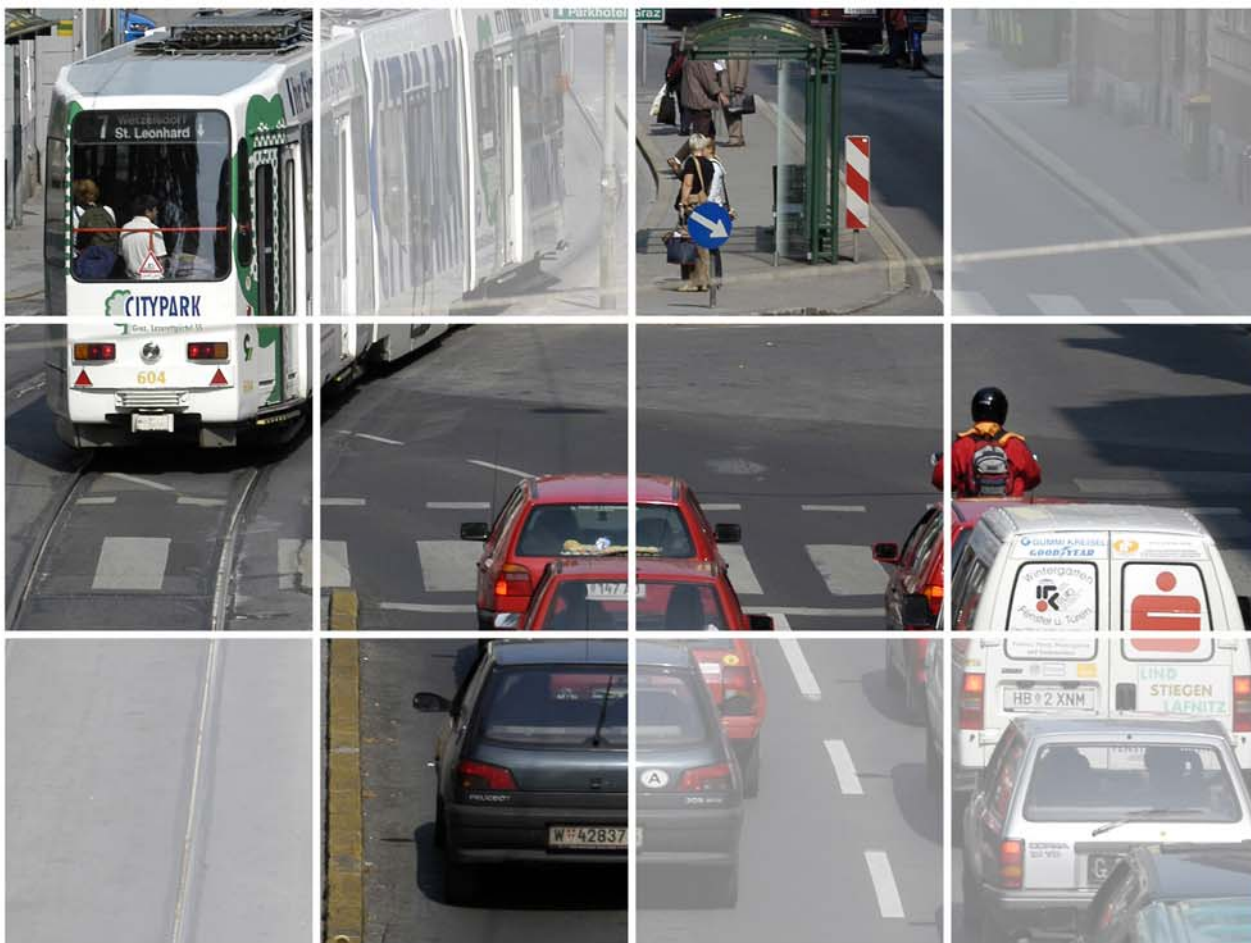


Urban traffic management and restraint

PORTAL
TRANSPORT TEACHING MATERIAL

Written Material 2003 - extended version



For the use of the following material:

The aim of PORTAL is to accelerate the take up of EU research results in the field of local and regional transport through the development of new education and training courses and teaching materials. The beneficiaries of the project are higher educational institutions.

Due to the size and (in some cases) the number of individual projects, it is not possible to explain each single result in detail and include it into these written materials.

The following set of material should rather act as a PORTAL and facilitate the access of single projects and detailed results by the lecturers. Therefore the material in hand doesn't lay claim to completeness.

Since the expectations of the lecturers regarding these materials are quite diverse - the expectations run the gamut from 'providing a survey of the result of the EU-research to a specific topic' to 'providing special results of a single research-project in detail' -, the attempt has been made to make a compromise and (more or less) come up to the expectations of all user groups.

The following compendium contains results of EU research-projects and complementary results of national research-projects. PORTAL thanks the partners and collaborators of the following projects. A complete list of the projects, consortia, and cited literature is given at the end of the material. There are also some ANNEXES not for translation (taking in account the already overloaded extended version).

This material of project results for the topic “**Urban traffic management and restraint**” and considering the subject area “Traffic management serving New, More Sustainable, Policies”, and was compiled by Alvaro SECO (Associated Professor in FCTUC) and Anabela RIBEIRO (Invited lecturer in FCTUC) and was adapted after a workshop with the Educational Test Sites.

ADONIS

CAPITALS

CONCERT

COSMOS

DACCORD

EUROSCOPE

ICARO

INCOME

IN-RESPONSE

PRIVILEGE

OPIUM

QUARTET PLUS

TABASCO

TASTE

WALCYNG

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1. Introduction

1.1 Definition of TOPIC

The term ‘Traffic Management’ represents the process of adjusting or adapting the use of an existing road system to meet specified objectives without resorting to substantial new road construction.

Thus this material is related to a large field involving both traffic systems and urban development issues. It is also a working area with strong links with both Civil Engineering and Urban Planning.

1.2 Objectives and skills

The Module here presented is not intended as a basic presentation on Traffic Engineering and Management.

The main objective behind its development was to present both undergraduate and post-graduate students, as well as traffic engineers, with the latest developments in traffic management strategies and solutions.

Transport infrastructure networks constitute an essential means via which city functions (centres of economic activities and citizen services) can be performed while at the same time serving the communication between the cities and their suburbs, outlying regions and other urban areas.

In this Module particular emphasis is given to the presentation of the implications on Traffic Management (TM) of the recent trend towards the adoption of more sustainable, environmentally friendly, transport policies.

Although not seen exactly as ‘Module Objectives’, some student’s ‘pre-requisites’ should be considered. For that matter please see point 1.5.

1.3 Challenges

The adoption of more sustainable, environmentally friendly, transport policies has created new challenges for Traffic Management.

Increasingly new traffic management solutions must contribute to a safer, cleaner and more efficient transport by reducing hazardous environments, controlling potentially dangerous situations in a better way, reducing environmental pollution, helping travellers to avoid congestion and unnecessary trips, gaining extra capacity from existing infrastructure and encouraging the use of more sustainable modes of transport.

This has meant that, while traditional traffic management would deal basically with the development and application of measures directed at optimising the efficiency of the transport infrastructure, the emphasis currently has been moving ever more towards guaranteeing an efficient movement of “people” and thus, in a non-neutral modal way, towards promoting a modal shift in favour of public transport and other environmentally friendly modes.

This new working “environment” has led to the search for new, “more intelligent”, transport systems based namely on new Telematics developments which have also, in themselves, strongly contributed to the evolution of the fundamental thinking about traffic management practice from a control based one towards an information based one.

It has also resulted in the perception that new TM strategies, should be ever more multi-modal in essence and supported by the linkage of Traffic Control and Information Systems.

The latest results and guidelines produced in European Projects will be presented with many of examples of implementation drawn from real life examples to emphasise the applicability of the new solutions.

Although many of the techniques, strategies and global solutions are applicable to rural environments, the focus of this Module is on urban transport and traffic problems.

1.4 Link with EU policies

As mentioned above the Traffic Management field is closely related with the practical implementation of the EU transport policies since they imply profound changes in the most commonly adopted transport infrastructure management strategies and techniques.

As populations grow and mobility management presents an increasingly difficult challenge, public authorities and private entities alike seek new solutions to the problems faced on today's Trans-European Transport Network. The network includes high-quality road and rail routes as well as ports, airports and inland waterways.

As it can be seen in the documentation presented at the Directorate General for Energy and Transport, 'major infrastructure investment is reaching its limits, the European Commission sees ITS – Intelligent Transport Systems and Services – as a viable solution to make the movement of people and goods more efficient and economical for all transport modes'. The White Paper on Common Transport Policy adopted in September 2001 identifies the alleviation of congestion and of transport bottlenecks as top priorities for the next 10 years and promotes the use of ITS to solve these critical issues.

Besides this central question - the link between traffic management and ITS - which the present document specially deals with, the White Paper gives several policy orientations that one should take into account when regarding the future of transport:

The main issue is the '*refocus of Transport policy on the demands and needs of the European citizens*'.... It lays the foundation for the right to having an efficient transport system offering high level of quality and safety on the basis of '*a more imaginative and rational use of the different means of transport and infrastructure*'.

Regarding the Urban Transport System, it is the special concern of the Commission that '*more than 75% of the population of the European Union lives in urban areas. Therefore urban transport accounts for a significant part of total mobility, and an even greater proportion of damage to the health of citizens and to buildings. For example, one-fifth of all EU kilometres travelled are urban trips of under 15 km. Between 1995 and 2030, the total kilometres travelled in EU urban areas are expected to increase by 40%*'.

The European Union is working toward the definition and implementation of a strategy to promote sustainable mobility in an urban context, which would include a range of actions such as:

- Promoting market take-up of lower-consumption vehicles and new propulsion technologies to reduce emissions
- Promoting the use of improved collective and non-motorised modes in conjunction with mobility management schemes
- Demand management schemes such as parking controls and access restrictions

- Information systems for better traffic management and improving traffic flow
- Integrated intermodal freight and passenger transport systems such as city logistics and improved terminals
- Fair and efficient pricing regimes
- Supporting integrated land-use and urban transport planning to minimise the need to travel and facilitate collective transport
- Promoting efficient public transport modes to people with reduced mobility
- Supporting and promoting cycling
- Possible contribution of ‘Teleworking’.

The main activities developed are: **ELTIS** - European Local Transport Information Service; **Citizens’ Network Benchmarking Initiative**; **EPOMM** – European Platform on Mobility Management; **People with reduced mobility** - People with reduced mobility (PRM) represent an important proportion of the EU population (about 35-40%). They are principally disabled people, elderly people but also people with a large amount of luggage or shopping bags, people with children in buggies, people with temporary injuries. The Commission has carried out and is currently promoting a series of initiatives aiming to facilitate and improve the accessibility to public transport for these citizens; **Cycling and Walking** - is by nature a clean mode of transport and has a potential for development if one considers that a significant share of all EU road trips (50%) are not going beyond 5 km. The European Commission has therefore carried out a series of initiatives aiming to promote cycling and walking.

1.5 Module structure description – summary of contents

Introduction

The object of study of the current text covers what was considered in PORTAL to be a Module, a sub-area of a Subject Area.

This module is structured in such a way that it can be used as part of different post-graduate or even under-graduate courses with wide thematic coverage such as under graduate courses in Transport or Master courses in Urban Engineering, Urban Planning or Highway Engineering.

It was particularly designed so that it could be used as the natural complement to a standard basic Traffic Engineering and Management subject area.

Prerequisites

The usage of the contents of this module implies background knowledge of a variety of traffic management concepts and solutions relevant for the development of integrated, multi-mode traffic management solutions. The following topics incorporate most of the significant areas of interest:

- Road networks’ basic organisation principles;
- Main road elements’ (e.g. links, junctions, traffic calming solutions) design concepts and techniques;

- Area wide traffic control systems: UTC (real or fixed time); AVL - automatic vehicle location; IDS - incident detection; ramp metering; road pricing
- Traffic and travel information (TTI) systems (pre-trip, roadside, in-vehicle collective or individual): FMS - fixed messages systems; VMS - variable message signing; route guidance systems;
- The basic design principles of pedestrian and cyclists networks': user/trips characteristics and needs; elements of the main systems and organisational criteria;
- Physical and control of public transport and HOV supporting systems;
- Parking management and control;
- Data collection and treatment: techniques and procedures; integration potential.

In relation to these topics students should generally be aware of the most significant concepts (e.g. "level of service") and design methods as well as of the state-of-the-art techniques and solutions applicable to the different transport systems namely in what concerns their expected performance and applicability problems.

Module organisation

This Module is organised in Units, with the theme presented in a systematic and structured way.

An initial analysis is made of new traffic management problems and objectives resulting from the need to respond to new transport policies, developed to answer the ever increasing mobility and accessibility needs and the also increasing environmental and urban quality restraints.

Afterwards, a list of traffic management strategies and measures available to support the different policy objectives is presented. It has resulted from a comparative analysis and integration of the many measures proposed in different EU research projects.

A comprehensive list of state-of-the-art, real life, implementation of packages of TM measures carried out in different European research projects is also presented after a reference to the importance of the existence of comprehensive monitoring and evaluation processes. Specific reference is made to their basic characteristics, results and transferability.

Finally, a brief reference is made to the current state-of-the-art knowledge in relation to the "Best, Integrated TM Measures" available to implement the new transport policies.

The complementary character of the different TM measures is stressed together with their ever-increasing need for integration.

In parallel the significant levels of incompatibility between many of the possible individual measures will also be pointed out with reference being made to the strategic need for a comprehensive selection methodology applicable in real life situations.

Attention will be given not only to the selection principles for basic integrated packages but also and specially to the listing of well-tested and useful combinations.

It is expected that this module will take between two and six teaching hours depending on the type and level of specialisation of the course in which it will be integrated.

2. Traffic Management and Restraint

2.1 UNIT I – Transport Policy Objectives and Strategies

The increasing need for mobility in modern societies has created a situation of overload of many transport systems.

Particularly important are the problems related to mobility and accessibility in urban areas where very high congestion levels, air and noise pollution, as well as loss of urban quality of life are common, putting at risk the social and economic prosperity of the affected regions.

The preponderance of the “private car” mode in most cities has proved to be incapable of reversing this situation, indeed starting even to be part of the problem.

This has led to the progressive development of an almost generalised consensus over the need to reduce the dependence from motorised transport (specially the private car) while maintaining or creating new efficient transport systems capable of serving not only the needs of individuals, but also the economy and society at large.

A number of Transport Policy objectives which can perhaps be contained in the word “sustainability”, are thus gaining increasing preponderance and influence in planning and management decisions (see for example CAPTURE, FR and INCOME, FR). This concept generally combines the idea of the need for:

- An efficient transport system (serving all mobility/accessibility needs);
- A safer transport environment;
- Protection of the environment;
- Reduction of energy consumption;
- Improvement of quality of life/economy

This need for a sustainable transport system is leading, in the urban environment, to a much-reduced emphasis on road building, with increased emphasis on optimisation of the existing infrastructure performance, on demand management and on the promotion of a modal shift towards public transport and other more environmentally friendly modes.

These general objectives can be translated into more specific and quantifiable goals. Based on a survey amongst different European Transport Authorities, the PRIVILEGE project (see PRIVILEGE, FR), suggests the strategic objectives presented in Table 1 below classified by importance (range 1 to 6). Other slightly different listings and ratings can of course also be formulated (see for example CAPTURE, FR).

In order to fulfil these goals a number of detailed and integrated policy strategies, hopefully capable of resulting in the development of new transport management and control solutions, can be envisaged.

An attempt to show this close interrelation between objectives on one side and general and more specific strategies on the other is presented in Figure 1 below.

Notice that while a significant number of the more specific intervention strategies possible for transport systems are mode oriented, others are directed at the global optimisation of the system performance.

Strategic requirement	A¹
Guaranteeing the accessibility of the city	6.00
Acceleration of public transport	6.00
Improving the mobility of pedestrians and cyclists	5.00
Concentration of suitable main roads	4.88
Reduction of emissions	4.88
Protection of sensitive areas	4.88
Improving the economy of public transport	4.50
General reduction of car traffic	3.50
Improving the flow of business transport	3.38
Reduction of temporary overcrowding	3.13
Improving chains of transport	3.00
Reducing the number of cars	1.50
Reduction of transport costs	1.50

Table 1 - Rating of Importance of Requirements (PRIVILEGE, final report)

Reference must also be made to the fact that there is a significant incompatibility potentially between some of the objectives and also between their corresponding policy strategies particularly in urban areas where the different transport modes compete intensively for the allocation of rare and valuable infrastructure space and/or time.

This fact reinforces the need for a significant emphasis to be put on the integration of the different modes within infrastructure management both at the strategy definition and at the integration of intervention measures levels. This latter problem will be analysed in the following units.

¹ 6.00 expresses the maximum proportion of choice in the requirements rating between the 7 authorities implied. They gave an importance from 1 to 6 points concerning the importance of each requirement. The column A represents the average off each requirement concerning the importance given by each authority.

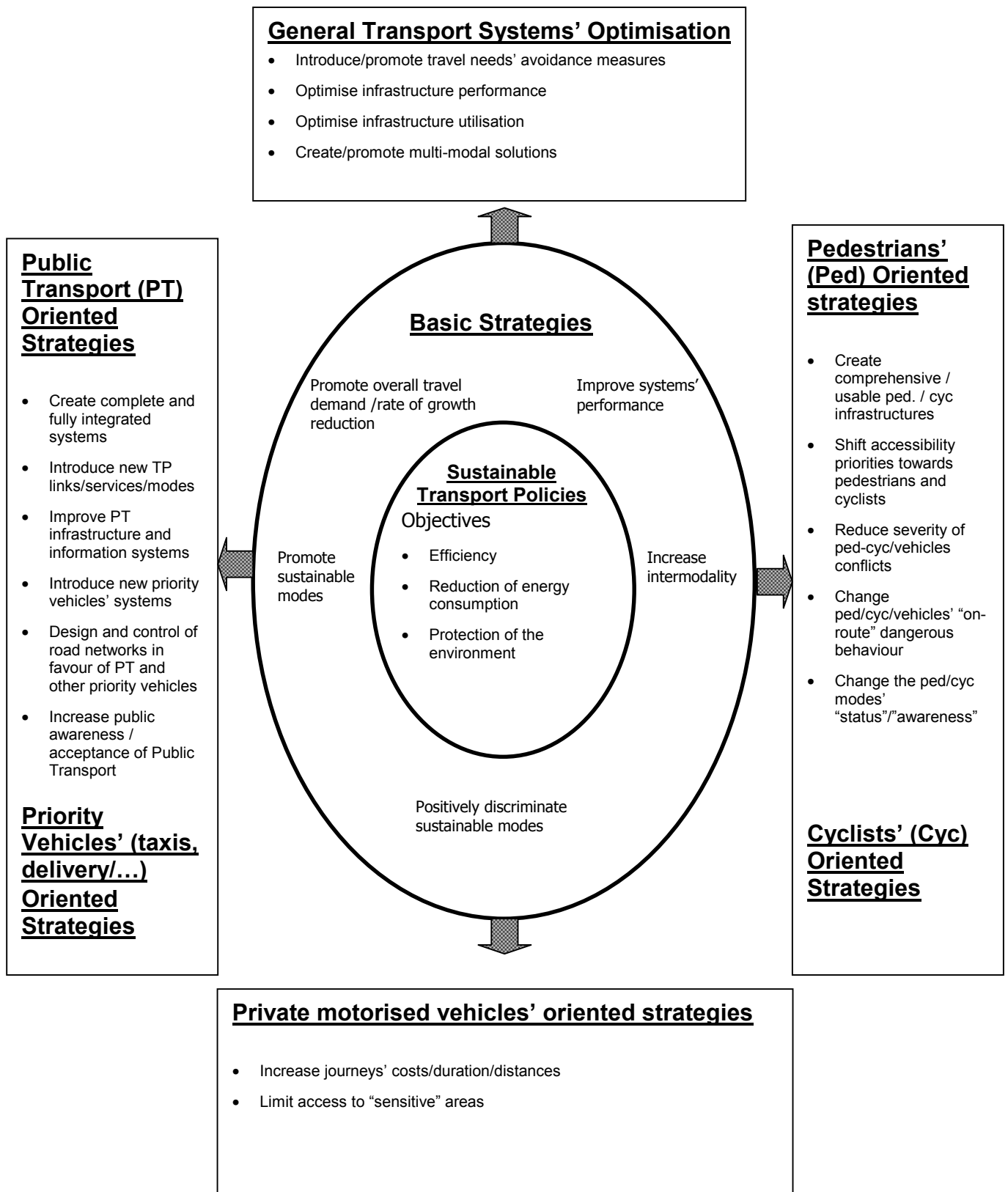


Figure 1 - Transport Policy Objectives and Strategies

2.2 UNIT II – Road User Groups’ Characteristics and Needs

A deep knowledge of the many different road users’ and modes’ characteristics, needs and relative importance is essential for the development of any coherent and efficient transport policy.

In the PRIVILEGE project a systematic identification and characterisation of the different users was made particularly in what concerns the level of priority treatment which ought to be allocated to each of them within the transport system.

The following types of traffic modes/users were identified as needing to be given separate consideration in the processes of priority allocation within the definition of a new transport policy (see PRIVILEGE, final report):

- Emergency vehicles (ambulances, police cars and fire engines)
- Public transport (trams, light rail and buses)
- Coaches
- Taxis
- High occupancy vehicles
- Commercial and domestic services
- Trucks (other than commercial and domestic services)
- Bicycles
- Pedestrians
- Privately used cars
- Privately used motorcycles

The description in PRIVILEGE of the characteristics of selected groups and of their respective priority allocation principles is described in Annex 1²

2.3 UNIT III – List of Different Policy Measures

Introduction

During the EU 4th framework research program several projects dealt with the problem of identification of a wide variety of measures, which, if implemented, could contribute, to the adoption of new transport policies.

The presentation in the projects of these measures was done in different ways but it is possible to identify a common structure amongst the approaches used namely in the way the measures

² The Annexes included at the end of this document are not for translation (only if considered strictly necessary)

were characterised in relation to their potential to serve the various aspects of the transport policies and how they would fit in the different types of intervention strategies in the transport system.

In the current Unit an attempt is made to present in a structured way the wide variety of available measures putting particular emphasis on those which fall within the Traffic Management domain but making a reference also to those which are closely related. The list presented represents a systemisation of the measures proposed in different ways by a significant number of projects (see INCOME, final report; PRIVILEGE, final report; ICARO, final report; TASTE, deliverable 1; CAPTURE, final report; ADONIS, final report; WALCYNG, final report).

Measures' classification and characterisation principles

Different criteria can be used to classify and characterise all the measures/solutions available in a transport system.

One of the most obvious and frequently used criteria was that of making the classification based on the type of intervention on the system. It was following this strategy that the areas of intervention of a significant number of recently developed EU research projects have been defined.

With this type of approach the different measures can for example be classified as Physical, Regulatory, Control, Organisational, Financial, Socio-Economic, Information or Marketing (for a slightly different classification see for example CAPTURE, final report).

It is apparent that most measures belonging to the Traffic Management (TM) area of intervention can be included in the Physical and Control categories although some might also be included in some of the other areas.

At the same time it must be stressed that not all of these types of measures can be considered TM measures. The main differentiating criteria are that TM generally deals with "Operational" and not "Strategic" measures and that the implementation of TM measures seldom results in a significant modal shift level.

However even this last criterion is losing its imperative in view of the ever more important need to balance "pure efficiency" management objectives with "system sustainability" ones.

A number of other classification criteria can, and should be used, in order to fully characterise the measures and to describe their applicability.

One of them is WHAT is/are the Targeted Mode(s)/User(s) ? For this purposes the user classification presented in the Unit II could be used.

Another one, particularly, but not exclusively, directed at the Physical and Control types of measures, is WHERE the measure is directed : network wide area, route based (e.g. arterial road), road section, junction, area (e.g. city centre or residential area).

Finally another particularly relevant criterion is to relate the different measures to the type of systems' intervention strategies adopted (see Unit I above).

In what concerns the measures' applicability a number of different approaches have also been proposed in the research projects reviewed.

One of them deals with the problems of identification of the environment(s) IN WHICH the measures are applicable.

The ADONIS project for example proposes the classification of the different pedestrian and cyclist oriented measures' by their applicability to different urban environments characterised by the current density of pedestrian/cyclists facilities and mode use. Three classes of measures are proposed (see ADONIS, final report).

The same ADONIS project also suggests that the applicability of the different measures could/should be classified in terms of their FIRMNESS.

The following possibilities are proposed: regulations (which have to be obeyed); guidelines (which can be deviated from but only with good reason); recommendations (which are deemed preferable since they are assumed to lead to favourable results); suggestions (which are expected to have a good result); possibilities (which are only supposed to have a good result).

Another relevant classification is that related to WHEN a measure can or should be in operation with for example the PRIVILEGE project referring to the following classification: all day; time dependent; traffic dependent.

In the current Unit an attempt is made to present a list of measures classified by the main targeted mode/user and by the way in which they serve the different types of systems' intervention strategies.

Naturally, while in many cases the classification is quite easy, in other cases it is quite disputable. This evolves from the obvious situation that many of the measures can serve different intervention strategies and or modes/users.

In the list presented below an attempt was made to classify the measures by their dominant characteristics but in some cases it was considered useful to present the same measure in more than one class.

The list is organised with the different measures aggregated in accordance to the main targeted transport system/mode and afterwards grouped in accordance with the most important specific strategy served.

Measures' classified list³

Strategies and Measures directed at General Transport Systems

Application of Travel Needs Avoidance Measures

- Land use planning measures
- Telecommunication based measures

Road networks' performance optimisation

- Optimised Traffic Signal Control for all traffic (isolated and area-wide): incident and congestion detection and response strategies (e.g. gating; queue relocation); pollution reduction/environmental protection strategies
- Ramp Metering and Tidal Lane systems
- Intelligent speed limit control/adaptation (ISA) systems (using on-road vehicle speed detection system and in-vehicle's speed reporting or controlling systems)

³ Organised by professor Alvaro Seco, FTCUC

Road networks' utilisation optimisation

- Pre-trip traveller information (interactive information terminal, Internet, etc.)
- Roadside collective traffic and travel information (TTI) and route guidance using (VMS) with information obtained from incident or congestion detection systems
- Parking information and guidance systems: fixed signposting; VMS (information on the location and availability of places and, eventually, availability and schedule of Bus services at P&R facilities)
- In-vehicle collective TTI (e.g. RDS-TMC service) about incident, hazardous or congestion situations
- In-vehicle individual TTI and route guidance
- Enforcement measures: at priority lanes and sections; at parking; at traffic signals; speed limit control

Introduction/improvement of multi-modal systems

- Park & Ride,
- Kiss & Ride
- Bike & Ride

Strategies and Measures for PT and Other Priority Motorised Users

Introduce new public transport links/services/modes

- New modes (e.g. light rail)
- Introduction of low floor buses
- Interchanges: new interchange construction providing new linkages within the transport network; easing transfer between modes (for and those with and without reduced mobility)
- Integrated public transport pricing

Introduce new priority vehicles' systems

- Introduction/improvement of car-pooling / van-pooling

Improve public transport infrastructures

- Stops: shelters at stops; seating at stops; access routes to and from stops; lay-byes and protruding and raised bus borders
- Interchanges: improvement of access to, and from, the interchange to the surrounding areas; provision of waiting facilities; provision of “activity” facilities while waiting; provision of new ticketing systems (especially for through ticketing between modes)
- Automatic enforcement of BUS lanes using video cameras connected to Bus AVL system

Improve public transport information systems

- New signing at stops (routes, timetables, mode transfer possibilities)
- At stops and in vehicles’ real time information systems on schedule conformity using Bus automatic vehicle location (AVL) systems

Change the design of a road network in favour of PT and other Priority Vehicles

- Bus lanes and Bus only streets/road sections
- Bus and Priority Vehicles’ lanes
- High Occupancy Vehicles (HOV) lanes

Change the control of a road network in favour of PT and other Priority Users

- PT priority at junctions: Bus advance areas at traffic signals (secondary stop line for other vehicles); turning exemptions at junctions
- Public Transport gap generating facilities at bus lay-bys
- PT Priority at junctions (isolated or coordinated): passive bus priority traffic signal regulations; application of AVL systems to give general or selective priority to buses at traffic signals
- Congestion management using UTC systems applying gating or queue relocation strategies to protect bus routes
- Application of VMS to automatically divert drivers from bus routes
- Application of VMS to automatically enforce adequate use of PT facilities
- Priority/emergency vehicles priority at junctions (isolated or coordinated): application of AVL systems to give priority at traffic signals
- Preferential pricing for HOV vehicles

Increase public awareness/acceptance of public transport

- Campaign to inform about new transport services
- Advertising.

Strategies and Measures directed at private motorised vehicles

Limit private vehicles' access to "sensitive" areas

- Administrative measures against private cars (e.g. Singapore and Athens)
- Access control/restriction in residential or city centre areas (except residents' vehicles, PT, emergency and delivery vehicles, ...)
- Restriction of Parking Space at city centres
- Restricted access to parking (in residential areas or city centres) by certain modes or durations

Increase private vehicles' generalised costs

- Road use pricing: time based, distance-based, cordon-based, congestion-based and pollution-based
- Parking pricing in city centres
- Traffic calming and restraint: motorised traffic speed reduction

Pedestrian Oriented Strategies and Measures

Create a "comprehensive/better" pedestrian infrastructure

- Create "global", continuous pedestrian networks
- Bollards on the pavement
- Elimination of pavement in access roads
- Extension of pavement and playground
- Improve night-time lighting of pedestrian paths
- Guiding lines for blind pedestrians
- Routes for disabled people
- Pedestrian precincts/ improvement of squares
- Direction signing for pedestrian

Shift accessibility priorities towards pedestrians

- UTC directed at VRU
- Access control for motorised traffic in sensitive Areas'
- Extension of pedestrian areas in city centres
- Creation of "PlayStreets"
- Selective location of big Traffic Attractors' (e.g. shopping areas)

Reduce severity of Ped/Veh conflicts by reducing vehicle speeds

- Traffic calming in through roads and local areas (e.g. traffic calming roundabouts)
- Speed reduction regulations in urban areas

Reduce Ped/Veh number and severity of conflicts with "improved" crossings

- Introduce formal crossing facilities (zebras, signalised, underpass/footbridge ...)
- Accent illumination of pedestrian crossings
- Elevated pedestrian crossings' pavements
- Reductions of crossing length by widening pavement
- Real time pedestrian detections and traffic light actuation
- School crossing guards
- Teachers' access to increased green light phase at traffic signals
- Electronic sounds for disabled pedestrians
- New designs for bus stops "crossed" by cycle lanes

Reduce Pedestrian delays at crossings by shifting priorities between modes

- Pedestrian signal flashing yellow at signalised crossings
- Extended crossing times for pedestrians at traffic signals
- Extension or early call of pedestrian phases using real time pedestrian detection

Create better/more comfortable interfacing/resting/waiting facilities

- Lowered kerbstones
- Implementation of benches and rest poles
- Level access to public transport

Change the “Status”/“awareness” of the pedestrian mode

- Government-supported local action plans with emphasis on pedestrians
- Information desks (with free street maps, ...)

Change pedestrians/drivers “on-route” dangerous behaviour

Traffic safety campaigns

- Parents’ education
- Children’s Traffic Clubs

Bicycle Oriented Strategies and Measures

Create a “comprehensive/usable” cyclist infrastructure

- Create “global”, continuous bicycle networks (cycle lanes, one/two way cycle tracks, streets with mixed use, crossings)
- Create storage facilities near public transport interchanges
- Admission of bicycles in public transport
- Introduction of “city bikes” systems
- Introduction of bicycles for trips on duty
- Introduction of escorted home-to-school cyclists
- Implementation of facilities for repairing bikes

General improvement of cyclists’ system

- Bicycle route signposting
- Cycle routes’ maps with recommended routes
- Bridges for cyclists as short cuts
- Paving (cycle) tracks along canals and rivers
- Infrastructure facilities regarding social safety
- Creation of better storage facilities/ cycle racks as standard, covered, guarded, underground;...
- Physical theft prevention measures (special cycle racks, locks, ...)
- Organisational theft prevention measures: computer program for recovered bicycles; bicycle registration programs
- Good maintenance (e.g. priority snow cleaning on cycling routes)

Shift accessibility priorities towards bicycles

- Introduction of bicycle lanes or tracks
- Admission of cyclists into pedestrian streets
- Cycle streets with mixed use
- Non-compulsory cycle lanes
- Two-way bicycle traffic in one-way streets
- Cyclists' priority at traffic signals

Reduce severity of Cyclists/Vehicles conflicts

- Traffic calming in areas with mixed traffic to reduce vehicle speeds
- Introduce new, “improved” types of design at junctions (e.g. recessed stop line in the carriageway; special use of blue cycle areas; staggered bicycle track at t-junctions; truncated cycle track at junctions)
- Priority green for cyclists at signalized junctions

Reduce cyclists delays at crossings

- Cyclist tunnels at junctions with high traffic flows
- All-directions-green signal for cyclists at signalized junctions
- Real time detection of cyclists at signalized junctions
- Turning right (left in the UK) on red for cyclists

Change the “status”/“awareness” of the cyclist mode

- Government-supported local action plans with emphasis on cycling
- Information desks (Bicycle units, ...)
- Promotion day for sustainable transport modes
- General public awareness campaigns (e.g. BikeBus'ters – DK)

Change cyclist/drivers “on-route” dangerous behaviour

- Cycling education courses
- Checking compulsory bicycle equipment at school

2.4 UNIT IV – Monitoring and evaluation

The importance of monitoring and evaluation of Integrated Traffic Management solutions has been fully recognised by all the EU projects involved in actual implementation.

Furthermore the need for a complete and coherent Evaluation Framework (EF), using specialised assessment tools and methodologies, was also widely recognised.

The Capture project (CAPTURE, final report) has used a comprehensive evaluation framework that, in spite of having been developed to evaluate specifically physical measures, can also be used in wider environments (see also TASTE, deliverable 1 or INCOME, final report)

In those projects the main impacts resulting from the real life implementation of different measures are broken down into four main categories: technical, operational, social and behavioural and environmental impacts.

In relation to the “Technical Impacts” the main objective is to check whether the implemented system “works”.

Aspects like ease of design, implementation and operation of implementation are evaluated.

In “Operational Impacts” the focus of attention is the implementation capability to improve the operation of public transport and other modes.

Speeds, delays and reliability of public transport, as well as corresponding effects in the other modes are the objects of study.

“Social and Behavioural Impacts” assess the potential effects on society and its citizens, both those using the transport system and non-users, affected by it.

As referred to in the Capture report (see Capture, final report, p.13) “At the lower level, impacts assess changes in travel behaviour and the relative impacts on different groups in society. The higher level assesses the wider impacts of changes in behaviour for economic and social development.”

Effects taken into consideration fall in the following categories: local level modal shift; city wide modal shift; effects on other road users; effects on those with reduced mobility; effects on safety and accident levels; the effects on the local economy; effects on perceptions about travel.

The “Environmental Impacts” category attempts to evaluate changes in environmental quality. Aspects like energy use, energy efficiency of public transport, pollutant emissions, air quality and noise are looked at.

The same project also presents a data collection programme, which includes the following survey types:

- On board surveys of vehicle speeds and bus patronage;
- Different modes’ traffic counts including the recording of car occupancy;
- Personal interviews with members of the public;
- Personal interviews with key players;
- Data on accidents;
- National data on engine sizes and fuel type;
- Noise measurement surveys.

The stated aim is the collection of information and indicators able to allow structured analyses such as cost-benefit analysis, and other forms of multi criteria analysis to be carried out, while allowing the freedom for many other kinds of assessment approaches.

In Figure 2 below (taken from CAPTURE, final report, page 3.244) the different types and applicability of available surveys are presented.

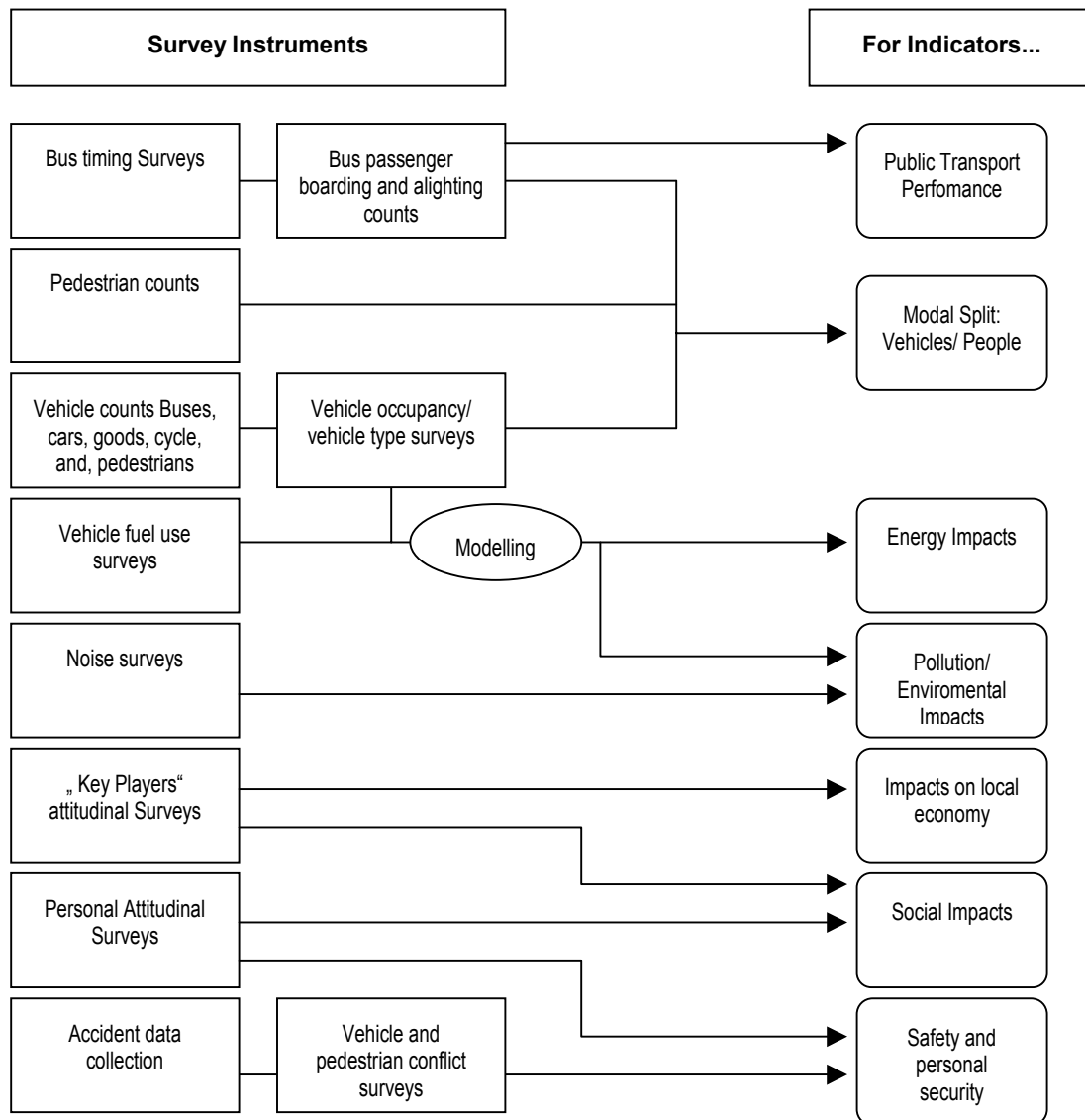


Figure 2 - The CAPTURE surveys – their uses and roles (CAPTURE, deliverable 8, page 3.244)

2.5 UNIT V – List of Relevant Practical Case Studies

Among all the Case Studies found to be relevant for the current Topic according to the information available in the Project Reports, the following 12 Case Studies were selected and are included here. The information collected, for each case study concerns:

- Test Site Location

- Objectives/Test Programme
- Combination of Solutions
- Technical description
- Observed results
- Potential for Implementation/Applicability Problems:

A more complete list of Case Studies can be found in Annex 2 and it includes, for each case study just general information and references.

Case Study 1 – Implementation of HOV lanes – Leeds

Test site location: Leeds (Great Britain); **Project Name:** ICARO

Objectives/Test Program: Introduction of a high occupancy vehicle (HOV) lane on the A647 radial route into Leeds (see Figure 3 and Figure 4) as one measure which could result in a more efficient use of cars on the route and which allow more people to access the city, without necessarily resulting in an increase in the number of vehicles. This measure also aimed at providing timesavings and more consistent journey times for existing HOV's and for buses.

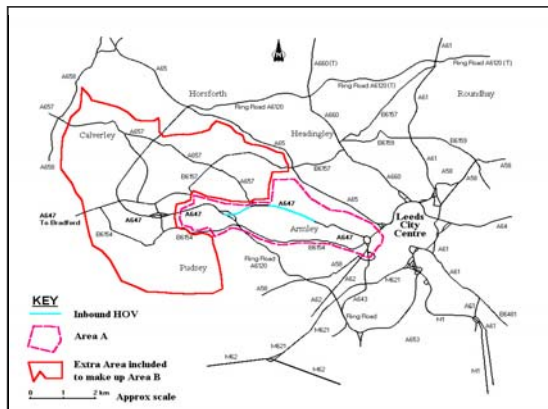


Figure 3 – Leeds's Hov Lane areas of influence. Font: 'ICARO – National Evaluation Report' – Leeds real life demonstration. Leeds City Council, Jan. 1999. David Gilson and Tim Dixon. Page 10

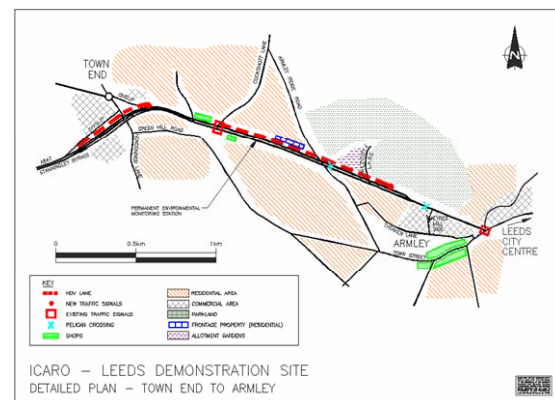


Figure 4 – Leeds's Hov Lane details. Font: 'ICARO – National Evaluation Report' – Leeds real life demonstration. Leeds City Council, Jan. 1999. David Gilson and Tim Dixon. Page 21

Combination of Solutions: HOV Lanes + Cycle Lane

Technical Description (Infrastructure measures): An HOV lane with 1.5 km length, 4.5m width and with a 1.3m cycle lane separately marked within the overall HOV lane. A special car logo has been designed and is used on road signs (see Figure 5).



Figure 5 - ICARO Proposal for an HOV traffic signal to be implemented on the European Level. See - 'ICARO – Deliverable n° 6 – Evaluation and Recommendations, page 131

The sign “2+ LANE” is used on the carriageway within the HOV lane. Other, new, specially designed HOV signs and advanced warning signs have also been installed. Half lay-bys have been provided at bus stops along the length of the HOV lane to permit vehicles to pass stationary buses. A special police enforcement lay-by has been provided at each end of the HOV lane route. The end of the HOV lane is controlled by traffic signals at the busiest times, giving priority to HOV's.

Observed Results: The performance evaluation was made considering occupancy counts, queue lengths and journey times (see Figure 6 and Figure 7). Other aspects analysed were: behavioural data from driver surveys; attitudes towards car-pooling through telephone survey results and environmental impacts.

Significant timesavings have been recorded for vehicles making use of the HOV lane in all cases. The biggest time saving was found in the 3+ scheme (3 or more persons in the car). By contrast, the SOVs (Single Occupancy Vehicle) experienced an increase in travel-times. Decrease in traffic volumes on the A647 between 9.7 and 16.5 %. Substantial increase in the HOV's occupancy rate (up to 20 %), which could be related with the increase in demand. This relation shows that the implementation of HOV lanes can be effective even in the very short-term e.g. the usual increase in traffic demand can promote a higher vehicle occupancy.

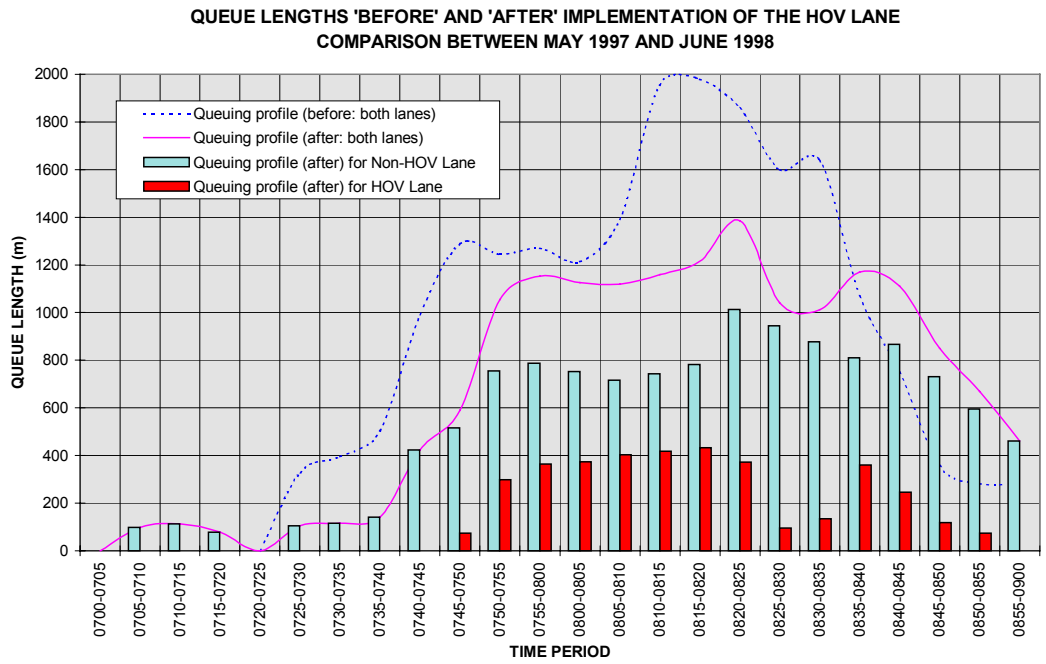


Figure 6 – Leeds’s Hov Lane queue lengths. Font: ‘ICARO – National Evaluation Report’ – Leeds real life demonstration. Leeds City Council, Jan. 1999. David Gilson and Tim Dixon. Page 46

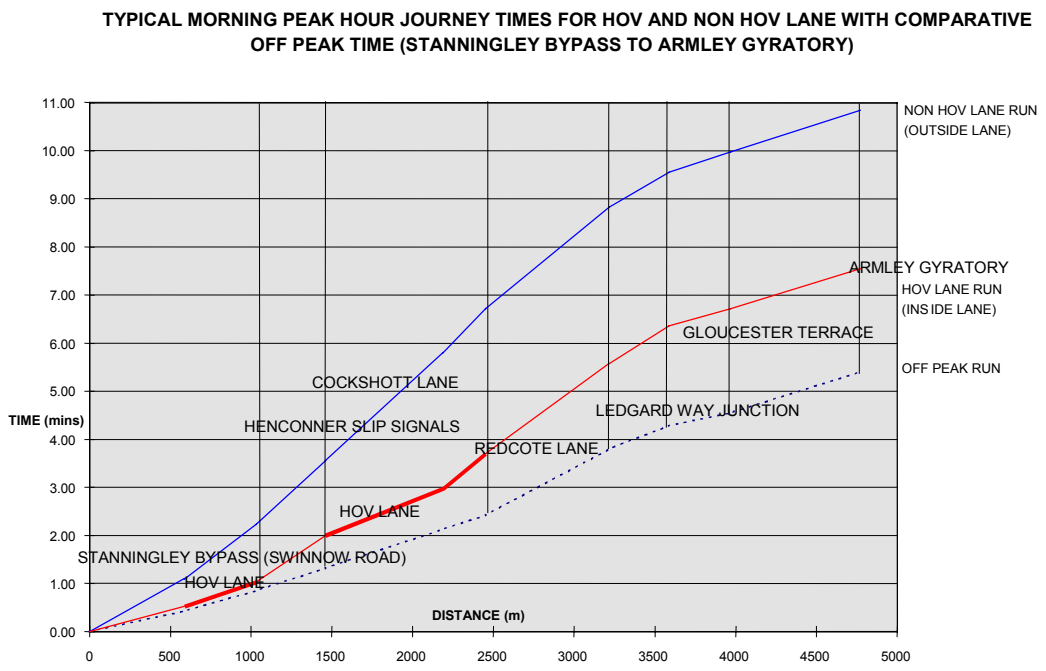


Figure 7 – Leeds’s Hov Lane journey times. Font: ‘ICARO – National Evaluation Report’ – Leeds real life demonstration. Leeds City Council, Jan. 1999. David Gilson and Tim Dixon. Page 53

The introduction of the HOV lane has been a success. Journey times for multi-occupancy vehicles have been reduced with consequential timesavings for all the occupants of these vehicles. In this respect, the morning peak scheme has been particularly successful, the evening peak scheme less so. However, traffic flows are less than anticipated and this reduction is unlikely to be due entirely to new car pools and modal change. Some traffic is diverting around the HOV lane although this appears to have no relevant consequences for local residential areas.

Potential for Implementation/Applicability Problems

For a successful HOV lane, there are a number of desirable features. The length of HOV lane should be maximised and provide sufficient journey time benefits for HOV's to outweigh the disbenefits for SOVs. Consideration should be given to start by providing SOVs with a journey time close to their 'before' journey time. At a later date, the local authority may wish to control the priority given to HOV's and traffic signals would assist in this. The 'before' data should be carefully studied to establish a good level of lane occupation. An empty HOV lane will cause SOV's to be critical of the solution and give cause for complaint. The origin-destination data will also provide an indication whether some traffic will be able to divert further. Not specific to the HOV lane, but necessary nevertheless, will be the consultation of those likely to be affected. Particularly in an urban environment, there may be properties such as shops and homes, which require access via the HOV lane. This should be achieved without causing the impression of abuse. Signing needs to be simple and effective. LCC (Leeds City Council) is considering smaller repeater signs to give joining motorists better information. Police enforcement is necessary and can be reduced as the scheme becomes recognised.

References

ICARO, D10a

Case Study 2 – The integration of reversible HOV lanes with Bus lanes – Madrid - Modelling

Test site location: Madrid (Spain); **Project Name:** ICARO

Objectives/Test Program: The modelling exercise had the following objectives:

To test the willingness of current 2 occupant HOV vehicles to accept the need of a third occupant to keep using the HOV lane (otherwise having to use the more congested conventional lanes); to increase the average car occupancy along the tested traffic corridor (N-VI); to reduce overall passenger travel time and to reduce overall vehicle-km, travel time and emissions.

The effects on the corridor functioning conditions were analysed considering a short-term (1997), a medium-term (2005) and a long-term term (2010) horizons with the following scenarios being compared with the '*Do nothing scenario*':

- scenario 0, '*Existing HOV lane with 2+*' (2 or more occupants per vehicle)
- scenario 1, '*Existing HOV lane with 3+*'. (3 or more occupants per vehicle)

Combination of Solutions: HOV Lane + Bus Lane

Technical Description: An HOV and bus lane comprising of 12.3 km lanes, supplemented by an additional 3.8 km bus-only lane has been provided and is connected to a transport intermodal centre to channel the traffic flow of most buses using the N-VI (see Figure 8 and Figure 9).

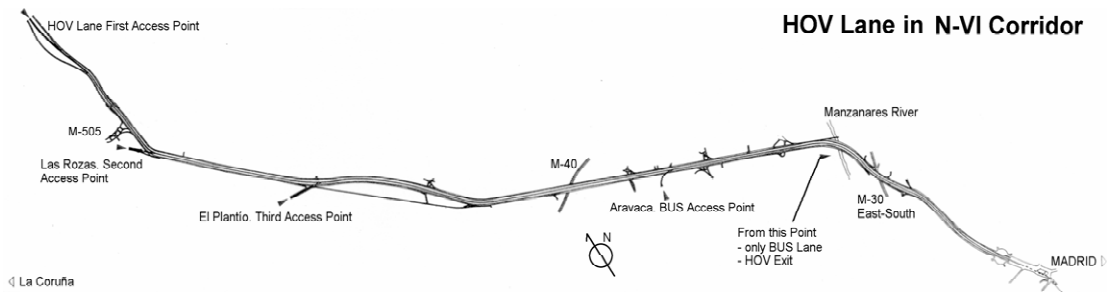


Figure 8 – Madrid’s HOV Lane and access points. Font: ‘ICARO – National Evaluation Report’ – Madrid modelling demonstration. Polytechnic University of Madrid, Transp. Department, Jan. 1999. Andres Monzon. Page 5



Figure 9 – Hov Lane general view. Font: ‘ICARO – Final Report – Madrid modelling demonstration. Page 74

These two facilities are reversible. The core of the HOV-Bus lane is located right in the central section of the N-VI corridor. This lane is separated from the general traffic lanes by an uninterrupted barrier.

In order to accomplish the objectives mentioned above, the following methodology was developed: computer aided telephone interview (CATI) to 1707 residents in the corridor that travel to Madrid at least once a week between 7 and 10 A.M; face to face stated preference survey to current HOV users with 2 occupants; modelling of the transport supply in the corridor, especially the HOV lane; modelling of transport demand: O-D matrix and its distribution among levels of occupancy; estimation of discrete choice models to quantify willingness to accept a third occupant; traffic assignment with EMME/2 with interaction with discrete choice model estimated; micro simulation analysis with FREQ11; and finally, analysis of the results and conclusions.

Observed Results: An increase in the occupancy rate to 3+ does not have a big impact on demand for the non-HOV lanes, but a consistent reduction in that demand can be brought about by the application of car-pooling measures. The analysis with EMME/2 indicated that a clear increase in the average occupancy rate was observed in all scenarios, even with the knowledge that the onset occupancy rate is already high (1.50 occupants per vehicle) The re-allocation of persons and cars reached in the equilibrium situation was the following: of 100 current ‘2 occupants’ vehicles: 45 prefer a third occupant to use the HOV lane; 39 change to conventional lanes with 2 occupants; 16 start using public transport services. The following table summarises

the main results in relation with the use of both alternatives. Both reference units - vehicles and persons - are used (see Table2). Car occupancy would increase from 1,5 to 1,78.

	VEHICLES ⁴		PERSONS ⁵	
	2010-0	2010-1	2010-0	2010-1
total in HOV lane	2,743	2,394	13,206	15,724
% of HOV ⁶ that use the HOV lane	75%	70%	82%	50%
HOV lanes (%):				
2 occupants vehicles	80%	0%	35%	0%
3 occupant vehicles	15%	95%	9,5%	45,5%
Public buses	5%	5%	55,5%	55,5%
% of total N-VI demand using HOV lane	40%	29%	44%	56%

Table 2 - Vehicles and persons split between HOV and non-priority lanes. Font - 'ICARO – National Evaluation Report' – Madrid modelling demonstration. Polytechnic University of Madrid, TransportDepartment, Jan. 1999. Andres Monzon. Pg22

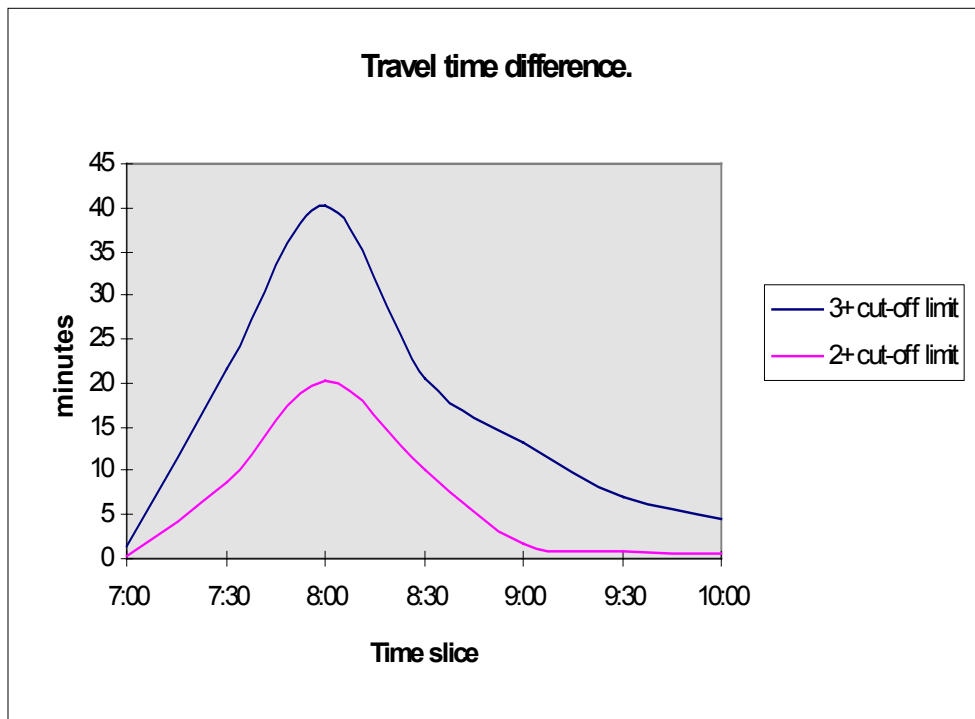


Figure 10 - Travel time difference between HOV and non priority lanes. Font - 'ICARO – National Evaluation Report' – Madrid modelling demonstration. Polytechnic University of Madrid, Transport Department, Jan. 1999. Andres Monzon. Pg32

⁴ Excluded public transport buses, which remain constant in both scenarios

⁵ Both in cars and public buses.

⁶ HOV refers to car with 2 or more occupants

A significant rise in time saving would prompt a user-shift towards HOV lanes, especially in the prospect of congestion far above the levels recorded at present (see Figure 10).

Potential for Implementation / Applicability Problems

The first issue is that the Madrid modelling case study is based on a real HOV in operation, and several real data were available to be used as input in the modelling process. Then it is possible to extract some real life results in two ways. First because there data exists before and after the implementation and secondly because the survey carried out to feed the modelling exercise was done to current users of the HOV facility, which therefore know the system operation characteristics.

Another specific fact is that the separation between conventional lanes and a HOV lane is a concrete barrier. It means that there are only 3 entry-points and only one exit at the end. Therefore users - even car-poolers - cannot use the HOV facility if they are leaving the road before the end. This is the case of 1/3 of the users. One clear conclusion is that HOV lanes are more useful in the case of very congested periods. Otherwise time losses to collect partners and detours to get the entry point are a big deterrent factor. The Madrid scheme corresponds to an interurban corridor with 16 kms length, which means that it's results can only be transferred to similar cases. The combination of a HOV/BUS lane with a BUS only lane, where car-poolers cannot enter, in the most congested part of the corridor (3 km), has proved to be very beneficial avoiding the space share competition between public Transport and car-pooling.

References: ICARO, D10b

Case Study 3 – Physical Measures to Improve BUS - Bucharest

Test site location: Bucharest; Project Name: CAPTURE

Objectives/Test Program: To collate and evaluate the effectiveness of physical transport measures designed to restrict or encourage the use of different modes.

The main goals of the Bucharest schemes relate to: maintaining the high level of public transport modal split against the car; improving the performance of public transport; passenger time savings; reducing congestion; enhancing environmental quality and safety conditions.

Combination of Solutions: Implementation of trolley lines; roundabout system with bus lay-bys; public transport lane and stop platform facilities.

Technical Description: Maniu Corridor - Introduction of 2 trolley lines on a 4,2 kms length of corridor; *Unirii* Square - implementing a roundabout system with bus lay-bys in a square; *Unirii* Blvd. -implementing a public transport lane on one side of a 600 metres corridor together with stop platform facilities; *Elisabeta* Blvd.- implementing a public transport lane on contra-flow on a 1km long corridor.

Observed Results: (As an example in the Unirii corridor)

The traffic counts and bus timings were undertaken on the corridor in June 1997 (before) and again in June 1998 (after), both in a weekday, morning peak, under normal weather conditions (23°C). Five bus routes were operating along the corridor in both the 'before' and 'after' situations. The average speed of buses along the corridor more than doubled, increasing by 116% compared with the 'before' situation. Considering the average bus speed in Bucharest (approximately 16.7 km/hour from RATB statistical data), the negative situation before the trial (with 4 km/hour less on the corridor than the RATB average) has changed, becoming faster than the city average by over 10 km/hour. In this way, the trip time in the trial segment fell by 56% or 102 seconds (see Table3).

	Before (June 1997)	After (June 1998)
Bus Frequency (n° of vehicles/hour/direction)	98	89
Average speed of bus travel on corridor/Km/hour	12.5	27.0
RATB average speed in Bucharest (km/hour)	16.5	16.7
Trip time (seconds)	180	78

Table 3 - Results of Implementing a public transport lane on one side of a 600 metres corridor together with stop platform facilities. See CAPTURE – Deliverable 8, Annex A, A1.2., page 1.159

The mean bus frequency decreased largely because in the period between the before and after surveys one bus service started to run on a longer route with the same fleet size, and a number of buses operating on other routes were redistributed. During the CAPTURE demonstration, the total number of private vehicles increased by 41%. The decrease in public transport vehicles by half is due to the decrease in bus fleet serving the 5 lines operating on the corridor. In the ‘after’ survey, the goods vehicles’ traffic had increased almost 6 times and taxis almost 4 times compared to the ‘before’ situation. One of the causes for this could be the business area development in the zone.

Potential for Implementation/Applicability Problems

The immediate advantage of introducing the bus lane was that after one week from introducing the measure, there was an increase in the average buses’ speed of buses and a decrease in their trip times per route segment. The bus lane was implemented on a third of the whole corridor length, thus on too small a scale to affect, in any way, the passenger modal split or the traffic behaviour of car drivers on the rest of the corridor or in the vicinity. The measure could be effective on a larger scale and for a longer period, causing changes in travel behaviour. Additional law enforcement powers would also assist the system. The Traffic Police Department currently doesn’t have the legal framework to apply a traffic violation fine. Furthermore, the measures on this segment would be more effective if combined with a ‘green light’ priority for buses. If the results remain satisfactory, it is possible that the bus lane will be extended to the whole corridor.

References: CAPTURE, final report (D8).

Case Study 4 – Public transport priority in UTC – London

Test site location: London; **Project Name:** INCOME

Objectives/Test Program: To test the priority at traffic signals for buses in terms of journey times and delays through the network

Combination of Solutions: UTC (Urban Traffic Control) and PTS (Public Transport Systems)

Technical Description: Priority was undertaken within different UTC systems including fixed time (SPRINT) and adaptive time (SCOOT). The priority algorithm consists on (i) estimation of bus arrival times at traffic signals, (ii) extension and recalling of signal phases, (iii) dealing with confliction priority requests and (iv) resynchronization of signal timings after a priority request has been serviced. Full-scale field trials were supported by automatic UTC and public transport data and by simulation modelling.

Observed Results: SPRINT – Impacts of SPRINT strategies on Buses (SPRINT Modelled Estimates), London. There is a strong impact in using recalls together with the green extensions (see Table 4):

Sample	SPRINT Strategy	Saving in Average Bus Delay (Secs/Junction)
Main Road Links	Green Extensions only	1.8
	Green Extensions and recalls	2.0
Side Road Links	Green Extensions only	2.4
	Green Extensions and recalls	6.4
All Links	Green Extensions only	1.9
	Green Extensions and recalls	2.9

Table 4 - Impacts of the SPRINT Strategies on Buses (SPRINT Modelled Estimates); See INCOME - Annex A to Final Report Technical Description, Results and Recommendations, Page A7

The BUS SCOOT was evaluated by both simulation and on-street trials. The simulation work was designed to advise on bus extension and bus recall target saturation values and to assess the effects of cycle times. Average bus journey savings of 4%-10% were measured across 20 junctions using Bus SCOOT compared to normal SCOOT control, with no significant impact on other traffic. This equates to average bus delay savings per junction of some 5%-20% (see Table 5).

BUS SCOOT Strategy	Average Savings in Bus	
	Delay – secs/bus/link (%)	Delay variability (%)
Extensions only	1.0 (5%)	1.3 (4%)
Extensions and recalls – Normal priority	3.9 (20%)	2.9 (8%)
Extensions and recalls – High Priority	3.7 (19%)	3.9 (11%)

Table 5 - Impacts of the SPRINT Strategies on Buses (SPRINT Modelled Estimates); See INCOME - Annex A to Final Report Technical Description, Results and Recommendations, Page A9
Potential for Implementation/Applicability Problems:

In SPRINT the benefits were lower than expected, because, with no traffic detection, SPRINT can not take advantage of the natural fluctuations in traffic flows which can allow more “spare green” to be re-allocated to buses on occasions. Taking these and other disadvantages it is still likely that higher benefits could be obtained from SPRINT than achieved in these trials, given further system development and tuning. In particular, benefits should be increased by:

- Providing greater detector distances (to the stop line) where possible;
- Providing local extensions facilities, where possible;
- Operating a higher target degree of saturation for green extensions;
- Providing link – specific priority facilities

Priority may not be feasible at heavily, regularly over-saturated junctions. In congested networks it is important to combine the bus priority facility with strategies to reduce the congestion along the bus route, or to provide bus lanes, which allow buses to bypass queued vehicles.

References: INCOME, final report b

Case Study 5 – Public transport priority in UTC - Gothenburg

Test site location: Gothenburg; **Project Name:** INCOME

Objectives/Test Program: To test the effects of the priority at traffic signals for buses in terms of journey times and delays through the network (measured at the intersections), using the actual Gothenburg priority systems.

Combination of Solutions: UTC (Urban Traffic Control) and PTS (Public Transport Systems)

Technical Description: Three different combinations of measures are supported by Gothenburg authorities representing different levels of integration, from low to high between UTC and PTS:

- Fixed time UTC and active bus/tram priority (Case A);
- Adaptive UTC (SPOT) and active bus/tram priority based on loop detection (Case B);
- Adaptive UTC (SPOT) and weighted bus priority using automatic vehicle detection (AVL) (Case C).

In this case study the three combinations were tested as cases A, B and C. Intersection waiting time is calculated by using the following formula, based on random variables at a signalised link with no active priority given.

$$Delay = \frac{1}{2} \frac{T_{red}^2}{T_{cycle}}, \quad \text{Where } T_{red} \text{ is the average red time and } T_{cycle} \text{ is the average cycle time.}$$

By taking the difference between the waiting times with no priority, calculated using the above formula, and the waiting times measured during the trials, a delay estimate was obtained. This estimate gives the reduction in waiting time when priority is active with respect to the normal waiting time at the intersection when no priority is given.

Observed Results: Total travel timesavings of 10%-15% could be achieved.

The priority given to trams in Cases B and C is no better than the achieved by traditional methods. Significant benefits for public transport were observed independently of the used strategy. In what concerns private vehicles the travel time impact (delay) is less than 5% in the afternoon and less than 10% in the morning peak. (see Table 6).

Dealy impact from measure A-C (in seconds)	Gothenburg medium Weight	Gothenburg high Weight
Case A (fixed UTC, non priority)	24,2 s	24,2 s
Case B (adaptive UTC, non priority)	22,2 s	22,2 s
Case C (adaptive UTC, AVL priority)	14,4 s	11,6 s
Difference A-C (s)	9,8 s	12,6 s
% improvement A-C	40,5%	52%

Table 6 - Public Transport waiting times under different UTC strategies Gothenburg. See INCOME - Annex A to Final Report – Technical Description, Results and Recommendations, Page A31

Potential for Implementation/ Applicability Problems

Priority may not be feasible at heavily, regularly over-saturated junctions. In congested networks it is important to combine the bus priority facility with strategies to reduce the congestion along the bus route, or to provide bus lanes, which allow buses to bypass queued vehicles.

References: INCOME, final report b

Case Study 6 – Integration of Public Transport Priority and AVL

Test site location: London, Gothenburg; **Project Name:** INCOME

Objectives/Test Program: Incorporation of bus location data, obtained from AVL systems integrated in Gothenburg and London transport priority systems following the integrated UTC/AVL application (UTOPIA), which has been operational in Turin for over 10 years.

Combination of Solutions: UTC (Urban Traffic Control) and AVL (Automatic vehicle detection)

Technical Description: The AVL data have been used for providing (i) bus detections (complementing loop detector data) and (ii) bus headway information (in London) (see Figure 11). Bus headway data have been used as a basis for *selective priority*: buses with the greatest headways (i.e. running late) are selected for full priority while other buses, with lower headways, receive little (extensions only) or no priority. The main expected advantage of selective priority over non-selective priority lies in regularity improvements, resulting in reduced passenger waiting times at bus stops.

The impacts of selective priority have been evaluated using the simulation models STEP, SPLIT and HUTSIM.

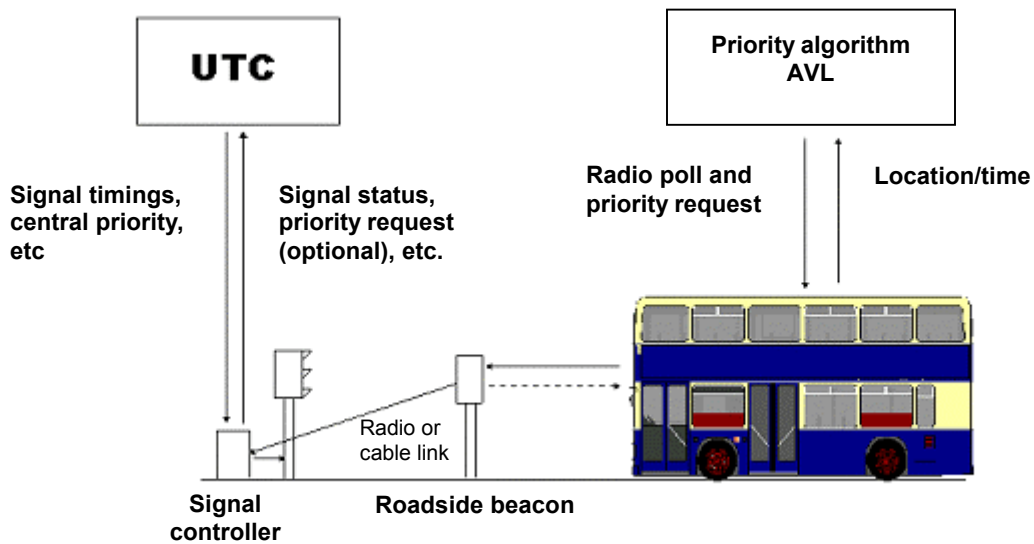


Figure 11 – Example of public transport/AVL priority architecture. See INCOME - Final Report – Page 13 **Observed Results:** Simulation results: potential savings in passenger waiting time of up to 22%; passenger waiting time savings are maximised when approximately 40% of buses receive priority, i.e. the 40% with the highest headways; passenger travel time savings tend to increase as more buses receive priority; combined passenger travel plus waiting time savings (expressed as a cost) increase with penetration rate up to around 40% of buses receiving priority; the rate of increase above 40% penetration then becomes marginal; overall cost savings are predicted to be up to twice those who would be achieved with non-selective public transport priority in UTC. (see Figure 12).

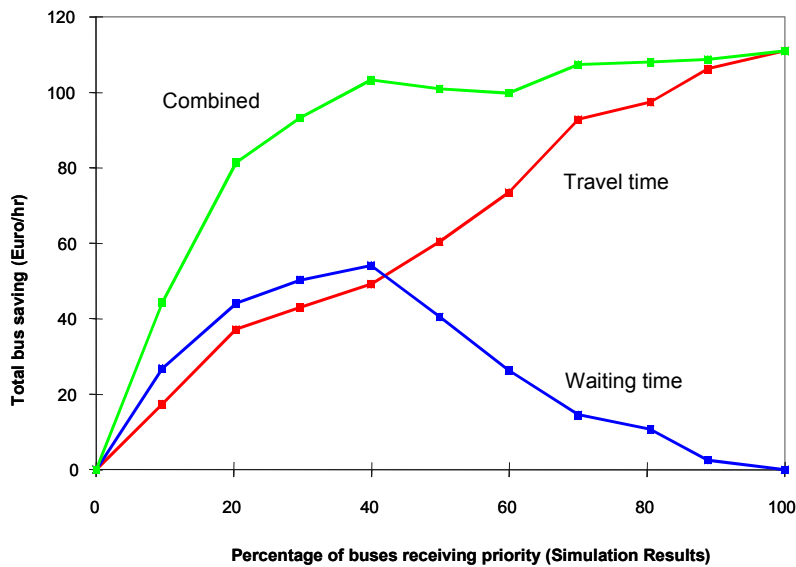


Figure 12 – Example of public transport/AVL priority architecture. See INCOME - Final Report – Page 13

Potential for Implementation/Applicability Problems

The infrastructure requirements are: Traffic signals under adaptive UTC control (selective priority has not been provided within a fixed time system but, in principle, it could be); AVL system to provide headway information and, optionally, detect buses; (Optional) Bus detection system, e.g. loops or DGPS, if the AVL is not considered to provide sufficient locational accuracy for public transport priority. A selective priority algorithm running within the traffic control system provides priority on a selective basis, e.g. depending on lateness of bus.

The benefits of selective priority increase with increasing irregularity of public transport services. Note that other methods may also be available to reduce irregularity, like congestion management, improved fleet management etc. There is a trade-off between passenger journey time and waiting time saving benefits depending on the numbers (or percentages) of buses receiving priority.

From the non-selective priority schemes some benefits could be expected with their levels depending on (i) type of control, (ii) congestion levels and (iii) bus flow levels.

For effective priority, buses need to be detected accurately and detected at suitable locations (e.g. downstream of bus stops). With AVL systems, which use radio polling at fixed time intervals (e.g. every 30 seconds) the detection location cannot be predetermined and is, therefore, non-optimal. This is catered for in Turin through the use of a two-minute forecasting horizon within which a number of bus/tram ‘detections’ occur, whilst, bus detection in London has used roadside beacons with the AVL system providing the headway data used by the selective priority algorithm.

References: INCOME, final report a

Case Study 7 – Integration of Variable Message Signs and UTC, Various

Test site location: London, Piraeus, Gothenburg, Turin; **Project Name:** INCOME

Objectives/Test Program: Integration of VMS/UTC and ferry schedules (Piraeus); Effects of re-routing at a VMS during incident conditions (London); Effect of providing estimated route travel time information (Gothenburg).

Combination of Solutions: Urban Traffic Control (UTC) Systems + Variable Message Signs (VMS).

Technical Description: These applications have mainly involved the use of VMS within UTC networks or one-way integration, with traffic data from UTC being used to select appropriate messages for display; integration in the other direction (from VMS to UTC) was not specifically undertaken.

It is expected that the adaptive UTC systems would react to changing traffic conditions caused by re-routing and a VMS evaluation was carried out mainly by simulation using various models: SATURN and TRANSYT in Piraeus, RGCONTRAM in London and HUTSIM in Gothenburg. These models were supported by questionnaire surveys of driver requirements and responses to VMS in London and Gothenburg.

Observed Results: The Gothenburg study considered the effect of providing estimated route travel time information to a proportion of the driver population in a small network. The main findings were: where a low proportion of vehicles receive information (below 10%), travel speeds for these vehicles increased by around 5%; at higher proportions (above 30%) network instability occurred and travel speeds were reduced for all vehicles.

These findings illustrate the need with VMS to use messages appropriate to the diversion rate desired.

The following journey time results were obtained from the modelling work in London that considered VMS re-routing after the occurrence of incidents:

- *VMS not integrated with UTC* - 23% average journey time savings for drivers passing the VMS, ranging between 14% and 33% for the different modelled incidents;
- *VMS integrated with UTC* - 28% average journey time saving for drivers passing the VMS, ranging between 20% and 37% for the different incidents modelled. Integration here refers to quicker VMS message activation due to the automatic incident detection function of UTC being linked to VMS.
- The impacts of VMS and UTC/VMS integration on the network as a whole depend on the benefits gained by VMS-affected drivers relative to the disbenefits, which might be caused to drivers on adjacent routes who are adversely affected by the increased traffic on their routes. There was evidence of network benefits of VMS in some cases and network disbenefit in others. This result was attributed to the relatively congested nature of the London network, offering limited scope for drivers to use free-flowing alternative routes.

The traffic safety simulation results showed an increase in average distances travelled and speeds for drivers diverting because of VMS of 3% and 3km/hr respectively (from 8km/hr). This occurs as many drivers seek longer, faster routes to their destination to avoid the congested area. This may have a very small negative impact on safety, although benefits could accrue through reduced queuing on the approaches to an incident (which would particularly benefit emergency services and potential casualties) and through the value of the VMS information itself (e.g. reduced stress).

Potential for Implementation/Applicability Problems

The infrastructure requirements are: variable message signs installed by the roadside; Communications to control computer (e.g. telephone lines, radio, etc.); Controlling computer + communications software; UTC, preferably adaptive, to respond to any changing traffic conditions.

Availability and capacity of alternative routes: VMS is only effective if drivers are able to re-route without causing major problems elsewhere in the network. Ideally, alternative routes will have spare capacity, be familiar to drivers and will not be much longer than the incident-affected route.

VMS/UTC integration: integration through data transfer/sharing can increase traffic benefits, while integrated control may increase benefits further, particularly where relatively high diversion rates are involved.

Frequency of updating/ reliability of information: driver confidence about the reliability of the information they receive is very important. If information is out-of-date or incorrect then compliance will be reduced.

Type of UTC system: adaptive systems can react to changing traffic patterns resulting from VMS; fixed time systems could be inefficient unless specific and accurate plans are developed for different scenarios or diversion rates are low.

VMS messages must be chosen with care and the likely re-routing effects must be anticipated prior to implementation to avoid creating problems elsewhere in the network (See Figures 13 and 14).



Figure 13 – On-board vehicle equipment for Turin's AVM system. See NCOME - Annex A to Final Report – Technical Description, Results and Recommendations, page A26

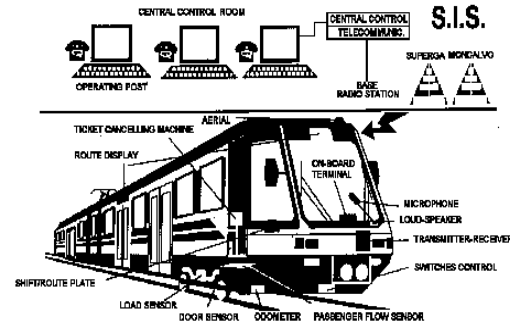


Figure 14 – Integration of Variable Message Signs and UTC. See INCOME - Final Report – Page 18

References: INCOME, final report b

Case Study 8 – Advanced Area-Wide Traffic Control Systems - London

Test site location: London; Project Name: COSMOS

Objectives/Test Program: Strategies for rerouting traffic to make the best use out of the capacity at junctions and in the links between them.

Combination of Solutions: VMS and Rerouting

Technical Description: A Variable Message Sign was installed on the main approach to Kingston from London and used to advise through-traffic to take the longer route round the A3 Kingston by-pass when there were large delays in Kingston. A new programme VAMPIRE was written to monitor the delays in a SCOOT network and recommend the setting of the VMS.

SCOOT already contained many techniques for the efficient control of traffic in congested conditions. The main development under COSMOS was a new gating logic to enable action at a distance to reduce the inflow of traffic to a critical area that is suffering from congestion.

In the case of incidents the effectiveness of different response strategies that could be implemented in the case of incidents or roadwork's that change the capacity of the network has been tested using the STEP traffic simulation tool.

For each link the average speed and flow during the morning peak with and without gating were taken from the assessment of delay.

Observed Results: The strategy was very successful and succeeded in diverting an average of 13% of the traffic turning towards Kingston when the VMS was used in the morning peak. The use of gating in SCOOT was very successful, reducing delay in the controlled area by 22%. Increases in throughput in the range of 10 to 20% were obtained for incidents near or at the stop line, if the best strategy was implemented.

The values for the pollutants, except for NO_x, and the fuel consumption decrease in a range of 8.5 – 11.5%.

Potential for Implementation/Applicability Problems: The technique is particularly suited to road networks like that in Kingston, UK. The gyratory system has a high capacity and is capable of efficiently accommodating large volumes of traffic, providing that queues do not cause significant exit blocking of critical junctions.

In Kingston, the network has a specific problem as one of the major exits from the system, Kingston Bridge, is subject to blocking from a point outside the controlled area. In addition, one of the critical junctions is not far from this exit.

Therefore, it should also be recognised that the gating technique will not provide the same benefits in every congested situation. The COSMOS method of analysing the causes of congestion developed in the work package on Common Control Strategies should be applied. If that analysis concludes that gating is an appropriate tool, then it can be applied with confidence that it will be of benefit.

Concerning accidents, and setting the cycle time to an optimum value, which was dependent on the location of the incident along the link, was the most critical action. Only when the incident is at the stop line is a high cycle time best. At other incident locations, where a full discharge is possible but only for a reduced time period, a shorter cycle time is best. The benefit gained by changing the saturation occupancy again depended on the location of the incident. For incidents close to or at the stop-line it proved beneficial to set the saturation occupancy value lower. Allowing the cycle time to jump straight to a new value gave good benefits in those situations where a large change in cycle time is needed. However, using different Split and Offset authorities to enable SCOOT to respond more rapidly to the changing flow conditions created by the incident, no significant benefits were obtained.

For the implementation of the new gating logic an existing SCOOT system is required and the costs depend on the network and the number of required VMS. For Kingston one gating cluster and one VMS were set up. The estimated costs are about 1,100 ECU for this enhancement. The reduction in delay was the basis of the calculation of the estimated benefits. The implemented gating logic at the Kingston test site led to a benefit in peak hours of about 541 ECU per hour and 714,120 ECU per year.

References: COSMOS, D07.4.

Case Study 9 – Advanced Area-Wide Traffic Control Systems - Turin

Test site location: Turin; Project Name: COSMOS/QUARTET PLUS/INCOME

Objectives/Test Program: The demonstrator is based on the system developed by the 5T project. 5T has deployed a network of Telematic traffic control systems for monitoring and controlling the mobility system of the whole city.

Inside the 5T system the COSMOS project has carried out modifications and enhancements to the existing systems in order to improve the response of the system to scenarios related to congestion and incident events.

Although the 5T system integrates all the traffic management systems (including parking management, public transport management etc.) the focus of COSMOS is concentrated on:

- The automatic detection of congestion and incident scenarios
- The management of such scenarios through
 - The response given by the signal control management system (UTOPIA)
 - The rerouting actions taken by the Town Supervisor

Combination of Solutions: VMS + Incident detection

Technical Description: The 5T system is structured as a hierarchical system organised on three levels. The first level is the ‘outstation level’. This is the level where Multifunctional Outstations (MFO) connects the peripherals on site (i.e. loop detectors, VMS signs, and bus stop displays, traffic light controllers). The MFOs work as nodes of a shared communication network used by all the systems to communicate with their outstations. The local communication network is based on point-to-point connections between the MFOs as to ensure that local information is exchanged directly between the MFOs. Some MFOs have then connections with the centre and act as routing point from the local communication network and the central level communication network.

At the intersections controlled by UTOPIA the MFO embeds the local level of UTOPIA, the SPOT controller.

The second level is the ‘centres level’. This is the level that includes the centres of the different systems. All the centres are connected to a backbone that allows them to communicate and exchange data with each other. This level permits the direct connection of different systems. As an example Signal Control and Public Transport Management are connected in order to exchange data for the request of bus priority actions. Each centre at this level is an autonomous system in charge of monitoring and controlling its outstation. The third level is the ‘Town Supervisor level’. This level concentrates all the available information about mobility in the city, calculates the network equilibrium and co-ordinates the control systems in order to maintain the network equilibrium. The system is made of a network of independent systems exchanging information (traffic data, control strategies) through a common reference network. The general strategy is to protect links from over saturation by utilising the available means including rerouting. This decision is made in the supervisor level.

(see Figure 15).

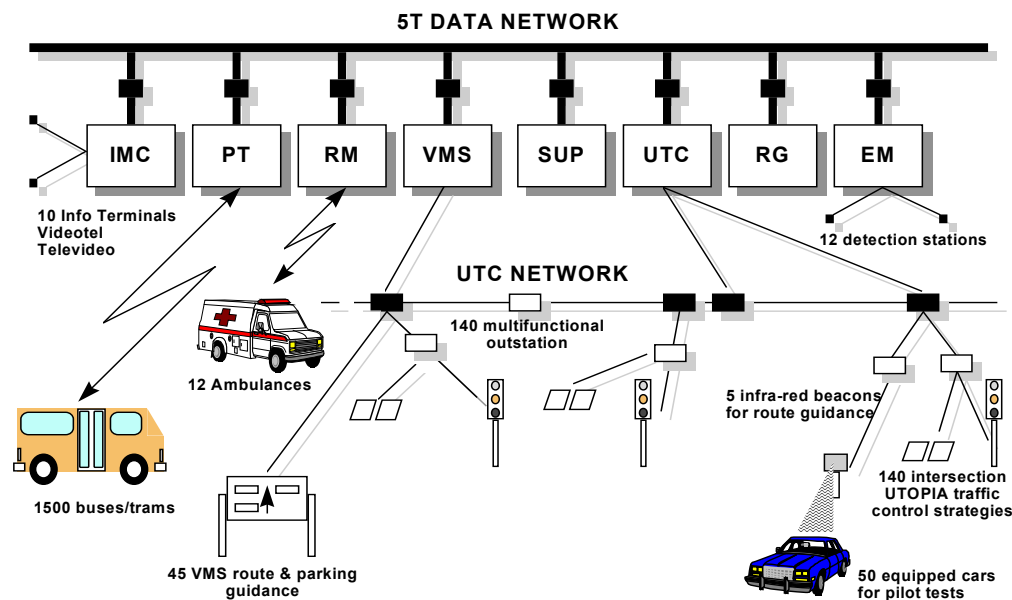


Figure 15 – 5T Open architecture schema; See INCOME - Final Report – Page 26.

Observed Results: In Turin Utopia isolated implementation resulted in 17% and 15% reductions in private and public transport vehicles delays respectively; even higher, not specified, results by the integration of VMS.

The large set of fields trials and surveys, which have been run in Turin, have shown that the integrated applications can provide very significant results:

Actions at the management and control level only (UTC+ AVL⁷) provided benefits in travel time as high as 17% for private traffic and 14,4% for public transport. Combined actions, with the help of the Town Supervisor, to grant coordination between the control and the information action, provided benefits in travel times, for the entire city and for familiar users, as high as 21.6% for private traffic (with regard to the on-board time + time to destination) and 19% for Public Transport (with regard to the origin-destination time). Both results are for familiar users only; results including unfamiliar users would be much higher, but are not reported here, due to low statistical significance. Actual reductions in pollutant emission due to the operation of the [5T] system are very difficult and complex to measure by means of field trials.

Potential for Implementation / Applicability Problems: There is evidence that the implementation of an integrated Telematics system [such as 5T] contributes to reduce pollutant emissions by as much as 21% (of which 12% are due to the environmental routing, 6% due to better UTC, 3% due to modal shift).

References: COSMOS D03.3, D04.3 and QUARTET PLUS D.3.1.

Case Study 10 – Local street improvements - Brugge

Test site location: Brugge Project Name: ADONIS

Objectives/Test Program: Improvements in security and centre city environment.

The city of Brugge eliminates footpaths systematically in inner city streets with low traffic intensity. The main condition is a traffic intensity of less than a hundred vehicles per hour. In other cases the height of the footpath is lowered over the full length to facilitate the access of all crossing pedestrians, and especially for wheel chair users.

Combination of Solutions: Elimination of pavements and footpath lowering.

Technical Description: Elimination of pavements in streets with limited car traffic (less than 100veh/hour). Lowering of the footpath height to facilitate the access of all crossing pedestrians, and especially for wheel chair users.

Usual surface width before the adaptation in case of elimination of a footpath: footpath 1.20 - 1.40 m, carriageway 2.80 - 3.00 m. Usual surface width of other inner town streets 6 - 10 m.

Observed Results: No complaints were made so far.

Potential for Implementation/Applicability Problems:

Positive: No accidents have occurred on the reconstructed streets so far, a sign of good traffic safety; more space is given to pedestrians, who can use the full street width (see Figure 16).

⁷ Automatic Vehicle Location



Figure 16 – Mechelen, Brugges. See ADONIS Project Final Report. ‘How to substitute short car trips by cycling and walking’. Chapter 5 – catalogue of Good Practice to Promote Walking. ‘P2’, page 22

Negative

Social insecurity might be created since no reserved space for pedestrians is available anymore. In the city of Brugge, elimination of footpaths is undertaken only in case of a general road reconstruction.

In case of lowering footpaths as an action on itself, cost of 20.000 - 30.000 BEF for each lowering is required.

References: ADONIS, final reportb

Case Study 11 – Access control for motorised traffic – Barcelona and Namur

Test site location: Barcelona and Namur; **Project Name:** ADONIS

Objectives/Test Program: The City Council of Barcelona designed a Mobility Plan in Ciudad Vella (the old quarter of the city), which foresees the creation of zones with pedestrian priority to induce natural mobility (on foot, by bicycle...) and progressively limit the access in the quarter of passing-through vehicles during the most conflictive hours. The following streets limit the first zone, which came into operation: Princesa, Via Laietana and Passage Isabell II. The main shopping area in Namur was recently pedestrianized.

Combination of Solutions: Priority zones for pedestrians. Gating control

Technical Description: *Barcelona:* The priority zone for pedestrians limits the circulation in this area. Only residents with vehicles registered in the quarter and authorised vehicles are allowed to enter the quarter. During the hours of vehicle regulation, speed will not exceed 10 km/hour and access will be exclusively made through the 2 gates. Some retractable posts, placed in the marked streets, prohibit the entry of non-accredited vehicles (see Figures 17 and 18).



Figure 17 – Signal at the entrance of la Ribera, Barcelona. See ADONIS Project Final Report. 'How to substitute short car trips by cycling and walking'. Chapter 5 – catalogue of Good Practice to Promote Walking. 'P2'.page 41

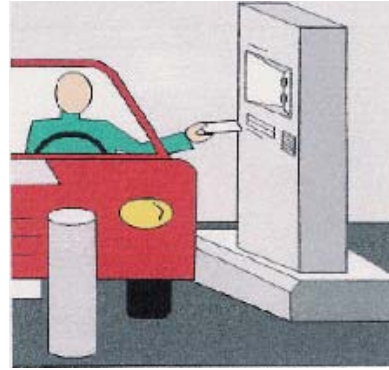


Figure 18 – Access control system. See ADONIS Project Final Report. 'How to substitute short car trips by cycling and walking'. Chapter 5 – catalogue of Good Practice to Promote Walking. 'P2'.page 41

Namur: In Namur only neighbours can enter the area by car.

To avoid the abuse of this exception, poles, posted on every entrance to the quarter, secure the access to the area. Inhabitants receive a badge with which they can sink the poles temporarily. The area is opened a few hours daily for goods delivery. On special request, a temporarily authorisation is granted (e.g. for removals) (see Figure 19).

Observed Results: In Barcelona no follow-up study has been made to analyse the consequences (safety, less noise, etc.) of this traffic restriction. In Namur the measure has proved to be successful. Only a few abuses have been noticed. Streets in the area are almost all less than 6 m. wide.

Potential for Implementation/Applicability Problems:

Different aspects for pedestrians

- Positive
 - Low speed area, which, in theory, should have a positive effect on safety. This has not been proved, as any follow-up study on the project has been carried out.
 - Car traffic is reduced to a minimum level and attractiveness for pedestrians is significantly increased.



Figure 19 – Namur. See ADONIS Project Final Report. 'How to substitute short car trips by cycling and walking'. Chapter 5 – catalogue of Good Practice to Promote Walking. 'P2', page 42

- Negative
 - In the case of Namur, social safety might be lower at night, since no traffic is allowed at night either.

Different aspects for non-pedestrians

- Positive
 - Priority also for cyclists.
- Negative
 - Restricted access to the zone for cars and other motorised traffic.
 - The area cannot be used for through traffic.
 - Car drivers might be locked up in the area if they enter during the daily opening hours and they want to get out afterwards.

References: ADONIS, final report b

Case Study 12 – Bicycle route and signposting - Nakskov - Denmark

Test site location: Nakskov (Denmark); **Project Name:** ADONIS

Objectives/Test Program: Nakskov is a provincial town with approximately 15,000 inhabitants. The share of bicycle traffic in the total transport volume is considerably larger than in many other comparable provincial towns. This is because the city structure is "tight", the distances are short, and the terrain is essentially flat. Besides establishing the cycle-route itself, the Cycle-route project entails thorough rebuilding of the cities important roads. In total, six junctions on the bicycle route have been completely rebuilt. One of the junctions was rebuilt as a roundabout. In addition, the town squares were completely rebuilt according to a new design program. Light poles, benches, and pavilions were given a user friendly and functioning design

throughout in a cobalt-blue colour. The bicycle route in Nakskov is one of six bicycle route projects in Denmark. The Nakskov project consists of 2 bicycle routes: A route going east-west, and a route going north-south. The two routes intersect each other in the centre of town. The route is 1.3 km long and connect bicycle tracks to the surrounding residential areas. Emphasis has been placed on creating a coherent net with an aesthetic and characteristic overall impression.

Combination of Solutions: Bicycle route with special signing for bicycle traffic

Technical Description: *Road-type:* Roads with 1 or 2 lanes; *Posted speed limit along the bicycle route:* Between 30 and 50 km/h. Cycle tracks are established on both sides of the ring road, whereas in the towns centre, generally dual tracks or lanes are made, permitting cycle traffic against the otherwise one-way traffic. As a continuous element of the bicycle route, the bicycle tracks are painted red, not only on stretches of bicycle tracks, but also at junctions. The colour suits the many red brick houses and tile roofs in the town, and makes cyclist areas stand out from the other road users. While road signs for car traffic have not been changed in connection with the project, special signing for cyclists was established for the first time in the town. The blue signs with white writing were made specifically for the bicycle route project, as there are as yet no rules for road signing for cyclists along local bicycle routes in Denmark. There are bicycle symbols, naming the destination, and distances in kilometres on every sign. The sign is placed on a pole, which suits the town's new street layout in terms of colour and design. Width of bicycle tracks: 1.8 - 2.0 metres. Width of bicycle lanes: 1.1 - 1.4 metres. Normally, it is not permitted to demarcate a bicycle area through a junction in colours other than blue or the same colour as the surface of the vehicle lane. But there are exceptions: to emphasise the structure of a path system, the colour of the cycle area through junctions can be the same as for the rest of the path system.



Figure 20 – The bicycle route. See ADONIS Project Final Report. 'How to substitute short car trips by cycling and walking'. Chapter 6 – catalogue of Good Practice to Promote Cycling. C-3 – page 122.



Figure 21 – Signs for cyclists. See ADONIS Project Final Report. 'How to substitute short car trips by cycling and walking'. Chapter 6 – catalogue of Good Practice to Promote Cycling. C-3 – page 122.

Observed Results / Potential for Implementation/Applicability Problems:

Different aspects for cyclists

- Positive
 - Cyclist friendly: After construction of the bicycle routes, there are more people who ride bicycles, and fewer people who drive cars.

- Almost 80% of interviewed cyclists have experienced that their bicycle rides through the town have seemed markedly safer and more accessible than before the bicycle route was constructed.
- The thorough rebuilding of roads has resulted in lowering the average speed of cars.
- The signs along the bicycle routes are placed primarily for the benefit of tourists; Danish as well as foreign. Therefore, as well as information about the surrounding residential areas, the signs include information about the recreative facilities such as; camping sites, information centres, theatres, youth hostels, etc.
- Safety for cyclists and non-cyclists:
 - Inspection of accident statistics 3 years prior to, and 3 years after the construction of the bicycle route project shows that the total number of accidents resulting in personal injury in the town zone has decreased from 81 prior to construction to 71 after construction.
 - The number of personal injuries has also decreased, from 100 prior to construction to 77 after construction. An analysis of the severity of the personal injuries shows that the number of cyclists killed and less severely injured is generally unchanged, while the decrease in personal injuries mainly concerns the seriously injured.

Different aspects for non-cyclists

- Positive
 - As mentioned above, the total number of personal injury accidents, and the number of personal injuries has decreased after construction of the bicycle route

Different aspects for cyclists.

- Negative
 - More streets have been rebuilt as one-way streets because of construction of the bicycle route.

References: ADONIS, final report b

2.6 Unit VI – Integrated Solutions – Basic Design and Applicability Principles⁸

Introduction

Many of the real life implementations recently carried out within several EU research projects have enabled a number of conclusions to be reached in relation to the problem of designing packages of measures directed at the implementation of more sustainable transport policies.

Due to the complexity of the real life problems usually faced, particularly in urban environments, it was not possible to elaborate a definite set of measures' selection rules to be used in this type of processes.

⁸ Developed by professor Alvaro Seco, FCTUC

It has however been possible to identify a number of basic design and selection principles as well as implementation related aspects, which can be quite useful for an experienced transport specialist.

These, which resulted from a critical evaluation of the different conclusions reached out within a significant number of research projects (particularly Capture, Opium, Adonis, Walcyng, Income, Cosmos, Taste, Privilege), will be succinctly presented in the sections below.

Basic transport systems' optimisation principles

The final result of an intervention in the transport system should always imply at least the maintenance of the prevailing accessibility and mobility conditions while providing better quality of life, environmental conditions and energy consumption efficiency.

The solution of any significant transport problem relies on an adequate joint and integrated utilisation of different modes and, ever more, of new, more sophisticated, normally multimode systems such as Park&Ride, Kiss&Ride, Byke&Ride or Car Pooling.

Furthermore a “sustainable” intervention in the transport system basically implies an integrated implementation of solutions in the following areas: optimisation of the “private” vehicles, public transport and other priority vehicles’ transport infrastructure performance; pedestrian and bicycle supporting systems; restriction measures directed to the “private car” mode; positive discrimination measures towards the more “sustainable” modes.

There is also a “geographical” dimension to the problem of designing an integrated package of measures.

The “Areas/Networks’ Wide”, “Major Route – Arterial Road” and the “Local/ Environmentally Sensitive Area” levels have particular relevance due to their specific characteristics and problems.

General principles for the design of Packages of measures

City size is not, a priori, a significant determinant to the selection of the adequate package of measures. On the contrary city type can be of significant importance.

In general, a single measure will not have a great effect and, in many cases, a ‘measure specific outcome’ cannot be expected which means that comparisons of effects between cities might not be at all possible.

Packages of measures linked together are more likely to succeed and while small scale measures might not be able to affect modal share, they might be important in providing the preconditions for a package of measures to have an effect.

Highly visible measures may have large impacts on public perception of public transport, pedestrian and bicycle modes, being then eventually as important as those producing ‘real’ impacts.

Finally it should be noticed that one key element for the success of any package of measures is the application of adequate enforcement.

System based integration principles

The optimisation of the performance of the road system should normally be assumed as a strategy to generate extra capacity for the whole transport system and not specifically, or even usually, to serve the “private car” mode.

On the contrary most positive measures applied to the “sustainable” modes are specifically designed to make these sub-systems more efficient, safe, reliable and comfortable and thus to improve the quality of service offered to these classes of users.

It should also be noticed that measures directed at restricting the usage of the “private” car and those directed at positively discriminating the more sustainable modes should be seen as the two faces of a coin both aiming to maximise the intended mode shift towards the latest ones.

In considering the problem of integrating different modes in a coherent transport policy a number of aspects should be taken into consideration:

- Pedestrians and cyclists, as well as people with reduced mobility needs, should be considered up-front since they tend to be given low priority;
- Separation of pedestrians and cyclists is preferable since although normally pedestrian measures are quite neutral to cyclists and vice versa, sometimes they can be negative or positive to each other (see ADONIS, FR);
- Often Public Transport and Bicycles challenge rather than complement each other.
- Also the use of Integrated Road Traffic Environment (IRTE) to optimise usage of available information and co-ordinate decision making through the integration of different sub-systems (UTC/signal control; PT management; Rescue management; Parking control; Collective route guidance; Individual route guidance; Informative media control; Fare integration and debiting; Environmental monitoring) seems a promising strategy.

For the optimisation of major road networks urban traffic control systems (UTC) and driver information Systems (DIS) are key elements of most packages. As showed before, quite a number of combinations of control measures have been successfully tested in different EU research projects and are worth considering:

- Redirection of traffic through VMS using information from incident and congestion detection and management systems (IDS-UTC) (particularly applicable to special events);
- Redirection of Parking seekers with VMS using information from incident and congestion detection and management systems (IDS-UTC);
- Integration of “re-routing” using VMS, with UTC systems;
- Integration of Route Guidance through individual in-vehicle systems and optimised UTC systems;
- Usage of Intelligent Speed Adaptation (ISA) system to optimise UTC via platoon control and management

A number of rules directed at supporting PT can also be presented:

- In view of the importance of the ‘visibility’ of the new solutions it may be preferable to concentrate measures in specific corridors rather than try to maximise global benefits over a wide area of intervention through separate implementation of different measures.
- The integration of physical measures like Bus lanes with control measures like Bus priority at traffic signals and UTC congestion management strategies (gating, queue relocation) is highly advisable.

- The introduction of ‘new’ modes (light rail, low floor buses, escalators, ...) can have an important ‘image’ advantage thus having the potential to be an important part of any policy measure package.

In what concerns car restriction supporting packages it is worth noticing that:

- Both in private car parking or access restriction strategies it is normally advisable to integrate physical, regulatory, financial, information and advertising measures in order to make the package as well fitted and “politically” acceptable as possible.
- The use of car access restrictions or reductions of circulating space in a ‘sensitive’ area is normally advisable as a complement to parking restricting measures since otherwise the ‘spare’ road space freed can quickly be taken up by extra through traffic.

Geographically based design considerations

In what concerns best practice in area-wide solutions the essential questions are those relating with comprehensiveness, complementarity and integration of solutions:

- In pedestrian and particularly in cyclists networks the implementation of global, continuous and standardised solutions is very important.
- PT supporting systems also tend to gain from integrated, continuous solutions both from a “visibility” and efficiency points of view.
- City centre car access or parking restrictions need to be complemented with other parking measures in surrounding areas to avoid collateral damages
- City centre car access or parking restrictions need also to be complemented with P&R provision and or improvement of other alternate, environmentally more acceptable modes (e.g. PT or cyclists networks) serving the same area in order to at least maintain the existing accessibility levels.

When considering the issue of best practice in major/arterial routes the main questions are those related to the partition of road time and space between different, conflicting modes and users (e.g. through and local car traffic, car parking space, pedestrians, cyclists, PT and other priority vehicles’ infrastructure), in accordance with their relative and many times disputed priority levels.

Normally one of the main questions is the definition of maximum environmentally acceptable car traffic levels and of the minimum levels needed for accessibility to the area.

Through traffic is usually the most desirable choice for elimination and on-street parking the technically (but not necessarily financially) easiest to eliminate

Another set of problems is related with the selection of the right level of segregation between modes considering that maximum separation implies maximum use of space.

- Pedestrians and cyclists are reasonably compatible but when both modes have significant importance segregation is highly desirable;

- PT efficiency will suffer significantly from significant co-existence with the general motorised traffic;
- Cyclists and PT can also share the same infrastructure but with costs in safety terms for cyclists and efficiency ones for PT;
- Coexistence between PT and other priority modes (e.g. car pooling) can have significant negative impacts on PT efficiency

Finally in “local/environmentally sensitive areas”, assuming that adequate accessibility levels were guaranteed in the citywide approach to the problem, the main problem is mainly one of harmonization/integration of usage on the same road space by different more or less compatible modes and users. Controlling the negative impacts of the private car mode, particularly its speed and intrusion potential are usually important questions.

Implementation problems

The main factors in successful implementation are: good public participation; existence of funding; number of Institutions involved.

There is however great variability in the complexity and effort needed for design even within most types of measures.

The type of measure is not necessarily an important factor explaining delays or failures in implementation. These problems normally lay much more in the detailed design associated to the specific “local” conditions than in the basic principles associated with each measure.

Measures new to a city or country may be difficult to design or have designs accepted. Although all measures take time to reach ‘stability’, new ones are likely to need some extra time “running” in order to gain popular acceptance.

Also important to mention is that there still remains a problem with the implementation of measures regarded as anti-car, both in terms of professional and public support. This can lead to situations in which, in order not to harm cars, new measures are not implemented to the level needed to generate the desired improvements.

While any restrictions on car use can be difficult to implement, if well designed, they tend to gain support as time passes by and even result in keenness for more change suggesting that a step by step approach might be advisable in implementing this type of measures.

3. National Differences/Local Adaptations

The applicability of the new traffic management strategies and solutions in the different EU countries is not automatic since there are significant differences at the legal, technical and regulatory environment.

At the regulatory level there are quite different situations concerning the level of coordination/integration between the local authorities, normally responsible for the management of the infrastructure, and the different operators (namely the PT ones). This results in different level potential for implementation of UTC + PT integrated solutions.

At the technical level there are also still some significant differences for the equipment, technical specifications and regulations, which hinder the easy transferability of the new, more advanced telematic solutions.

It should be notice however that significant work is currently being done in this field at the National and European levels within the European Technical Committee CEN/TC framework

Finally in relation to the application of some of the measures there is also a significant need for harmonisation of the legal framework in several countries (e.g. in relation to HOV or traffic calming solutions; in relation to the regulation of the motorised traffic/bicycle conflicts).



Figure 22- The HOV sign has no legal supporting framework in Portugal

4. Exercises

4.1 Exercise 1

Selection of “best-practice” cross-section solutions applicable to main “Arterial” roads

Inputs:

- Total available space between the buildings present on both sides of the road;
- Different Scenarios in relation to the modes/road functions’ relative priorities

Usable learning material:

- Discipline “Manual” including “ Key Topic” documentation

Outputs:

- One “optimal” cross-sections for each priority scenarios

4.2 Exercise 2

Qualitative selection of “sustainable” traffic management measures’ packages

Inputs:

- “Virtual” city characterization (size, urban characteristics, ...)
- Types of Policy strategies which are supposed to be supported (traffic efficiency, PT priority, support for pedestrian or cyclists, ...)

Usable learning material:

- Discipline “Manual” including “ Key Topic” documentation
- Key Topic Related Projects’ Database (CDROM with Projects’ Deliverables)

Outputs:

- One or two different “TM Packages” with reference to:
 - List of TM measures
 - List of potentially useful Non-TM complementary measures
 - Expectable results
 - Envisaged applicability problems

5. Glossary

5T

IRTE system used in Turin (Telematic Technologies for Transport and Traffic in Turin)

BUS SCOOT

SCOOT with bus priority facilities included

SCOOT

Adaptive signal control (London)

SPRINT

Fixed time control with bus priority (London)

SPOT

Adaptive signal control, based on UTOPIA (Gothenburg)

UTOPIA

Adaptive signal control (Turin)

RGCONTRAM

Route Guidance Continuous Traffic Assignment Model

HUTSIM

Helsinki University of Technology Simulation

TRANSYT

Traffic Network Study Tool

SATURN

Simulation and Assignment of Traffic in Urban Road Networks

SPLIT

Selective Priority to Late buses Implemented at Traffic signals

STEP

SCOOT Testing and Evaluation Programme

UTMS

Urban Traffic Management Systems

UTMC

Urban Traffic Management and Control

PTS

Public Transport systems

VMS

Variable Message Signs

DIS

Driver Information Systems

UTC

Urban Traffic Control

PGI

Parking Guidance and Information System

AVL

Automatic Vehicle Location

ATT

Advanced Transport Telematics

ITS

Intelligent Transport Systems

IRTE

Integrated Road Transport Environment

RDS-TMC

Radio Data System Traffic Message Channel

ASTRID

Automatic SCOOT Traffic Information Database

INGRID

Integrated Incident Detection

TDM

Traffic Demand Management: The management of travel patterns through a whole range of strategies influencing generation of transport demand and its distribution on different transport modes and within the respective transport networks.

Access restrictions

A measure consisting of either prohibiting or limiting very heavily the access of private cars into a given district within an urban area.

Add-a-lane

A general implementation approach whereby an HOV facility is created by adding roadway capacity to an existing highway or motorway, usually by widening the motorway or highway or modifying the median or outside shoulder. (see also convert-a-lane)

Average vehicle occupancy

The number of persons divided by the number of vehicles travelling past a selected point over a predetermined time period (i.e. 1.3.).

Barrier-separated facility

An HOV lane that is physically separated by guardrail or concrete median barriers from adjacent mixed-flow freeway lanes. The opposing directions within a barrier-separated facility may be separated by a barrier or buffer.

Car-pooling

Car-pooling is at least two people riding in a car usually belonging to one of the occupants, whether one person always drives or the car-poolers alternate driving. Each member has to be able to drive independently. Driver and passengers know before the trip that they will share the ride and at what time they will be leaving. Professional and/or commercial transport are not considered as car-pools. Both the driver and the passenger(s) are considered as car-poolers.

Delay

The increased travel time experienced by a person or vehicle due to circumstances that impede the free flow of traffic. It is measured as the time difference between actual travel time and free-flow travel time.

Enforcement

The function of maintaining the rules and regulations to preserve the integrity of a preferential facility.

Enforcement area

A space on which enforcement can be performed, such as the space where vehicles may be stopped by police officers. Enforcement areas can be delineated within an available shoulder or provided at specific locations such as entrances and exits.

General purpose lane(s)

Lanes adjacent to or affected by an HOV facility that are available for use by all vehicles (i.e. single-occupancy vehicles, HOVs, transit, trucks, etc.).

HOV (high occupancy vehicle)

A road vehicle meeting an occupancy requirement of two or more people.

HOV lane

A form of preferential treatment in which lanes on motorways or highways are restricted for the exclusive use of high-occupancy vehicles during designated periods or continuously.

HOV system

The collective application of physical line-haul and support facilities, programs and policies that are effectively integrated to provide a comprehensive application of HOV incentives in a corridor or region.

Informal Car-Pooling

A form of car-pooling in which the mix and/or number of travelling passengers varies from one day to another; there is no formalised arrangement for regular riders.

Level Of Service

A descriptive measure of the quality and quantity of transportation service provided to the user which incorporate finite measures of quantifiable characteristics such as travel time, travel cost, number of transfers, etc. Operating characteristics of levels of service for motor vehicles are described in the Highway Capacity Manual (TRB, Highway Capacity Manual 1985).

Lift Giving Scheme

A scheme where drivers give lifts to people who usually stand at specially designed places. (As opposed to car-pooling) the individuals never know beforehand whether or when they will be picked up and by whom.

Matching

Services, efforts or activities undertaken to group potential car-poolers in order to be able to form car-pool teams. These services can simply be newspaper ads in a regular or a dedicated newspaper. Often however, matching services come as computerised tools, managed by dedicated organisations, which can be contacted by phone or more sophisticated means of access.

Mobility Management

Mobility management is primarily a demand oriented approach to passenger and freight transport involving new partnerships and a set of tools to supporting and encouraging changes of attitude and behaviour towards sustainable modes of transport. These tools are usually based on information, communication, organisation and co-ordination and require promotion.

Mode

A particular form of travel (i.e., walking, bicycling, travelling by bus, travelling by car-pool, travelling by train, etc.).

Mode Shift

The shift of people from one mode to another (i.e., single-occupancy vehicles to HOVs or vice-versa).

Non-Separated (HOV) Lane

An HOV lane that is not separated from adjacent mixed-flow freeway lanes (i.e., delineation via a standard pavement stripe).

Off-Peak Direction

The direction of lower demand during a peak commuting period. In a radial corridor, the off-peak direction has traditionally been away from the central business district in the morning and toward the central business district in the evening.

Park-And-Pool Area

A parking facility where individuals rendezvous to use car-pools and van-pools as a transfer of mode, usually from their private automobiles. The facility is not served by public transportation.

Preferential Parking

Parking lots or spaces near destinations (i.e. companies, administrations, schools, inner city areas) that are reserved for HOVs as a means to encourage car-pooling.

Preferential Ramp Metering

An HOV facility that provides a bypass around a queue of vehicles delayed at a ramp traffic meter, toll plaza or other bottleneck location (i.e., bridges, tunnels, ferry landings, etc.).

Preferential Treatment

In transportation, giving special privileges to a specific mode or modes of transportation (i.e., bus lanes or signal pre-emption at intersections).

Ramp Meter

Traffic light control at the entrance of a facility (e.g. motorway / freeway) allowing access to the facility for a limited number of vehicles. Possibility to give preferential treatment to HOVs.

Ridesharing

The function of sharing a ride with other passengers in a common vehicle. The term is usually applied to car-pools and van-pools. (see also car sharing)

Reversible Flow Lane

An HOV facility in which the direction of traffic flow can be changed at different times of day so as to match the peak direction of travel during periods of peak demand. (Also called tidal flow lane.)

Road Pricing

Road tolls installed with the objective of decreasing car use, at least during a part of the day (i.e. to provoke a shift from solo driver to other modes or a shift of trips to other parts of the day). Two types of toll applications can be foreseen: individual segments of roadway, and access routes into the centres of metropolitan areas.

Single Occupancy Vehicle

Vehicles with one person only, including taxis without passengers.

Transport Demand Management (TDM)

see mobility management

Tidal Flow Lane

see reversible flow lane.

Van-Pool

A prearranged ridesharing function in which a number of people travel together on a regular basis in a van, usually designed to carry 7 or more persons.

Violation

An infraction of the rules and regulations for roadway use. In an HOV context, a violation can include vehicle and occupancy eligibility.

Violation Rate

The percentage of traffic in the HOV facility that does not qualify to be in that facility.

Customers

In the marketing model customers are those people who buy a certain product, in the WALCYNG case those who already walk and cycle on short distances instead of using the car. The word is used synonymously with "users" and, to a certain degree "road users"; the latter are both "users" and "potential users" when addressed in the sense as we did in WALCYNG (see below).

Potential users

Those people or groups who could walk and cycle instead of using the car for short trips, but who do not, yet. They have to be identified, addressed and, in some way, to be convinced. We sometimes say "car drivers" and mean "potential users".

Road users

Consist of users (those who already walk and cycle), potential users (those who could walk and cycle as far as the length of their trips is concerned) and others (who may become target groups when it comes to facilitating walking and cycling, e.g., by reducing car speeds).

Target persons and target groups

Those groups that we want to address when enhancing walking and cycling and that consist of both "users" (see below), "potential users" (see above) and other road users (see above), but also of experts, administration officials, people from industry and decision makers/politicians. Target groups may be subgroups of the potential users as well.

6. Literature

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Internet

<http://www.cordis.lu/transport/src/project.htm> - EU Transport Research Projects

http://europa.eu.int/comm/energy/index_de.html EU Projects

http://europa.eu.int/comm/transport/index_de.html EU Projects

http://www.cordis.lu/telematics/tap_transport/keydocuments.htm - Key Reports and Documents from the TAP-Transport Sector (4FP)

http://europa.eu.int/comm/dgs/energy_transport/index_de.html – General Direction Energy and Traffic

<http://www.brisa.pt/via-verde> Via Verde Portugal

<http://www.walkinginfo.org> Pedestrian and Bicycle Information Centre

Please Note: At the end of the document there is further information on the projects deliverables included in Annex 2.

The Annexes included at the end of this document are not for translation (only if considered strictly necessary).

7. Traffic management – The consortia of the projects

ADONIS - Analysis and Development Of New Insight into Substitution of Short car trips by cycling and walking

Consortium:	
VTI - Swedish National Road and Transport Research Institute (CO)	SE
University of Groningen (RUG)	NL
Langzaam Verkeer	BE
Danish Road Directorate	DK
Danish Council for Road Safety Research	DK
SWOV - Institute for Road Safety Research	NL
Ingenieria de Trafico S.L.	ES

CAPITALS - Capitals' Project for Integrated Telematics Applications on a Large Scale

Consortium	
Region de Bruxelles Capitale	BE
Azienda Comunale Energia ed Ambiente	IT
Direction Régionale de l'Equipement d'Ile-de-France (DREIF/SIER)	FR
Empresa Mixta de Trafico S.A.	ES
Senatsverwaltung fur Bauen, Wohnen und Verkehr	DE
Ville de Paris	FR

CONCERT – Cooperation for Novel City Electronic Regulation Tools

Consortium:	
Barcelona Tecnologia S.A.	ES
Bristol City Council	UK
Direction Départementale de l'Equipement	FR
Dublin Corporation	IE
MOVE GmbH	DE
Municipality of Thessaloniki	GR
Public Road Administration - County of Trondelag	NO

COSMOS – Development of a Training Course for Mobility Consultants

Consortium:	
Langzaam Verkeer (CO)	BE
FGM-AMOR	AT
Wuppertaler Stadtwerke WSW	DE
De Lijn	BE

DACCORD – Development and Application of Co-ordinated Control of Corridors

Consortium:	
Hague Consulting Group	NL
Autostrade Italia Nord Est	IT
Centro Studi sui Sistemi di Trasporto S.p.A.	IT
Institut National de Recherche sur les Transports et leur Securite (INRETS)	FR
Technical University of Crete	GR
TNO-National Organisation for Applied Scientific Research	NL

EUROSCOPE – Efficient Urban Transport Operation Services Co-Operation of Port Cities in Europe

Consortium:	
Stadt Koln	DE
Azienda Municipalizzovta Transporti Genova	IT
Communaute Urbaine de Strasbourg	FR
Cork Corporation	IE
Eratosthenes Consultants Ltd.	GR
Freie und Hansestadt Hamburg, WIB	GR
Hampshire County Council	UK
Landesentwicklungsgesellschaft Brandenburg mbh	DE
Municipality of Piraeus	GR
Municipality of Rotterdam	NL

ICARO – Increase of Car Occupancy through innovative measures and technical instruments

Consortium:	
Universitat Fuer Bodenkultur Wien	AT
Leeds City Council	GB
Universidad Politecnica De Madrid	ES
Langzaam Verkeer Vzw	BE
Highways Agency	GB
University Of Leeds	GB
Austrian Mobility Research	AT
Traject C.V.	BE
Ds Data Science Ag	CH
Nea	NL
Transportonderzoek En -Opleiding	NL
Trias Sa Consulting	GR
Centre D'etudes Techniques De L'equipement De L'est Administration	FR
CENTER FOR CLEAN AIR POLICY	CZ

INCOME – Integration of traffic control with other measures

Consortium:	
Stratec S.A.	BE
University Of Southampton	GB
Transport Research Laboratory	GB
Mizar Automazione S.P.A.	IT
Tfk - Transport Research Institute	DE
Traffic Control Systems Unit (London)	GB
London Regional Transport	GB

IN-RESPONSE – Incident Response with On-line Innovative Sensing

Consortium:	
Transeuropean Consulting Unit of Thessaloniki (TRUTh)	GR
Alcatel ISR	FR
Aronis Drettas Karlaftis Consulting Engineers	GR
Institut National de Recherche sur les Transports et leur Securite (INRETS)	FR
Ministry of Transport, Rijkswaterstaat AVV	NL
Norwegian Public Roads Administration	NO
Sociedad Iberica de Construciones Electricas S.A.	ES
Steierwald SchOnharting und Partner GmbH	DE
The Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology (SINTEF) Transport Engineering	NO

PRIVILEGE – Priority for Vehicles of Essential User Groups in Urban Environments

Consortium:	
The Mva Consultancy	GB
Lothian Regional Council	GB
Traffic Planning Division, City Planning Department- City Of Helsinki	FI
Stadt Schwerin, Dezernat V, Bauverwaltung Und Stadt- Entwicklung, Amt Für Verkehrsanlagen	DE
Hessisches Landesamt Fur Strassen-Und Verkehrswese	DE

OPIUM – Operational project for integrated urban management

Consortium:	
Merseyside Passenger Transport Executive	GB
Liverpool City Council	GB
Steer Davies And Gleave Ltd.	GB
Transport & Travel Research Ltd	GB
Transport, Infrastructure And Telematics	BE
City Of Gent	BE
Stadt Heidelberg	DE
Sabine Hug Umweltberatung	DE
District De L'agglomeration Nantaise	FR
Société D'economie Mixte Des Transports De L'agglomération Nantaise	FR
Transport Environment Development Systems	GR
Metron Spatial Planning And Development	GR
Municipality Of Patra	GR
Dienst Ruimtelijke Ordening - Utrecht	NL
Ministry Of Transport, Public Works And Water Management	NL

QUARTET PLUS – Validation of a European Urban and Regional IRTE based on Open System Architectures

Consortium:	
MIZAR Automazione S.p.A	IT
Consorzio 5T	IT
ITF Intertraffic GmbH	DE
Landeshauptstadt Stuttgart	DE
Mairie de Toulouse	FR
MATTISSE Consortium	UK
Municipality of Athens	GR
National Technical University of Athens	GR
Planet S.A.	GR
Swedish National Road Administration	SE
Verkehrsministerium Baden-Württemberg	DE

TABASCO – Telematics Applications in BAVaria, SCotland and Others

Consortium:	
CETE de Lyon	FR
DIVV Amsterdam	NL
Dublin Corporation	IE
Glasgow City Council	UK
Steierwald Schönharting und Partner GmbH	DE
Technische Universität München	DE
The Scottish Office	UK
Traffic Control Systems Unit	UK

TASTE – Analysis and development of tools for assessing traffic demand management strategies

Consortium:	
Albert Speer & Partner GmbH	DE
Beratung Und Planung Im Verkehrswesen	DE
University Of Newcastle Upon Tyne	GB
Prof. K. W. Axhausen	AT
Barcelona Tecnologia S.A.	ES
Prof.Dr.-Ing Hans-Georg Retzko	DE

WALCYNG - How to enhance Walking and Cycling instead of shorter car trips and to make these modes safer

Consortium	
Lund Institute of Technolog (CO)	SE
Chalmers University Of Technology Ab	SE
Factum Chaloupka, Praschl, Risser Ohg	AT
Universitat De Valencia Estudi General	ES
University Of Helsinki	FI
Institute Of Transport Economics	UK
De Voetgangersvereniging (Vv)	NL
Franco Gnavi Consulting And Associates	IT
City Of Helsinki	FI
Transport Technologie-Consult Karlsruhe GmbH	DE

8. Annexes

8.1 Annex 1 - Road Users Groups' Priority Definition

(Transcription from Privilege – Final Report – pp. 13/20)

Emergency vehicles

Emergency vehicles comprise ambulances, police cars and fire engines.

When they are on emergency call, they must have unrestricted access to any part of the road network at any time, and they must also be allowed to park wherever it is most convenient for them. However, in most parts of the network they only appear very rarely, so that it would not be appropriate to maintain any priority measures all year round.

Furthermore, while driving on duty, emergency vehicles are generally considered to have the highest priority everywhere in the road network, even to the extent that they are allowed to break most normal traffic rules and regulations, e.g. crossing white lines, using pedestrianised streets, or driving through red traffic lights. There is therefore generally not only no realistic possibility, but also no need for any further priority treatment.

An exception to this could be in the immediate vicinity of hospitals, police stations or fire stations, where vehicles could benefit from priority measures frequently.

Furthermore, a lower level of privileges for these vehicles would also be justified when they are not on call, allowing them to go back to their base without undue delay to be prepared for another emergency call.

Public Transport

Public transport (PT) comprises in this context only trams, buses and coaches for scheduled services, e.g. those vehicles sharing the general road space. In most traffic situations and in most parts of the urban networks, PT will have priority over all other motorized road users. However, there are some exceptions to this general rule, e.g. where heavy industry predominates in an area, access for lorries and trucks may be of greater importance than public transport; or at signalized intersections, where the frequency of PT arrivals from opposing directions reaches a level where a high degree of PT priority might only be achievable at the price of intolerable delays for all other road users.

Several possibilities for the use of the road space by PT vehicles exist: physically segregated lanes, dedicated lanes (with or without allowing access for taxis) within the general road space for critical points or for complete routes; shared lanes of priority lanes with other priority vehicles; 'swim' with other traffic in general road space.

The need to provide priority for both trams and buses is generally highest where they have to compete most strongly with the private car, e.g. in peak traffic, in inner cities, and on main arterials and other main roads.

However, the need for priority has always to be determined on a case by case basis, as it depends more on the traffic volumes and mix of traffic than on the type of area.

Coaches

Coaches are vehicles used for the purpose of carrying a number of passengers and operate scheduled and private hire services. They differ from PT buses in that all passengers must be seated.

There are four main categories of coaches to be considered: coaches for long-distances scheduled services, in many cases replacing or complementing rail services, coaches used to collect commuters or school children; coaches for tourist parties; sightseeing coaches.

The first two categories are the most relevant for priority treatment in urban areas, where they generally deserve to be treated in the same way as buses. Current practice, however, is different in different countries and cities, in some places allowing them to use bus lanes and in others not.

In contrast, tourist or sightseeing coaches will generally not need any priority treatment (although they are currently allowed to use bus lanes in Helsinki).

Taxis

Whilst taxis are an important part of the transport provision, they normally do not receive as much priority as mass transit vehicles.

Their main advantage over private cars is that they provide transport for a much higher number of travelers per day. Furthermore, they require only limited on-street parking space for those periods in which they are waiting for customers (for which they should have dedicated road space in the form of taxi ranks), while private cars spend most of the day in parking mode. Moreover, for handicapped or elderly people or for people who have to carry bulky or heavy goods with them, taxis may be the only alternative to the private car, because walking from and to the bus stops may not be feasible for them.

Another point in the taxis' favor is their easy categorization and identification. If taxis are allowed to use a bus lane, that otherwise would not be used to full capacity, then this is easy to legislate for and to monitor.

In terms of their priority rating taxis should, as a general rule, be highest where they are complementing or feeding public transport with low density and/or low frequency, and lowest where they are competing against it. Stopping to load and unload passengers must, as for buses and coaches, be allowed almost anywhere along built-up roads.

High Occupancy Vehicles (HOV)

Vehicles with high occupancy can either result from: people who would normally have different origins but a common destination at the same time (or vice versa) and meet with the particular purpose of undertaking part of the journey together, i.g. for car pooling; or the fact that a group of people has a common origin and a common destination at the same time (e.g. a common neighborhood and a common workplace).

Priority treatment could work as a positive encouragement for car pooling and, therefore, for making more sensible use of the road space. On the other side, it has certainly to be avoided that HOV lanes are seen as an incentive to use the car rather than public transport. In any case, priority for HOV would always be lower than for PT.

Although there are a number of schemes already in the US, in Europe there are so far only two examples (Amsterdam and Madrid) and only limited conclusions can be drawn from them. In order to realistically study the logistics of prioritizing HOV's and implementing HOV measures, a separate project would be required that would need to consider the particular complexities of awarding priority to this group in a European context.

Local Commercial and Domestic Services (LDS)

Local commercial and domestic services are vital for the sustainability of urban life; but through the delays that they experience traffic congestion, they are becoming more and more costly.

There are three distinct categories in this road user group. These three categories are defined below and have been assigned the following order of importance:

1. Delivery of goods.
2. Public Utilities.
3. General business.

In principle, deliveries have similar importance as public utilities. General business is of lower importance.

Delivery of goods

Delivery service vehicles can be trucks, delivery vans or private cars. To encourage the use of more environmentally friendly vehicles, trucks to be considered for priority treatment could be restricted to 'city trucks' under 7.5 tons.

The following groups have been defined as delivery services: postal services for business and residential areas; delivery of supplies to local traders; delivery of goods to private homes; private care services such as 'meals on wheels' for elderly people.

Postal services must, for reasons of fairness, comprise deliveries by the general post office as well as private delivery services such as UPS or DHL.

For the delivery of goods (whether to traders or to private homes), there is the general distinction between special goods and general goods to be made, with special goods to be given clearly higher priority: special goods are those that entail either a particular urgency (e.g. pharmaceutical goods) and/or a particular security hazard (e.g. large amounts of money to be picked up from shops or delivered to banks) and/or particular social aspects (e.g. meals on wheels); general goods are all other goods, including e.g. groceries, bulky goods or breakable goods.

The local delivery of both special and general goods can generally be from outside to several points in the area, from a producer within the area to several customers, individual point, or through distribution centers. However, this will normally not make any difference concerning the priority rights to be given to any of them.

Where delivery vehicles require access to the CBD, special loading/offloading areas should be designated to avoid on-street parking. This will reduce the possibility of traffic blocking back.

The above groups should generally be allocated priority only at off peak periods. Delivery vehicles used to provide services to residential areas should be allowed access only to that part of the residential area necessary for the delivery. This avoids delivery vehicles using other residential areas as rat-runs.

The types of vehicles used for the delivery of goods will vary with the types of goods. Although this should not affect the level of priority of any group in principle, In practice, it means that awarding priority rights to cars and monitoring the use of priority measures which can be used by cars on a delivery tour will be much more complex.

Public Utilities

Public utilities are, in some countries as in the UK by definition, services where public authorities act either as supplier or as regulator. These include: water and drainage services; electricity; gas; telecommunications, road maintenance.

For the purposes of this study, refuse collection is added to the above list.

Vehicles used for public utilities provide essential services to business and residential areas and would therefore deserve some priority treatment.

Public utility vehicles should generally only receive priority in off peak periods. Consideration should be given to whether dedicated lane usage is appropriate. Access to residential areas would, of course, be essential. Furthermore, they may receive special parking rights.

General Business

The following groups have been categorized as general business: social services (doctors and nurses); tradesmen; other local businessmen; salesmen; state visitors, governmental, ministerial and other administrative traffic.

The first group, social services, will be given a level of priority determined by the importance of their journey. A doctor on an emergency call will receive higher priority than a nurse on a social visit. The rights that this group has today differ from town to town and country to country. Therefore a universal importance rating cannot be applied.

Tradesmen will be considered for priority increases such as permitted access and off-street parking. The extent of priority for these purposes will be examined when assessing individual schemes. Other local businessmen, although possibly important to the economic activity in an area, will not receive any on-street priorities other than access rights and permits for parking. Traveling salesmen will not receive any priority rights.

State visitors, for whom exemption from existing regulations applies today, will also be exempt from road closures under priority schemes. Other governmental, ministerial and other administrative traffic will not receive any priority rights.

Trucks

There are two main types of truck journeys that do not fall under the category of local commercial services: journeys by all trucks above 7.5 tons; journeys that originate within the area, but have their destination outside; and journeys that have neither origin nor destination there, but only pass through the area or network section.

If the area in question is an industrial area and/or the road network section they use is part of an inter-urban or urban highway, then special priority measures might be considered

A particular status could be given to 'city-trucks' under 7.5 tons, which might be treated like LDS.

Bicycles

There are three main categories of special road space for cyclists: cycle paths; cycle lanes; and cycle roads.

Cycle paths, which may only be shared by pedestrians, are the safest option for cyclists, as they separate them completely from motorized vehicles (however, for pedestrians it is safest if they are also separated from cycles).

Cycle lanes usually run between the carriageway and the pavement. Their design requires particular care, as safety hazards for cyclists from parking or turning vehicles have to be avoided.

Some cities allow the use of bicycles in bus lanes. Other cities do not regard this as commendable, because they believe that this could actually increase the accident risk for cyclists. Furthermore, unless the common lane is very wide, this lane sharing could be counter-productive in so far as cyclists could obstruct buses.

Cycle roads, which have been implemented in some cities, provide a compromise solution between cycle paths and cycle lanes. Cycle roads are laid out like normal roads, i.g. they consist of carriageway plus accompanying pedestrian pavement, but only cycles are generally free to use the carriageway, while motorized vehicles are only permitted to use them for access and then have to adapt their speed to the cyclists.

In addition, priority should be considered for bicycles at intersections. If cycle lanes are implemented, or if cycle paths or cycle roads cross major roads, then bicycles should also receive a dedicated signal and special green time. Advanced stop lines could also be considered.

Pedestrians

Pedestrians have to be able to move safely on every part of the road network (except motorways), which entails both walking along the pavement as well as crossing roads. But more particularly, they need to be treated as high priority road users in inner-city areas in CBDs and in residential and recreational areas. In CBDs, complete pedestrianisation of road sections would be the ideal response, wherever this is feasible. In residential and recreational areas, a shared use of road space, where motorized vehicles have to slow down so much that even children playing in the middle of the road are safe in all circumstances, is the ideal response.

Private car users are the main traffic group that, to all intents and purposes, should not benefit from the priority system but, instead, be discouraged from using their private car and encouraged to use other modes of transport. Private cars will, therefore, generally only get priority treatment for access to and parking opportunities in the residential areas they originate in. Currently, in many cases they also have special access and parking rights around offices; however, it should be investigated whether this is always justified, or whether it would be better to encourage employees, through the lack of parking provision, to use public transport for commuting.

An exception to this general rule should be made for handicapped drivers who depend on their private cars for their mobility.

Privately Used Motorcycles

Although motorcycles are more efficient in terms of road space and less polluting in comparison to cars, in practice, they share similar characteristics to the small car. For this reason, in the particular context of the PRIVILEGE project, there is little need to distinguish them from the privately used car.

8.2 Annex 2 – Further Reading – The European Deliverables

ICARO - Increase Of CAR Occupancy through innovative measures and technical instruments

General Description

The overall aim of ICARO was to investigate the measures and instruments that can increase car occupancy. Mainly focusing in transport policy research, in the end of the project recommendations and guidelines were delivered on how to increase car occupancy at both local and national levels. This project also aimed to involve key decision makers in local, regional and national government and involved in planning and implementing traffic and transport policies. ICARO carried out a combination of both research and demonstrations.

Basically the **objectives** in ICARO were:

- Identification of best practices concerning technical instruments and organizational measures to increase private car occupancy;
- Identification and understanding of the institutional, legal and cultural framework necessary for increasing car occupancy. There may be considerable differences between countries with respect to the acceptance of measures and instruments;
- Implementation in real life demonstrations of the techniques and measures that can increase private car occupancy, involving a mix of innovative and technical measures;
- Investigation in substitute behavior that might occur as an undesired effect of schemes for increasing the car occupancy;
- Creating a methodology for selecting the right measures and instruments;
- Dissemination of the results to all interested parties.

<http://www.cordis.lu/transport/src/icarorep.htm#6>

Deliverables and documents

- D1 - Best practice (on measures to increase car-pooling)
- D2 - Institutional, Legal, Financial, Cultural and Legal Framework
- D6 - Evaluation and Recommendations of ICARO
- D7 - Implementation guidelines for increasing car occupancy
- D8 - Brochure on car occupancy increasing measures
- D9 - Video on car-pooling

- D10 - CD-Rom with all papers of interest: Best Practices; Legal, Institutional, Financial, and Cultural Frameworks; A Synthesis of the National Reports; Reports on Real Life Demonstrations; Modeling demonstrations; Evaluation, Analysis, Transferability, Recommendations; Implementation Guidelines; Final Report.

INCOME - INtegration of traffic Control with Other MEasures

General Description

The INCOME project was concerned with Urban Traffic Management Systems (UTMS) with emphasis on the integration of three key components: Urban Traffic Control (UTC), Public Transport Systems (PTS) and Driver Information Systems (DIS).

The main objectives of the INCOME project were to:

- Review the UTMS policy objectives at the European, national and city levels and establish user requirements for integrated UTMS strategies;
- Develop, implement and evaluate integrated UTMS strategies thorough field trials and simulation studies;
- Provide recommendations for future integrated UTMS strategies.

INCOME had demonstrations sites in:

- London (serving for review and simulation in UTC/DIS; for review, simulation and field trial in UTC/PTS; for review and simulation in UTC/DIS/PTS);
- Turin (for review and field trial in UTC/PTS; for review and field trial in UTC/DIS/PTS)
- Gothenburg (for review and simulation in UTC/DIS; for review, simulation and field trial in UTC/PTS; for review, simulation and field trial in UTC/DIS/PTS);
- Piraeus (for review, simulation and field trial in UTC/DIS)

INCOME, FR, 2000, (Final Report) - 'Final Report for Publication – The INCOME Book', Introduction, Objectives of the Income Book, page 3

Deliverables and documents

- Final Report for Publication – The INCOME Book
- Annex A to Final Report for Publication – The INCOME Book
- D2 - Recommendations and requirements for UTMS strategies
- D3 - Evaluation methodologies
- D14 - State-of-the-art review of urban traffic management systems, policies and strategies
- D15 - Results of UTC/DIS strategy implementation and evaluation for London

- D16 - Results of UTC/DIS strategy implementation and evaluation for Gothenburg
- D17 - Results of UTC/DIS strategy implementation and evaluation for Piraeus
- D18 - Results of UTC/PTS strategy implementation and evaluation for London
- D19 - Results of UTC/PTS strategy implementation and evaluation for Turin
- D20 - Results of UTC/PTS strategy implementation and evaluation for Gothenburg
- D21 - Results of feasibility studies and evaluations of UTC/DIS/PTS strategies
- D22 - Integration of results and recommendations
- D23 - Dissemination and exploitation of results

OPIUM - Operational Project for Integrated Urban Management

General Description

The OPIUM project concerned the areas of parking management and guidance, traffic calming and bus priority measures designed and implemented a range of physical traffic management measures. The project evaluated also the impact of the measures on transport efficiency, safety and modal split in urban areas, with particular reference to the impact on vulnerable road user.

In the end of the project some recommendations were made for the future development of urban transport policies taking account of different urban environments including legal and institutional barriers, the need to improve the quality of life and the needs of different users of the urban transport system (including elderly and disabled persons).

‘The project objectives were:

- To design and implement a range of physical traffic management measures within the OPIUM cities;
- To evaluate the impact of the measures on transport efficiency, safety and modal split in urban areas, with particular reference to the impact on vulnerable road users;
- To make recommendations for the future development of urban transport policies taking account of different urban environments, including legal and institutional barriers, the need to improve the quality of life, and the needs of different users of the urban transport system (including elderly and disabled persons).’

OPIUM, final report, 1999, (D6) - ‘Final Report for Publication’, Executive Summary, page i

Deliverables and documents

- D1: Inception report, giving a detailed overview of all physical measures that the individual cities will introduce but also reviewing the correct state-of-the art in Europe;
- D2: Evaluation framework, developed together with the CAPTURE project, describing a detailed evaluation program at a city level, at a strategic level and a European level (comparative assessment);

- D3: City design measures, describing the measures designed within each city;
- D4: City implementation measures, describing all city demonstrations including an identification of all problems that occurred during the implementation as well as the associated measures and actions necessary to solve those problems;
- D5: Detailed city impacts, synthesis of the findings of the evaluation work;
- D6: Final report, providing a brief overview of the total project and recommendations for further developments in this field.

PRIVILEGE - Priority for Vehicles of Essential User Groups in Urban Environments

General Description

The PRIVILEGE project **objectives** were the identification and development of those categories of traffic, which may deserve higher priority than others in terms of guaranteed mobility in overcrowded road networks. The difficult task was to ensure uninhibited and non-congested access for those traffic categories with higher priority while maintaining a general level of accessibility to every destination for all travelers.

In order to achieve these objectives an analysis of existing household data relevant to transport was carried out. Measures to improve the use of the existing transport infrastructure were also analysed, including encouraging modal shift from private to public means of transport.

Deliverables and documents

Final Report

Taste - Analysis and Development of Tools for Assessing Traffic Demand Management Strategies

General Description

Different Traffic Demand Management (TDM) strategies have been studied in various European pilot projects. However, there is still a lack of appropriate assessment tools. The design of TDM strategies requires the appropriate use of most relevant software tools (adequately integrated) in order to best fulfil the priorities of the Common Transport Policy.

There is a lack of consensus of which tools are most appropriate for assessing TDM strategies at a European level. Moreover, intermodal aspects have not been sufficiently considered by the assessment tools developed so far.

‘To overcome the difficulties mentioned above, the TASTE project main **objectives** were:

- Identify common requirements and objectives for assessing TDM policies and strategies;
- Review and classify the existing TDM assessment tools;
- Identify gaps or inadequacies in the currently available tools, and modify available tools to better meet the requirements for the assessment of European TDM policies and strategies and to integrate selected TDM Assessment tools in a toolbox;
- Carry out and to document case studies to test adapted and integrated assessment tools;

- Provide guidance, validated through collaboration with a TASTE User Group, to use of the best available TDM assessment software tools;
- Elaborate guidelines for an appropriate use of the developed toolbox and as a common European framework for the assessment of TDM policies and strategies and elaborate tasks for further research and development in this field.’

TASTE, SR, 1999, (Summary Report) - ‘Summary Report’, Objectives, page 2

Deliverables and documents

- D1 - Assessment Framework and Needs Analysis
- D2 - Review of Tools
- D3 - Toolbox Development
- D4 - Case Studies
- D5 – Guidelines on the Use of Tools for Assessing TDM Strategies
- Exploitation and Dissemination Report
- Final consolidated progress report
- Final Report for publication

SUTRA - Sustainable Urban Transportation

General Description

‘The general **objectives** of the SUTRA Project are focused mainly on the development of a consistent and comprehensive approach and planning methodology for the analysis of urban transportation problems, which helped to design strategies for sustainable cities.

This included an integration of socio-economic, environmental and technological concepts including the development, integration, and demonstration of tools and methodologies to improve forecasting, assessment and policy level decision support.’

<http://www.ess.co.at/SUTRA/>

Deliverables and documents

As the project is being developed under the 5th framework no final documents are yet available.

MUSIC - Management of traffic using traffic flow control and other measures

General Description

The MUSIC project is intended to demonstrate that novel methods of traffic control can be used, alone or in combination with other measures (park&ride, re-allocation of road space to public transport, road pricing, information) in a cost effective manner in order to reduce congestion, improve the efficiency/cleanliness of urban travel and influence modal choice.

To accomplish this the project team constructed reliable simulation models of relevant parts of the road network, developed a common evaluation framework, developed a new traffic management and control strategies for each demonstration site using the simulation models and developed guidelines for simulation which would allow cost effective application of the novel traffic control techniques in a range of networks.

MUSIC, final report, 1999, (D8) – ‘Results and Guidelines’, Summary Report, page 3

Deliverables and documents

- D1 - "City Simulation Models"
- D2 - "Evaluation framework"
- D3 - "Traffic Management and Control Strategies"
- D4 - "Agreed Demonstration Projects"
- D5 - "Implementation of demonstration Projects"
- D6 - "Before' Studies"
- D7 - "'After' Studies"
- D8 - "Results and Guidelines"
- D9 - "Dissemination of Results and Guidelines"

ADONIS - Analysis and development of new insight into substitution of short car trips by cycling and walking

General Description

The overall objective of the ADONIS project is to encourage car drivers to change to cycling and walking on short trips. The work done is mainly related with recommendations and examples in how to do it.

This objective considered:

- Cyclists’, pedestrians’ and car drivers’ reasons for mode choice.
- Interesting and new physical and non-physical measures for cyclists and pedestrians
- Statements from people who have been involved in an accident
- National differences, if any.

‘Developing a combined use of measures to promote both walking and cycling, expresses a philosophy that emphasizes the minimizing of the use of measures that would negatively affect the “other group”, the ongoing considering of each group’s interests, and the serving of each group’s interests whenever possible.

A catalogue like this will never be really complete; other measures are conceivable, and there is more to report about each measure. The main purpose of this description of how to use the

catalogue is to stimulate road authorities to prime the creative process intended to keep looking for good solutions.

Furthermore, it is assumed that only when people have good facilities they will use other means than the car for short trips. Naturally, just having good facilities is not enough; people have other reasons for taking the car instead of cycling or walking. Obviously, therefore, it is necessary to accompany this project with another one (WALCYNG) involved in developing a marketing strategy (based on the wishes and convictions of target groups) for developing communications intended to replace short car trips with cycling and walking.'

ADONIS, final report, 1998, (Final Report) - 'Best practice to promote cycling and walking', The philosophy behind ADONIS, page 1

Deliverables and documents

The ADONIS results are described in four separate reports:

- Final Report - How to substitute short car trips by cycling and walking
- CD-Rom - Best practice to promote cycling and walking
- Report - Behavioral factors affecting modal choice (DfT, INTRA)
- Report - A qualitative analysis of cyclist and pedestrian accident factors (DfT, SWOV)

WALCYNG - How to Enhance Walking and Cycling Instead of Shorter Car Trips and to Make these Modes Safer

General Description

'The purpose of WALCYNG is to sort out conditions and measures, which may contribute in replacing short car trips with walcyng (walking and cycling). WALCYNG applies a Marketing Model, formalised in four main parts:

- Information policy: One has to collect information about potential and practising customers so that the preconditions for the behaviour they should choose could be made attractive.
- Product and distribution policy: Adequate and attractive technical solutions are worked out, and considered thoroughly so that they will meet customers' and potential customers' needs.
- Incentive and pricing policy: One also has to provide incentives given by the society, institutions, companies, etc., on all levels, both to encourage walking and cycling and to discourage the use of car for short trips.
- Communication policy: Users and potential users have to be informed that their needs and interests are taken into consideration, on the product and distribution side, as well as on the incentive side. The product has to be displayed and has to be given a positive image.

The project outcome aims both at road users who could replace their short car trips, employers who could support and benefit from a modal change among their employees, and authorities and decision makers who can influence on modal split by changing frame conditions.'

WALCYNG, final report, 1998, (D6) - 'WALCYNG – How to enhance WALKing and CYCLING instead of shorter car trips and to make these modes safer. Final Report', Executive summary, page I

Deliverables and documents

- Report WP No. 1 - Short trips in European countries
- Report WP No. 2 - Products and efforts for pedestrians and cyclists
- Report WP No. 3 - General Problems of Pedestrians and Cyclists
- Report WP No. 6 - Attitudes towards walking and cycling instead of using a car
- Report WP No. 8 - Incentive Strategies
- Report WP No. 9 - Communication strategies
- Report WP No. 10 - Inoculation
- Report WP No. 11 - Outlining future lobbying
- FINAL Report - WALCYNG - How to enhance WALKing and CYcliNG instead of shorter car trips and to make these modes safer.

CAPTURE - Cars to Public Transport in the Urban Environment

General Description

The main aim of CAPTURE is to collate and evaluate the effectiveness of physical transport measures designed to restrict or encourage the use of different modes. Such measures include parking management, traffic calming, bus priority measures, pedestrianisation, restriction of road space for the private car, car pooling, encouragement of off-peak public transport among others.

The project has evaluated the implementation of demonstrations of physical measures in 11 cities. The policies under study include improvements to public transport movement and high occupancy cars in corridors, and changes to the access and management of areas with high levels of trip making such as in city centres. Most of the measures aim to improve the ability of travellers to combine the use of several means of transport easily – such as by improving facilities at bus stops and larger interchanges, and moving parking areas to outside central areas to encourage the use of alternative means of transport to gain access to city centres.

Effective transport policies to influence the use of different means of traveling will comprise a package of measures such as the pricing and financing of the transport system, its traffic light control, its organization and operation, background legislation, its marketing, vehicle stock, land use planning, and the potential to substitute travel. As they form the basic infrastructure, physical transport measures are of fundamental importance in a successful package of policy measures.

CAPTURE, final report, 1999, (D8) - 'The effectiveness of physical transport policy Measures - The results of 11-city Demonstrations', Executive summary, page vii

Deliverables and documents

- D1 - Project Evaluation Plan
- D2 - Pan European Survey - Results of a survey of physical transport policy measures in 90 cities throughout Europe

- D3 - Design of physical measures in the CAPTURE test sites
- D4 - First Year Project Progress Report (not publicly available)
- D5 - Implementation of measures in the CAPTURE test sites
- D6 - Second Year Project Progress Report (not publicly available)
- D7 - CAPTURE Demonstration Conduct
- D8 - The effectiveness of physical transport policy measures: The results. City demonstrations
- D9 - Results, Recommendations and Conclusions
- D10 - Report of the CAPTURE / OPIUM joint conference - Brussels

CAPITALS - Project for Integrated Telematics Applications on a large Scale

General Description

Large metropolitan areas, like the capital cities Brussels, Berlin, Paris, Madrid and Rome all suffer from common transport problems due to the continual growth in the mobility demand of their inhabitants. As a result of this, the common objective for such large conurbations needs to be: To install and improve traffic information services at various levels for all kinds of users by means of implementing appropriate telematics applications.

The main focus of the CAPITALS project is on a commonly agreed traffic information service platform, upon which public, public/private or private services for administrations and service operators to end users (travellers, etc.) can be based. To achieve this, all cities enlarged their 'content providing' level by interlinking traffic control and other systems to improve the data content base. CAPITALS addressed developments in the information service chain, reaching from content providing to end users, in four operational work areas:

- Traffic Management and Information,
- Multimodal Information Services,
- Advanced Traffic Control Strategies,
- Demand Management.

Good progress has been made in all the European capital cities, Brussels, Berlin, Paris, Madrid and Rome, involved in the project. Following the overall objective of preparing the basis and setting up the platform for developing and demonstrating first information services, the capitals have:

- Enhanced the 'content providing' level by interlinking traffic control and information systems,
- Agreed a common 'information providing' level for information services,
- Implemented 'service providing' for travellers and citizens.

Deliverables and documents⁹

- D3.3 Final report on traffic management and information strategies
- D4.3 Final Report on Multimodal Information: Rome Demonstration
- D5.2 Final report on advanced control strategies
- D6.2 Results and main findings on chained mobility products
- D7.3 Final Evaluation Report
- D20 Final report

COSMOS - Congestion Management Strategies and Methods in Urban Sites

General Description

The COSMOS (Congestion Management Strategies and Methods in Urban Sites) project has developed, validated and demonstrated new procedures for reducing and, where possible, preventing congestion in densely trafficked urban areas.

These procedures comprise:

- Special modules for Congestion and Incident Management (CIM) on the basis of Automatic Congestion and Incident Detection (ACID) which can be included in any on-line network signal control systems, and
- Strategies for rerouting traffic to make the best use out of the capacity at junctions and in the links between them.

COSMOS started with the definition of general and specific user requirements for congestion and incident management. Based on these requirements, the strategic interfaces between urban signal control and other UTC systems (in particular rerouting either with VMS or through in-vehicle route guidance, but also public transport and parking management) in the specific context of CIM were defined.

This integration concept comprises both data flows and the requirements for prediction and modelling tools and strategies for the development of control decisions.

Common Control Strategies (CCS) for Congestion and Incident Management with on-line network signal control was elaborated. These principles take account of

- The information available from ACID (the term 'AID' that is generally used for Automatic Incident Detection has, for COSMOS, been enlarged to also include the reference to congestion detection) or from the system operator,
- The possibilities of on-line urban network signal control; and

⁹ Public deliverables

- The restrictions set by the demands of other UTC systems.

Based on these general principles, a set of specific control strategies was specified. This common development has branched out, in subsequent tasks, into the specification of algorithms and the building of three separate demonstrators for SCOOT, MOTION and UTOPIA.

COSMOS, final report, 1999, (D07.4) - 'Summary of the COSMOS validation results', Executive summary, page 5

Deliverables and documents¹⁰

- D2.1 Final Report
- D 3.1 Definition of user requirements
- D 3.3 Integrated UTC strategies for congestion and incident management
- D 4.5 Report on Strategies for urban rerouting as part of congestion and incident management
- D 7.4 Summary of the COSMOS validation results

Daccord - Development and Application of Co-ordinated Control of Corridors

General Description

'The overall objective of the DACCORD project is to design, implement and evaluate an advanced dynamic traffic management system for integrated (i.e. network-wide) and co-ordinated (co-operative and simultaneous consideration of diverse traffic control measures) control of corridors of interurban motorways. Additionally, an objective is to further develop an open system architecture for interurban traffic management.'

More specific main objectives of the DACCORD project are summarised below:

- evaluation of on-line short-term forecasting techniques of flows and speeds in order to predict travel times, by means of comparison between predicted and observed values, using different prediction methods;
- assessment of practical results from motorway-to-motorway control, both in terms of operational methodologies and in terms of impacts on traffic flow;
- development of methodologies for integrated and co-ordinated control, including its effects on network-wide traffic flows, speeds and travel times;
- open system architecture: providing a framework for the integration of existing and future dynamic traffic management applications, improving inter-operability, and contributing towards an open European market for products and services, by improving competitiveness of the European industry, and the efficiency of services of public interest.

¹⁰ Public deliverables

Deliverables and documents¹¹

- D 3.1 User requirements for DTM applications
- D 3.2 User requirements for architecture
- D 6.1 Co-ordinated control strategies
- D 6.3 Off-Line Simulation Results
- D 7.1 Draft architecture
- D 7.2 Consolidated DACCORD architecture
- D 9.1 Demonstration
- D 10.1 Draft evaluation plan
- D 10.2 Final Evaluation plan

EUROSCOPE - Efficient Urban Transport Operation Services Co-operation of Port Cities in Europe

General Description

The overall objective was to develop and to demonstrate information and management systems and services for travellers, for logistic transport companies and in urban network control areas.

This general objective was followed up in three work areas:

1. Informed Traveller Information systems and services are implemented to better inform travellers on roads, in Public Transport, on ferries etc. about opportunities to make a trip. Such systems comprise pre-trip and on-trip information which is given via e.g. on-board units in vehicles, variable message signs, public access terminals etc.
2. Logistics Information and Communications Systems Information and messages on both logistics services and traffic situations is provided to users such as haulage transport companies and truckers themselves. On-line communication systems help to improve a direct and actual information service to the actors in this freight and fleet management area.
3. Network Control Measures are established in order to improve and enhance many control and management systems in urban areas. This comprises network monitoring and integrated management strategies using e.g. signal control and variable message sign systems, incident management measures including systems as CCTV surveillance and radar are addressed as well.

Also, priority measures for Public Transport are implemented to improve the whole traffic network situation. Strategic Information Systems form the basis for strategic measures in this area.

¹¹ Public deliverables

Eleven common key applications are addressed within these areas.
EUROSCOPE, TR, 1999, (D19) - 'Evaluation Results and Comparative Assessment', Project Objectives, page 10

Deliverables and documents ¹²

- D 4 - Comprehensive Studies on 1996 Demonstrators
- D 8 - Comprehensive Studies on 1997 Demonstrators
- D14 - Exploitation Plan
- D16 - Project Recommendations EUROSCOPE Book
- D18 - EUROSCOPE Conference Proceedings
- D 19 - Evaluation Results and Comparative Assessments key validation results

In-Response - Incident Response with ON-line innovative Sensing

General Description

'Fast and reliable incident detection, verification and response are critical to reducing traffic delay and increasing safety on motorways. Innovative sensing technologies could assist in reacting effectively to incidents and emergencies. These include machine vision, automatic vehicle identification, weighing-in-motion, and closed-circuit television. In order to respond more efficiently to road emergencies by providing faster service, and to improve efficiency of incident management in total, authorities can use the new information that the innovative technologies make possible in IN-RESPONSE.

On-line innovative sensing is used to improve the main components of incident management, including incident detection, incident verification and incident response, especially medical emergencies, in high-speed arterials and motorways.

Performance improvements have been sought by innovative technologies:

- Hybrid technologies based on machine vision, automatic vehicle identification and weighing-in-motion for improved incident detection
- Combination of multimedia communications, CCTV, cellular phones and conventional methods for incident verification
- Combination of decision support systems and algorithms for effective incident response and health emergency response.

Implementation of IN-RESPONSE has demonstrated improvement in the incident management system. Following site calibration, performance improves steadily. Future developments will include addition of incident prediction to facilitate integration to traffic management.'

http://www.cordis.lu/telematics/tap_transport/research/projects/in-response.html

¹² Public deliverables

Deliverables and documents¹³

- D 3.1 Report on User Needs
- D 4.1 Report on functional specifications
- D 5.1 Modules Design
- D 5.2 Modules implementation aspects
- D 5.3 Report on system architecture design and interoperability

CONCERT - Cooperation for Novel City Electronic Regulating Tools

General Description

The general aim of the project is the assessment of demand management policy instruments such as pricing/ restraint measures. The potential of the different measures will be assessed, the impact of integrated pricing/restraint measures on urban travel behaviour evaluated, the public acceptability of different forms of pricing/restraint tested, and the obstacles to their implementation examined.

Deliverables and documents¹⁴

- D6.2 Results & Main findings on chained mobility products
- D7.2 Results & Main findings on integrated payment and information integration: Marseilles pilot
- D8.2 Results & Main findings on pricing and restraint: Barcelona, Bristol, Thessaloniki and Trondheim pilots
- D8.3 Pricing & restraint strategies: guidelines for European Policy Development
- D3.1 Evaluation plan
- D10.1 interim report on City business plans
- D10.2 Smart demand management business plans
- D9.2 Mobility data integration (please contact the project coordinator to obtain this deliverable)

¹³ Public Deliverables

¹⁴ Public Deliverables

Quartet Plus - Validation of a European Urban and Regional IRTE based on Open System Architectures

General Description

Quartet Plus is one of the major demonstrator projects in the Fourth Framework Programme of the EU. The project builds on earlier Pilot studies and is intended to show the potential benefits of an integrated approach to transport management.

The six main sites have staged extensive long-term trials of European and Regional Integrated Road Transport Environment (IRTE) to assess their impact on end-users, authorities, operators and industries.

The sites are Athens, Turin, Stuttgart, Gothenburg, Toulouse and Matisse (UK Midlands). To demonstrate the transferability of system architectures and modules, the cities of Livorno (I), Pau (F), Thessaloniki (GR) and Stockholm (S) have staged tests of technologies developed in the project.

Comparable Telematics Applications

- On-line control strategies
- Internet information
- Variable message sign information
- Public transport information
- Public transport priority and regularity management
- Metropolitan scenarios, socio-economic analysis

Validated impacts

- Reduced journey times
- Reduced fuel consumption
- Better control of pollution levels
- Improved public transport services
- Better-informed travellers
- More comfortable and convenient travel
- Cost effective use of technologies
- Cost savings for operators
- Provision of multimodal routing services

Deliverables and documents¹⁵

- D 03.1: 'Design of Field Trials, Studies and Analysis for Multimodal Information in IRTE' (July 1996)
- D 03.2: 'Integration of Electronic Wallet Applications into IRTE' (April 1998)
- D 04.1: 'Design of Field Trials, Studies and Analysis for Multimodal Information in the IRTE' (July 1996)
- D 05.1: 'Design of Field Trials and Assessment Methods for PT Management in the IRTE' (August 1996)
- D 2.1 Comprehensive Evaluation of Urban/Regional IRTE: the User View and Suggestions for Exploitation
- D 03.1(Issue 2): 'Comparative Impact Assessment of IRTE in Six Sites' (February 1998)
- D 04.1(Issue 2): 'Validation of User Behavioural Changes due to Multimodal Traffic Information and Related Impacts on the Transport System' (February 1998)
- D 05.1 (Issue 2): 'Validation of IRTE supported Public Transport Management' (February 1998)
- D 07.1: 'IRTE Evaluation in Six Sites: a Complete Framework' (July 1996)
- D 07.2: 'IRTE Evaluation in Six Sites: a Complete Framework' (September 1998)
- D 7.3 IRTE Evaluation in six Sites : Results of the European Approach

Tabasco- Telematics Applications in Bavaria, Scotland and Others

General Description

TABASCO is a European demonstration project implementing multi-modal information and control systems as a contribution towards solving transport problems in cities and regions.

The project has had a dual focus: the user-orientated validation of transport telematics systems implemented in cities and in their surrounding regions, and the integration of these systems to produce a more efficient transport system as a whole. Increased transport efficiency can produce very significant benefits. Estimates have put the cost of congestion in Europe at over 100 billion ECU per year, so even a one per cent decrease in congestion would produce enormous savings. TABASCO has demonstrated how the use of transport telematics can help to reduce congestion by improving traffic control in urban networks and on motorways and by providing better information to drivers both before the journey and during the journey itself. It is also expected that greater use will be made of public transport as a result of the availability of easily

¹⁵ Public deliverables

accessible information on public transport alternatives to the private car or the use of transport telematics to help provide accurate, reliable and timely information on Park+Ride services for intermodal trips.

The main telematics systems demonstrated have been traffic management and control strategies and systems for urban, regional and integrated (i.e. linked urban and regional) traffic management, public transport traveller and Park+Ride information, event management on motorways, the interconnection of traffic information and control centres, and urban traffic control linked with public transport priority. Overall objectives have included linking urban and interurban telematics systems, investigating the combined impact of multi-faceted telematics applications and services, stimulating modal change, setting up public/private partnerships and understanding the related institutional and organisational issues, and validating data standards and system architectures.

The main work of the TABASCO project has been the implementation of the demonstrators.

This has been carried out with notable success. At each stage of the project, user groups have been directly involved, and the specification and development of the demonstrators has been driven largely by well-specified user requirements. The following demonstrators have been implemented and evaluated:

- Public transport information systems in Glasgow (bus stops), Munich (bus/tram stops) and South Yorkshire (Internet) were well accepted by the users and interviewees declared the intention to make more use of public transport, because of the availability of improved information.
- Variable Message Signs for Park+Ride in Munich (motorway site) and for a combined parking guidance and P+R system in Amsterdam led to sizeable socio-economic benefits: the costs for the Amsterdam system will be recovered from reduced travel times alone within seven years; and the reduction of vehicle operating costs through the Munich system.

TABASCO, final report, 1998, (D10.3) - 'Evaluation Results and Comparative Assessment', Executive Summary, page 10

Deliverables and documents ¹⁶

- D 2.1 External Liaisons
- D 3.3 Results of demonstrations and overall evaluation
- D 4.3 Park-&-Ride information TABASCO: results of demonstrations and evaluations
- D 5.1 Interconnection with Scotia
- D 5.2 System architecture report
- D 6.2 Network control: enhancement to strategy selection and simulation tools
- D 6.4 Network control: final evaluation report
- D 7.5 Inter-urban corridors: final report

¹⁶ Public deliverables

- D 8.1 Sites, User Needs and Traffic Model Verification Report
- D 8.3 Urban integrated traffic control evaluation results
- D 9.1 UTC with PT priority: report on user needs, functional specifications and demonstrators
- D 9.3 Final Report
- D 10.1 Draft validation plan
- D 10.2 Final Validation plan
- D 10.3 Final evaluation report