INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES
SEVILLE
W.T.C., Isla de la Cartuja, s/n,
E-41092 Sevilla

Monitoring Progress towards Sustainable Urban Mobility

Evaluation of Five Car Free Cities Experiences

Laura Lonza Ricci

December 2000

EUR 19748 EN


JOINT
RESEARCH
CENTRE
EUROPEAN COMMISSION

Printed in Spain

Foreword

This report presents the results of the assessment study of the Car Free Cities network commissioned to the JRC-IPTS by the Environment DG of the European Commission and referred to in the Memorandum of Understanding establishing co-operation between the two Directorates General.

The objective of the work was to propose an analytical framework to evaluate progress towards sustainability in urban mobility planning and management and to test it with selected case studies. The structure of this report is based on the methodological outline presented in the **first chapter**.

The main benefits deriving from the analytical framework proposed are that it includes all the variables able to have an impact on sustainability at the local level. The role of transport and mobility has been highlighted as it represents the main focus of this study, however it is up to the user of the analytical framework to characterise each of the system's components to the degree of detail considered appropriate. The direct relationships between the components of the system have been presented in the methodological outline specifying which elements are to be taken into account and specified for each of the system's components. The relevant relationships have then been highlighted in the case study analysis and in the last chapter, which compares the five selected cities.

The framework aims to be comprehensive so that it could be applied beneficially to a broader number of European urban areas. The analytical framework is a useful qualitative tool for local decision-makers both to assess the potential impacts of a given transport policy measure and to evaluate the progress of an implemented measure. It makes a comprehensive overview of the system available without ignoring relevant aspects that impact on the urban system, whether they are transport related or from elsewhere, for instance from the regulatory framework at various levels. Being a conceptual framework for analysis, the proposed methodology does not required specific skills and is extremely user friendly. Obviously, being a qualitative tool, it implies subjectivity and it is not appropriate for modelling. Nevertheless, models can no doubt be applied to it maintaining the inherent logic. Information about the system's components and the relationships between them can be produced by modelling rather than using the qualitative solution of questionnaires and interviews used here.

The methodology proposed in the present study allows therefore to take into account some components of the urban system and its functioning, which – despite their importance – are often ignored by other, more quantitative-oriented, assessment methodologies, due to the fact that they are 'soft' variables. For instance, the organisational patterns of a local authority are sometimes taken for granted. Comparisons and information on good practice across cities in Europe are often based on the assumption that the cultural context within and around an organisation is not a relevant parameter. On the other hand, quantitative models focusing, for instance, on the urban transport system or even the integrated models of transport and land-use planning cannot take into account 'soft' parameters that the analytical framework makes it possible to keep in view.

Certainly, the accuracy of the outputs of analysis depends on the quality of the data gathered and the forecasting techniques employed. Nonetheless, the comprehensiveness of the analytical framework proposed in the study enables a thorough 'environmental analysis' to be performed, defining the environment as the factors external to an organisation that influence its functioning and performance. The analytical framework has been designed with the aim of carrying out three basic goals:

1. To inform key decision makers about the current and potential changes taking place in the environment;
2. To provide important intelligence for strategic decision makers, and;
3. To challenge the assumptions widely held among decision-makers so that they become more sensitive to opportunities, threats, and possibilities in the system.

The benefits expected from the use of the analytical framework presented in this study are mainly:

1. To generate descriptions of current changes in the urban system, indicators of potential changes and alternative descriptions of future changes. Such descriptions provide decision-makers at the local level with lead time to identify, understand and adapt to external issues; and,
2. To offer one mechanism for organisational learning by inducing decision-makers to think beyond their current operating concerns, forcing them to view the system with an open mind.

The latter point is the key to the comprehensiveness of the analytical framework proposed: the system considered should be understood on its own terms, not merely from the specific perspective of the decision-makers in one sector, namely transport and mobility, of the urban system. Important threats and opportunities in the system can be appreciated only when decision-makers try to learn about their environment rather than responding to crises or by listening to internally generated information.

The **central part of the report** outlines the findings of the study carried out in five selected cities that represent main areas of activity of the Car Free Cities network. Car Free Cities aims to promote a 'new mobility culture' for urban areas and comprises over 60 cities in Europe. We considered it worthwhile to take a 'snapshot' of the results achieved by some of its members, which are representative of the network's areas of activities. What seems to be interesting and new in the approach presented in this report is the application of a selection of indicators which are fairly easily available to the local authorities (although mostly spread across different services). They are analysed in such a way as to allow an attempt to evaluate the impacts of a given mobility policy on the progress towards sustainability of the urban area. It would be extremely interesting to move from this 'snapshot' to the application of the analytical framework so as to diagnose limiting factors for the progress of the transport policies applied in the five cities involved. Nonetheless, this certainly goes beyond the scope of this work.

The five cities analysed are Barcelona, Bremen, Nottingham, Strasbourg and Turin. Initially, the work was supposed to include the case of Amsterdam, namely having regard to city logistics. Unfortunately, data from the city of Amsterdam have not been made available and therefore the challenging theme of freight transport in urban areas has been left out. Hopefully, it might be possible to include it in future research findings. The case studies were selected on the basis of the main areas of activity of the Car Free Cities network and also took into account (a) geographical balance and (b) an equal representation of various urban dimensions. The focus being on urban areas, it was impossible to take into account the case of rural regions, which is inextricably linked with the problems of mobility in urban areas. Again, this would be an interesting research area to exploit: the problem of interfaces between local, regional and long-distance transport networks deserve increased attention as the effectiveness of urban mobility measures largely depends on what is happening in the surrounding area. Due to the impossibility of following each link and connection suggested by the subject matter covered here, the geographical balance criteria followed in the selection of our case studies was enriched with a 'position' criteria. This means that an attempt has been made to include in the sample of five cities ports, such as Barcelona and Bremen, cities located at the intersection of cross-border transport networks, such as Strasbourg and Turin, and cities that represent the core of a regional economy, such as Nottingham.

Information has been extracted from a questionnaire circulated to the five local authorities. The structure of the questionnaire is briefly presented in Chapter 1 and the questionnaire is included in the Annexes. Where sufficient information was not available from other sources (the Internet, publications, project results, etc.), an attempt to complete it via interviews was made. To get a complete picture of the situation in a city though, it would be worth addressing a survey at citizens and so ascertain their attitudes towards, or level of awareness, of the specific measure considered. Additionally, it would be interesting to interact more closely with the private sector. As it stands, the report captures the perspective of one stakeholders' group, namely the local authority, which – interesting as it may be – does not provide the complete picture of the situation. To carry out the full analysis allowed by the analytical framework, an iterative approach would be required, involving all the actors concerned. Some of this has been attempted by using other indirect sources of information, due to limited resources.

The **last chapter** of this report compares the results for the five cities analysed and makes an attempt to formulate recommendations which could be useful to local authorities and identifies some focal points of attention which could be relevant for the European level. Above all, it highlights the importance of adopting a systems approach when monitoring progress of any given urban mobility measures towards sustainability. The final chapter includes some suggestions for future actions at EU level as well as for an added-value role of the Car Free Cities network in the coming years.

Author:
Laura Lonza Ricci
Joint Research Centre – Institute for Prospective Technological Studies
TSD Unit – Transport & Mobility Group
http://www.jrc.es
Tel. +34 954 488 496
Fax: +34 954 488 279
E-mail: laura.lonza@jrc.es

Table of Contents

Methodological Outline:
An Analytical Framework

Rationale

A number of activities are being carried out across Europe to improve mobility in urban areas in the context of the striving towards sustainability. The aim is that of preserving the positive impacts of transport on citizens' quality of life and the economy while at the same time minimising the negative external effects of ever-increasing transport volumes, which is one of the top concerns at the local as well as the European Institutions' level. A methodological outline is presented allowing the assessment progress achieved by transport-related actions in the direction of improved urban sustainability.

The objectives of the methodology presented include the assessment of the impacts of urban transport and transport-related policies on mobility in urban areas across time and sites. The methodology proposed allows for the identification, analysis and classification of organisational and technological success factors and bottlenecks of innovative solutions adopted at the local level in view of improving urban mobility in the context of increased sustainability. In particular, the following benefits are expected to be drawn with the application of this methodological outline:

- Identification and analysis of critical issues driven by the policy to integrate sustainability considerations in transport policy at the local level and across levels, including interactions between local, regional, national and EU levels of competence and intervention;

- Identification and analysis of needs and requirements at the local level to accelerate transport policy integration towards sustainability of urban transport systems, and;

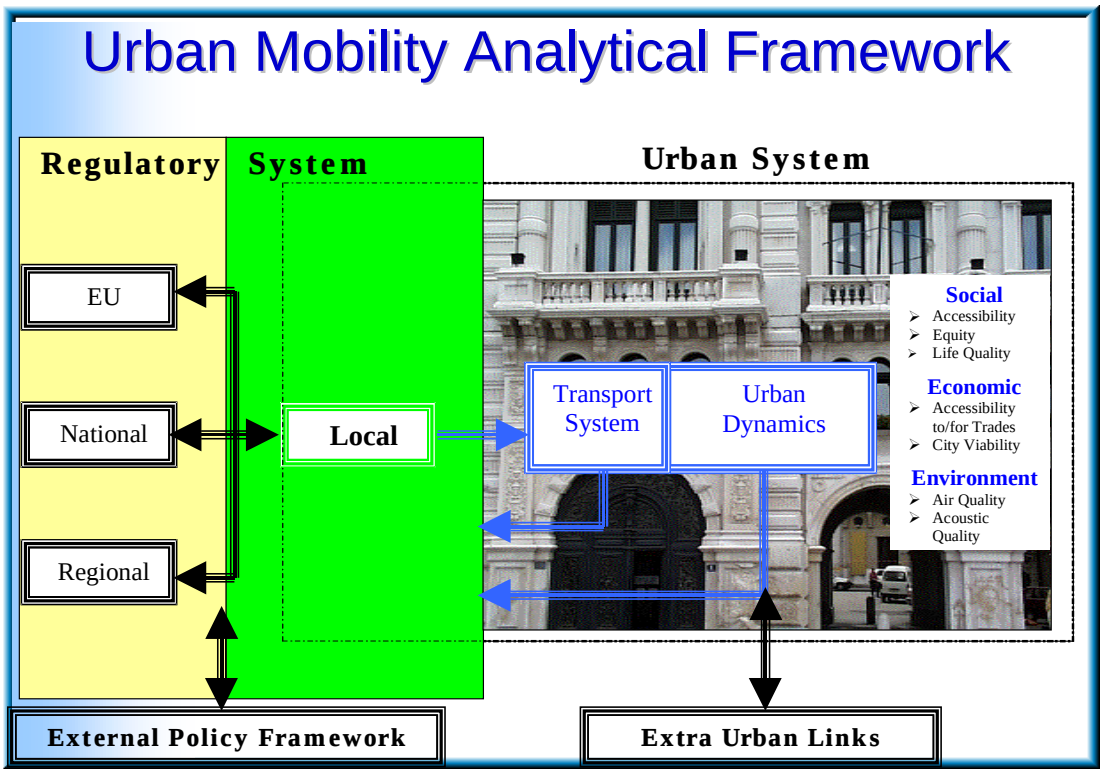
- Identification of both site-specific and transferable variables for effective transferability of successful experiences in the field of sustainable mobility across European urban areas.

This method of assessment should not only allow progress made in a given area towards the goal of sustainability in urban mobility to be highlighted but also the evaluation of the impacts of specific mobility-related measures on sustainability in different urban areas in order to compare performance across European urban areas.

Methodological Outline

In order to consider all relevant variables influencing transport policies in urban areas in general, an analytical framework has been used. Its components and their interrelations are presented in the following section (see the figure on the next page).

Figure 1. Analytical Framework



The analytical framework is to be used to diagnose limiting factors to the implementation of the transport policies implemented in the five selected cities. Nonetheless, to transform basic, measurable indicators into the three dimensions of sustainability, additional evaluation work has been carried out. This is presented in the analysis of the five case studies.

Indicators

The assessment of transport policies and their impacts on sustainability implies the need to represent complex, and often abstract, phenomena by means of a set of appropriate indicators based on quantifiable and available measures. Selected indicators provide concise information highlighting what is happening in a large system, they are comparable across different cases and supply a useful and relatively quick way of displaying reality. Indeed, provided a number of criteria – outlined below – are respected, indicators represent a reliable source of information and schematisation of systems.

In fact, indicators make comparisons easier and present the facts to policy-makers and the public at large in way that is easy to grasp without their needing a strong technical background. The indicators used here have been selected on the basis of the following criteria: (1) close correlation to sustainable mobility; (2) quantitative and monitored data; (3) available or easy-to-obtain information; (4) close correlation with the policy agenda and organisational schemes; (5) transparency, that is avoidance of biased information favouring one or the other interest.

The set of indicators presented in this study is based on existing work on measurement methods. Specifically, reference is made to the work carried out in this area by the European Environment Agency on the 'Transport and Environment Reporting Mechanism' (TERM) and by the Working Group on Indicators for Sustainability of the European Commission's Expert Group on the Urban

Environment. Additionally, the OECD and the UNO experiences in this area have been a reference point and these sources are listed individually in the 'Bibliography' section at the end of this document.

Specifically, three levels of aggregation of indicators have been taken into account when carrying out this analysis. In fact, the double aim of the analytical framework should be satisfied, comprising the possibilities of (1) comparing the situation before and after the implementation of the transport policy measures, and (2) establishing a comparable grid across urban areas focusing on actions taken and progress made towards sustainable mobility.

In order to carry out this monitoring (1) and benchmarking (2) exercise, comparable measures are needed, that is measures or values expressed and used by city policy-makers needed to be aggregated to form comparable variables.

At the highest level of analysis, the driving factors to evaluate sustainability are broadly defined as ***social, economic and environmental needs***. Such identification is based on the definition of sustainable development as 'the need to adjust *economic growth* to remain within the bounds set by the *environment*, via careful managing of critical resources and technological advance, and the guarantee of adequate conditions of liveability for all present and future generations.'

Such level of aggregation is abstract and complex to obtain from basic, measurable indicators. Therefore, a second level of aggregation has been created highlighting the main areas impacted by transport. These areas are presented schematically in *Table 2*. The coloured lines represent the main direct links between the impacted areas and the first level of aggregation, i.e. needs.

The set of quantitative indicators is also listed to give a complete overview of the measures included in the analytical framework. For a complete description of the draft indicators and their respective targets, please refer to the Annex.

Table 1. Levels of Aggregation of Indicators and Impacts of Transport

Needs	Main Areas Impacted by Transport	Quantitative Indicators
Social	Accessibility	- Urban Land Cover - Built-up Area - Open Areas - Derelict Areas - Urban Renewal Areas - Area Dedicated to Transportation Network - Mono-functional Areas - Land-use Distribution by Housing Units - Proximity to Urban Green Spaces - Urban Population Density - Employment Distribution in Productive Sectors/ Weight of SMEs - Unemployment - Employment of People with Reduced Mobility - Concentration of local pollutants (e.g. SO2, NOx, CO, PM, Lead, Benzene) - Exposure to Noise (inhabitant per time period) - Car Ownership - Modal Split - Traffic Volumes/ Average Vehicle Speed - Commuting Patterns
	Mobility	
	Equity	
Economic	Economic Activity (Enabler)	
	Traffic Density (Congestion)	
	Air Quality	
	Acoustic Quality	
	Spatial Development (including Accessibility of Green Spaces)	
Environmental	Rational Use of Materials and Energy	
	Technical Safety and Personal Security in Vehicles and Transport Infrastructure	
	Visual Impact	
	Preservation of Cultural Heritage	

Table 2. Additional Analytical Requirements at the Local Level

Organisational Aspects	*Public Awareness*
- Policy Cross-Sector Integration (Urban Mobility/ Environment/ Economic Development Master Plan) - Mobility Agency - Co-ordination Across Sectors and Levels in the Public Administration - Co-ordination Between Public and Private Sector	- Citizens' Involvement in the Decision-making Process - Information Availability on Sustainable Mobility - Specific Publicity Actions of the Public Administration (User Groups) - Mass Media
Transport & Mobility	*Legal Issues*
- O/D Structure per Mode - O/D Structure within the Commuting Community - Transport Costs on End-Users, including PT fare structure, Road Pricing and Parking Schemes	- Competence Framework across Levels - Legislation in Force having an Impact on Mobility Policies at the Local Level

Description of the Analytical Framework

Urban Dynamics

The needs identified and briefly presented in this section are the 'Driving Factors' and they represent features common to all urban areas. Urban areas differ widely though and there is the basic need to characterise them by including a description of the city covering aspects such as its spatial structure (compact or dispersed patterns) and its economic activity structure. This section is dedicated to identifying and further specifying the main aspects to be tackled in order to characterise the distinctive feature of a city.

City Components

Each of the following characteristics needs to be filled in with a precise city in sight.

- Profile of city activity (industrial, commercial, residential, leisure, cultural, etc.)
- Spatial organisation of activities (zoning, integration of activities, mix, etc.)
- City density (compact vs sprawling) analysed together with its number of inhabitants, that is its size
- Structure of the city service and utility provision and distribution, including energy and water distribution, waste disposal and public services availability.
- Social and occupational profile of citizens

Behavioural Patterns of Citizens

Behavioural patterns of citizens also form part of the urban dynamics, including:

- Consumption patterns
- Acceptance of new technologies
- Acceptance of de-materialisation trends
- Participatory behaviour
- Individual vs collective behaviour
- Degree of environmental awareness and concern
- Effect of health issues on lifestyles and political behaviour.

Transport System

This component of the analytical framework comprises transport infrastructures and modes. It reflects the operation of the market and therefore users (passengers and users of freight transport) find themselves on the demand side. On the supply side there are a number of actors, including public and private operators and producers of technologies and vehicles.

To detail the situation in each city, the following aspects need to be analysed:

- Attitude of the general public towards the car and other transport modes
  - Shift in priorities such as costs, performance, comfort, safety, etc.
  - Acceptance of new mobility concepts based on the provision of services such as car-sharing, car-pooling, etc.
  - Incentives for car users (e.g. company cars) and to users of other transport modes
- Attitude of users of cars and/or PT modes
- Amount of leisure time and regulation of working hours
- Housing conditions and preferences
- Interfaces between local transport and long-distance transport, as the latter has an important impact on transport flows in the urban area.

In an ideal situation of perfect market conditions consumers could choose the combination of transport and land-use options that best meet their preferences. In reality, the distorsions in the transport market and poor land-use planning contribute to the inefficient performance of the system. This reduces choices for users and has a cumulative effect, worsening the mobility situation in urban areas. In fact, it has to be borne in mind that transport imposes a variety of external costs on others, including traffic congestion and accident costs, as well as various types of environmental impacts, most notably air pollution and acoustic nuisances. Such impacts deserve to be analysed, as they determine interactions between actors on both the demand and the supply sides of the transport and mobility component.

The problems of the greenhouse effect, air pollution, noise and other environmental impacts are perhaps less immediate and less visible to the urban transport system users and decision-makers than the congestion problem, nevertheless they are likely to be more important, especially in the long term. Congestion causes delays and economic loss. Environmental degradation leads to long-term health problems and the destruction of the natural environment. Additionally, transport safety represents a major transport problem with huge costs imposed on society at large. The extent of environmental problems from urban transport varies from country to country and from city to city. Moreover, the subjective perception of environmental problems varies perhaps even more.

Regulatory Framework

The Regulatory Framework influecincing mobility at the urban/local level includes several components at different levels, namely the EU, national, regional levels and, above all, those measures adopted at the local level itself.

All levels of regulation and intervention play a leading role in exclusive or shared areas of intervention. As a consequence, the resulting picture cannot be expected to be always clear: policy strategies and interventions to help solve the urban mobility riddle in the direction of increased sustainability involve different levels and areas of the public administration. Additionally, the issue is evolving rapidly and new issues are emerging, thus determining new tactics and strategies adding to or gradually modifying the existing regulatory framework. In general, an important process of re-thinking the way transport and mobility issues are targeted is underway, in which the policies and the policy objectives of the European Union provide a guiding function with regard to establishing new pathways for research and implementation.

Although the regulatory framework comprises several aspects (the organisational framework, economic and financial tools, and voluntary measures, among others), a major role is being played by legislation in force at the EU and national levels. They define the main economic conditions for transport operators and manufacturers as well as the general framework conditions for the regional and local levels of the public administration.

European Policy Level

Policies relevant to transport and mobility in urban areas are defined in several EU policy areas, particularly environmental policy, the Common Transport Policy and, other areas, such as RTD, energy, regional development and industry.

Identifying the environmental impacts of transport and related policy actions is an integral part of future policy planning. In accordance with the obligation to integrate environmental protection into the definition and implementation of all Community policies (article 130r of the EC Treaty), a range of legal instruments have been adopted and are currently in force. They comprise the Air Quality Framework Directive [Dir 96/62] and the legislation deriving from it, including the Directive on Emission Standards (for SO2, NO and NO2, lead and PMs) [Dir 99/30]. The upcoming Clean Air For Europe (CAFE) programme will take an integrated approach to atmospheric pollutants coming from both mobile and fixed sources in line with the spirit of Directive 96/62. Other initiatives such as the Auto-Oil programme are also worth mentioning.

A broad range of issues have been put on the European political agenda and become priorities across the Union. Such priorities reflect the pro-active approach of the European Union towards improving the quality of life of its citizens by providing a safe environment and lasting economic competitiveness. At the same time, they stem from the concerns of those faced with planning and managing day-to-day problems of urban mobility, i.e. locally elected representatives, urban mobility managers and citizens at large.

The 'Citizens' Network' [COM(95)0601] and 'Fair and Efficient Pricing' [COM(95)691] Green Papers in the field of transport give evidence of the steering role of the European Commission to foster urban mobility towards improved sustainability and to provide a level playground for all modes in the transport system. Both Green Papers build on the principles of the Common Transport Policy included in the White Paper on 'The Future Development of the Common Transport Policy' in 1992 and re-presented in 'The Common Transport Policy Action Programme 1995-2000'. The main impacts of such initiatives include awareness raising and the willingness to induce a modal shift away from the private car by improving alternatives and eliminating market distorsions currently favouring the car.

'Towards an Urban Agenda for the European Union' COM(97)197 represents another initiative by the European Commission targeting European urban areas as it aims at opening a dialogue on the future of urban development in Europe. The document sets out a strategy for a co-ordinated and coherent response to cope with the increasing number of urban problems, among which the issue of sustainable mobility plays an important role. Equally relevant is the Communication 'Sustainable Urban Development in the European Union: a Framework for Action' COM(98)605.

National and Regional Policy Levels

National regulatory frameworks are organised differently in the Member States of the European Union. Nonetheless, it seems possible to identify three main trends in the legal developments across the EU. First, involvement of the private sector has been increasing as part of the process of constructing the Single Market, although the current extent of private ownership remains the minority. Deregulation has not gone beyond competitive bidding and contracting out of transport-related services in the urban and inter-urban services, which fosters competition by increasing pressure for cost control and productivity gains.

A second important trend is the devolution of control, management, planning and finance of public transport from central (national) government levels to regional (provincial) and local (municipal) government levels. That devolution of financial responsibility has been one of the main incentives for experimenting with deregulation and privatisation.

The third trend is the spreading regionalisation of public transport with increasingly integrated services and financing over entire metropolitan areas and conurbations. Transport financing has become an increasingly serious problem throughout the EU, partly because of the rising marginal costs of building, maintaining and operating ever more sophisticated transport systems, and partly because of the tighter policies governing the allocation and distribution of scarce public resources among public authorities at all levels. In general, urban public transport in Europe covers between a third and two thirds of its operating expenses from passenger fares, varying from country to country. It is likely that financial pressures will grow in the coming years and that increased productivity through selective privatisation and deregulation may improve the performance of public transport. Additionally, we may see the emergence of new organisational schemes such as the setting up of metropolitan areas as functional units reaching beyond urban administrative borders or the creation of mobility agencies assembling all transport and mobility-related competence and responsibilities in a given area

It is also worth noting that both stricter policies to allocate public resources and environmental concerns are limiting major expansions of transport infrastructure capacity throughout Europe. Given the limitations of supply-side approaches to solving the urban transport problem, policies are increasingly turning to demand-side solutions. Currently, European governments – although at different intervention levels - are starting to adopt policies aimed at limiting, re-channelling or articulating travel demand. Mostly, this has involved measures to encourage increased car-pooling or public transport use, high-occupancy vehicle (HOV) lanes, banning of private cars from city centres, limitations on parking, increases in parking fees and traffic calming in residential neighbourhoods. Another transport-related measure is the redistribution of car travel from peak periods to off-peak periods (employment policy measures via flexible hours).

Pricing, another demand-side policy has been a well-known option for quite some time now, for instance to tackle congestion problems: having to pay for scarce road capacity at peak hours may make a great deal of sense, as charging a zero price obviously encourages overuse. Nevertheless, authorities are only starting to endorse its implementation on a widespread basis, as it has been considered another form of taxation as well as an infringement of personal freedom and an unfair rationing of mobility. A more popular pricing strategy has been the widespread use of deeply discounted monthly tickets for public transport, increasingly marketed as environmental tickets, combining the advantages of cheap travel and a clear conscience. In co-ordination with higher taxes

and fees for car use, reductions in public transport fares are intended to shift modal choice away from single-occupant vehicle use, although at the price of an increased subsidy to public transport.

Another aspect to be considered refers to land-use policies, which have been crucial in shaping urban development patterns and thus travel demand and transport-related concerns today. Land-use policies vary greatly from one country to another within the EU. Some have very restrictive laws and regulations on land use (through subsidies, zoning, building codes and tax policies) whereas others have no significant government control over the use of privately owned land. Since public transport and, to some extent, walking and cycling, require compact development in order to be feasible, the variation among countries has important implications for different patterns of evolution in urban travel behaviour.

Local Policy Level

The final part of the section dedicated to the description of the 'Regulatory Framework' component is devoted to the 'Local Policy Level'. Indeed, it is the closest to the citizen and the one which is best informed about real-life problems. It has broad competence over implementing urban mobility strategies and measures and plays a major role in providing input to policy-making at the higher levels. Additionally, voluntary measures adopted by local authorities play here a significantly more important role than the other levels. It is particularly interesting here to focus on the participation of citizens in the decision-making process and other forms of awareness raising. Indeed, European local authorities bear the main responsibility for regulating travel behaviour as a means of improving urban transportation.

In view of the constraints on the supply-side, local mobility measures are increasingly focused on transport demand management (TDM) measures, which include car-sharing and car-pooling, public transport improvements, cycling and walking infrastructure improvements and parking management. These can improve financial performance of the transport system at the local level while at the same time serving environmental purposes. Other transport-related policy measures rooted in local authorities' responsibility are linked to land-use planning and, in particular, to mixed zoning, which reduces the need to travel and provides the citizen with a broader range of travel choices. Additionally, local authorities can influence commuters' travel patterns by foreseeing incentives to companies promoting the shift towards modes not relying on the use of the private car by employees.

Concluding remarks

Extensive RTD programmes have been promoted at the EU and National levels, and also by the private sector, to propose technologically advanced solutions to help solve the urban mobility problem. These are being implemented at the local level and it is important that evaluation of technological solutions and expression of requirements for further research be expressed by the end-users. Indeed, this seems to be the only way to make sure that research and technological development provide consistent answers to existing needs while at the same time being coherent with overall policy objectives.

Thorough monitoring and evaluation procedures together with support to decision-making through of exchange of experiences seems to be the optimal way to achieve the progressive integration of sustainability considerations into urban mobility planning and policy-making. That is why the analytical framework proposed seems to provide a solid starting point for analysing the undoubtedly very complex issue of urban mobility.

The analytical framework proposed in this study may help to identify the factors shaping urban mobility. Because of the interactions emerging from the components' description in the previous sections, a dynamic model seems to be a useful step forward in evaluating the impacts of the current regulatory framework on mobility in urban areas. At the same time, such a model might help to provide feedback to diagnose bottlenecks and success factors as well as to draw lessons from current

experiences in view of continuing to improve the regulatory framework and to provide satisfactory answers to European citizens.

Particular emphasis needs to be placed on the implications of new regulatory and policy frameworks in the transport sector as far as technological innovation and regional and local/urban development are concerned.

The analysis of issues as complex as those involved in the transport system requires an interdisciplinary and integrated perspective taking into account technological innovations as well as organisational and socio-economic aspects. That is why alongside the need to improve the understanding of the complex relationships characterising the components of the transport system, the exploration of potential future development paths and policy strategies is given particular attention.

Measures Implemented in Five European Cities: Impact Evaluation

Introductory remarks

To start the Section on the presentation and analysis of the case studies considered, the reader is given a quick description of each location. This background information characterising the urban area is intended to help set the context for the analysis of the mobility measures considered.

As outlined in the previous Chapter, which described the methodology, it would in fact be desirable to have a far more detailed insight into the local situation, however limited resources have meant that this was not possible here. Using the proposed analytical framework to perform a study in greater depth would certainly imply gathering more data on the regulatory, economic and social situation of the cities considered. In this study a questionnaire was used to collect information on the basic, quantitative indicators needed for the analysis (in Annex). The information kindly provided via the questionnaire by local decision-makers and practitioners only gives an outline of the situation: despite being fairly complete, much of it is based on estimations by the surveyed authority and leaves a section open for optional answers.

The five cities analysed are Barcelona, Bremen, Nottingham, Strasbourg and Turin. The case studies were selected on the basis of the main areas of activity of the Car Free Cities network and also took into account the geographical balance and the need for equal representation of various urban dimensions. The geographical balance criterion followed in the selection of the case studies was enriched by a 'position' criterion, which meant that we sought to include a variety of different cities in the sample, i.e. ports, such as Barcelona and Bremen, cities located at the intersection of cross-border transport networks, such as Strasbourg and Turin, and cities that represent the core of a regional economy, such as Nottingham.

The Sections dedicated to the five selected cities are subdivided into a general description of the site followed by a presentation of the measure analysed. Sometimes it is a purely policy measure, as in the case of the first city considered, Barcelona, in other cases being mainly based on the development and implementation of technological solutions, as in the case of Turin, and most often consisting of a clear mix of policy and technical measures.

With the support of the analytical framework, a first level of analysis is attempted based on the quantitative indicators followed by the analysis of the impacts of the measures considered in the light of the main transport-related problems of the City and the main benefits expected from their implementation.

The Case of Barcelona

Site Description

Barcelona is the Capital of Catalonia, situated in the North East of Spain. It is a city of 1,508,805 inhabitants (1996 figures) and covers an area of 99.07 km². Barcelona is a dense city with an average of 15,230 inhabitants per km² (inh/km²) which reaches 19,468 inh/km² in the city centre. The density of the city is also reflected in its land cover: 75% of the urban area is built with the remaining 24.8% set aside for green space. Housing accounted for 68,375 in 1990 with 669,459 housing units and 14.4% of the built environment is dedicated to other purposes than housing.

Barcelona is the core of a large metropolitan area of over four million inhabitants and a dynamic economic and cultural centre. Its transport infrastructure reflects this situation with 1277.305 km of road network and a rail and tram network of 64.94 km in the urban area. The metropolitan area of Barcelona has a metro system of 80.6 km, regional railways for 140 km and a state railway network of 422 km. Additionally, there are 95.2 km of cycle tracks and 1.111 km² of pedestrianized streets (over 1% of the total urban area).

At the same time, the transport infrastructure experiences heavy pressures with an average speed for private cars in the city centre of 20.6 km/h and 18.6 km/h for public transport vehicles. Vehicle ownership is 605 per 1000 inhabitants, of which 414.5 are cars. There are 1,152,838 vehicles on the streets on a normal working day (as of 1998) with 850,000 private cars commuting into the city every day.

As far as the economic outlook of Barcelona, its strongest pillar is clearly the tertiary sector, which encompasses 83.2% of economic activity and employs 76.4% of the active population. The secondary sector completes the picture while the primary sector is practically absent. Unemployment is slightly lower than the average for the EU and the Spanish national average with around 9% unemployment rate, slightly higher for men than for women.

Table 1A

Basic Indicators	Barcelona
Urban Land Cover	99.07 km² (100%)
Built-up Area	74.31 km² (75%)
Green spaces	24.35 km² (24.8%)
Derelict Areas N/A	N/A
Urban Renewal Areas N/A	N/A
Area Dedicated to Transport Network	1277.305 km
Mono-functional Areas	Negligible
Land-use Distribution by Housing Units	68,375 buildings in 1990 with 669,459 units. 14% of built-up area is destined to purposes other than housing
Proximity to Urban Green spaces	almost all population
Urban Population Density	centre: 19468 inh/km²; average: 15230 inh/km²
Employment Distribution in Productive Sectors / Weight of SMEs	Tertiary 76.4%, Secondary 23.4% N/A
Unemployment	9%
Employment of People with Reduced Mobility	N/A
Concentration of local pollutants (e.g. SO2, NOx, CO, PM, Lead, Benzene)	not a problem
Exposure to Noise (inhabitant per time period)	exceptional
Car Ownership	605 vehicle/ 1000inh; car: 414.5 car/ 1000inh
Traffic Volumes/ Average Vehicle Speed	1.152.838 cars/day (1998)/ car: 20.6km/h; PT: 18.6 km/h
Commuting Patterns	40% by PT; 2% by bicycle

Barcelona's Mobility Pact

On 22 July 1998, the Barcelona City Council signed the "Mobility Pact" with 28 different actors participating in managing the city's mobility. Signatories to the pact include parking companies, private transport companies, taxi unions, the chamber of commerce, entrepreneurial associations, the federation of the city neighbourhoods and cycling associations, among others.

The "Mobility Pact" is an extremely interesting pioneer experience in Europe. The principles inspiring it and the common commitment to impact on Barcelona's mobility already constitutes a success in itself. The fundamental goal of the "Mobility Pact" is to ensure sustainable mobility which is more environment- and user-friendly, better planned, more efficient and more energy-conscious. Accessibility, considering the specific needs of different users and establishing mechanisms to protect everyone's right to mobility, is also a driving principle.

Barcelona is a dense city and the core of a bustling metropolitan area. Increasingly heavy commuter traffic and Barcelona's growing capacity as a cultural, leisure and tourist centre have led to a steady rise in the number of journeys made. Different transport modes, spaces where people gather and stroll, parking areas and goods distribution operations converge in a common and public space need to be shared in the best way possible.

The "Mobility Pact" is promoted by the Municipality of Barcelona as a way to meet the growth and diversity of mobility needs without neglecting the urban environment, the quality of life of its inhabitants or the needs of the transport system.

A good quality of life for all citizens is an equally crucial issue and public transport plays a key role in achieving this goal in the "Mobility Pact". Policy guidelines to improve 'intermodality', facilitating the rational and combined use of the different modes of transport, represent therefore a core activity as does greater attention to the needs of the pedestrians and the right to walk. At the same time, a more rational use of private vehicles is sought.

Intervention in this case is at the metropolitan level and therefore includes the municipalities surrounding the urban area. They are committed to working together with the city council to ensure a sustainable transport strategy for the Greater Barcelona area.

More specifically, the goals of the Mobility Pact include the following action lines.

- The achievement of high quality, integrated public transport; the maintenance of traffic speeds and the improvement of commercial speeds for surface public transport;
- An increase in the surface area and the quality of the public areas set aside for pedestrian use; an increase in the number of parking spaces and improvement of their quality;
- Enhancement of citizens' information and awareness, as well as better signals and signs;
- The definition of a set of legal regulations suited to the mobility of the city of Barcelona[1];The improvement of road safety and respect between users of the different modes of transport;
- The promotion of less polluting fuels and the control of air pollution and acoustic nuisances caused by transport;
- The promotion of cycling as a regular means of transport, and;
- The achievement of an agile, orderly distribution of goods and products throughout the city.

The capacity for co-operation between local government and the public at large is very important. In fact, the proposed social pact for sustainable mobility is a reflection of the desire to lay down common criteria for optimal mobility in the city and to define the steps to be taken to achieve this common goal. The adoption of a 'metropolitan' approach – rather than a local or 'municipal' one – aims to take into account all the mobility-related problems faced by all users of the transport system in all modes.

Barcelona's "Mobility Pact" is not the end of a process of reflection and consensus but rather the beginning of a common effort to realise plans and projects. For example, task forces are being created involving all signatories of the Pact to address specific issues, such as the organisation of the Car-free day, so as to ensure proper representation of all those affected. The overall development of the Pact and progress on specific issues is discussed and updated at least once a year. The "Mobility Pact" is an agreement that remains open to all, allowing other groups, associations or institutions in favour of its principles and actions to join in.

[1] The new Transport Plan has been adopted in Barcelona at the beginning of 2000. The key elements of the new plan include the support to public transport, the improvement in parking management and capacity, and better citizens' access to information.

Table 2A
The Mobility Pact: Qualitative assessment of the its likely impacts

Criteria	Ranking			
	N/R	+	++	+++
Accessibility				✲
Mobility			✲	
Equity			✲	
Economic Activity		✲		
Traffic Density (Congestion)		✲		
Air Quality	✲			
Acoustic Quality	✲			
Spatial Development (including Accessibility of Green spaces)			✲	
Rational Use of Materials and Energy	✲			
Technical Safety and Personal Security in Vehicles and Transport Infrastructure		✲		
Visual Impact	✲			
Preservation of Cultural Heritage	✲			

N/R = not relevant; **+** = slightly positive; **++** = positive; **+++** = very positive

The table above summarises the information from the questionnaire circulated to decision-makers in the City of Barcelona with a view to understanding the potential impacts of the measure adopted, i.e. the impacts of the Mobility Pact on the characteristics of the mobility system. The data show the 'potential' impacts rather than the actual ones because the measure being analysed is very 'young' and allows only an ex-ante evaluation of what its main strengths are most likely to be. The criteria are presented in the column on the left while the ranking proposed by the author is presented on the right hand side of the table.

The high relevance given to the accessibility aspect is mainly justified by the goals set in the Mobility Pact, which aim to provide viable alternatives to the private car by promoting a public transport system that is integrated at the metropolitan level. It is not possible to have a clear idea of whether this goal will in fact improve mobility in the city as much, despite the stated goals of increasing vehicle and public transport speeds in the city centre. In fact, although accessibility by modes alternative to the car might very much increase, mobility in the city centre or at the interfaces between the centre and the surrounding areas might be impacted only to a more limited extent. The same is true for equity issues, when considering that nothing is stated about user costs for the improved public transport system or the parking policy pursued by the city. More generally, a more attractive urban area will result in higher real estate prices, which will have a negative impact on the lower income strata of the urban population. Complementary measures should then be foreseen in other areas of intervention by the local authority and therefore are not included in the Mobility Pact. Spatial development, including the accessibility of green spaces, will benefit from the broad goals of re-conquering public space and improving accessibility.

The criteria can be further grouped in three general sectors, which are in fact the three pillars of sustainability, based on the direct links highlighted in Table 2 of the Methodology Outline (Chapter 1). The aim here is to evaluate whether the measure considered is balanced in that it does not exclude or impose a negative impact on any of the three facets of sustainability. Obviously, only a tentative evaluation can be made, as apart from the direct links that can be identified, there is a range of indirect impacts which can only be foreseen but not adequately weighed before the implementation of the Mobility Pact. From the goals of the Mobility Pact, the situation of the City of Barcelona sketched in the first section, in Table 1 and in the section dedicated to site-specific characteristics, it seems to be possible to summarise the likely implications of the Mobility Pact on overall urban sustainability as follows.

Table 3A
From the Areas Impacted to an Overall Consideration of Sustainability

Pillars	Ranking			
	Irrelevant	Marginal	Average	Significant
Social				✲
Economic		✲		
Environmental		✲		

Additionally, it has been considered worth collecting other corollary but nonetheless relevant information, namely on the city's organisational structure, legal framework and citizens' awareness. These data are presented in the Sections on Urban Dynamics and the regulatory framework.

Site-specific Characteristics

Co-ordination mechanisms within the urban mobility area have received a considerable boost from the agreement to adhere to the Mobility pact made by a number of actors and stakeholders from the public and private sectors as well as community representatives. The idea would then be that of building upon strengthened links facilitated by shared objectives to improve the measure and make it fully operational. The outcomes that can be evaluated at the moment are not really balanced and, indeed, they could not be, considering that this is a very recent measure aimed at providing a common base for discussion on mobility measures in Barcelona. The Mobility Pact by itself, though holistic in its approach has an impact mainly on social aspects, as shown in Table 3A.

Site-specific factors for Barcelona are the cohesion procedure, the co-ordination mechanisms as well as the problem structure, to be compared with that of the other cities in the cross-site comparison. The desirability of a wider implementation of the Mobility Pact is still lacking clear parameters for evaluation to receive full support, although it is clear already that the measure aims at maintaining the city as a community space. The loss of the city as a collective space leads to the functional fragmentation of the urban area induced by increasing extension and by the growth in the use of private cars. Therefore, the Mobility Pact seems to be a valuable attempt to concentrate attention and action of the public authority onto the internal aspects including the quality of the urban space, its creativity and citizens' satisfaction. Possibly, Indeed, the aim of the action is that of increasing the role of the city in defining its citizens' identity and their sense of belonging, which is a pre-condition to the co-operation needed to achieve sustainability within and around the urban area.

No specific budget has been assigned to the Mobility Pact, however it is envisaged that targeted Task Forces and Working Groups will be set up and that they will be allocated a budget. The absence of data at the moment, however, makes it difficult to assess the feasibility and attractiveness of the overall measure. The additional information provided on Barcelona shows that citizens have good access to environment- and traffic-related information from the public authorities. Although no communication campaigns have been launched in 1999 specifically targeting the Mobility Pact, greater transparency of mobility-related information and management, together with increased opportunities for citizen participation in the decision-making process is directly linked to the adoption of the Mobility Pact.

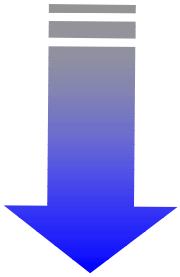
Obstacles and Benefits

According to the results of the questionnaire in Barcelona, the main obstacles to the implementation of the Mobility Pact that have been identified primarily revolve around organisational and financial

difficulties. The lack of acceptance of innovative measures on the part of the citizens is cited as the primary bottleneck for the successful implementation of the measure.

Top five obstacles to the implementation of the Mobility Pact

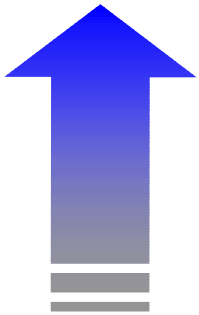
1. Lack of Acceptance of Innovative Measures of the Part by Citizens
2. Complexity of the New Initiative
3. Insufficient Public Funds
4. Legal Problems
5. Problems of institutional/inter-department Co-operation



The benefits expected from the implementation of the Mobility Pact in Barcelona must necessarily be linked with other measures targeting specific aspects for the improvement of mobility in the city and, specifically, a better match between the needs of passenger and commercial traffic.

Top five expected benefits from the implementation of the Mobility Pact

1. Better Access for Citizens
2. Better Technical Organisation
3. Better Organisational Integration
4. Improved Planning/ Decision-Making
5. General Higher Quality of Public Services



The exposition above gives a simple ranking of the problems resulting from the questionnaire without applying weightings to them. The sames is true of the way the top five mobility-related problems affecting the City of Barcelona have been set out.

Top five mobility-related problems in Barcelona

1. Congestion
2. Freight Transport (Commercial Traffic)
3. Load and Unload
4. Parking
5. Enforcement of Measures

An examination of the benefits and problems encountered when applying the Mobility Pact in full in Barcelona should not only rest on the kinds of mobility problems experienced in the city but also needs to take into account also the organisational mechanisms that exist there. Although the organisational solution currently in place in Barcelona does not foresee the existence of an agency in charge of planning, developing and managing transport technologies and, more generally, the transport system, there are several co-ordination mechanisms. Regular meetings are held between mobility-related units of the city administration, transport stakeholders in the public and the private

sector. Additionally, meetings are regularly held across levels of the public administration (between the local and the regional and national levels) in charge of transport and mobility. This institutional setting has certainly paved the way to the Mobility Pact, both as a possible solution to the shortcomings of the existing co-ordination mechanisms and also as an outcome of their existence. Indeed, Barcelona is looked upon as a model of local public administration at the world level. The modernisation of local public management based on citizens' participation, transparency of public action and the flexibility of decentralised management units compared to crystallised managerial processes are sometimes referred to as the 'Barcelona model'.

Observations

In view of the results of the questionnaire and the additional information collected on the City of Barcelona, it is interesting to try a rough assessment of whether the Mobility Pact is a valuable solution to the mobility problems of Barcelona. Above all, it is of interest to consider whether the adopted approach can be labelled as 'sustainable' that is balanced as far as its impacts on the social, environmental and economic domains are concerned. The considerations regarding the possibilities, and indeed the opportunities, for transferring the experience of Barcelona to other European cities will be tackled at a later step in this report, i.e. when carrying out the cross-sites comparison.

The attractiveness of a proposed measure can be evaluated by weighing up its impacts and its cost-effectiveness. In terms of impacts, the analysis of the quantitative indicators shows that the social impacts of the Mobility Pact on the City of Barcelona are significant, whereas they are minor with regard to environmental conditions and economic activities. Nonetheless, it has to be borne in mind that the measure analysed is very recent so that it is not possible to make an inter-temporal evaluation of its impacts and, much less, of its further developments. As mentioned above, the Mobility Pact seems to be an appropriate instrument for maintaining or re-building the urban texture and the 'spirit' of the city. It represents therefore a solid basis from which to tackle the main problems of the city, specifically congestion and the balance of passenger and commercial traffic. Considering the cost-effectiveness of the Mobility Pact, it does not seem to impose significant costs on participants, but rather sets the framework conditions to bring them together into a discussion forum where more specific measures - and therefore specific costs attached to each measure - can be discussed and agreed upon.

Nonetheless, uncertainties remain about the effectiveness of the proposed framework. To safeguard the efficient operation of the Mobility Pact, it seems that regular evaluations need to be included in its functioning and it might also be useful to monitor the activities of its subscribers in the light of the objectives indicated in the document.

The regular progress assessment of the objectives stated in the Mobility Pact and monitoring of signatories' activities is made difficult by the absence of targets (qualitative or quantitative) as no targets have been defined to trace progress towards meeting the general objectives. Indeed, there are no safeguards to ensure that the Mobility Pact is no more than declaration of good intentions leading to no practical results, and in fact there is no guarantee that this will not happen. In light of the successful modernisation of Barcelona's local management though, the probabilities of success seem high. However, it is hard to express the same optimism about transferability of the experience to other European areas. The context in which the Mobility Pact has developed relies upon site-specific factors such as the existence of an active and organised civil society and the public authority's openness to dialogue.

Additional Information

In line with the measure analysed and in contradiction with the somewhat negative conclusions drawn above, it is worth highlighting some of the information provided via the optional section of the questionnaire. It seems that the local authority is making a considerable effort to make environmental information broadly available to the citizens in Barcelona.

Thus, information about the levels of key local air pollutants are available on the Internet, on Videotext as well as via more traditional media such as local press and local radio and TV stations. Forecasts about air pollution levels are available via basically the same means, whereas forecasts on noise levels are only available on the Internet. Information about traffic conditions and various transport modes is broadly disseminated via the Internet, public kiosks, by telephone and via the traditional local media. Decisions encompassing sustainable mobility are concretely supported only via the local press and local TV and radio stations.

The Internet seems to be useful also for enhancing public participation in the design and management of the city of Barcelona. Examples include the possibilities for involvement in discussion groups and community networks, the chance to make suggestions to the local authority and lodge complaints (also by telephone and fax), to express opinions about the planning process and to request public documents.

The Case of Bremen

As in the previous Section, this section gives a brief overview of the urban area analysed, which in this case is the Hanseatic City of Bremen. The structure of the presentation is the same as that used in the case of Barcelona.

It should be noted that as the questionnaire was returned to us incomplete, we do not have information on a number of points. Therefore, additional information has been sought from other sources concerning mobility and planning-related measures in the city as well as other cities' experiences with car sharing. Nevertheless, the lack of information limits the possibilities of direct comparison with the other four cities considered in this study.

Site Description

The City of Bremen located in the North-West of Germany is one of the Hanseatic Cities, together with Hamburg, Lübeck and Rostock. Hanseatic cities enjoy a broader autonomy and each constitute a state in the federal institutional system characterising Germany. The Hanseatic City of Bremen is the smallest state in the country, comprising Bremen city and the port city, Bremerhaven. It is a city of almost 547,000 inhabitants and covers an area of 326 km^2. The population density of the city has an average of 1722 inh/ km^2 which reaches its peak in the city centre with 4940 inh/km^2.

Table 1B

Basic Indicators	**Bremen**
Urban Land Cover	317.66 km² (100%)
Built-up Area	171.96 km² (54.1%)
Green Space	141.6 km² (44.6%)
Derelict Areas	4.24 km² (1.3%)
Urban Renewal Areas	N/A
Area Dedicated to Transport Network	1528 km
Mono-functional Areas	N/A
Land-use distribution by Housing Units	271.000 housing units (33.6% of total urban area).
Proximity to Urban Green Space	N/A
Urban Population Density	centre: 4940 inh/km²; 1722 inh/km² average
Employment Distribution in Productive Sectors / Weight of SMEs	N/A
Unemployment	N/A
Employment of People with Reduced Mobility	N/A
Concentration of local pollutants (e.g. SO2, NOx, CO, PM, Lead, Benzene)	N/A
Exposure to Noise (inhabitant per time period)	N/A
Car Ownership	440 car/ 1000inh
Traffic Volumes/ Average Vehicle Speed	N/A/ car: 15-20 km/h; PT: 21.9 km/h
Commuting Patterns	10% by PT; 3% by bicycle before and after the implementation of the measure

No information about the employment structure and economic performance of the City of Bremen was provided on the questionnaire, but other sources state that the main sectors of economic activity comprise the motor industry, steel-plants, shipbuilding, port activities and trade, services and administration. Equally, no information was provided about air quality levels and air pollution crisis in the course of 1999. This makes it obviously difficult, if not virtually impossible, to venture any guesses about the position of the city with regard to sustainability. Nonetheless, some detailed information on the transportation network and the citizens' mobility patterns were provided.

The road network covers 1528 km, cycling tracks cover 650 km and pedestrian areas 3.4 km in total. Car ownership is 440 per 1000 inhabitants and, on the average, each inhabitant of Bremen travels 659 km by car, 207 km by public transport, 218 by bicycle, and 192 km on foot each year. The average speed of private cars in the city centre ranges between 15 and 20 km/h while the performance of public transport vehicles is better with an average speed of 20.1 km/h. Nevertheless, it is difficult to compare the performance of public transport and private cars due to the lack of information about the number of vehicles using the urban road network on an average day.

Additionally, some information was provided on commuting patterns and is presented in the table below. With regard to the way the situation is evolving over time, the only significant change seems to be in the number of customers of public transport, although it does not seem that this increase is having an impact on commuting patterns into the city.

Car-sharing in Bremen

A car-sharing scheme has been developed in Bremen as a centralised network of user groups and vehicles for shared use. This means shifting individual mobility by private car from the notion of ownership of a vehicle to that of using a service, i.e. the vehicle.

Low basic costs and a pay-as-you-drive system are basic elements of such schemes, which have been set up in approximately 300 European cities, in Switzerland, Germany, Austria, The Netherlands and the United Kingdom. The aim of car sharing schemes is the rationalisation in the use of resources and is complementary to other innovative measures of urban transport and mobility, such as making public transport systems more attractive to users, supporting cycling and walking and integrating of mobility service provision in planning and land-use development schemes.

In Bremen, StadtAuto was founded in 1990 as a private initiative (with the legal status of a club) and is currently a limited company working as a mobility service company. In June 1997, the German Conference of the Ministers of Environmental Protection adopted standards for 'ecologically-friendly car-sharing'. It was then recommended that car-sharing schemes and organisations be supported on account of their positive impacts on the urban environment.

Initially, the activity involved only 28 participants sharing 3 cars. In the summer of 1999 these figures had grown to 1700 users with more than 80 cars available at 40 car-sharing locations. Consideration the size of the population of Bremen, these are big numbers. Additionally, it is worthwhile mentioning that car sharing is now mentioned in city development plans and will be used for new developments.

Co-operation with both private and public actors is an interesting feature of the development of StadtAuto in Bremen. Indeed, an agreement with Opel Auto allows the requested number of vehicles to be supplied at peak periods, such as during weekends. Apart from the inclusion of car sharing in city development plans, close collaboration with the City (and State in the case of Bremen) administration has led to joint projects at the European and local level. At the same time, the European organisation of Car Sharing (ECS) has been located in Bremen.

Car Sharing in Bremen cannot be seen in isolation, as it is complements a number of other measures targeting environmentally-friendly modes of transport, such as public transport, cycling and walking. Car sharing works in fact as a 'mobility insurance' policy when public transport is not available (nights

and distant locations) or when cycling and walking are not appealing to the user (long distances, bad weather conditions or when carrying goods). Indeed, it is interesting to look at the increasing collaboration schemes between car sharing and public transport. In fact, surveys in Bremen show that car sharers tend to use more often public transport and not only in peak hours. A major project in Bremen is the *Bremer Karte plus AutoCard* combining car sharing and the monthly or annual public transport pass in a contactless smart card, including a "car-on-call" service with electronically controlled access.

In particular, the booking process is easy: members phone the booking office and make a reservation for the car they need at one of the StadtAuto locations. The locations are equipped with either an intelligent locker, containing the car keys, or give direct access to the cars via the smart card. Vehicles accessed by smart card have an on-board computer, linked via mobile phone to the central booking office, and a transponder field on the windscreen. The smart card identifies the user, the computer then releases the doors, the immobiliser is released after entering the PIN code via a small keypad on the dashboard. The ignition keys are in the glove compartment.

Two thirds of all rentals last less than 6 hours. The rates per hour vary depending on the type of car. Cars can be booked and taken at any time, day or night. About 50% of all rentals are booked less than 6 hours before the start of the journey and around 25% of rentals are booked just before the car is needed. The European Car Sharing network (ECS) provides access to cars in more than 300 towns and cities in Europe as of January 1998. The implementation of intelligent lockers near public transport stations should improve access to StadtAuto vehicles. This target is carried out together with the development of quality standards for energy-efficient car sharing organisations in the framework of the ZEUS (Zero and Low Emission Vehicles in Urban Society) project within the THERMIE program of DG Energy.

The Bremer Karte plus AutoCard started on 1 June 1998 and gained almost 500 new participants in the first 12 months. A survey carried out by the University of Bremen in charge of the ZEUS project has shown that about 150 cars have been replaced. 16% of the new customers of the Bremer Karte plus AutoCard are new customers for public transport season tickets. The same study concluded that a considerable shift has also been observed in the performance of the public transport company, which increased the share of new users with annual passes from 54% to 78% giving public transport a major role as a basic means of transport, although there is no evidence that this is an impact of the introduction of car-sharing alone.

Table 2B
Car Sharing: Qualitative assessment of its likely impacts

Criteria	Ranking			
	N/R	+	++	+++
Accessibility			✲	
Mobility			✲	
Equity			✲	
Economic Activity		✲		
Traffic Density (Congestion)				✲
Air Quality				✲
Acoustic Quality				✲
Spatial Development (including Accessibility of Green spaces)			✲	
Rational Use of Materials and Energy				✲
Technical Safety and Personal Security in Vehicles and Transport Infrastructure				✲
Visual Impact		✲		
Preservation of Cultural Heritage		✲		

N/R = not relevant; **+** = slightly positive; **++** = positive; **+++** = very positive

The table above attempts to draw some information from the questionnaire circulated to decision-makers in the City of Bremen and information collected from other sources, namely evaluations of the measure introduced to understand the impacts of the measure adopted. The criteria are presented in the column on the left while a ranking is proposed on the right hand side of the table.

It seems that car-sharing schemes can certainly improve mobility in the urban area, and that they have a positive impact on equity and therefore on accessibility for all. Reducing congestion is possibly the first impact of car-sharing as it allows the same level of mobility with a reduced number of vehicles on the same streets, which has an impact on both air quality and noise levels. Obviously, a limited experiment does not allow conclusions to be drawn about the progress of the city's mobility system towards sustainability, but it does highlight its strong points. The reason for the high value attributed to 'Safety' is due to the fact that shared cars are regularly checked by the supplier to ensure thay are in perfect condition. They are also more difficult to steal or break into into, thus enhancing users' personal security.

The criteria proposed above can be further grouped into three general sectors, which are the three pillars of sustainability, based on the direct links highlighted in Table 2 of the Methodology Outline (Chapter 1). The aim here is that of evaluating whether the measure, or the range of measures, considered are balanced in that they do not favour any of the three facets of sustainability over the others.

Table 3B
From the Areas Impacted to an Overall Consideration of Sustainability

Pillars	Ranking			
	Irrelevant	Marginal	Average	Significant
Social			✲	
Economic			✲	
Environmental				✲

Despite the limited scope of the car sharing initiative, which does not allow its impacts on the overall sustainability for the City of Bremen to be evaluated, it is possible to highlight its main implications. Due to the fact that the negative impacts of transport on congestion and therefore urban air quality and noise levels are reduced by car sharing, on account of the reduced number of vehicles circulating on the streets, the main sustainability dimension impacted would seem to be the environment. Nonetheless, a change in the social values attached to car-ownership is expected to influence the social dimension of sustainability. Additionally, the local authority anticipates that it will be in the position to convert public space currently devoted to cars (parking areas) to common areas available for the use of other citizens (parks, playgrounds), which also adds to the 'social' quality of the city. Such a change is expected to progress with the continuation and the enlargement of the car sharing initiative. The impact on the economic dimension of sustainability stems mainly from the reduction in congestion.

Site-specific Characteristics

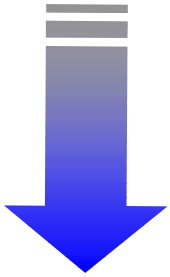
The site-specific characteristics of Bremen are worth mentioning after having attempted a preliminary evaluation of the car-sharing schemes implemented in the city. First, it is worth mentioning the on-going commitment of the local authority to improving mobility in the urban area. Secondly, it is worth mentioning the greater degree of autonomy enjoyed by the Bremen local administration as a city-state. Thirdly, the adoption of high-tech solutions to facilitate the widespread use of innovative mobility measures seems to play an important role in underpinning the feasibility of the car-sharing scheme. Fourthly, it is worth drawing attention to the degree of environmental awareness in the city, namely for actors involved in the implementation of innovative mobility patterns in the city, such as StadtAuto and a number of developers, who as early as 1992 proposed the option of a car-free neighbourhood. Indeed, the acceptability of measures aimed at introducing alternatives to current mobility patterns seems fairly high in Bremen possibly because it is happening on fertile ground. Nonetheless, the second major obstacle identified by questionnaires to the broader implementation of Car Sharing in Bremen is precisely the lack of awareness on the part of the citizens.

Obstacles and Benefits

According to the answers given by the local authority on the questionnaire, the main obstacles identified for the broader implementation of the Car-Sharing scheme relate to problems of a technical nature only marginally. Indeed, the highest priority has been assigned to organisational problems and, specifically, mechanisms of collaboration between the city's departments and institutions involved. Conversely, the top benefit of the Car-sharing initiative would be to contribute to solving that problem by enhancing collaboration at the institutional level.

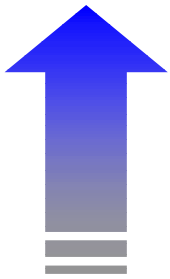
Top five obstacles to the broader implementation of Car-Sharing in Bremen

1. Problems of Institutional/Inter-department Co-operation
2. Lack of Awareness by Citizens
3. Lack of Acceptance of Innovative Measures by Citizens
4. Difficulty in Supplying Up-to-date and Relevant Information
5. Technical Problems



Top five benefits expected from the wider implementation of Car Sharing in Bremen

1. Better Co-operation with Other Institutions
2. Better Organisational Integration
3. Better Technical Organisation
4. Better Access for Citizens
5. Improved Planning/Decision-Making



The questionnaire did not ask respondents to place weightings on each of the obstacles and benefits, so they are presented here according to the priority given by the local authority in the questionnaire.

Top mobility-related problems in Bremen

1. Noise
2. Lack of Parking Space
3. Air Pollution
4. Congestion

Again, it would be interesting to evaluate the perceptions about expected benefits and obstacles to more extensive car-sharing schemes in Bremen against the organisational background of the city administration. Unfortunately, very limited information has been provided on this aspect on the questionnaire. There are no strategic plans for either transport or environmental protection in the city and no information was provided on co-ordination mechanisms between services within the local authority and across levels of public administration (federal level).

Observations

In view of the results of the questionnaire and the additional information collected on the City of Bremen, it is interesting to try a rough assessment of whether the Car-Sharing scheme is a valuable solution to the mobility problems of Bremen. Above all, it is of interest to consider whether the adopted approach can be labelled as 'sustainable' that is balanced as far as its impacts on the social, environmental and economic domains are concerned.

Attractiveness can be evaluated by taking into account the impacts of the proposed measure and its cost-effectiveness. Considering the first aspect, the analysis of the quantitative indicators shows that the environmental impact of the Car-Sharing scheme in Bremen are interesting, although limited in scope for the time being. From the social viewpoint, the initiative is highly acceptable thus enhancing its feasibility and its attractiveness and facilitating its implementation on a wider and wider scale. Indeed, the existence of the European Car-Sharing draws immediately the attention to the transferability potentials of this scheme and its more widespread implementation throughout Europe. Further considerations regarding the possibilities, and indeed the opportunities, to transfer the experience of Bremen to other European cities will be expressed at a later step in this report, namely when carrying out the cross-location comparison. No negative impacts on the economic activities and the competitiveness of the city as such could be detected. On the contrary, improved mobility and accessibility in the urban area allowed for by car sharing is expected to have on the average good impacts on the economic texture of the city. Additionally, from the single user's viewpoint the use of a shared car reduces the costs of a privately owned car (for instance, by paying only a share of the yearly insurance and yearly tax). This allows the analysis to conclude that the car-sharing scheme in Bremen is a significant measure in the quest for sustainable mobility at the local level.

The feasibility of the measure, or its implementation, can be evaluated by looking at its acceptability to users, the willingness of the parties involved to incur higher costs than otherwise expected, and the technical and organisational feasibility of the measure.

It seems therefore that the Car-Sharing scheme implemented in Bremen is an ideal solution, although attention must be paid to the fact that there are certain limitations to generalising the success of Car-Sharing schemes and expanding their use. In particular, shared cars are used intensively by drivers who individually drive little. The intensity of use of the vehicle is a prerequisite to keep the costs at a reasonable level for each individual user. But at the same time car-sharing is attractive only to those who are not using the car intensively anyway. This is the market segment in which car-sharing schemes promise to be successful. At the same time, it is interesting to consider whether expansion could take place outside urban areas where population is dispersed and public transport less frequently available, if at all.

Further reading on car-sharing experiences (World Transport Policy & Practice, 1999) focuses attention on the overall positive performance of car-sharing on the world scene. The only remark to be made on this point is that information about the impacts of Car sharing on the dimensions of sustainable development should be collected more systematically and subsequently disseminated to the widest audience possible. It seems that the City-State of Bremen is well on the way to do that by giving a high profile to its car-sharing experience and drawing increasing attention to its success.

No optional information about interaction with the general public and availability of mobility and environment-related information were provided by the city-state authority.

The Case of Nottingham

Here too, some background information on the City of Nottingham will be given at the start of the section dedicated to analysing the impact of Commuter Schemes on Nottingham's Transport and Mobility situation. As the analysis proceeds, outstanding differences from the cases presented earlier will be highlighted so as to draw attention to some site-specific characteristics and, therefore, to the caution necessary when interpreting the schematic tables translating quantitative indicators into more general categories of indicators.

Site Description

Greater Nottingham in the East Midlands (UK) has a population of 750,000, thus making it the largest conurbation in the region. The City of Nottingham itself has a population of 286,800 with a density of 3844 inh/km^2, which drops to 2000 inh/km^2 in the city centre. The reader will no doubt be struck this major difference compared with Barcelona and Bremen. In Barcelona density is extremely high both on average and in the city centre. Bremen does not show a dense population pattern in the overall area, but concentration rises in the city centre. The opposite is true for Nottingham City.

Nottingham is an active urban centre, and one of the consequences of this is that it attracts large numbers of cars of both workers and visitors on a daily basis. Quality of life in the city is therefore at stake as a result of increased air pollution and growing congestion. The lack of information on average speeds of vehicles used for public and private transport makes it difficult to obtain a view of the congestion problem faced by Nottingham.

The tertiary sector forms the mainstay of the city's economic structure, as we have already seen to be the case in Barcelona. Again, lack of data makes it impossible to say whether this is also true of Bremen. Unemployment is much higher for men (78% of the unemployed) than for women (22%). The 25-44 age group suffers the worst unemployment rate, accounting for 35.9% of total unemployment, followed by the 16-24 age bracket which accounts for 25.2% of total unemployment.

Urban space is 87% covered buildings and 13.4% is set aside for green space. The total housing stock comprised 119,000 housing units in 1998 and 25% of the built environment is dedicated to purposes other than housing. The road network of Nottingham City covers 775.3 km with approximately 100 km of cycling tracks and 2 km of pedestrian roads.

Average speeds for private cars and public transport were not available for this survey, which makes it difficult to assess the problem of congestion experienced in Nottingham. Transport to and from work represents an important share of trips in all urban areas and the City of Nottingham is among the pioneering examples in dealing with commuter traffic. Although no comprehensive information has been provided on the modal split in Nottingham, detailed information is available on commuter patterns. It is worth highlighting is that commuter distribution across different modes (public transport and bicycle) has been considered only for workers commuting into the city centre (84000). The table does not include information on commuters going out of the city to reach their places of work. No information about the modal split of those was provided but it is relevant to mention that they count for 22000 people.

Table 1C

Basic Indicators	Nottingham
Urban Land Cover	74.6 km² (100%)
Built-up Area	65 km² (87%)
Green Spaces	10 km² (13.4%)
Derelict Areas	<0.1 km²
Urban Renewal Areas	Very little
Area Dedicated to Transport Network	N/A
Mono-functional Areas	N/A
Land-use Distribution by Housing Units	119000 units in 1998 of which 19% are apartments. 25% of built-up area is destined to purposes other than housing
Proximity to Urban Green spaces	N/A
Urban Population Density	Centre: 2000 inh/km²; Average: 3844 inh/km²
Employment Distribution in Productive Sectors / Weight of SMEs	Tertiary 78%, Secondary 22%, Primary <1% Highly relevant in the tertiary sector: 35000 employees; Relevant in the secondary sector: 8000 employees Present in the primary sector: <1000 employees
Unemployment by gender	Male: 78; Female: 22%
Employment of People with Reduced Mobility	24%of those of working age
Concentration of local pollutants (e.g. SO2, NOx, CO, PM, Lead, Benzene)	N/A (monitoring scheme fully operational in 2005)
Exposure to Noise (inhabitant per time period)	<20%
Car Ownership	250 vehicle/ 1000inh
Traffic Volumes/ Average Vehicle Speed	N/A
Commuting Patterns into the Urban Area	62400 (74.2%) by PT; 3200 (3.8%) by bicycle

The information provided in the table above deserves comment. First, as already pointed out at the start of this section, the density of population in Nottingham is low compared to that of the other cities included in this survey, and particularly so when the density of inhabitants in the city centre is considered. Secondly, car-ownership is very low and, thirdly, the share of commuters by public transport is currently very high in comparison with those in the other cities.

Although the strategy to monitor air quality is currently not fully operational and will be in 2005, it is worth mentioning that data are available although the new strategy will dedicate increasing attention to transport-related air quality problems. Current air quality monitoring shows low levels of sulphur dioxide (SO_2), apart from some episodes closely linked to weather conditions bringing in pollution from a distance. Average PM10 is generally below the threshold established in the National Air Quality Strategy (NAQS), except for some episodes closely related to the SO_2 pollution trend. Carbon monoxide levels are also normally low and far below the NAQS running 8 hour mean. Ozone air pollution is low overall with the exception of some slightly higher than average readings at some of the monitoring stations and mainly during summer months.

Commuter Planning in Nottingham

This section focuses exclusively on the initiatives in the area of commuter planning, despite the fact that Nottingham is actively involved in a number of other mobility management-related actions such as the Clear Zones of the DETR and the MOST project funded by the European Commission's Fifth RTD Framework Programme tackling transport and the problem of social exclusion.

Interestingly, the Commuter Planning Strategy started by the local authority is having a considerable on-going positive impact on other organisations. A good example is provided by the Green Commuter Plan adopted by Nottingham City Hospital, which is structured as a cycling strategy, a pedestrian strategy, facilities for disabled people and partnerships with public transport operators. Before entering other topics though, let us start from the beginning with the Mobility Adviser promoting Green Commuter Plans and the Commuter Planners Club, both initiated by the City Council.

In the framework of the EU-funded project MOSAIC[2], the City of Nottingham created the position of full-time Mobility Adviser to stimulate and support Green Commuter Plans[3]. This meant that a qualified employee with a knowledge of both Green Commuter Plans and planning and transportation was employed to work together with the major employers in the city to (1) raise awareness and promote the idea of Green Commuter Plans; (2) provide support and advice. The first eighteen-month pilot was successful and it was subsequently decided to establish a permanent full-time post for the Mobility Adviser in the local authority. The initiative is part of the City's Planning and Transportation Strategy to reduce SOV commuting, increase demand for public transport, walking and cycling. The City's Planning Policy backs up the Strategy by targeting the reduction of free or low-cost long-term commuter parking.

The idea behind the Commuter Planners Club is that of providing a forum at which existing and new commuter planners can meet to exchange ideas, set up projects and formulate common approaches to shared problems. Meetings are attended regularly by employers who mostly represent large organisations (counting for about 1/3 of total employment in the city and 1/6 of employment for the Greater Nottingham area). The first Club was established by the City Council following discussion with the first Commuter Planners due to the observation that many of the difficulties faced were similar and would have benefited from sharing information, experiences and ideas.

The activities of the Commuter Planners Club have led to the creation of a tax sub-group which lobbies the national government to modify tax laws so as to de-tax financial commuter plan incentives. Also, the Club has led to the creation of partnerships such as the Cycle Friendly Employers Group which attracts national public funding to provide cycling facilities and incentives for staff.

[2] MOSAIC (Mobility Strategy Applications in the Community) UR-95-SC.165

[3] A Green Commuter Plan is a site-based plan for action implemented by an employer in partnership with staff which aims at reducing single occupant vehicle (SOV) commuting to a given site. The plan promotes actively public transport, walking and cycling.

Table 2C
The Commuter Planner Support Activities: Qualitative assessment of likely impacts

Criteria	Ranking			
	N/R	+	++	+++
Accessibility			✲	
Mobility				✲
Equity			✲	
Economic Activity		✲		
Traffic Density (Congestion)				✲
Air Quality				✲
Acoustic Quality				✲
Spatial Development (including Accessibility of Green Spaces)	✲			
Rational Use of Materials and Energy				✲
Technical Safety and Personal Security in Vehicles and Transport Infrastructure	✲			
Visual Impact		✲		
Preservation of Cultural Heritage	✲			

N/R = not relevant; **+** = slightly positive; **++** = positive; **+++** = very positive

The information collected via the questionnaire sent to Nottingham local authority enabled an analysis of the impacts of the measure being analysed, that is the impacts of the Commuter Planner support provided to local employers by the City Council via the Club and the Mobility Adviser. The criteria are presented in the left-hand column while a ranking is proposed to the right.

The main impacts of the Commuter Planner are seen in the areas of urban transport and, more specifically, commuter traffic. It is therefore a fairly straightforward matter to highlight that the main areas benefited include congestion (namely at morning and afternoon peak hours), air quality and noise levels in connection with the reduction of congestion. Overall mobility is improved and it is reasonable to assume that users of the road network (car or public transport) not participating in the commuting schemes supported by the Commuter Planner also benefit from smoother commuting traffic, thus having a favourable impact on accessibility.

The criteria outlined above can be further grouped in terms of the three pillars of sustainability. The aim is that of looking at the balance of the measure analysed in that they are not exclusively dedicated to improving the local situation in one of the three facets of sustainability.

The Commuter Planner support activities can not be considered as exerting more than a marginal impact on the social dimension of local sustainability in Nottingham, although they tackle its top mobility problem. Certainly, they do increase the sense of belonging and sharing for those participating in the commuting schemes but the impact on the average citizen is fairly limited, despite an indirect positive effect caused by improved air quality and reduced acoustic nuisances at peak hours. The economic dimension is impacted to a larger extent, as a consequence of reduced congestion at peak hours. The environmental dimension of sustainability is mostly benefiting from this exercise, as improved air quality and the more efficient use of resources seem to indicate.

Table 3C
From the areas impacted to an overall consideration of sustainability

Pillars	Ranking			
	Irrelevant	Marginal	Average	Significant
Social		✲		
Economic			✲	
Environmental				✲

Site-specific characteristics

The additional information collected in the optional section provides useful tips about the communication strategy adopted by the local authority and the accessibility of information for the citizens, which constitute a specificity of Nottingham.

The concern about commuter traffic in particular is not resulting in the needs of other user groups being neglected. In fact, the local authority provides specific information services for school children/young people, tourists, interest groups and NGOs as well as local industry and local businesses, which constitute the main target for the considered set of measures.

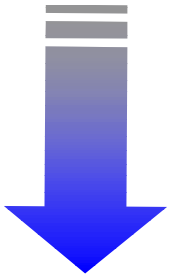
The local authority provides information on the state of the environment (namely air quality conditions and air-quality forecasts), traffic information and mobility-related decision support to the public as well as general information to increase environmental awareness. Information is provided via a multiplicity of means, including videotext, the Internet, telephone or fax, local media (press, radio and TV) and, limited to general information to increase environmental awareness, information at kiosks. Additionally, citizens in Nottingham can access local authority services to request information on traffic and the environment as well as to request specific municipal services.

Obstacles and Benefits

According to the questionnaire and in line with the nature of the measure considered, the top five problems related to the implementation of the measure in Nottingham are clearly non-technical ones. They relate mainly to finding adequate partners in the private sector, to inform and attract citizens to the proposed new mobility schemes, and to modify the regulatory framework.

Top five obstacles to the implementation of the Commuter Planner Support

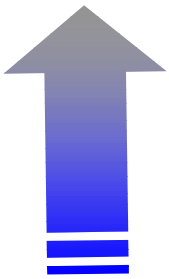
1. Identification of appropriate personnel in the private sector to drive the initiative forward
2. Lack of awareness among citizens
3. Legal problems
4. Problems of institutional/inter-departmental co-operation
5. Lack of acceptance of innovative measures by citizens



The benefits expected from continuing the implementation of the support measures focusing on curbing solo car commuting looking at both the Commuter Planner Club and the Mobility Adviser see in the first place the reduction of car-dependency. The other benefits are again non-technical in nature and are linked with a smoother organisation of mobility in the area.

Top five expected benefits from the implementation of the Commuter Planner Support

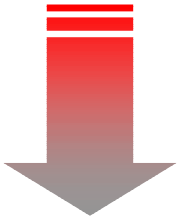
1. Modal shift away from the private car (Car-dependency reduction)
2. Better access for citizens
3. Better co-operation with other institutions
4. Better organisational integration
5. Improved planning/decision-making



Expected obstacles and benefits have to be seen in the light of the most important mobility problems experienced in Nottingham and, at the same time, against the organisational framework characterising mobility management at the level of the Nottingham local authority. The City of Nottingham has adopted two strategic plans targeting transport and the main environmental problems, respectively. Therefore, there are shared visions for the future of the city as far as mobility and the environment are concerned. There is no specific body in charge of planning, developing and managing transport technologies and transport systems, but co-ordination mechanisms are in place at the local level within the public authority and with the private sector as well as across levels of public authority at the national and regional levels.

Top-five mobility problems

1. Congestion
2. Air pollution
3. Increased use of the car
4. Decentralisation of employment/retail shopping
5. Declining use of public transport



Conclusions

Based on the information provided by the local authority via the questionnaire and additional information on commuter planning, it is possible to attempt a rough assessment of whether the measures adopted by Nottingham are making a valuable contribution to solving mobility problems. It is particularly interesting to consider whether the measures can be labelled as fostering 'sustainable mobility', that is having a balanced impact on the social, economic and environmental dimensions at the urban level.

The attractiveness of the measures implemented to promote more sustainable commuting patterns in Nottingham and to involve employers in their development can be evaluated by taking into account the impacts of the measure and its cost-effectiveness. From the questionnaire, no precise information is given about the costs incurred by local authority in implementing the measure, except that a full-time staff member has been employed for this purpose and that some money for the meetings has been allocated. However, it appears to be a relatively low-cost solution implying, above all, the commitment and the goodwill of participants as well as the prospect of obtaining some benefits from the public sector (not necessarily at the local level) from promoting an innovative scheme for employee mobility. It would therefore seem to be the perfect solution. Why is it then that the main problem in implementing the measure is finding appropriate private sector operators willing to take it on?

Perhaps giving further publicity to the positive results could help recruit new adepts or persuade sceptical employers. Indeed, although there is a newsletter available and very good information on the Internet, surprisingly little is said about achievements. Saying more about achievements would be

good promotion for the measures adopted by the local authority and – hopefully – help tackle the second main obstacle identified in the questionnaire for the successful implementation of the measure, which is the lack of awareness on the part of the citizens.

Site-specific factors for Nottingham seem to include the presence of a core group of employers (including the local authority) who share a vision for future transport in the urban area of Nottingham. From the information received, it seems that meetings among employers adhering to commuter planning schemes are appreciated, and prove useful to discuss shared problems and take action in view of common objectives. This willingness, and subsequently its achievements, is to a good extent the result of a specific culture which – nonetheless – faces no concrete obstacles other than the cultural ones for its transposition elsewhere.

The feasibility of the measure and of its implementation can be evaluated by looking at its acceptability to users, the willingness of involved parties to incur higher costs, and the technical and organisational feasibility of the measure. Users' acceptance is crucial here. The local authority claims in the questionnaire that citizens are not sufficiently aware of the measure and – my supposition – its benefits, and that there is a lack of acceptance of innovative measures on the part of the citizens. Here again it would seem that improved communication and information about the achievements of the commuter planning schemes might modify the situation and gain more supporters among the general public.

Additional information

With regard to the points raised above, it seems though that the local authority is taking care of informing the citizens about mobility issues as well as transport-related environmental problems. It is noteworthy that the 'general information to increase environmental awareness' is the only area where information is provided at public access kiosks, whereas other information is made available on videotext, the Internet, telephone/fax and local media.

The quarterly newsletter dedicated to commuter planning is published in runs of 1000 copies. It might be argued that this is not enough to enable widespread distribution. Nonetheless, to counter this argument, it has to be pointed out that 6 articles on commuter planning have been published in the local press in the last 12 months and three interviews were given at the local radio/TV channels in the same period. It seems then that appropriate coverage is being given to the measure.

What is maybe not broadly developed is interaction with citizens. The participation in discussion groups/community networks can take place 'in writing'. It is far from clear how this can happen. More or less the same works for participating in planning processes and for the provision of concrete support for sustainable mobility decisions. Possibly, broadening the channels of interaction with the citizens might result in better acceptance of commuter planning schemes, which – in spite of the fact they involve employers closely – have their very concrete impact on citizens' mobility patterns.

The Case of Strasbourg

When discussing transport policy, Strasbourg is almost immediately associated with its modern tram-lines and, more generally with measures aimed at reducing car dependency by making public transport more attractive. Indeed, the city has over ten years history of transport and mobility policy innovation.

First of all a clarification is necessary. The mobility policy analysed in these pages finds its source in the action of the *Communauté Urbaine de Strasbourg*, which is the authority grouping the 27 municipalities of the metropolitan area. For simplicity, it will be referred to as a 'local authority', but the reader should keep this point in mind

Site Description

The City of Strasbourg has a population of 263,896 inhabitants and is the nucleus of a broader metropolitan area of 433,000 inhabitants. The population density is not very high, with an average of 3,383 inhabitants per square kilometre in the 78 km² covered by the urban area. Not much information was provided via the questionnaire as far as the transportation network is concerned. Nonetheless, we know from other sources that there is a considerable network (around 300 km) of cycle ways. One distinctive feature of Strasbourg is that in 1997 the car ownership ratio which was as high as 1.01 per inhabitant. The number of vehicles on the road network of the *Communauté Urbaine* on a normal day is 220,000 with an enviable average speed for public transport vehicles of 50 km/h and an equally excellent average speed for private cars of 50 or 30 km/h, depending on the zone.

The information provided on the questionnaire was piecemeal. The absence of information about the road network and the space used by roads and parking, the built area and the availability of green spaces makes it impossible to draw any conclusions about available data on cycling paths, and the average length of trips per inhabitant by different modes. This is also because - in the latter case - only information about trips on foot or by bicycle were provided.

As in the other cases looked at, the economy is characterised by the fact that the primary sector plays only a very slight role, employing just 0.012% of the active population. The secondary sector employs just over a quarter of the active population, while the service sector employs slightly less than the remaining ¾ of the active population of the *Communauté Urbaine*. Unemployment measures are given in absolute numbers: 10,753 men and 8,960 women are unemployed, which leaves us anyway with an overall unemployment lower than 8% of the population.

Table 1D

Basic Indicators	Strasbourg
Urban Land Cover	78 km² (100%)
Built-up Area	N/A
Green spaces	N/A
Derelict Areas	N/A
Urban Renewal Areas	N/A
Area Dedicated to Transport Network	N/A
Mono-functional Areas	N/A
Land-use Distribution by Housing Units	N/A
Proximity to Urban Green spaces	Between 1/3 and 2/3 of population
Urban Population Density	N/A
Employment Distribution in Productive Sectors / Weight of SMEs	Tertiary 74.2%, Secondary 25.6%, Primary <1% Not very relevant in either the secondary or the tertiary sector: 470 and 1691 employees respectively;
Unemployment by gender	Male: 10.75 %; Female: 8.95%
Employment of People with Reduced Mobility	N/A
Concentration of local pollutants (e.g. SO2, NOx, CO, PM, Lead, Benzene)	Critical air quality levels on: 2 days in 1999 on 7 days in 1989
Exposure to Noise (inhabitant per time period)	N/A
Car Ownership	1010 vehicle/ 1000inh in 1997
Traffic Volumes/	220000 vehicles/day
Average Vehicle Speed	Private cars 50km/h or 30km/h in the city centre; Public Transport 50km/h in the city centre
Commuting Patterns into the Urban Area	29444 (44%) by PT; 27352 (51%) by bicycle (1997)

Transport Management in Strasbourg

The development of the new mobility policy in Strasbourg started in 1990 and arose out of the recognition that sustainable development was not compatible with the omnipresence of cars in the city. The first policy actions were based on the outcomes of a survey on mobility patterns in the city carried out in 1988 which revealed the clear dominance of the private car. The subsequent action plan was therefore based on the idea that this trend needed to be reversed. The general objective stemming from this observation was – in the case of Strasbourg – the willingness to design and reorganise urban spaces so as to provide a balanced situation for different modes of transport, and thus benefit walking, cycling and public transport.

The first result of the decisions adopted in 1989 was the constructing of the first tram line, line A which was completed in 1994. The performance of the line has exceeded expectations, with 70,000 passengers a day against rather than a forecast 50,000. The second line is under construction and expected to be finalised in November 2000.

As regards the analytical framework, intervention on the Transport & Mobility component has focused on Urban Dynamics. The overall goal has been split into three objectives: reducing private car traffic (accounting for 72.5% of urban transport in 1989); increasing public transport use (11% of urban transport in 1989); and, if possible, increasing the use of bicycles (approximately 12% in 1989). Acceptability was checked via a household survey in 1989.

In 1995, public transport services (trams and buses) were meeting the identified target of a 30% increase with respect to 1992 with a 32% increase of passengers, around 50% of them using park-and-ride facilities, thus proving the popularity of the mix of measures. In 1995, traffic entering the wider city centre had dropped by 17% with respect to 1992. Since 1997, a study has been under way involving the regional and national levels to see how public transport could be made more attractive in urban and suburban areas through improved co-ordination of rail and tram services.

Table 2D
New Mobility Policy: Qualitative assessment of its likely impacts

Criteria	Ranking			
	N/R	+	++	+++
Accessibility				✲
Mobility			✲	
Equity			✲	
Economic Activity			✲	
Traffic Density (Congestion)				✲
Air Quality				✲
Acoustic Quality				✲
Spatial Development (including Accessibility of Green spaces)	✲			
Rational Use of Materials and Energy	✲			
Technical Safety and Personal Security in Vehicles and Transport Infrastructure	✲			
Visual Impact			✲	
Preservation of Cultural Heritage			✲	

N / R = not relevant; **+** = slightly positive; **++** = positive; **+++** = very positive

The table above attempts to draw some conclusions from the quantitative measurements provided by local decision-makers in the Strasbourg *Communauté urbaine* so as to understand the impacts of the mix of measures adopted in the framework of the new mobility policy. The criteria considered as relevant for this analysis are ranked on the right-hand side of the table. They are rated from 3+ to 0, which indicates no impacts or mixed impacts. Congestion reduction and, subsequently, the related impact of transport on air and acoustic quality in the city are the areas where the new mobility policy undertaken by the Strasbourg *Communauté urbaine* had greatest influence. Equally, accessibility is greatly enhanced by the broadening of transport choices and the modernisation of the public transport system. The reduction of pollution and the fall in the use of private cars in the urban area has had a very positive impact also on the visual impact and enabled better preservation of the cultural heritage of the city, which is undoubtedly an one of Strasbourg's outstanding assets, both economically and otherwise. The new mobility policy is having a positive impact on the local economy through reduced congestion and improved mobility, although there are limitations due to the congestion problem existing on the outskirts of the urban area. Indeed, this is the next problem that the public authorities, on the initiative of the *Communauté urbaine*, want to tackle.

No information was provided on the strategy adopted by the *Communauté urbaine* to raise public awareness. Nonetheless, it seems possible to infer that there will be on-going involvement of citizens and other stakeholders in decision-making through the consultation processes (surveys) undertaken by the authority in the implementation of the most significant measures of the mobility policy. It is interesting to note that the totality of the budget dedicated to innovative measures in mobility is going to be used to fund the implementation of the steps foreseen by the mobility action plan.

It would seem worthwhile to compact the criteria outlined in the table above and attempt a rough assessment of the three pillars of sustainability. This would allow us to get an overview of the Strasbourg mobility policy from the point of view of sustainability. The initial considerations which motivated the action by the local authority were in fact based precisely on the need to ensure the sustainable development of the city and it was this that led to the need to reduce car dependency. The continuous support given to the measure proves that its outcomes have been received positively. The table below is explained with some detail in the next section, which covers the site-specific characteristics.

Table 3D
From the Areas Impacted to an Overall Consideration of Sustainability

Pillars	**Ranking**			
	Irrelevant	Marginal	Average	Significant
Social			✲	
Economic				✲
Environmental				✲

Site-specific characteristics

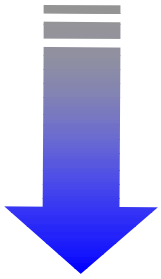
Objectives were achieved via a mix of measures, ensuring a balanced impact on the three dimensions of sustainability. Accessibility and equity grew thanks to increased transport alternatives. The city gained in terms of the attractiveness and economic viability of its centrally located businesses through improved accessibility and its image of a future-oriented, dynamic urban area. Environmental quality improved thanks to the reduction in through-traffic. Capacity in charged parking places has doubled since the inception of the new mobility policy growing from the initial 3000 to 6000.

Strategic objectives were clearly identified and shared by stakeholders, targets were defined and monitored, and care was taken to achieve a balanced impact on the various aspects of urban life. The analytical framework allows the strengths of the policy adopted to be identified (on-going political commitment of the local administration), its weaknesses (limited involvement of the private sector), and therefore site-specific and transferable aspects of the Strasbourg experience. The body in charge of the policy and its management is the Mobility department in the *Communauté urbaine*, whose activities are set in the context of both the mobility and the environmental action plan.

What is equally interesting is that the local administration functions as the innovation agent, exporting its mobility policy to the surrounding regions and fostering the adoption of innovative mobility patterns. That is to say, original objectives are being adapted to new spatial and time horizons.

Obstacles and Benefits

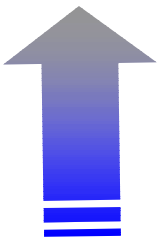
Top five obstacles to the implementation of Strasbourg new Mobility Policy



1. Legal problems
2. Problems of institutional/interdepartmental co-operation
3. Technical problems
4. Complexity of the new initiative
5. Insufficient public funds

The top obstacles identified by the local authority in Strasbourg with regard to the implementation of the new mobility plan are mainly of non-technical nature, which is hardly surprising considering the specific set of measures being assessed. Moreover, non-technical, and namely organisational and institutional problems emerge as the key problem area in all the cases considered in this study.

Top five expected benefits from the implementation of Strasbourg New Mobility Policy



1. Better access for citizens
2. Generally higher quality of public services
3. Better co-operation with other institutions
4. Higher rate of enforcement of regulations
5. Better organisational integration

The first priority of the new mobility policy is mirrored clearly as the top benefit of the measure under assessment, i.e. a user-friendly and therefore accessible urban area. The remaining four identified benefits focus once more on the organisational re-arrangements allowed – or needed – by the adoption of an integrated strategy for sustainable mobility in an urban area. Indeed, they are in line with the main obstacles to the implementation of this complex and innovative mobility scheme and the second top benefit highlights enhanced quality in the provision of public services, which is indeed a remarkable outcome.

Despite the brief presentation of the New Mobility Policy adopted by the Strasbourg *Communauté Urbaine*, obstacles and benefits need to be considered in the light of the identified top-five problems related to mobility. The questionnaire respondents have pointed out the following.

Top five mobility-related problems in Strasbourg

1. Commuting to work during rush hours
2. Freight delivery in the city centre
3. Peri-urban freight traffic
4. Adoption of pedestrian-friendly mobility measures
5. Implementation of 30km/h-zones and traffic control devices

The benefits and obstacles arising out of the adoption and implementation of a new mobility policy in Strasbourg give a snapshot of the current situation. Nonetheless, the situation is dynamic, as shown by the problems identified.

Commuter traffic is still perceived to be the main problem, despite the improvement in public transport and cycling and pedestrian facilities in the urban area as well as the implementation of park and ride schemes. The scope seems to be different though: it takes a step back from the urban area itself to adopt a wider perspective including the city's hinterland. goods traffic is considered to be major problem for sustainable mobility in Strasbourg, whilst mobility policy in Strasbourg has focused on passenger transport. At the same time, two problems are associated with freight transport: delivery of goods in the city and freight traffic around the city, so again widening the scope of the analysis.

Conclusions

The analysis of the innovative mobility policy in Strasbourg leads to very positive judgements. An integrated set of measures has been adopted since the beginning, based upon the regular verification with citizens of the acceptability of the measures adopted since the initial phase of policy planning (first survey in 1988, second survey in 1997) and the balanced combination of push and pull measures to alter transport behaviour, among other factors.

The capacity of the *Communauté urbaine* to have a medium and long-term perspective allows the mobility policy in Strasbourg to update its 'vision' of the future. The current plans for 2010 have not shifted away from the initial assumptions: enhanced public transport, better facilities for cyclists including rent-a-bike solutions, restrictive car parking policy based upon the extension of paying parking areas and park and ride solutions, traffic calming measures in the urban area.

At first sight, it seems then that the Mobility Plan is there and not being renewed really. The new scope of application of the mobility policy adopted in Strasbourg more than ten years ago though highlights the validity of the approach adopted, on the one hand, and, on the other, the willingness to expand its logic. The actions foreseen against the time horizon of 2010 promise to be extremely interesting as they target peri-urban traffic, including both private cars and freight traffic around the city.

The *Communauté urbaine* is therefore co-ordinating its activities with those of the regional authorities to articulate traffic flows at the regional scale. Activities also include additional modes of transport, particularly the links between train and tram services and improved connections with the city's airport. The city is therefore seen as embedded in its surrounding region. Strasbourg's special geographical position also means this implies considering cross-border traffic carefully.

The Case of Turin

The case of Turin differs considerably from the previous cases analysed for a number reasons. The technological, rather than policy-oriented, nature of the measures implemented, their initial pilot character, and the growing need to adapt the organisational framework in which the actors operated in the pilot scheme to ensure the successful transition from pilot to full-implementation. The fact that the City of Turin only recently became involved in the Car Free Cities network also makes it different from the other four cities considered here, as they were founding members of the network and have in fact contributed to shaping its activities. The recent economic history and reality of Turin as Italy's the 'car-city' is also an influencing factor.

Site description

Turin is the main city of the region of Piedmont and one of the biggest cities and economic centres in Italy. The current population of the city is 909,741 and the metropolitan area as a whole has 1,476,931 inhabitants. The population trends in the area of Turin have been marked by a constant decline in the population of the city since 1975, which has only partially been mirrored by decreasing of total population in the whole metropolitan area (the urban area and 24 bordering municipalities). Nonetheless, this drop has been very uneven, with the population booming in some areas but, on average, slowing down in the 1990s. The average population density in the city centre is 6,989 inhabitants per square kilometre, which drops to 2,212 when the metropolitan area is considered as a whole. The density is much higher in the city centre, where there are 10967 inhabitants per square kilometre.

Compared to the other cities considered in this study, Turin covers a much larger area: 130 square kilometres for the city itself and 668 square kilometres when considering the whole metropolitan area. Car ownership in the Turin conurbation has been growing steadily over the past twenty years and remains among the highest in Italy with 630 vehicles per 1000 inhabitants. The data for the national territory in 1998 showed a rate of 591 vehicles per 1000 inhabitants of which 539 are passenger cars.

The road transport network develops for 1500 km, with 70 km of cycling tracks and 100 km for the tram and rail network. The urban area of Turin leaves rather little space for green spaces, which represent 11.5% of the total. Derelict areas cover 3% of the total urban area and an area of exactly the same dimensions is affected by urban renewal plans. The remaining 85.4% is built-up area.

The density of population is mirrored by the overall number of housing units, which is 420945 for the urban area. The information provided with regard to newly built apartments offering parking space can unfortunately not be used, as it relates to the overall number of existing housing units.

Table 1E

Basic Indicators	Turin
Urban Land Cover	130 km² (100%); 668 km² with the metropolitan area
Built-up Area	111 km² (85.4%)
Green spaces	15 km² (11.5%)
Derelict Areas	4 km² (3%)
Urban Renewal Areas	4 km² (3%)
Area Dedicated to Transport Network	1500 km road network; 70 km cycling tracks;
Mono-functional Areas	100 km rail and tram network
Land-use Distribution by Housing Units	N/A
	420945 housing units in the urban area
Proximity to Urban Green spaces	
Urban Population Density	N/A Centre: 10967 inh./ km² Average (city): 6989 inh./ km² Average (city + metropolitan area): 2212 inh./ km²
Employment Distribution in Productive Sectors / Weight of SMEs	Tertiary 65%, Secondary 34%, Primary <0.1%
Unemployment by gender	N/A
Employment of People with Reduced Mobility	N/A 2-3%
Concentration of local pollutants (e.g. SO2, NOx, CO, PM, Lead, Benzene)	Critical air quality levels on: 2 days in 1999
Exposure to Noise (inhabitant per time period)	
Car Ownership	Between 1/3 and 2/3 of the population 630 vehicle/ 1000inh in 1997
Traffic Volumes/	
Average Vehicle Speed	600.000 vehicles/day Private cars 16km/h in the city centre;
Commuting Patterns into the Urban Area	Public Transport 14.05 km/h in the city centre 125.000 daily, residents in the Province of Turin PT: 23.000 (18.4%) in 1999; 29.250 (23.4%) in 1991; Bicycle: 2-3%

Other useful information provided by the local authority in Turin concern the overall capacity of paying parking spaces, which totalled 37,211 in 1999 and the figures for the sales of monthly public transport travel passes. Data are provided for 1997 and 1998 with 1,237,500 and 1,231,311 respectively, therefore confirming the trend for public transport use evidenced by the composition of commuting patterns in and out of Turin.

5T Project in Turin

In 1992 the City of Turin decided to start a large-scale project of mobility telematics called 5T (Telematic Technologies for Transport and Traffic in Turin). The 5T project's approach to mobility problems in Turin was driven by high technology solutions aiming at reducing average origin-destination travel times by 25% and to decrease both mobility-related air pollution and energy consumption by 18%. The system developed has an open architecture covering urban traffic control, public transport management, priority for emergency vehicles, parking control and management,

environment monitoring and control, driver information, fares and debiting. Since its inception in 1992, the main actors involved have been the local public transport operator and other public and private partners.

The financial commitment of 14.1 billion ITL (over 7 million Euros) by the consortium partners was complemented with 3.7 billion ITL (slightly less than 2 million Euros) from the Italian Ministry for the Environment and 5.7 billion ITL from the EU via the projects QUARTET (Drive II Programme) and its extension QUARTET+ (4th RTD Framework Programme). It is therefore an extremely expensive measure in comparison with the other case-studies looked at here. Nonetheless, it is also worth mentioning that the other cities are currently implementing primarily policy-oriented measures, and these might need to be backed up by technological solutions once implemented. This makes it even more interesting to look at the success story of 5T in Turin to consider what the impacts of the project are on sustainable mobility in the city, how it is expected to develop, and how the analytical framework can help identify and order the existing links and weights in the development of 5T in Turin.

First of all, an attempt is being made to move from the quantitative indicators briefly outlined above to the impacts of 5T on a number of criteria relevant to sustainability.

Table 2E
5T: Qualitative assessment of its impacts

Criteria	Ranking			
	N/R	+	++	+++
Accessibility				✲
Mobility			✲	
Equity			✲	
Economic Activity			✲	
Traffic Density (Congestion)			✲	
Air Quality			✲	
Acoustic Quality	✲			
Spatial Development (including Accessibility of Green Spaces)	✲			
Rational Use of Materials and Energy			✲	
Technical Safety and Personal Security in Vehicles and Transport Infrastructure			✲	
Visual Impact			✲	
Preservation of Cultural Heritage	✲			

N / R = not relevant; **+** = slightly positive; **++** = positive; **+++** = very positive

The table above aims to use the information provided in the questionnaire together with additional sources of information, such as the evaluation of the QUARTET+ project and the performance of 5T in Turin, to try and understand its impacts on a number of aspects directly related to local sustainability. Compared with the ranking given for other cities, it has to be borne in mind that the impacts of 5T have been evaluated and measured quantitatively under real-life conditions. Other measures considered in this report that can be classified as being 'soft' and not so highly technology-oriented as 5T, and not yet fully operational, have been given a 'tentative' ranking, that is 'as if' the policy had been implemented as planned or, in other cases, 'as if' the likely impacts were fully realised. In fact, however, this is something that hardly ever happens in reality.

It is worth trying to understand how 5T works, what its main components are and what purposes they fulfil, both separately and as a system.

5T is composed of nine subsystems and the *City Supervisor*. The City Supervisor integrates the subsystems to generate the best services to the citizens' mobility while ensuring the urban environment is protected. It is the most innovative development of the entire project. Every few

minutes it monitors the traffic, generates an hourly mobility forecast, tests the air pollution effects, and decides a general strategy for the following period in order to achieve and maintain user equilibrium, compatible with the environmental protection constraints. The subsystems co-operate with the general strategy taking the supervisor decisions into their specific operating strategies.

The *Urban Traffic Control* subsystem manages the traffic lights by a traffic-responsive regulation according to on-line local measurements and the area policies suggested by the supervisor. It also gives traffic light priority to public transport. Through SIS (the operation aid system running since 1994 on the Turin PT fleet) the *Public Transport Management* subsystem manages the public transport speed and regularity via position monitoring and traffic-light priority, again in line with the supervisor strategies. This subsystem also passes on the information to the public. The *Maximum Priority* subsystem helps ambulances navigate through the urban network and clears traffic light controlled junctions along the chosen route. The *Parking Control and Management* subsystem, in conjunction with 8 automatic parking areas, supplies forecasts of the availability of parking places and enables tele-booking by Videotel for customers with a smart card. The *Environment Monitoring and Control* subsystem uses weather forecasts, data from 11 pollution detection stations, and traffic data to allow it to generate short term forecasts of the environment conditions and make them available to the supervisor that it can adopt the mobility measures compatible with safeguarding the environment. The *Variable Message Signs* subsystems provides collective dynamic guidance to the different city districts and real-time information on the available spaces at the automatic parking lots. The *Route Guidance* subsystem helps drivers of specifically equipped cars in navigating through the route network in order to optimise the trip time within the real traffic conditions. It operates with 50 specially equipped cars. The *Information Media Control* subsystem supplies real-time information on the state of public transport, traffic, parking and the environment via Teletext and the Internet. It provides on-line information to help people make their pre-trip planning on the best mode and best route through 10 kiosks installed in different parts of the city. The *Fares and Debiting* subsystem ensures that payments can be made without stopping at automatic parking lots to the drivers of the 150 equipped cars. It also enables tickets for public transport to be bought at car parks using smart cards.

5T concluded the testing phase in December 1997 and the management phase has since started. The application of telematics to the management of transport and the provision of information to end-users has proven to have significant impact on urban mobility, and it is estimated that it will cut average journey times in Turin by 20%, with a corresponding increase of the road network capacity. The systems are viewed favourably by users and they have a positive impact on the choice of transport mode. Although only qualitative evaluations are available, 5T is leading to a structural modification of demand from private to public transport modes[4].

[4] For additional information on QUARTET+ and 5T, please refer to the following websites: http://www.trentel.org/transport/frame1.htm and http://frida.transport.civil.ntua.gr/qrtplus/

Table 3E
From the Areas Impacted to an Overall Consideration of Sustainability

Pillars	Ranking			
	Irrelevant	Marginal	Average	Significant
Social			✲	
Economic				✲
Environmental				✲

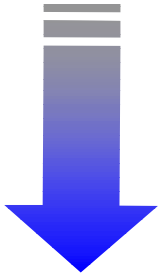
It seems that the rationalisation of urban traffic allowed by 5T has greatest impact on the economic and environmental dimensions of sustainability, due to the smoother situation of traffic in the urban area and the easier accessibility that it allows. The benefits for air quality have been demonstrated and, indeed, air quality regulations are among the parameters included in the functioning of the 5T system. Table 2E above presents acoustic pollution as not being relevant precisely because it is not expressly considered in the system. Nonetheless, it is more than reasonable to suggest that reduced congestion and smoother traffic flows will also have an impact on noise levels. The social dimension of local sustainability is possibly the least impacted by 5T, as it is not expected to exert a direct impact on travel behaviour or modal choices.

Site-specific characteristics

With regard to the analytical framework, the positive impacts of 5T on Transport & Mobility in the Urban Area of Turin have produced far-reaching effects on organisational schemes within the city boundaries and beyond. Regulatory frameworks are being revised to (a) extend the application to the whole public transport network and (b) turn the project consortium into a new body in charge of the management, integration and development of mobility in the metropolitan area of Turin. A revision of competence distribution is therefore under way at the local, provincial and regional level (mainly for environmental monitoring concerns) and a new approach to the organisation of the recently defined Metropolitan Areas are some of the outcomes of the 5T project. To put this evolution in its context, it is useful to consider the top-five identified obstacles and benefits resulting from the application of 5T and to consider at the same time the top-five mobility problems in the City of Turin.

Obstacles and Benefits

Top five obstacles to the implementation of 5T in Turin

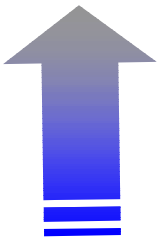


1. Complexity of the new initiative
2. Technical problems
3. Difficulty in supplying up-to-date and relevant information
4. Problems of institutional/ interdepartmental co-operation
5. Insufficient public funds

The top obstacles identified in Turin with regard to the implementation of 5T have a balanced focus on measures of both technical and non-technical nature. The management of a technically complex and integrated project faces problems arising out of the specific implementation and performance standards of the applications, as well as management and organisational problems.

Top five expected benefits from the implementation of 5T in Turin

1. Generally higher quality of public services
2. Higher rate of enforcement of regulations
3. Better technical integration
4. Greater cost efficiency
5. Greater/ improved awareness of environmental issues



One of 5T's top priorities to is improve the quality of public transport and make it more attractive to users. This will promote more rational use of the road transport network in the urban area of Turin but needs at the same time a clear political willingness to claim back the public space from cars so as to make public transport service more cost effective and generally improve management of road space . Alternatives need to be both available and attractive to the public if transport demand is to shift towards less environmentally damaging modes of transport. The close integration existing between the 5T architecture and environmental concerns, air quality in the urban area and also the quality of the urban space, allows both an improved enforcement of regulations and an increased public awareness of the urban environment.

Following the brief presentation of the 5T project, obstacles and benefits expected from its full-scale implementation need to be considered in the light of the top-five mobility-related problems identified in Turin. The questionnaire respondents have pointed out the following.

Top five mobility-related problems in Turin

1. Increasing public transport role in urban mobility
2. Creation of parking spaces
3. Transport and traffic safety
4. Reduction of air pollution and acoustic nuisance
5. Improved communication and marketing

With regard to the lowest priority, that is improved communication and marketing, the answers to the optional section of the questionnaire provide some insight. Citizens in Turin can get information on key local air pollutants, on air quality forecasts and also on traffic conditions via the teletext. Surprisingly, this information is not made available through the local press such as the local newspapers. This is possibly due to the incomplete information provided in the questionnaire , as it is a quite common source of information for air quality conditions in Italy. Citizens benefit from concrete support for sustainable mobility decisions (as a subsystem of the 5T project) via teletext, the Internet and public kiosks. General information aimed at raising citizens' environmental awareness is made available via teletext. Outside these specific areas, which are in fact closely linked to the 5T project, citizens have little access to information and no opportunity to participate in the city policy-making process. According to the questionnaire in fact, citizens can only request public documents via the Internet.

It seems indeed that the communication strategy of the public authority could be improved and citizens' awareness of the area where they live and/or work could be enhanced by enabling them to express their opinions and participate more actively via discussion groups as well as enabling the submission of suggestions and complaints.

Conclusions

The analysis of the implementation of the 5T project in Turin leads to very positive judgements although some gaps can be identified, namely on the side of communication and participation strategies with the citizens. An integrated, yet flexible and open, telematics architecture has been implemented and tested in Turin. The test phase has been accompanied by the verification with citizens of the acceptability of the solutions implemented. Possibly, the performance and the results of 5T though are not being made available to the public at large as systematically as they could.

The validity of the approach adopted by 5T seems now to have reached a level of maturity sufficient to allow it to exert its impacts fully on the organisational arrangements required by integrated management of mobility and, more broadly, increased quality of life in the urban area via the proper integration of socio-economic considerations, along with the metropolitan dimension. In this regard, it seems that the organisational development of the 5T consortium into a Mobility Observatory for the area of Turin will provide long-lasting results providing the appropriate co-ordination mechanisms are put in place. Certainly, this is a case to be followed closely and to be examined when the organisational part becomes operational.

Comparative Assessment and Concluding Remarks

The aim of this chapter is to compare the results derived from the analysis carried out in the previous one. In the first section an attempt is made to rank the problems identified and to check what kind of benefits the local authorities are trying to achieve by choosing a given mobility policy instead of some other alternative. This choice is inevitably linked to contingent and complex considerations. The result here is that they are flattened into a single diagram, which distorts the picture somewhat, but still provides some insight into the objectives of each local authority. In the same way, and with the same kind of limitations, the obstacles faced by local authorities in implementing innovative mobility policies can shed some light on common areas of difficulty which could be overcome if issues were tackled in a holistic way, that is by trying to see the specific policy embedded in its overall context. A task which the use of the analytical framework can facilitate.

The respondents to the questionnaire had to provide information about the top-five mobility-related problems in their city. This was an open question which led to a variety of answers. The following summarises the trend for the five cities although some discretion in the interpretation. For instance, the top priority for the Strasbourg *Communauté urbaine* has been formulated as 'commuting to work at the rush hour', which has been included in the 'congestion' category.

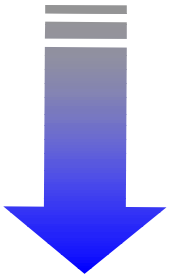
Overall top-five priority problems in the selected five cities

1. Congestion
2. Air Pollution and Acoustic Nuisances
3. Freight Transport and Delivery in the City
4. Lack of Parking Space
5. Safety Concerns

In fact, the problems of pollution and goods transport in the city turn out to be given basically the same level of priority. Nonetheless, air pollution and acoustic nuisance problems have been put down as second priority from the top, as they have been expressed as a top-five priority concern by four of the five cities surveyed. The same criteria has also been followed when presenting the main benefits and obstacles deriving from the implementation of the various measures implemented in the urban mobility policy area.

The remaining concerns expressed touch upon the need to increase the attractiveness and the quality of service of public transport, the intricacy of the problems raised by urban sprawl (which is in fact closely connected with the modal split) and the difficulty of enforcing regulations.

Top five obstacles to the implementation of the various mobility measures considered

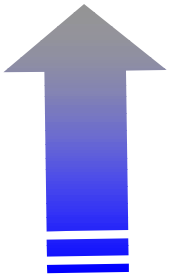


1. Problems of institutional/inter-departmental co-operation [5 cities!]
2. Complexity of the mobility measures considered [3 cities]
3. Legal problems [3 cities]
4. Technical problems/Public awareness/Public acceptance
5. Insufficient public funding/Difficulty in supplying relevant, up-to-date information

For the five cities surveyed, institutional co-operation represents a major obstacle to the implementation of the mobility-related measure analysed, which – it is worth remembering here – aims at being 'sustainable' and therefore holistic in its approach towards the mobility problem. It is not surprising then that the complexity of the mobility measure represents another top-priority problem. It seems in fact that a very close link exists between the difficulty of implementing a complex initiative and trying to do so with organisational patterns that are not fully fit for understanding and being able to process a complex situation. Considering that the respondents to the questionnaire belong to the public sector, the legal problems they refer to when mentioned as third priority are possibly closely linked with organisational issues. The fourth priority raises a certain surprise: in the case of Turin, 'improved communication and marketing' is mentioned as one of the top-five problems of mobility. Surprisingly though, when looking at the list of obstacles to the implementation of the measure considered, nothing is said about insufficient citizens' awareness or the related area of citizens' acceptance.

As far as expected benefits are concerned, once more organisational issues appear among the top-five mentioned by respondents to the questionnaire.

Top five benefits to the implementation of the various mobility measures considered



1. Better access for citizens [4 cities]
2. Better co-operation with other institutions [3 cities]
3. Better technical integration [3 cities]
4. Better organisational integration [4 cities]
5. Generally higher quality of public services [3 cities]

The only remark concerns the very close link between the second and the fourth priority, which would in fact come to represent the top benefit expected from the implementation of the various measures which the five cities surveyed are working on.

The picture given by the comparison among the five cities is very interesting. It proves – although for a very limited sample – that cities of different dimensions, located in different countries (and consequently, different institutional settings), characterised by different habitat patterns, and having different relations to long-distance networks are all faced with very similar problems when trying to implement sustainable mobility measures.

Transferability

The five cities selected for this report are very diverse. As mentioned in the first chapter during the discussion of the selection criteria used, this diversity was a deliberate strategy, the idea being to obtain a small but representative sample of European urban areas. The outcome of the analysis is that the weak links, or rather those that need close attention, are located within the Regulatory System. The institutional setting at the local level determines the degree to which it is possible to tackle complex issues by overcoming functional divisions within the local authority smoothly. At the same time, this has an important influence on how things are dealt with at higher levels, particularly at the national and EU levels.

Indeed, it would seem that the fact that cities are adopting comprehensive measures is not simply an outcome of their own local situation. It is in large part due to the will exerted at other levels to tackle mobility in urban areas in a holistic way. Even a superficial reading of the policy guidelines presented in the EC Communications mentioned in Chapter 1 is certainly persuasive. Nonetheless, transferring ideas into practice always proves to be difficult and therefore there seems to be room to ask if and how the experiences of the five cities can be generalised and taken out of their context as a means of suggesting useful steps to be taken at the national and EU levels. At the same time, such general remarks could be taken up by other urban mobility decision-makers and adapted to other local contexts. Indeed, the role of the Car Free Cities network could be even more pro-active.

Systems approach to urban mobility policy making

The analytical framework proposed in this report is a useful means of drawing attention to the public policy system as a whole and the need to see cross-sector issues as being characteristic of the policy system. Better handling of cross-sector issues is not just a matter of better tools and techniques, although they have their place, but of a fundamentally different approach to government. It seems that effective handling of cross-sector issues requires an impacts-driven approach to public policy, where structures, systems and processes are designed around the policy problem to be solved rather than having the problem defined in terms of the existing system. Two representative examples comprise air pollution and land-use planning. Air pollution is undoubtedly one of the major negative externalities caused by transport. Solutions are often developed separately in the public services affected by the problem according to their specific functioning and competence attributions, usually under the leadership of the environment department. There is no guarantee that objectives and targets are agreed upon and shared by all actors involved, nor that the strategy to solve a problem is a coherent whole instead of a collection of separate attempts. Piecemeal approaches are understandable, as they are in line with the functional separations and competence attribution both between sectors of the local authority and between different levels of intervention. Nonetheless, it leads to reduced efficiency in the use of available resources and, eventually, reduced public confidence in the authorities. Analyses focusing on transport only are unable to identify the impacts on economic activities' localisation deriving from changes in transport supply and, conversely, the long-term impacts of the re-location of economic activities on the transport system. The interrelated problems of transport and land-use planning have to be tackled from a common perspective.

Additionally, a framework for analysis is useful in that it helps to identify limiting factors, critical areas of intervention, priorities, and to obtain a balanced view of the impacts of policy actions within a specific urban context. The 'missing links' of the city-specific urban mobility policy measures considered have been highlighted in Chapter 2 of this report. It seems in fact that despite the need to substitute functional separations with a holistic approach in urban policies, in-depth analysis is still very much required to establish the links between sectors of intervention and areas of impact. Therefore, maintaining a specific focus on mobility in a clearly defined context is not contradictory. Also, the diversity of urban realities makes it highly desirable - and extremely difficult - to transfer experiences.

We will now try to generalise a number of conclusions which could be beneficial not only to the local decision-makers of the five cities considered in this report but also to the other members of the Car Free Cities network and to the steering of the network itself.

To achieve sustainable mobility in urban areas, many trade-offs must be faced. It is up to local decision-makers to recognise shortcomings and engineer them out of the urban mobility system. Therefore success depends on an integrated approach to closely related policy areas.

This is not a straightforward task. Evaluating whether needs are being taken into account in a balanced way has to reflect a number of criteria going beyond the sector-based approach adopted so far. The process of moving from the vision of an integrated approach to its actual achievement is far from being accomplished. The points listed below have been identified as key success factors when analysing urban mobility measures with the proposed framework in the five selected case studies. The general remarks offered result from the comparison of the different experiences analysed. The footnotes are therefore merely for guidance and elements of each of the following remarks can in fact be found in most of the five case studies.

Long-term evaluation via indicators[5]

To evaluate the implementation of any given mobility measures correctly, it is crucial to define clearly objectives, targets and indicators. Nonetheless, dynamism must be given an appropriate place. No policies are carved in stone. The purpose of defining objectives, targets and indicators is to help monitor changes and, where changes are not achieved, to revise those elements which have not worked as initially envisaged.

Co-ordination of transport and spatial development policies[6]

Interconnecting transport infrastructures and spatial planning is a fundamental part of the effort to steer urban mobility towards more sustainable patterns. This relationship determines the type and level of traffic. It also determines the activity of all other modes (pedestrian, public transport, etc.) and what happens to the connections between modes. Changing the balance between mobility needs and spatial planning changes the environmental impacts of transport and the social texture of urban areas. It is crucial to understand how this happens, i.e. to understand the relationships. Promoting new mobility behaviours needs to be accompanied by new perceptions of the public space and also of lifestyles, paying attention both to the social texture of the city and of course also to the economic acceptability of the measure to citizens.

Competence levels, intervention areas and the spatial scope of urban mobility problems[7]

Despite the different degrees of competence to intervene in urban policy matters, problems, their causes, their evolution and, most importantly, their interrelationships with dimensions outside the transport sector need to be known in detail. If strategic long-term objectives and targets to measure their progressive achievement – or, conversely, their need to be adjusted – are to be decided upon in an efficient way, then the frame within which the dynamics of the system takes place needs to be clearly outlined. Moreover, this needs also to be understandable to non-experts.

[5] Please refer in particular to the experience of the Strasbourg *Communauté urbaine*.
[6] Please refer in particular to the experiences of Strasbourg and Barcelona.
[7] Please refer in particular to the experience of Turin, despite the stated need to improve communication and marketing of the measure.

Fostering partnerships to reduce conflicts in urban mobility[8]

Policy actions involving a large number of actors benefit greatly from partnerships with other organisations. That is why mobility managers have to consider working together with other departments, other local authorities and to tighten links with the community and local transport operators. Improved co-operation patterns within the public sector are not everything, and partnerships with major employers and transport operators in and around the urban area are also highly important.

Monitoring Progress

Urban mobility actions belong to the urban dynamic process and their progress needs to be followed over time. That is why the impacts of any new measures and policies need to be checked systematically via a clearly defined monitoring programme.

Monitoring is a pre-requisite for optimising system performance, i.e. to see how things have changed and whether targets are being met before taking corrective action. The aim of monitoring is therefore that of comparing situations whether in time, space or both. The use of indicators and a transposable analytical framework allows comparative benchmarking of results between urban areas.

This is an additional role that the Car Free Cities network could assume. Important as it is to maintain the activities of its working groups, which all tackle crucial problems affecting the urban mobility system, the network could facilitate the exchange of experiences when it comes to monitoring the progress made by its member cities towards achieving (or, most likely, approaching) sustainable mobility. The horizontal task of monitoring could complement the existing working areas.

The analytical framework proposed in this report could be a useful tool helping members of the Car Free Cities programme to structure such an activity systematically rather than haphazardly. In fact, the sense of having local authorities' networks goes beyond the mere presentation of some project to encompass exchanges of know-how. And this often happens randomly rather than following a structured approach. Precisely because management styles will continue to be very diverse across the European urban landscape, the exchange of information and the monitoring of progress made could be an asset for the local authorities and it would prove most beneficial by adopting a systems approach and an iterative pace of analysis.

Using a twofold approach to monitoring seems to provide a comprehensive picture of an urban mobility system, as outlined in the first chapter of this report. On the one hand, there are the activities, initiatives and interrelationships of the regulatory system at different levels concerning specific mobility actions. On the other hand, information is collected and impacts of given actions assessed via the use of indicators and a coherent scheme to analyse their impact on the three dimensions of sustainability. The former activity could be shared without creating additional workload by the Car Free Cities network co-ordination office whilst the latter could become routine for the local authorities. The existing experience within the network's members would certainly smooth the process of adopting a systematic approach towards monitoring progress for sustainability. Indeed, it could also become a banner, an informal 'sustainable mobility labelling' for the network's members.

[8] Please refer in particular to the recent developments of the experience in the Strasbourg *Communauté urbaine* and equally to the experience of Nottingham, despite the expressed difficulty in finding suitable counterparts in the private sector to implement the initiative.

Concluding remarks

To conclude this report, it should be underlined that an evaluation carried out as a one-off task can shed some light on a situation but it is in fact crucial that methods used for monitoring be kept consistent over time so that results can be compared properly. In any case, they should be kept simple. And, certainly, it is crucial to keep the momentum: successful results need to be publicised and information about upcoming steps widely disseminated.

Concerning the implications for future EU policy-making in the areas of urban environment and urban sustainability, it seems important to highlight the strategic importance of co-ordination of policies impacting on the urban dimension and of coherence of objectives. An attempt is being made within the on-going 5th RTD Framework Programme via various key actions focused on transport and urban areas. From an operational viewpoint, EU policy-makers could take advantage of the proposed framework by using it as a simple reference point to ensure that no relevant aspects and impacts of transport policy and regulation are considered in isolation from their context. The analytical framework proposed could be used by the European Commission's services and agencies, for instance by overlaying the relevant services to be informed or consulted when focusing on a specific segment indicated in the analytical framework. Equally, it could be used by overlaying the existing regulatory framework affecting each component in the system or combinations of them in order to highlight missing links, duplications or currently unexploited synergies.

It seems also relevant to highlight the role played by networks of local authorities. Car Free Cities has been able to gather an urge deeply felt by many local authorities and provided a means to exchange experiences and to make local authorities' voices heard at the EU level in a coherent manner. It seems also that local authorities involved in the network's activities have 'grown' over the years and that the learning process made possible by networking has proven positive for most of the network's members. Widespread dissemination of the network's activities and results via discussion fora focused on thematic priorities expressed by local authorities and somehow reflected in the present report seems to be an ideal way of gaining additional insight in urban mobility problems and possible ways of tackling them.

Although the activities of the Car Free Cities network have the benefit of mirroring very closely the needs of European local authorities, it seems that its activities could benefit from being structured on sound analysis rather than representing waves of public concern. The monitoring of the successful results obtained by its members and the transfer of the lessons learned to all members of the network as well as to European local authorities at large could then be fully exploited. Attention should be given to the comparability of results between European cities so as to be able to identify not only success stories but also successful instruments, providing the specificity of each city is respected and duly considered.

As a more general conclusion, it is worth remembering the important role performed by European urban networks in supporting local authorities. Technological and infrastructure improvements can be adopted at the local level and they certainly help mitigate some of the harmful effects of urban travel, but they will never solve the problem. They are instruments producing fruitful results if planned and handled in an appropriate way to meet clear, understandable and acceptable objectives, which are sustainable. The on-going exchange of experiences and discussions on policy measures which is facilitated when local authorities are networked, is highly valuable. It seems though that to avoid the dispersion of energy, time and resources, clearly set monitoring tools, assessment strategies or methodologies, whichever they might be, bring with them considerable added value.

Bibliographic Sources

CEC – Commission of the European Communities (1999), *'Memorandum of Understanding (MoU) Establishing Co-operation Procedures between Directorate General XI (DG XI) and the Joint Research Centre (JRC)'*, Brussels

CEC – Commission of the European Communities (1999), *'Common Set of Indicators for Local Sustainability. Second Proposal'*, Working Group on Indicators for Local Sustainability of the European Commission's Expert Group on the Urban Environment, http://www.sustainable-cities.org/expert.html

CEC – Commission of the European Communities (1999), *'Long List: Indicators Considered in the Final Round of Discussions before Defining the First Proposal'*, Working Group on Indicators for Local Sustainability of the European Commission's Expert Group on the Urban Environment, http://www.sustainable-cities.org/expert.html

CEC – Commission of the European Communities (1998), *'Sustainable Urban Development in the European Union: A Framework for Action'*, COM (98)605, Brussels

CEC – Commission of the European Communities (1997), *'Towards an Urban Agenda for the European Union*', COM (97)197, Brussels

CEC – Commission of the European Communities (1995), *'Global Environmental Change and Sustainable Development in Europe*', Brussels

EEA – European Environment Agency (1998), *'Proposed Transport/ Environment Reporting Mechanism (TERM) for the EU*', Copenhagen

ESTO – European Science and Technology Observatory (1998), *'Vehicle Technologies Future Analysis*', ESTO Report Series 1, Seville

IIUE – The International Institute for the Urban Environment (1998), *'Indicators for Sustainable Urban Development*', Proceedings of the European Commission Advanced Study Course, Delft

IPTS-JRC – Institute for Prospective Technological Studies – Joint Research Centre (1998), *'The Future of Individual Transport. Towards the Integration of Social, Technological, Economic and Political Driving Forces (STEP)'*, Draft Report, Seville

OECD – Organisation for Economic Co-operation and Development (1999), *´Territorial Data and Indicators. The Methodology*', http://www.oecd.org/tds/ statscheme.html

OECD – Organisation for Economic Co-operation and Development (1998), *'Towards Sustainable Development: Environmental Indicators*', Paris

OECD – Organisation for Economic Co-operation and Development (1997), *'Better Understanding Our Cities: the Role of Urban Indicators*', Paris

Pucher, J., Lefèvre, Ch. (1996), *'The Urban Transport Crisis in Europe and North America*', MacMillan Press Ltd., Basingstoke, Hampshire

Skinner, I., Fergusson, M. (1999), *'Instruments for Sustainable Transport in Europe*', Report from the Swedish Euro-EST Project, Swedish Environmental Protection Agency, Stockholm

Taylor, D. (1998), *'Using Sustainability Indicators to Implement Local Agenda 21'*, Paper to World Congress of Environmental and Resource Economists, Venice, June 25-27 1998

UN CSD - United Nations Commission on Sustainable Development (1996), *'Indicators of Sustainable Development Framework and Methodologies'*, New York

World Transport Policy & Practice (Journal) (1999), *'Car Sharing. A Hammer for Sustainable Transport'*, Volume 5, Number 3, Eco-Logica Ltd., Lancaster

Annexes

Annex 1

Indicators used for the evaluation of mobility in the selected urban areas and the selected case studies:

A set of indicators is presented. The final selection might vary in accordance with the type of information made available by the cities. The aim is twofold: (1) comparing the situation before and after the implementation of the transport policy measures and (2) establishing a comparable grid across the selected sites focusing on the progress made towards sustainable mobility. A standard questionnaire based on these indicators is used to collect the information.

	ENVIRONMENT	**Target**	**Indicator**
	1. Air quality	Concentration of SO2, Nox, O3, CO, Lead, Benzene	- Air pollution monitoring of carried out by the local authority
	2. Acoustic quality	Exposure to noise (inhabitant per time period)	- Exposure to noise above 65 dBA
	3. Accessibility of green spaces	Proximity to urban green spaces	- % of people within 10 minutes walking distance from urban green spaces
	LAND-USE	**Target**	**Indicator**
	1. Urban population	a) Population	- Number of inhabitants in city and metropolitan area
		b) Population density	- Population per km²
			- Resident population per km² by sub-area
		c) Mono-functional reas	- % mono-functional areas
	2. Urban land cover	a) Total area	- Area in km²
		b) Total built-up area	- Area in km²
			- Per capita land area paved for roads and parking
		c) Open areas	- Area in square kms
			- % green area
		d) Transportation network	- Road network length in kms
			- Tram and rail network length in kms
			- Cycling tracks length in kms
			- Pedestrian roads length in kms
	3. Derelict areas	Total area	- % of total urban area
	4. Urban renewal areas	Total area	- % of total urban area
	5. Housing	Land-use distribution by housing units	- Number of housing units
			- % of the built environment intended for other purposes than housing
			- % of population living in an apartment
	6. Urban mobility	a) Car Ownership	- Number of Cars per 1000 inhabitants
		b) Modal split	- Number and average length of trips in kms per inhabitant per mode of transportation per day
		c) Commuting patterns	- Number of commuters into and out of conurbation
			- As % of urban population
		d) Traffic volumes/ Congestion	- Number of vehicles on main routes
			- Average speed of private cars in the city centre
			- Average speed of public transport vehicles in the city centre
	ECONOMY	**Target**	**Indicator**

	1. Weight of the economic sectors	Economically active population	- Distribution of employed persons among the main sectors of the economy - % of unemployed people by gender and major age bracket - % of people employed by SMEs (up to 25 workers)
	2. Accessibility to services and opportunities	Participation of handicapped people in employment	- % of disabled people in employment of total disabled persons of working age
	ORGANISATIONAL ASPECTS	**Target**	**Indicator**
	1. Policy guidelines	Integration across sectors	- Mobility action plan - Environmental action plan
	2. Organisational structure	Integration across sectors	- Mobility agency
	3. Financial structure	a) Support to sustainability b) Funding structure	- Budget 1999 for innovative actions in mobility - Main sources of funding
	4. Co-ordination meetings in the public administration	a) Across sectors of the same administrative level (horizontal co-ordination) b) Between same sectors at different administrative levels (vertical co-ordination) c) Across sectors at different institutional levels (oblique co-ordination)	- Number of meetings held in 6 months - Existence of formal co-ordination mechanisms - Number of meetings held in 6 months - Existence of formal co-ordination mechanisms - Existence of economic incentive schemes - Number of meetings held in 1 year - Existence of formal co-ordination mechanisms - Existence of economic incentive schemes
	5. Co-ordination/ consultation meetings between the public sector and private actors	Opening of the local authority towards collaboration with the private sector	- Number of meetings held in 1 year - Existence of formal co-ordination mechanisms
	TRANSPORT	**Target**	**Indicator**
	1. Transport Costs		- Capacity of paying parkings - Monthly PT cards sold - % of primary schools served by PT - Road pricing schemes
	2. Trips to work	Commuters	- Number of commuters by public transport for those working in the conurbation - Number of commuters by bicycle for those working in the conurbation
	3. Traffic safety	Fatalities and casualties from traffic accidents	- Number of people killed or seriously injured in traffic accidents per 1.000 inhabitants per year - Modal split of traffic fatalities and casualties

Annex 2

Questionnaire

EUROPEAN COMMISSION

DIRECTORATE-GENERAL JRC

JOINT RESEARCH CENTRE

Institute for Prospective Technological Studies (Seville)

CASE STUDIES ASSESSMENT OF THE CAR FREE CITIES NETWORK

***

Please return the completed questionnaire to:

JRC-IPTS/ Laura Lonza Ricci, E-mail: laura.lonza@jrc.es, Fax: +34 954 488 279

SOME BASIC DATA ON YOUR CITY/ METROPOLITAN AREA (MA).

Population	***(✎Please specify)***
Number of inhabitants	
Population per km²)	
Resident population per km² in the city centre	
Urban Land Cover	***(✎Please specify)***
Total area in km²	
Total built-up area in km²	
Green area in km² (not including water courses)	
Derelict land in km² on total urban area	
Per capita land paved for roads and parking	
Transportation network	***(✎Please specify)***
Road network (length in km)	
Tram and Rail network (length in km)	
Cycling tracks (length in km)	
Pedestrianised roads (length in km)	
Urban mobility	***(✎Please specify)***
Car ownership ratio per 1000 inhabitants	
Number of trips in km per person per mode per year	
Average length of trips in km per person per mode	
Number of commuters into and out of conurbation	
Number of vehicles on main roads on a working day	
Average speed of private cars in the city centre	
Average speed of public transport vehicles in the city centre	
Housing	***(✎Please specify)***
Overall number of housing units	
% of the built environment intended for other purposes than housing	
% of population living in an apartment	
% of new apartments (five years) offering one or more parking spaces in the building	
% of total urban area affected by urban renewal plans	

SOME BASIC INFORMATION ON THE ECONOMIC SITUATION IN YOUR CITY/ MA.

1. ***How has the relative weight of economic sectors evolved in your city /or metropolitan area since the beginning of the action under assessment?***

	Economic Production	*% Primary Sector*	*% Secondary Sector*	*% Tertiary Sector*
Starting Year:…….. 1999				

2. ***Please provide some information on <u>employment</u> in your city /or metropolitan area***

	Primary sector	*Secondary sector*	*Tertiary sector*
% of active population employed in…. ***Number of employees in SMEs (up to 25 workers) in…*** ***% of unemployment by age bracket***			
	M	***F***	
% of unemployment by gender			

3. ***What % of disabled people is employed? And what was the situation at the beginning of the action under assessment?***_____ (✎ *Please specify*).

SOME BASIC INFORMATION ON ACCESSIBILITY IN YOUR CITY/ MA.

4. ***How many citizens have access to the following proximity services and recreational activities within 10 minutes walking distance from their homes?*** (✎ *Please indicate).*

	Access within such a short walking distance is **<u>exceptional</u>**	Between **<u>one third and two thirds</u>** of the population	**<u>Almost all</u>** population has walking access to such services/ activities
Green Areas			
Nursery and primary schools			
Medical Service			
Post office			
Bank			
Local public administration			

SOME BASIC INFORMATION ON POLLUTION EPISODES IN YOUR CITY/ MA.

5. ***Were there any critical air quality levels in 1999 (i.e. the competent authority was legally obliged to inform the public)?*** ☒ *Check <u>one</u> box, please*

☐ No ☐ Yes, on……. days. *(✎ Estimate a figure, please!)*

What was the situation of air pollution at the beginning of the action under assessment? Were there episodes of critical air levels then?

☐ No ☐ Yes, on…….. days. *(✎ Estimate a figure, please!)*

6. ***What is the level of noise nuisances in your city (or metropolitan area)?*** ☒ *Check <u>one</u> box, please!*

☐ exposure of population to noise levels exceeding 65 dBA is <u>exceptional</u>
☐ between <u>one third and two thirds</u> of the urban population are exposed to noise levels over 65 dBA
☐ <u>almost all</u> population is exposed to noise levels exceeding 65 dBA
☐ <u>other:</u>
……..

SOME FACTS ON TRANSPORT.

7. ***What is the overall capacity of paying parking spaces in the urban area? Has it increased since the beginning of the action under assessment?***
   ----------(✎ *Please specify*).
8. ***Is a road-pricing scheme currently in place?*** ---------- ----------☐ No ----------☐ Yes
   Is there a plan to implement road pricing over the next three years? ---☐ No ----------☐ Yes
9. ***How many Public Transport monthly cards were sold at the beginning of the action under assessment and how many were sold in the first months of 1999?***
   ---------- (✎ *Please specify*).
10. ***What is the % of primary schools served by Public Transport in the whole urban area? Has it grown since the beginning of the action under assessment?***
    ---------- (✎ *Please specify*).
11. ***How many commuters working in the urban area use Public Transport regularly today?***
    ---------- *(✎Please estimate!)*
    And how many did so at the beginning of the action under assessment?
    ---------- *(✎Please estimate!)*
12. ***How many commuters cycle to work regularly?***
    ---------- *(✎Please estimate!)*
    And how many did so at the beginning of the action under assessment?
    ---------- *(✎Please estimate!)*
13. ***How many people were killed or seriously injured in traffic accidents in 1997? And what is the situation in the first half of 1999?*** ---------- (✎ *Please specify*).

SOME FACTS ON ORGANISATIONAL ISSUES.

14. ***Is there a mobility action plan in force which addresses the major transport-related problems of your city (or metropolitan area)?*** ☒ *Check <u>one</u> box only, please!*
    ☐ Yes
    ☐ No, but there are plans for certain areas_____✎Please give a few keywords!
    ☐ No, there are no formal policy plans in force.
15. ***Is there an environmental action plan in force which addresses the major environmental problems of your city (or metropolitan area)?*** ☒ *Check <u>one</u> box only, please!*
    ☐ Yes
    ☐ No, but there are plans for certain areas_____✎Please give a few keywords!
    ☐ No, there are no formal policy plans in force.
16. ***Is there a Mobility Agency in charge of planning developing and managing transport technologies and systems?***
    ☐ Yes
    ☐ No, but it is planned to establish one in the next three years
    ☐ No, but there are formal mechanisms of co-ordination with regular meetings between:
        ☐ Mobility-related units of the city administration
        ☐ Transport actors in the public and private sector
        ☐ Transport-related units across levels of public administration (regional/ national levels)
        ☐ Mobility-related units across levels of public administration (regional/ national levels)
    ☐ No, it is not planned to pursue integrated action for mobility-related issues.
    ☐ Other: -
    _____

FINANCING OF MOBILITY ACTIONS IN YOUR CITY/ MA.

17. ***How much is your organisation planning to <u>spend</u> in 1999 on innovative measures in mobility*** *(excluding internal costs and training and costs for maintaining existing infrastructure)**?***

✎ *Please give an approximate figure!*

……currency:……

18. ***How much of that budget is destined to the action under assessment?***

✎ *Please give an approximate figure! .....currency: .....*

19. Which are the 3 main sources of funding your authority has mainly used in implementing innovative transport measures in the past? ☒ *Check the 3 most relevant boxes, please!*

☐ National/ regional funds
☐ Own funds of the authority
☐ European Research Programmes
☐ European Cohesion/ Structural Funds
☐ Reinvestment of revenues/ earmarked taxes or fines
☐ Private sector contributions

KEY PROBLEMS AND POLICY AREAS.

20. What are currently the five largest problems related to mobility in your own city/ or metropolitan area (in order of priority)? ✎ *Please give a few keywords!*

Our most pressing problem is: .....
Our 2nd most pressing problem is: .....
Our 3rd most pressing problem is: .....
Our 4th most pressing problem is: .....
Our 5th most pressing problem is: .....

BENEFITS AND OBSTACLES OF THE ACTION UNDER ASSESSMENT

21. What are the 5 major benefits expected from the action under assessment?

✎ *Please rank the 5 crucial issues in the order of importance (1 = highest ... 5 = lowest)!*

Rank

..... greater **cost efficiency**
..... improved **internal communication / work flow**
..... better **cooperation** with other institutions
..... improved **planning/ decision making**
..... higher rate of **enforcement of regulations**
..... generally higher **quality** of public services
..... better **access** for citizens
..... improved outside **image** of authority
..... better **technical integration**
..... better **organisational integration**
..... greater/ improved **awareness** of environmental issues
..... others ..... (✎ *Please specify*).

30. What are the 5 major obstacles that you face in implementing the action under assessment?

✎ *Please rank the 5 crucial issues in the order of importance (1 = highest ... 5 = lowest)!*

Rank

..... insufficient **public funds**
..... **legal** problems
..... problems of **institutional/ interdepartmental cooperation**
..... difficulty in supplying up-to-date and relevant **information**
..... lack of **awareness** on the part of citizens
..... lack of **acceptance of innovative measures** on the part of citizens
..... **technical problems**
..... **complexity** of the new initiative
..... **opposition** from polluters/ lobby groups
..... lack of **political** support
..... others ..... (✎ *Please specify*).

OPTIONAL SECTION

Please note that answering this section is optional.

It is meant to provide additional information to the evaluators about your local authority's approach to mobility management and related services to the public.

Delivery of public services/ and external communication.

22. What information and services does your authority provide for the public? And which technical platform are you using to deliver them? ☒ *Check all relevant boxes for each item, please!*

Our citizens can get the following information: ... via ...	**Videotext or minitel**	**Internet**	**public access kiosks/ terminals**	**telephone/ fax**	**local press radio/ TV**
key **local air pollutant** levels	☐	☐	☐	☐	☐
air quality **forecasts**	☐	☐	☐	☐	☐
noise pollution levels	☐	☐	☐	☐	☐
traffic conditions	☐	☐	☐	☐	☐
intermodal transport information	☐	☐	☐	☐	☐
concrete support for sustainable **mobility decisions**	☐	☐	☐	☐	☐
general info to increase **environmental awareness**	☐	☐	☐	☐	☐
advice for businesses on **"city logistics"**	☐	☐	☐	☐	☐
other (✎) _____	☐	☐	☐	☐	☐
other (✎) _____	☐	☐	☐	☐	☐

Our citizens have access to the following (interactive) services: ... via ...	**(interactive) videotext or minitel**	**Internet**	**public access kiosks/ terminals**	**telephone/ fax**	**in writing/ personally**
request electronic data on the environment	☐	☐	☐	☐	☐
order **municipal services** (e.g. collection of toxic waste)	☐	☐	☐	☐	☐
request specific **information on traffic conditions**	☐	☐	☐	☐	☐
participate in **discussion groups**/ community networks	☐	☐	☐	☐	☐
make **suggestions** to council/ register **complaints**	☐	☐	☐	☐	☐
participate in **planning processes**	☐	☐	☐	☐	☐
request **public documents** (e.g. environmental reports)	☐	☐	☐	☐	☐
other (✎) _____	☐	☐	☐	☐	☐
other (✎) _____	☐	☐	☐	☐	☐

23. Are there specific services for any these groups? ☒ *Check all appropriate boxes, please!*

☐ School children/ young people
☐ Local industry/ businesses
☐ Tourists (not resident in the area)
☐ Allergic people
☐ Interest groups/ NGOs
☐ Other groups.....(✎ *please specify*)

Some specific information on the dissemination strategy for the initiative under assessment.

24. How many articles on the selected case study were published in the local press in the last 12 months?
.....(✎ please specify)

25. How many interviews were released to the local radio/ TV in the last 12 months?
.....(✎ please specify)

26. How many public debates were organised prior to the undertaking of the action under assessment?
.....(✎ please specify)

27. What kind of dissemination material was created by the local authority on the action under assessment? How many copies were distributed?
.....(✎ please specify)

28. Were there any specific publications on the action considered destined to specific target groups?
.....(✎ please specify)

Impact and relevance of technology

31. What <u>do you personally</u> believe the impact on your city of innovative transport measures might be in the next 2-3 years? ☒ *Check <u>one</u> box for each area, please!*

The impact will be ... ... in these areas ...	**Low** (i.e. no or very little actual change)	**Moderate** (i.e. some benefits are expected)	**significant** (i.e. major improvements will be achieved)
reducing **air pollution** and **green house gases**	☐	☐	☐
reducing **noise pollution**	☐	☐	☐
reducing negative **effects of transport**	☐	☐	☐
improving **waste management**	☐	☐	☐
using **natural resources/ energy** more rationally	☐	☐	☐
protecting **bio-diversity**	☐	☐	☐
enforcing **environmental legislation**	☐	☐	☐
improving internal **education and training** opportunities	☐	☐	☐
better/ more effective **decision making**	☐	☐	☐
increasing public participation in **decision making**	☐	☐	☐
enhancing **public awareness** of environmental issues	☐	☐	☐

32. In which areas <u>do you think</u>, technical improvements would most provide a benefit for the quality of the environment in your city/ metropolitan area? ☒ *Please check the <u>3</u> items of greatest relevance!*

- ☐ coordinated urban **traffic management**
- ☐ improved **information to car drivers**
- ☐ better **information on collective/ non-motorised transport**
- ☐ road **pricing**/ access **restrictions**
- ☐ increased **teleworking** (i.e. working from home through a computer network)
- ☐ extension of **electronic services** (to avoid travelling)
- ☐ other ..... (✎ *Please specify*).

THANK YOU FOR COMPLETING THE QUESTIONNAIRE!

Would you suggest other persons to provide details for the action under assessment?

✎ *Please provide their contact details below!*

……
……
……
……
……
……

Do you have any additional comments?

✎ *Please, write them below (if necessary, add a new page)!*

……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……