplished during the course of the project meant that a wide range of experience was acquired and all those concerned became more familiar with the hybrid system and its most significant indicators.

The data show that battery problems were the main cause of vehicle breakdowns. This confirms the results of similar European experiences, from which it emerges that enhanced battery performance will, in the near future, be one of the crucial factors of success for the development and diffusion of hybrid vehicles.

The main project initiatives provided a useful contribution to the new hybrid generation, concerning, in particular, the battery subsystem and the control system with improvement of power train efficiency and subsequent reduction of fuel consumption.

As far as pollutant emissions are concerned, the field checks and the results that emerged during the course of the project have in fact confirmed the theoretical qualitative and quantitative evaluations: pollutant values are decidedly lower than in the traditional internal combustion engine.

In conclusion, as far as the PORTAL project is concerned, the main items of the FLEETS project are:

- Experience gained from the project on the possible contribution of hybrid buses to public transport;
- Methodology of on-line evaluation of energy consumption and emissions;
- Description of the on-line measurements;
- Comparative results of field tests;
- Reliability and stress factors of hybrid buses

Contact person and experts

The contact person is Mr Maurizio Romanazzo of ENEA and possible guest lecturers are: Mr. F. Filippi and Mr. Luca Persia of the Rome University (DITS – Transport department) as well as Mr. R. Ragona of ENEA.

Materials

The materials of the project consist of three specialised reports (project design, energetic and environmental impact of hybrid vehicles, evaluation process and monitoring instruments) and a final report summarising the whole project activity. The material could be partially used for the training modules, as far as the technical measures for reducing emissions and energy consumption and the methodologies for their evaluation are concerned.

Terni is an interesting site not only for the hybrid buses and the remote sensing system AVL-AVM (Automatic Vehicle Localising and Monitoring), installed by ATC

(Azienda Trasporti Consortile) within the framework of the FLEETS project, but mainly for the traffic flow management and monitoring system used by the Municipality (see also the REGIT project).

Sites for study visits

The city of Terni could be a site for study visits, concerning not only the hybrid vehicles fleet for public transport, but also the bus fleet control system (AVL-AVM) and the UTC system (see also above the project REGIT).

2.10 Results of the CANTIQUE project

CANTIQUE (*Concerted action on non technical measures and their impact on air quality and emissions*) was a concerted action performed by an within the European Commission 4th framework programme – transport RTD projects.

The main objectives for CANTIQUE were:

- to provide a synthesis of relevant results from 4th framework transport RTD projects;
- to produce guidelines for policy decision makers for the selection of cost-efficient non-technical measures to reduce climate and pollutant gas emissions;
- to give input for policy development in the field of emission reduction and to indicate future research needs.

The CANTIQUE guidelines are derived from the results of a review and evaluation of existing measures, projects and findings.

Although especially focused on the local level, the guidelines are aimed at forming a decision support for policy makers at all levels. This also incorporates the consideration of trade-offs between different decision levels and the indication of potential fields of conflict. The evaluation of the various projects and measures included in the guidelines lead to the recommendation of appropriate non-technical measures to reduce emissions on local and strategic levels for national, regional and local authorities.

The CANTIQUE consortium operated in close collaboration with DG TREN and the Auto Oil Programme.

CANTIQUE was specifically designed to assess the effectiveness of Non Technical Measures (NTMs), based on a detailed review of past and present European experiences, and on the analysis and interpretation of results achieved so far. The data

used in CANTIQUE for the evaluation of NTMs have been drawn from project, studies and experiments previously carried out in European cities and locations (London, Stuttgart, Como, Athens, Lyon, Turin, Gothenburg, Cologne, Netherlands area wide and Germany area wide).

In order to facilitate comparisons, the NTMs have been classified in three main groups: regulation (parking management, traffic control, traffic restrictions, low emissions zones, etc.), pricing (road pricing, parking charges, etc.) and modal shift (public transport priority, increased frequency, etc.) measures.

Results of the project

The main result of the project is a methodical approach to NTMs choice and implementation. National, and Local Policy Makers and Authorities have been provided with a decision support tool for the evaluation of non-technical measures, the selection of most cost-efficient measures and their implementation at the respective level.

Contact person and experts

The contact persons are Mr. R.Kober of TUV Rheinland (Germany) and Mr. A.Ricci of ISIS (Italy). Possible guest lecturers are: Mr. D. Bosseboeuf (ADEME- France), Mr. A. Vantelon (BCEOM – France), Mr. H. Hohnscheid (VDV – Germany), Mr. C. Brand (University of Oxford – U.K.) as well as Mr. R. Vacca of ISIS (Italy).

Materials

The materials of the project consist of five intermediate reports (deliverables), a final report and a brochure used for dissemination.

In our opinion, three of the five intermediate reports as well as the final report can be used to as a basis to produce training and teaching materials concerning the non-technical measures for reducing emissions and energy consumption.

Sites for study visits

According to the results of the different assessments done during the project, the most effective non-technical measures for reducing pollutant emissions from traffic, among the considered cities, could be seen in Athens, London, Lyon (France), Como (Italy), as well as in the Netherlands.

2.11 Results of the UTOPIA project

The main objective of the UTOPIA (*Urban Transports Options for Propulsion systems and Instruments for Analysis*) project is to provide decision-makers with the necessary information base, tools, methods and guidelines for hastening the market introduction of the most appropriate transport solutions based on new propulsion

technologies and systems (NPS). NPS will have a wide range of impacts on many aspects of society, in particular on the environment, which need to be understood by decision-makers, together with how these impacts affect the likelihood of market take-up. UTOPIA draws on experiences and previous studies in Europe and the rest of the world, to assess the introductory methods that have been used. The project analyses how these can best be applied to the specific situations that occur in Europe and provide tools to understand what the effects of this might be. Ongoing demonstration projects such as ZEUS and CENTAUR were used as case studies and test sites. The project analysed the methods and results of new propulsion system demonstration projects around the world; developed guidelines on the best ways of introducing such systems based on the findings of this analysis; developed software to help decision-makers in both comparative testing of different sites where new systems are being introduced, and in finding appropriate technological solutions for specific urban situations.

Results of the project

UTOPIA produced a State-of-the-art review, inventories and databases of new propulsion systems and market-oriented transport concepts based on these systems, recommendations on policy guidelines for fostering the Europe-wide introduction of new systems. A best practice guide to market deployment of new systems and concepts, primarily aimed at market actors development of two complementary evaluation methodologies (a multi-criteria analysis and a Decision Support System) for assessing market acceptance, policy factors and environmental impact case studies and on-site test reports concerning the introduction of new systems and concepts

Contact person and experts

The contact person is Mr Jonathan Murray of Energy Saving Trust (London – U.K.) and possible guest lecturers are: Mr. Bernard Guellard of CERTU (France), Mr. Eugenio Borgia and Mr. Stefano Ricci of the University of Rome (DITS - Italy), Mr. David Moon of AEA (U.K.), Mr. Wolfram Krewitt of the Stuttgart University (IER - Germany), Mr. Peter Zwaneveld of TNO (The Netherlands), Mr. Boelie Elzen of the Twente University (The Netherlands), as well as Mr. Horst Georg Marks of Volkswagen AG (Germany).

Materials

A number of reports were produced useful for the PORTAL goals, in particular: State-of-the-art inventory of new propulsion systems; State-of-the-art inventory of new transportation concepts; State-of-the-art inventory of demonstration projects; Inventory of market acceptance factors; Analysis of case study findings; Market aspects of urban transport problems and solutions; The Policy Framework; Evaluating Demonstration Projects.

Other reports are not yet available. We hope that they will be available as soon as possible.

Sites for study visits

In our opinion, the most interesting demonstration sites for study visits are:

- Toulouse and Belle-Ile (France) (Touc experiment), concerning electric vehicles (public & individual car for passenger and freight);
- Hybrid bus in Bologna (CENTAUR project - Italy);
- The Super Bus Way in Leeds (U.K.);
- The bicycle lift in Trondheim (Norway).

2.12 Results of the FANTASIE project

The main objectives of the FANTASIE (*Assessment of new technologies and environmental issues*) project are: identification of new technologies (evolutionary and revolutionary) and lines of technological development which are expected to have a major impact on transport systems in the EU and the attainment of the CTP aims: this includes world-wide technology forecasting. Development and validation of methods of assessment which enable the scale of the impact to be quantified. This includes the introduction of new technologies as well as replacement of existing technologies (coexistence of existing and new technologies). Assessment of new technologies using the methodology developed and validated in this project to quantify the impacts in the categories environment; safety; efficiency; socio-economic, market and others. Assessment of potentials for improved efficiency and safety and for reducing environmental impacts and potentials of use of recycled materials. Policy synthesis for CTP and policy requirements to get a sustainable mobility in Europe. This requires the consideration of the whole transport area with all its modes and technologies as well as areas outside the transport sector. Therefore the changed roles of different actors, modified functional and social requirements of the transport system(s) and changed policy requirements have to be taken into account.

Results of the project

The assessment work and the qualification of the impacts were done for various time horizons. The assessments and methods would be targeted primarily for use by EC and member state government officials in their role as providers of advice to policymakers and as the channels by which policy implementations are devised on a day-to-day basis, in addition, these activities would be designed to complement the work of the EC Task Forces, and the methodology framework also would be provided for application in other projects. At the end of the project policy options were recommended.

Contact person and experts

The contact person is Mr Ulrich Leiss of IABG (Germany) and possible guest lecturers are: Mr. F. Filippi and Mr. Delle Site of the Rome University (DITS – Transport department), as well as Mrs. M.C. Bell of the University of Leeds (ITS) and Mr. David Moon of AEA Environment (U.K.).

Materials

A number of deliverables are available, including the Final Report. The most interesting are: A structured State-of-Art Survey and Review; Forecast of new technologies with major impacts, Characterisation of technologies for impact assessment, Synthesis of impact assessment and potentials.

Sites for study visits

None

2.13 Results of the ENIGMATIC project

The main objective of the **ENIGMATIC** project (European Network on Integration of new Generation Mobility And Transport Innovative Concepts) is to replace typical bilateral negotiations on integration of new generation vehicle and transport innovations by a truly multilateral process to define a common strategy. Thus ENIGMATIC is bringing together stake holders to discuss several non-technical key issues (user expectations, infrastructure, political framework, marketing approaches, safety, cost issues, etc.) of the market introduction in a European context. 30 organisations, representing research, car and infrastructure supply industry, authorities, market actors and user representatives have signed up for ENIGMATIC to take part in this information exchange among the network members. ENIGMATIC is still open for further participants. The issues addressed are handled in 6 in-depth workshops, offering the members a possibility to create a common vision and communicate their specific expertise. Newsletter, a homepage and a conference is foreseen for dissemination.

Results of the project

The project is still ongoing.

Contact person and experts

The contact person is now Mr. Herbert Wancura of Intema (Graz – Austria).

Materials

At present no material is available. The report of the first two meeting will be issued within the next two weeks. The other reports of the planned meetings will be available by the end of the present year.

Sites for study sites

None

3. RECOMMENDATIONS FOR NEW MODULES

As the results of the analysis of selected projects, that we have done in WP2, we think we have reached a better definition of our key-topic as well as a better comprehension of the work that should be done into the next project steps (WP4-5). On this basis we have focused the content of training modules, setting the relevant subjects.

The eight subtopics, which are listed in point 2.1, should become the main subjects of the training modules to be designed in WP4 and of the teaching materials to be produced in WP5.

We are quite convinced that the defined subtopics, which should be developed in the subsequent phases of the PORTAL project, are fitting the training needs outlined in WP1 and, at the same time, they cover the main outcomes of the EU-funded projects of the 4FP.

From this point of view, in the next working steps it will be sufficient to go in depth into the mentioned subjects, starting from the information and the materials already gathered.

As far as the 5FP projects are concerned, we could not assert the same: up to now we are not so sure that we have enough information about the most important results and achievements of the 5FP projects, which are now underway. Moreover the actual development of those projects should be compatible with the schedule of the PORTAL project.

4. FINAL CONCLUSIONS

Our general conclusion is the following: the outcomes and the materials of the selected/analysed projects are a good basis for designing the specialised training modules and producing the relevant training materials, to incorporate the most important results of the EU projects, in order to bridge the gaps which have been identified in the previous WPI.

There are also many experts who are potentially able to give training and to use in a correct manner the teaching materials, which will be produced by the PORTAL, and some interesting sites for study visits.

However, we need to take into account that the prospects of some new technologies are rapidly and continuously changing, especially in the field of urban transport. Therefore we suggest that it will be necessary to check and update the present investigation before the end of the training module design, in order to be sure to include into the training courses and materials the more recent developments of the new technologies and/or methodologies.

Intellectual property rights status

As far as the written material is concerned, all the reports of the considered projects are public: therefore we do not think there will be particular problems in producing teaching materials from them.

As far as the software tools are concerned, which will be needed as training aids and for practical demonstrations, the educational sites (if they are not provided with the necessary licenses) will have to ask the authorisation and/or in some cases to pay the license fee.