

CiViTAS
Cleaner and better transport in cities

POINTER
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Overview of Evaluation Findings

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1 INTRODUCTION

1.1 Background and Objectives

The CIVITAS Initiative concerns ambitious cities that are introducing sustainable urban transport policy strategies. The aim is to achieve a significant change in the modal split towards sustainable transport modes.

CIVITAS-POINTER was established as the Specific Support Action for CIVITAS Plus to efficiently and professionally plan, realise, manage and control the following activities:

- Independent overall cross-site evaluation of the measures undertaken by the CIVITAS PLUS cities including monitoring and analysis of the implementation process;
- Support the EC in the technical and formal monitoring of the CIVITAS PLUS projects through the provision of specialist and independent advice;
- Development of policy recommendations on the basis of validated project results;
- Targeted Pan-European dissemination and awareness-raising.

A key part of all the projects within CIVITAS is evaluation, since it is important to understand the nature and extent of the impacts made by the measures introduced in the cities and of the processes involved. **A CIVITAS measure is defined as a specific application contributing towards clean urban mobility which will be evaluated with appropriate rigour within CIVITAS.** For each CIVITAS measure implemented by a city both impact and process evaluation are expected to be carried out and fully reported. In specifically agreed and selected cases, such as where implementation is too late for any sensible impact evaluation, process evaluation is the minimum output that may be accepted.

The aim of the evaluation within CIVITAS-POINTER was to support and ensure that the evaluation within individual cities and projects was undertaken in such a way that:

- The impacts of individual or packages of measures are understood in a clear and unambiguous way with rigorous statistical interpretation where this is possible and valuable;
- Methods, approaches and outputs are co-ordinated and comparable across cities, so that value is added to enable coherent understandings to be developed at a European level;
- Clear and supportable messages are determined regarding the value of sustainable urban transport measures, singly and in combination, which can be actively promoted across Europe. This will be undertaken in the context of EC transport policy and will supplement findings from CIVITAS I and II;
- The evaluation procedure will include the assessment of results and outcomes as well as processes of planning and implementation;

- Based on the insight from the processes of implementation, interpretations and explanations will be given for success/ failure and policy recommendations will be formulated.

CIVITAS-POINTER aims to place the evaluation results in the context of EC transport policy and findings from other studies, and carefully assess the information available in order to develop clear understandings at a European level. This report provides an overview of the CIVITAS results and an understanding of the processes which will lead to effective implementation more widely.

1.2 CIVITAS PLUS Measures within Cities and Projects

In CIVITAS PLUS there were 25 European cities participating from 12 European countries. These cities were grouped to demonstrate the measures within 5 projects: Archimedes, Elan, Mimosa, Modern, Renaissance. Each CIVITAS city selected a set of measures to implement in order to achieve the objective of clean urban transport in cities. Overall, just over 305 measures were implemented by the cities and these are categorised into the following 8 areas or workpackages.

- Alternative fuels and clean, energy-efficient vehicles
- High quality energy-efficient Passenger Transport
- Economic based Demand Management strategies
- Mobility Management, Communication and Education
- Safety and Security
- Mobility services for energy-efficient vehicle use
- Energy efficient freight distribution
- Innovative Transport Telematics Systems

The distribution of the numbers of measures among the 5 projects and 25 cities is given in Table 1.1.

Table 1.1: Measures in the Cities and Projects by Workpackage

Theme		1	2	3	4	5	6	7	8	
Project	City	Alternative fuels and clean, energy-efficient vehicles	High quality energy-efficient Passenger Transport	Economic based Demand Management strategies	Mobility Management, Communication and Education	Safety and Security	Mobility services for energy-efficient vehicle use	Energy efficient freight distribution	Innovative Transport Telematics Systems	Total
ARCHI MEDES	Aalborg	1	2	1	2	2	3	1	3	15
	Donostia San Sebastian	1	3	2	3	2	3	1	3	18

	Brighton & Hove	1	1	1	2	2	2	1	3	13
	Iasi	1	5	1	4	1	1	1	2	16
	Monza	2	1	0	1	0	2	0	5	11
	Usti	0	0	3	2	2	1	2	0	10
	Sub- Total	6	12	8	14	9	12	6	16	83
ELAN	Brno	1	1	0	2	0	0	0	1	5
	Gent	5	4	2	5	2	2	1	3	24
	Ljubljana	3	1	1	3	3	1	1	3	16
	Porto	1	1	1	1	0	1	0	1	6
	Zagreb	3	2	1	3	2	0	1	1	13
	Common	1	1	0	0	1	0	1	0	4
	Sub- Total	14	10	5	14	8	4	4	9	68
MIMOSA	Bologna	2	2	2	2	2	2	1	5	18
	Funchal	2	4	1	1	0	2	0	3	13
	Gdansk	1	0	0	4	2	1	0	1	9
	Tallinn	1	3	0	1	1	1	1	3	11
	Utrecht	1	2	1	3	1	4	4	2	18
	Sub- Total	7	11	4	11	6	10	6	14	69
MODERN	Brescia	2	2	1	3	2	2	1	1	14
	Coimbra	2	1	0	2	1	1	0	1	8
	Craiova	3	1	1	1	1	1	1	2	11
	Vitoria-Gasteiz	2	1	2	1	1	1	1	1	10
	Sub- Total	9	5	4	7	5	5	3	5	43
RENAISSANCE	Bath & N.E.Somerset	1	1	1	1	1	3	1	1	10
	Gorna Oryahovitsa	1	0	1	1	0	0	0	0	3
	Perugia	2	1	3	2	3	2	2	0	15
	Skopje	1	0	0	1	0	0	0	2	4
	Szczecinek	1	2	1	1	1	2	0	2	10
	Sub- Total	6	4	6	6	5	7	3	5	42
Total	42	42	27	52	33	38	22	49	305	



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2 APPROACH TO EVALUATION

2.1 Introduction

2.1.1 Evaluation Task

In CIVITAS-POINTER, the evaluation task has been divided into two main parts, impact evaluation and process evaluation:

- **Impact evaluation** includes the evaluation of a wide range of technical, social, economic and other impacts of the measures being implemented by the cities.
- **Process evaluation** involves the evaluation of the processes of planning, implementation and operation, including the roles of information, communication and participation.

Impact evaluation deals with understanding the practical/technical effects of measures within the city whereas process evaluation is concerned with understanding more clearly why measures have succeeded or failed. Both are built upon a common framework approach to ensure a consistent high quality of cross-site outputs. The integration and interpretation of the results from both aspects will provide the necessary comparative insights and understanding of the effectiveness of the measures at the European level.

2.1.2 Scope of the Evaluation

Evaluation activities within CIVITAS may be considered at four different levels, as follows:

- **Measure Level:** evaluation of individual measures. This is the basic level of evaluation on which all other levels depend.
- **Package (or bundle) Level:** evaluation of categories and/or packages (bundles) of measures implemented and evaluated together; such bundles can be identified where individual measures complement each other to the extent that a distinction between their implementation or impact does not make sense.
- **City Level:** evaluation of the results at the city level. City level evaluation aims at assessing how much all the measures implemented within the city together contribute to addressing each of the five main impact evaluation areas, and to provide results from the demonstration measures for cross-site evaluation at the CIVITAS level. City level is mainly relevant to impact evaluation and is looking for a more coherent interpretation of measure level results for the city. This would involve some elements of up-scaling.
- **CIVITAS level:** overall cross-site evaluation. **Cross-site evaluation** aims at identifying and transferring good practice and will be based on the evaluations within cities and projects of CIVITAS PLUS and the findings from CIVITAS I in order to contribute to better and cleaner transport in urban areas.

Although obviously inter-related, the objectives and scope of the evaluations at each level are different.

European cross-site evaluation is a distinct exercise as compared to the evaluation undertaken by the individual projects and cities. The European Commission needs to evaluate the results of the measures implemented by the CIVITAS cities, so that insights on how the measures performed and the comparisons between different cities and projects will provide knowledge on the effectiveness of specific measures and packages of measures and so help to identify good practice and transferability. Importantly, the European cross-site evaluation will also provide the European Commission with information necessary to disseminate the notion that changes in urban transport technologies and policies can indeed be highly beneficial to European citizens at large, and to replicate similar practices elsewhere.

Cities are particularly keen to assess the effectiveness of the measures they have selected for implementation, as their main goal is to create a culture for clean urban mobility within a framework of sustainable development. In this context, evaluation is, first and foremost, instrumental to the measurement of the results achieved. It must provide the necessary feedback to policy-makers for them to further pursue the ultimate objective of improving the performance of their city. As a demonstration site, the cities have the responsibility to contribute to the cross-site evaluation and the transferability assessment requirements at the CIVITAS level.

The cross-site evaluation at the CIVITAS level is a complex task since:

- The measures were implemented across 17 cities, which operated under different institutional, legal, and cultural settings, leading to different user needs and consequently to different demonstration objectives;
- The implementation included a wide variety of measures in different settings;
- The measures involved several groups of local stakeholders with different and sometimes conflicting objectives;
- It may be either not possible to separately introduce measures in a sequential way for such evaluations to take place, or not desirable because of longer term effects, the added value of introducing a coherent group of measures or the constraints/requirements of particular locations.
- Definitive causal relationships between the packages of implemented measures and the impacts are rather difficult to establish and even more difficult to separate out the impacts of a single measure within a package.

Facing such a challenging task, it was very important to establish a clear evaluation framework to ensure good coordination within the CIVITAS evaluation activities, good co-operation between CIVITAS-POINTER and the projects/cities, and a high quality of cross-site evaluation

2.1.3 Setting a Framework for Evaluation

The resulting evaluation framework is illustrated in Figure 2.1 below. The framework relates all the elements of the evaluation clearly and logically and formed a basis for common understanding of the objectives of evaluation for all the groups involved i.e. EC, CIVITAS-POINTER, projects and cities. A core tenant of the CIVITAS-POINTER approach is that the projects and cities should have a common ownership of evaluation and, thereby, commitment to a process in which they see clear value for their cities.

It is clear that the European cross-site evaluation builds upon the results of evaluations undertaken by the projects and cities, and that it can only produce the expected added value if the evaluation outcome at each individual site is of high quality and produces good, clear results. For this to happen, in turn, methodologies for measure, city and cross-site levels must be harmonised in several ways:

- The general approach for evaluation must be consistent across the CIVITAS cities. The before-and-after comparisons must be carried out consistently across the CIVITAS cities.
- The indicators used for measuring the impacts must be consistent across the CIVITAS cities. However, this does not prevent cities from having their own additional local indicators for evaluation and assessment at the local level.
- The methods of measurement must be consistent across the CIVITAS cities or at least produce rigorous comparable results.
- How the impacts are measured at the measure and city levels needs to be monitored, and related information that might contribute to understanding the nature and extent of the results collected, especially for context-specific situations.
- Transferability of the results must be assessed in order to draw conclusions at the European level.

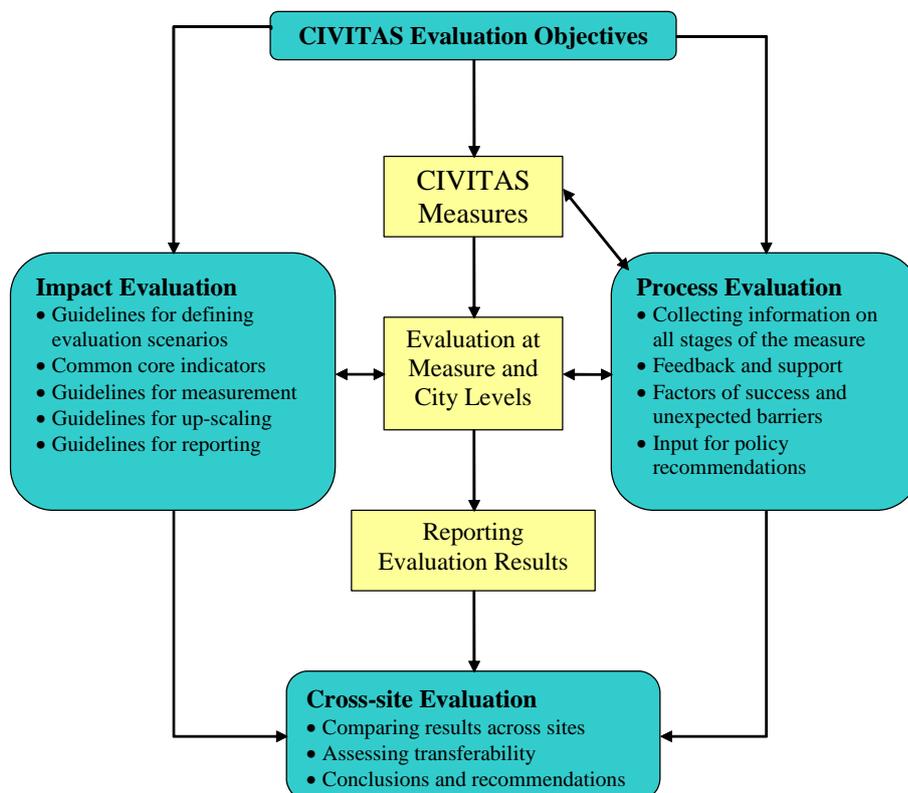


Figure 2.1: Evaluation framework

2.2 Impact Evaluation

2.2.1 Introduction

The evaluation framework relates all the elements of the impact evaluation clearly and logically and forms a basis for common understanding of the objectives of evaluation for all the groups involved, i.e. cities, projects, CIVITAS-POINTER, EC, and CIVITAS Advisory Committee.

Impact evaluation is an assessment or estimate of the impacts or effects of a measure, for example concerning safety, environmental conditions or transport efficiency, on the particular target groups (drivers, system operators, society, etc.) that are affected. For this, relevant indicators need to be determined which describe important characteristics of the situation and which can be measured or estimated both before and after the implementation of the measure, so that appropriate comparisons can be made of any changes or with any alternative(s).

The **context** in which the decision to implement a measure has been made should have a strong bearing on the impacts which need to be evaluated, the objectives against which they are measured and the target groups to be considered. The context should also influence whether the impact evaluation refers to specific test or demonstration site(s) only, or to a defined large-scale transport network (type and size). In the latter case, the system impacts should be generalised through appropriately ‘scaling-up’ the results to the city level. An impact evaluation may be based on the results of direct observations or surveys, of other experiments, of calculations, e.g. modelling or simulation, and/or of a technical evaluation. An impact evaluation may provide input, for example, for a related socio-economic evaluation or may support the decision process directly.

The impact evaluation process may be considered to be as shown in Figure 2.2 below.

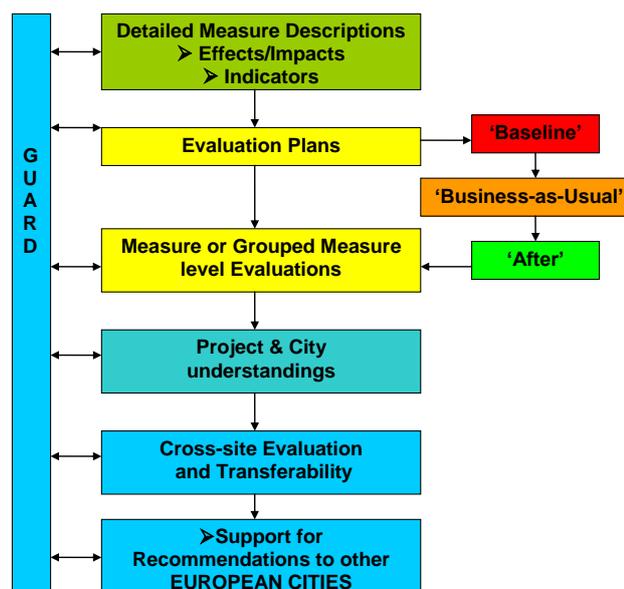


Figure 2.2: Outline of Impact Evaluation Framework

2.2.2 Method of Approach

Evaluation in CIVITAS is essentially based on ‘before-and-after’ comparisons, but must be carried out consistently across the CIVITAS cities to give the added value gained from being part of a Europe-wide initiative. The Baseline, Business-as-Usual and After situations provide a common structure for the conduct of surveys and other measurements needed to provide such consistent comparisons. These situations are explained below.

Baseline Situation

Baseline surveys are necessary to enable subsequent changes resulting from CIVITAS measures to be determined by the cities and are carried out *prior* to the introduction of CIVITAS measures. The baseline measurements should be of sufficient scale to enable expected changes to be judged statistically where this is appropriate and possible and should encompass all city-wide indicators that may change.

Another objective of the baseline survey is to collect data necessary for the impact predictions of the business-as-usual scenarios. The data collection should cover a long enough period to provide the inputs necessary for such predictions. The baseline surveys may also help to fine-tune the design of the measures.

Business-as-Usual Scenario

In CIVITAS evaluations, the business-as-usual scenario is used to predict what would have happened at the end of the project if the CIVITAS measures were not introduced. One of the main objectives of business-as-usual scenarios is to determine the impacts of the measures by comparing results between scenarios with and without the measures.

Possible ways to estimate the ‘business-as-usual’ situation include forecasting from historical data, modelling (where appropriate local models are available) or monitoring a parallel ‘control’ site with the same characteristics without applying the project measures to it.

All the factors which may change during the evaluation period and which could influence travel and its impacts in the cities need to be identified at an early stage of the project and included in the baseline records. At the end of the study, it may be necessary to update the business-as-usual predictions in the light of actual changes in other factors which are different from that predicted.

After Situation

The ‘after’ or ex-post situation provides a final set of measurements for evaluation which can be compared with baseline and business-as-usual measurements to assess the effectiveness of the measures implemented. With the measures having been implemented, it is possible for many impacts to be measured directly in real transport conditions. However, such measurements have to be statistically sound to ensure the high quality of the evaluations.

2.2.3 Identification of impacts

In CIVITAS PLUS, over 200 measures were implemented by 17 cities to demonstrate how these measures can contribute to achieve the CIVITAS objectives. As with other transport

measures, most of the CIVITAS measures have a wide range of impacts on many aspects of a city transport system. The following situations needed to be considered:

- Impacts within and beyond the CIVITAS interests
- Direct and indirect impacts; for example if a bus fleet is converted to run on bio-diesel there will be a direct impact on the emissions produced, but there may also be an indirect impact on the numbers of passengers using the buses if they are more attractive.
- Short-term (i.e. that can be measured within the lifetime of CIVITAS evaluation) and long-term impacts (e.g. on land use and planning);

As implied above, deciding which impacts should or should not be included in the evaluation is not straight forward. To assist in this process, both the evaluation objectives (desired impacts) and the measures (potential impacts) needed to be considered through considering the following questions:

- What impacts does the CIVITAS measure have?
- Do the impacts have influence on achieving the CIVITAS objectives?
- Are the impacts direct or indirect?
- Will it be feasible to measure the impacts within the lifetime of the CIVITAS PLUS evaluation process?

For CIVITAS evaluation, one of the key criteria for identifying impacts was whether the impacts can contribute to the achievement of the CIVITAS objectives (directly and indirectly), but it was also important from a practical perspective to understand how feasible it was to measure the impacts.

2.2.4 Selection of common indicators

Once impacts have been identified, appropriate indicators to quantify the impacts must be selected. As there are often many indicator options for measuring an impact (e.g. for congestion level), the selection of the right indicators is very important for an evaluation with limited resources.

For cross-site evaluation, it is necessary to define a set of common indicators and to determine those indicators in a comparable way at different sites. This will enable a cross-site comparison or a generalisation of the results provided by the individual projects/sites. Two basic requirements have to be taken into account when defining indicators:

- (1) they must be able to clearly reflect the related performance or impact; and
- (2) they must be capable of reliable assessment using the experimental tools and measurement methods chosen.

In selecting common indicators, the main criteria to follow should include relevance, completeness, availability, measurability, reliability, familiarity and independence.

METEOR developed a set of common indicators which were used in the evaluation of the CIVITAS I measures. Five evaluation areas: economy, energy, environment, society and transport, were identified which are divided by using subcategories: benefits, costs, energy consumption, pollution/nuisance, resource consumption, acceptance, security, quality of service, safety and transport system. In total, there were 28 CIVITAS I Common Core Indicators.

These were reviewed and further developed, resulting in a set of 29 Common Core Indicators for use in CIVITAS PLUS. These are given in Table 2.1.

Table 2.1: CIVITAS PLUS Common Core Indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
ECONOMY						
1		Benefits	Operating Revenues	Operating revenues	Revenues per pkm	Euros/pkm, quantitative, derived or measurement
2		Costs	Operating Costs	Operating costs	Costs per pkm	Euros/pkm, quantitative, derived or measurement
ENERGY						
3		Energy Consumption	Fuel Consumption	Vehicle fuel efficiency	Fuel used per vkm, per vehicle type	MJ/vkm, quantitative, derived or measurement
4				Fuel mix	Percentage of fuel used by type	Percentage, quantitative, derived or measurement
ENVIRONMENT						
5		Pollution/Nuisance	Air Quality	CO levels	CO concentration	Ppm or g/m3, quantitative, measurement
6				NOx levels	NOx concentration	Ppm or g/m3, quantitative, measurement
7				Particulate levels	Particulate PM10 and/or PM2.5 concentration	Ppm or g/m3, quantitative, measurement
8			Emissions	CO2 emissions	CO2 per vkm by type	G/vkm, quantitative, derived
9				CO emissions	CO per vkm by type	G/vkm, quantitative, derived
10				NOx emissions	NOx per vkm by type	G/vkm, quantitative, derived
11				Particulate emissions	PM10 and/or PM2.5 per vkm by type	G/vkm, quantitative, derived

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
12			Noise	Noise perception	Perception of noise	Index (%), qualitative, collected, survey
	SOCIETY					
13		Acceptance	Awareness	Awareness level	Awareness of the policies/measures	Index (%), qualitative, collected, survey
14			Acceptance	Acceptance level	Attitude survey of current acceptance of the measure	Index (%), qualitative, collected, survey
15		Accessibility	Spatial Accessibility	Perception of accessibility	Perception of physical accessibility of service	Index(%), qualitative, collected, survey
16			Economic Accessibility	Relative cost of service	Cost of service relative to average personal income	Index(%), quantitative, measurement
17		Security	Security	Perception of security	Perception of security when using service	Index, qualitative, collected, survey
	TRANSPORT					
18		Quality of Service	Service reliability	Accuracy of timekeeping	Number and percentage of services arriving / departing on time	No and %, quantitative, collected, measurement
19			Quality of service	Quality of service	Perception of quality of service	Index, qualitative, collected, survey
20		Safety	Transport Safety	Injuries and deaths caused by transport accidents	Number of accidents, fatalities and casualties caused by transport accidents	No, Quantitative, measurement
21		Transport System	Traffic Levels	Traffic flow by vehicle type - peak	Average vehicles per hour by vehicle type - peak	Veh per hour, quantitative, measured
22				Traffic flow by vehicle type - off peak	Average vehicles per hour by vehicle type - off peak	Veh per hour, quantitative, measured
23			Congestion Levels	Average vehicle speed - peak	Average vehicle speed over total network	Km/hr, quantitative, derived

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
24				Average vehicle speed - off peak	Average vehicle speed over total network	Km/hr, quantitative, derived
25			Freight Movements	Goods vehicles moving in demo areas	Daily number of goods vehicles moving in area	No, Quantitative, derived or measurement
26			Modal split	Average modal split-passengers	Percentage of passenger-km for each mode	%, quantitative, derived
27				Average modal split-vehicles	Percentage of vehicle-km for each mode	%, quantitative, derived
28			Vehicle Occupancy	Average occupancy	Mean no. persons per vehicle/day	Persons/vehicle, quantitative, derived, measurement
29			Modal split	Average modal split-trips	Percentage of trips for each mode	%, quantitative, derived

2.3 Process Evaluation

2.3.1 Introduction and goals of the process evaluation

The main goal of the process evaluation procedure of CIVITAS POINTER is to develop new findings about factors of success, and strategies to overcome possible barriers during the implementation phase of CIVITAS Plus measures by cross-site analyses of all relevant information. A specific focus lies in the identification of potential barriers, which might lead to a serious delay in the implementation of the measure or even to cancellation. During the initial stages of planning and preparing a transport measure, it is important to establish the constraints and context within which the project is designed and implemented.

Conflicting interests between project partners, or external stakeholders, can lead to management and communication problems. Understanding the objectives and concerns of stakeholders can help to identify such issues at an early stage, or even help to avoid them.

However, barriers are not the only factors to be identified; information on factors of success is needed as well. It is the task of the process evaluation to analyse the whole process for each measure and to document all relevant activities for each measure implemented during the CIVITAS Plus Initiative, even if there are no particular barriers. This approach enables the development of strategies for the successful implementation of sustainable transport measures. Together with the results of the impact evaluation the documentation of the process evaluation will be the basis for the information and recommendations for other European cities, which is one common goal of the CIVITAS Plus Initiative.

2.3.2 Starting points of the process evaluation

There are number of starting points to fulfil the aforementioned objectives.

The data will be gathered on the measure level. The process evaluation will mainly take place at the measure level and will be carried out according to the different themes defined for CIVITAS Plus cities (e.g. measures for clean vehicles, access restriction etc.). Sometimes it might be appropriate to define a bundle of measures within the CIVITAS Plus Initiative, for which it is useful to analyse the process conjointly, as the same target persons, stakeholders, decision-makers etc. are involved. Please note, however, that such bundles may be defined only for the purposes of analysing the common processes involved, and does not mean that any such bundles have to be used for the impact evaluation as well, though they may be.

Furthermore the process evaluation is linked with the typical phases of a measure (or bundle of measures), known as the investment life cycle, which can be classified in three time periods:

- **Planning, Preparation and Design phase.** Options for possible measures are discussed in order to select one at the end of this phase. The selected measure is developed in detail and design work for the measure is conducted. If appropriate during the preparation phase, engagement activities for stakeholders are organised to manage potential barriers at an early phase of the measure and to achieve a high level of acceptance. At the end of this phase all planning details are fixed, including all decisions and permissions that are a pre-condition for starting the implementation phase.
- **Implementation (construction) phase.** The measure will be implemented in real life. This phase can be accompanied by information activities for the public providing information about the implementation phase, if transport users are affected, and

providing information about the upcoming operation phase (awareness and information campaigns). At the end of this phase the measure starts operation.

- **Operation phase.** The measure is opened to the public, i.e. users are able to increase their utility. It might be appropriate to conduct specific information and communication campaigns to bridge possible information gaps of users or potential users of the measure. The first phase of operation lies within the time-frame of the CIVITAS Plus Initiative and can be analysed and evaluated by CIVITAS-GUARD. The long-term running is the outstanding time (beyond the CIVITAS Plus Initiative) until the measure comes to the end of its life, which could be caused by technical facts, programme termination, end of funding, redesign, or reconstruction.

The data are provided by the measures, but collected and analyzed by the cities. POINTER assessed the results with regard to the cross-site and EU level and supported the measures and the cities with their evaluation work.

2.3.3 Method of approach

Introduction

Based on an initial proposal from CIVITAS POINTER, the methodological approach of the process evaluation has been discussed and further developed between CIVITAS POINTER and the CIVITAS Plus projects and cities in workshops as well as at Evaluation Liaison Group (ELG) meetings. Additional comments have been received and further discussions have been continued via e-mail as well. This participatory way of working has led to a way of carrying out the process evaluation which is well accepted by the CIVITAS Projects, cities and measures.

Methodological framework

The idea behind the approach is system and transition based thinking. The reason for this is that CIVITAS PLUS aims to achieve a societal change or shift towards a more sustainable urban mobility and transport system in Europe. Such a shift in terms of 'safe, clean, reliable, affordable, efficient etc'. is quite a (societal) challenge. It means that the fulfilment of our transport and mobility needs are to be changed and that intertwined shifts on various levels are required. In fact changes in the way of thinking about mobility, in the way of organizing the mobility and transport system and in the daily routines regarding to mobility are necessary. These changes are called respectively a paradigm shift, a structure shift and a routine shift. Together they lead to a fundamental change of the urban transport and mobility system and this fundamental change is called a transition.

Within this transition towards a more sustainable urban mobility and transport system the measures in CIVITAS Plus play a vital role in the transition towards a more sustainable urban mobility and transport system. They can be seen as steering instruments by learning about the drivers, barriers, opportunities and threats to change our thinking, acting and organizing. Furthermore they are instruments to mobilize (transition) actors, put pressure on the existing regime to change and can play a very important role as showcases (inspiration and motivation) towards a sustainable mobility system.

Process Evaluation Design

As seen in Figure 2.1 the CIVITAS Process Evaluation Design consists of three related building blocks, which form the basis for the data collection:

The first building block is the **Measure Process Evaluation**. The Measure Process Evaluation builds the basis of the process evaluation. All CIVITAS PLUS measures have been assessed in the same way with information gathering based on a semi-closed questionnaire (Measure Process Evaluation Form), divided in 3 parts:

- General administrative information. This information has to be completed in the first reporting period and can be copied to the following reporting periods. Changes have to be amended in each reporting period.
- General content information. Here the three levels of objectives have to be described. If there are no changes the objectives can be copied to the following reporting periods.
- Content: This is the part that contains information and statements concerning barriers/drivers and success /failure.

The second building block is the **Focused Measure Process Evaluation**, including an in depth analysis of a limited number of selected focused measures. Information is gathered with questionnaire forms containing mainly open questions based on so called Learning Histories Workshops and / or in-depth interviews. The selection of these focussed measures was based on the following criteria:

- Relevancy for city policy
- Expected impact on five pillars of EU Green Paper on Urban Transport.
- Expected impact on CIVITAS evaluation categories (transport system, environment, economy and/ or society / people)
- Possibility to carry out a complete Cost Benefit Analysis
- Innovativeness of measure (technique, consortium, process, learning etc)
- Number and kind of stakeholders
- Manageability of the measures
- Potential for Transferability
- Representative for a group of measures a specific context

The third building block consists of **Process Topics and Issues**. The main criterion for selecting a topic/issue is its significance for several measures and/or cities. It can be a special barrier, driver, area, methodology, solution, etc, but must be related to the measure processes. In fact they are measure over-arching, for example transferability, up-scaling, citizens' participation, stakeholder motivation.

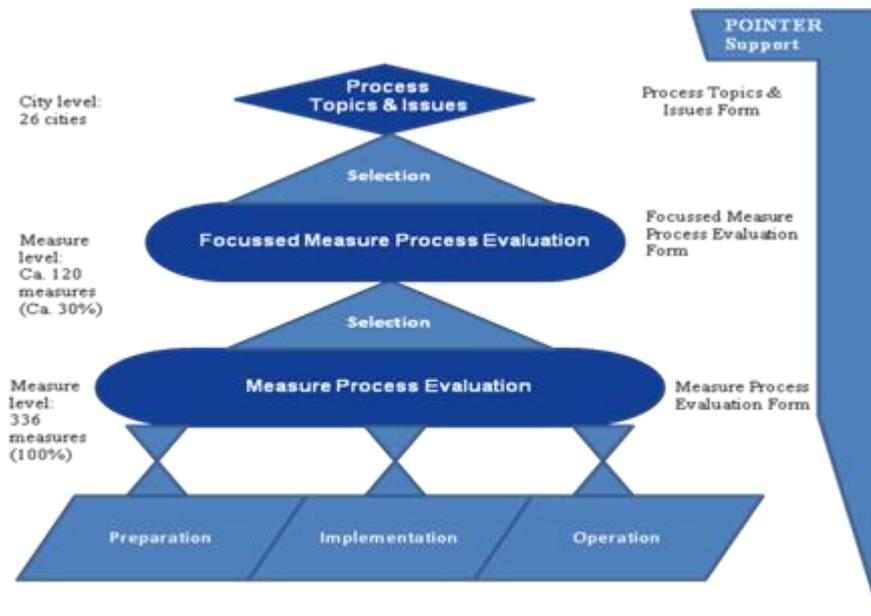


Figure 2.1: CIVITAS PLUS Process Evaluation Design (Van de Lindt and Emmert, 2009b)

Use of information and data

During the conducting of the evaluation it appeared that the quality of the completed forms varied enormously; not only between the projects, but also within them and even within the cities. Another problem was that not all the cities were accurate in following the time planning and the provided manuals and instructions. Furthermore it appeared that carrying out a proper learning history was rather problematic for many cities and measures. The organization of the workshop was often seen as too time consuming and there was the inexperience with the method as well, despite the provided instructions and the workshops that were held in Porto (Portugal) and in Delft (The Netherlands).

All by all the results at the form level were hard to analyse and to interpret and it was decided that the forms were better to be used by the cities and measures to complete a proper (process evaluation part of the) Measure Evaluation Results Template (MERT). The process evaluation part and some general measure information of the MERTs has been put in an Excel database and into a SPSS system file for analysing purposes.

Before conducting the analyses the database was enriched with a number of help-variables concerning measure-clusters, leading- and learning cities, success implementation rate of measures, quality of the process evaluation and focussed – non-focussed measures. This has been done for three reasons. The first is to enlarge the possibility of a better understanding of the outcomes. The second is to create the possibility of making comparisons between CIVITAS I, II and Plus in the more overarching policy analysis (see POINTER deliverable 3.2.2) and thirdly for data analysis after CIVITAS Plus in more detailed studies.

3 EVALUATION FINDINGS

In any particular city, CIVITAS measures have overlapped in both time and location, as well as with other local, national and European initiatives. Whilst this has made it difficult to identify the specific effects of any individual measure, it has been possible to generate valuable understandings of the impacts of individual measures and of the processes which led to their success or failure. The detail of what was found is available in the reports of the four projects (Archimedes, Elan, Mimosa, Modern, and Renaissance) and in the individual measure templates which are annexed. These templates contain much contextual and other information.

In addition to the project reports, POINTER has produced a series of cluster reports which bring together the measure outputs to provide a coherent cross measure/cross site interpretation. The conclusions from these cluster reports are given in the following sections. Separate reports have been produced which deal with those measures for which a detailed Economic Evaluation has been possible, and for Process Evaluation.

3.1 Cluster 1 – Alternative Car Use

Process evaluation

- Political support is an important driver, especially at the preparation phase and was mentioned for 46% of the measures. The reason for this is that this cluster requires a paradigm shift from car ownership to car use. Politicians and local governments have an important role in this shift by stimulating (speeding up) institutional changes (for example in Bath), declare city planning and mobility visions (for example in Perugia), etc. However, the lack of political support may cause a chain reaction to other barriers, which are difficult to overcome.
- The paradigm shift is often hampered by cultural barriers such as when owning a car remains attractive or habitual. These were explicitly mentioned in Bologna and Monza, but probably are main barriers everywhere.
- Institutional aspects can be either a barrier or driver. An example of the first is found in Gent, where a barrier was the lack of legal means to force the taxi operators to cooperate in establishing a taxi sharing service. An example of institutional aspects as a driver was found in Bath where the process of getting permission of on-street parking for the City Car Club was able to be speeded up.
- Spatial barriers were often related to finding suitable locations for carpooling or for locations with special services such as recharging points for electric vehicles (for example in Donostia-San Sebastian).
- Spatial barriers sometimes are caused by the danger of split incentives, i.e. who has to invest and who gets the revenues? This discussion was seen in Perugia, where the pilot site was not managed by the municipality.

- Involvement in terms of special arrangements between stakeholders or target groups can function as a barrier, but also as a driver. This was seen in Perugia, where an agreement between the municipality and the company that runs the city car-park service led to additional carpooling service.
- Technological barriers occurred mainly at the preparation stage. For example, in Bath, there was a lack of sufficient number of electric and or hybrid vehicles due to market circumstances at that time. The availability of suitable and well-functioning software plays an important role. In Monza the booking software for the car sharing scheme did not function optimally which caused a barrier, but in Craiova the software supported the car-poolers well and acted as a driver.

Impact evaluation

A series of key messages for the successful establishment and/or continued operation of car sharing and car pooling systems can be discerned from the evidence provided by the cities in the CIVITAS Plus programme.

The case for alternative car use schemes

The experience from Brescia and the assessment conducted in Coimbra suggest that new car sharing schemes can be successfully implemented to reduced private car use and deliver other economic and environmental benefits. Previous research suggests that the appetite to develop car sharing schemes is increased through the engagement and support of principal stakeholders, such as the city or municipal authority (to provide political, legal or financial support), and the local public transport operator (e.g. to provide smartcard integration and convenient interchanges across different modes). This is also borne out by the CIVITAS Plus projects. The start-up costs can also be reduced through the inclusion of municipality-owned vehicles as part of the car sharing fleet, and scheme take-up is in turn increased by the inclusion of the local authority or government as customers. The introduction of a high proportion of clean or electric-powered vehicles from the outset is particularly valuable.

The experience from Perugia and Craiova show new car pooling measures can also be successful in reducing private car use, when they are generated by the city or municipal government in response to a recognised demand for these services.

However, the success of all alternative car use schemes can be variable, as the experience from Donostia-San Sebastián and previous CIVITAS studies have shown. Many other factors must be considered, including the following:-

- i) *Continued need to increase awareness and promotion*
Despite some successes, and consistent with previous studies, the general awareness of alternative car use schemes in the CIVITAS cities was relatively poor. The experience from Donostia-San Sebastián, as with previous CIVITAS findings, suggests that additional marketing and/or promotion is necessary to attract private users and businesses to the new services. Intervention by the city or municipal authority (in conjunction with the local scheme provider) should be a prerequisite if alternative car use schemes are to be successful.
- ii) *Incentivising Users*

In some European cities, e.g. Bath, specific circumstances such as space constraints, congestion levels, cost/shortages of parking spaces, and factors such as high cost of car ownership (e.g. for insurance and/or high taxes in new cars) can make alternative car use schemes very attractive to users. However, where such driving factors are absent, alternative car use can be met with limited success for both companies and private users, even where strong promotion and endorsement through different communications channels have been provided. This was the case in Aalborg. In these circumstances, additional incentives or financial motivations are required to develop a successful car sharing or pooling scheme. In Gent, for example, prospective users were offered limited free trials to encourage them to try out the car sharing service. This resulted in an increase in the number of subscribers for the short to medium term.

iii) *Community engagement and 'word-of-mouth' promotion*

However, as shown in Monza, free trials in themselves may not be self-sustaining in the long term, and additional measures that engage the community are required to support the continued use or growth in car sharing and pooling. This has not been clear from previous studies. Moreover, the evidence from Gent (and initial indications from Utrecht) suggest that engagement of the local community in determining e.g. the car sharing locations (through a 'vote for a car sharing station in your neighbourhood' initiative in the case of Gent), and using other 'word-of-mouth' communications measures are more effective in promoting and sustaining alternative car use. Such measures could include home social sessions (e.g. 'coffee and cake time') to introduce people to the services, as well as the appointment of local 'client ambassadors' to advocate their use. This is an important finding from CIVITAS Plus, and should be highlighted to future schemes.

iv) *Consider need from business subscribers*

Successful car sharing schemes in this cluster have courted both business and private participants, as their hours of use tend to be complementary. (Business users tend to require vehicles between 9am and 5-6pm during weekdays, whereas the demand from private individuals tends to peak in the evenings and at weekends.) Targeting business customers in addition to individuals not only increases subscriber volume (often several fold), but also optimises the use of vehicles during any 24-hour period. However, the experience from Gent shows that business users also have specific requirements which need to be met, such as 'pool' smartcards for their employees to access shared vehicles. This finding of CIVITAS Plus supports results that have been found previously that effective car sharing usually involves tailoring solutions to specific subscriber bases. Similarly, previous research has indicated that company employees can provide a high source of demand for car pooling schemes. This is supported by the Craiova and Perugia examples in this Cluster. Car pooling seems particularly effective where large businesses are located in suburban areas with limited car parking and/or where they are not well-served by public transport. The inherent demand from these businesses, which includes universities and public utilities, increases the potential for success in car pooling, which in turn is said to be successful in reducing traffic congestion and pollution.

v) *Importance of effective collaboration*

Typically, stakeholders are involved in developing and implementing alternative car use schemes. The measures have highlighted the importance of effective cooperation. The taxi-sharing experience from Gent shows that, where partners do not cooperate, the scheme is likely to fail from the outset, even if the city or municipality is willing to initiate and promote the scheme.

vi) *Upgrading car sharing schemes*

As well as enlarging a service, upgrades of existing car sharing schemes should also involve the deployment of more environmentally friendly vehicles (i.e. adaptation to more technical state-of-the-art). As shown by both the Bath and Bologna CIVITAS Plus projects, changing from petrol to more environmentally 'clean' fuel vehicles can make further contributions to reducing pollution and emissions, as well as in demand.

Usefulness of impact evaluations

While nearly all the cities in this Cluster provided some results, which were useful in their given context, it is evident that several projects did not devote sufficient resources into determining their 'Baseline' and 'Business-as-usual' situations beforehand, e.g. through surveys to determine existing user awareness, and were unable (or found it difficult) to provide 'before-and-after' comparisons of the benefits to be derived from alternative car use schemes. Where a city did devote resources to establish the data for these scenarios, as in the case of Bath, more meaningful and rigorous impact results were obtained.

Recommendations

From the conclusions of the work with the CIVITAS PLUS projects, the following recommendations are made:

- City or municipal authorities should *ensure* they are pro-active in promoting (or continuing to promote) alternative car use schemes, as marketing and promotion are prerequisites for the attraction of private users and businesses to these services.
- Where congestion, space constraints and other urban driving factors (such as high parking charges) are absent, the administrators or operators of alternative car use schemes should provide financial incentives or other motivations such as free trials to attract additional users, as promotion and endorsement alone may be insufficient in these cases.
- Promotions through 'word-of-mouth' and strong community engagement, including the use of local 'client ambassadors' or 'nudgers,' are more effective in sustaining usage of car sharing schemes for the long-term. Administrators of such schemes should consider for example, engaging the local community to introduce people to these services and in determining the car sharing locations, which can deliver sustained benefits over traditional 'top down' promotional campaigns.
- Car sharing schemes should target business users as well as private individuals, as this increases both the utilisation of vehicles across different time periods, and the number of subscribers. However, these schemes will need to improve the business offering according to user needs, for example by providing a corporate 'pool' card. Similarly, city or municipal authorities should consider targeting businesses located in suburban areas, which have limited parking or that are not well-served by public transport, for potential carpooling schemes, as these provide a high source of demand.

- As with previous CIVITAS findings, scheme administrators or developers should ensure that all project stakeholders are engaged (and committed) to the deployment of alternative car use schemes.
- Car sharing schemes should deploy more environmentally friendly vehicles where possible, as these help to reduce pollution and emissions as well as private car demand. The higher leasing cost incurred for these vehicles can be offset by lower fuel consumption costs.
- A sound feasibility study is essential before starting measures of alternative car use in the field. This should contain topics such as possible target groups and their culture, possible participants (frontrunners) and their interests, spatial requirements, equipment needed, business models, and possible positive and negative effects.

3.2 Cluster 2 – Clean Vehicles and Fuels

Process evaluation

- Where vehicles have to be modified or replaced technical barriers occur at all the measure stages. At the preparation stage, the problems relate to knowledge whereas at the operation stage they are related to more daily operation routines. An example of this can be found in the measure ‘Alternative fuels in Coimbra’ and in Brno (Optimised energy consumption in tram and trolley bus network) where there was a lack of necessary components for the equipment lacked.
- The switch towards clean fuels can be hampered by legislation at the national level. An example of this was found in the measure ‘clean public transport strategies in Zagreb’ where the Croatian government stated a norm for the fuel mix of biodiesel that hampered the achievement of the measures.
- Spatial barriers often dealt with finding suitable locations, for example a suitable piece of land for a filling station (Gorna Oryahovitsa, Alternative fuels and clean vehicles) or in Brighton & Hove (Electric vehicle charging points) which faced electricity supply problems and vandalism to the charging points.
- Changing towards clean vehicles and fuels often requires large investments. Therefore, political support acts as an important driver and 53% of the measures in this cluster mentioned political support as driver.
- Political support is also often closely related to involvement and organizational drivers. These were mentioned for 40% and 51% of all cluster measures respectively.
- Political trust in new technology is important to gain political support for new developments. This was demonstrated in the city of Utrecht (stimulating the use of clean vehicles by innovative parking policy) and in two measures in the city of Gent (extended biodiesel production; clean public transport strategies).

- The involvement driver is very important because there are many stakeholders involved in the switch towards clean vehicles and fuels from governments to adjust regulations to users to accept the changes.
- A switch towards clean vehicles and fuels demands specific knowledge. The Brescia measure 'Renewable energy production to feed buses with low environmental impact' showed that an agreement with experienced installers acted as an important driver for the measure. The importance the knowledge driver was also demonstrated in the more RTD like studies, for example in the Gdansk study 'Alternative fuels. Here the knowledge was provided by the Gdansk University of technology.
- Knowledge also functions as a driver in terms of knowledge and experience exchange. This was the case for the measure 'clean minibus fleet implementation' in the city of Szczecinek where the learning experiences from the city of Krakow (CIVITAS CARAVEL city) were regarded as important.

Impact evaluation

- Most measures were focused on assessing the provision of technologies and fuels that were relatively well established. Different levels of biodiesel were tested in 6 measures; CNG was tested in 7 measures; LPG was tested in 3 measures; and hybrid and electric vehicle technologies were tested in 15 measures.
- Buses using various levels of biodiesel have been tested, predominantly between B5 and B30 (although up to B100 for 6 buses in Aalborg). Use of such biofuel blends resulted in a slight reduction in CO₂ emissions. Results for CO and NO_x were variable with some increases, some decreases).
- Assessment of CNG use in buses revealed a significant reduction in particulate emissions, and indications that CO₂ and NO_x decrease, while CO increases. CNG has been generally less costly than diesel, so fuel costs have been reduced, but any savings on fuel costs are likely to be outweighed by the initial implementation costs of introducing new vehicles.
- For buses using LPG, the results for emissions showed marked increase in CO₂, and decreases in CO, NO_x and PM
- The relative attractiveness of fuel alternatives depends on issues of taxation, legislation and regulation, supply reliability, and general technical and operational competency.
- More hybrid testing was carried out in the CIVITAS Plus than in previous CIVITAS programmes. Only one hybrid vehicle was evaluated as part of CIVITAS II, while over 40 vehicles were tested in 9 locations in the current programme. Fuel consumption was generally reduced for hybrid vehicles, taking advantage of the regenerative braking system. Costs of hybrid vehicles (in particular, buses) were higher than for the diesel equivalent, which may restrict any future growth in the public transport market, but there are no costs implications for adapting the current infrastructure.

- Measures in some locations were adversely affected by local legislation relating to alternative fuels, particularly in regard to caps on the amount of biofuel that could be used in a blend, and by financial restrictions in carrying out planned improvements and new buildings for housing local fuel supply stations. Some measures were either curtailed or significantly amended as a result.
- The retrofitting of buses to use dual-fuel was found to be a cost-effective way of extending the life of buses currently in service, while lowering emissions.
- Eco-driving training was found to be effective in reducing fuel consumption in the short term, although longer term analyses indicate that the impact reduced over time.
- Participation in campaigns to influence greater use of alternative fuels and cleaner vehicles has been generally slow, with numbers of users initially much lower than envisaged in both the electric vehicle charging scheme in Brighton and Hove and the 'Green Tariff' parking scheme in Bologna. However, indications are that uptake of the incentivised parking increased during the closing months of the programme. Public transport users generally considered environmental issues to be important, but did not seem to consider such issues when deciding on mode use.
- Overall, CIVITAS Plus has contributed to the introduction of 460 biodiesel vehicles (new or modified), 176 CNG vehicles, 73 LPG minibuses or buses, 46 hybrid buses, 29 electric vehicles and 31 EEV buses. In addition, 70 trams were fitted with an energy recovery system and 35 methane converter kits were given to residents of Perugia. Measures have contributed widely to the continued growth in the public and private purchase of cleaner vehicles, and some influence on public attitudes to alternative fuels and cleaner vehicles could help to stimulate the regional market for such vehicles.

Recommendations

- National and international standards for biofuels are needed to instil confidence in users and providers. Without such standards, the difficulties encountered in the implementation of some measures in ensuring consistent supplies of fuel will be replicated elsewhere. Contractual conditions were found to be necessary to overcome barriers associated with fuel provision.
- The promotion of alternative fuels for more sustainable operation requires coherent consideration of taxation and legislative policies for the different fuel types at a regional and international level, as well as local political and management support.
- Retrofitting older municipal and public vehicles to use alternative fuels can offer a cost-effective short- to medium-term solution to allow current fleets to continue to be used beyond their current lifespan (in terms of EURO standards).
- Policies, incentives and technologies should be developed to encourage eco-driving, including ensuring refresher courses are available to ensure the short-term benefits continue into the longer term.

- Cities wishing to implement more sustainable vehicle fleets should have access to relevant technical and operational expertise to help specify, implement and maintain the fleets, as such expertise is often outside the scope of the traditional competences of their staff. Additional expertise is needed to develop effective awareness campaigns, and how to help overcome barriers of slow uptake of incentive schemes.
- Whilst the costs of hybrid vehicles remain higher than for the most modern equivalent conventionally powered vehicles, the sustainability benefits are valuable and need to be promoted.

3.3 Cluster 3 – Cycling and Walking

Process evaluation

- Political aspects acted as a very strong barrier as well as a powerful driver. An example of the first is 'The House of the Cycle and Cycle activities' in Gent where the tendering procedure was stopped due to a change of local government, resulting from national elections. An example of political support as a major driver was found in Vitoria-Gasteiz where the support led to tailor made regulations, local laws, etc. (institutional driver).
- Political aspects are so important because they are linked to other possible barriers or drivers, such as investments or a city plan. In Utrecht (Public and rental cycles) local elections resulted in a governmental change, and politicians new decided not to invest further in the measure. Donostia-San Sebastian had a long and stable 'cycling supporting' local government and remained willing to invest in infrastructure despite the high costs. (Even the business sector invested). Another driver example was found in the city of Tallinn where the long term Tallinn Traffic Safety Development Plan 2005-2014 acted as a framework for the measure 'Improvement of visibility and safety of crosswalks and cycle tracks'.
- Cultural aspects are one of the main sources of barriers to successfully encouraging cycling. This can be linked to cycling itself. For example, cycling is perceived to be unsafe (Donostia-San Sebastian) or cycling is seen as a sport activity (Usti Nad Labem, Gdansk). In other cases, the barrier was that the car still holds a strong position as a status symbol and cities are developed from a 'car friendly' perspective.
- Spatial barriers can be related to the topography of a city. For example in Donostia-San Sebastian, where the hilly topography leads to high investment costs (financial barrier). In other cities, the spatial barrier means a lack of space. For example, in Ljubljana, because cycling has never been seen as a mode of transport (cultural barrier), agreements were necessary to create cycling space. This again was difficult because there was no clear legislation (institutional barrier) and little political support (political barrier).
- Involvement can be extremely hampering or stimulating to measure progress. In some cases the involvement had to do with targeting important groups such as the shopkeepers in Donostia-San Sebastian or schoolchildren in Aalborg. However, due to

intensive effort both measures were very successful. In other cases, like the 'Bus and Cycle' and 'Location-enabled mobile search and guidance' measures in Funchal, the involvement was information provision. The latter later measure used mobile devices with a target group of people that were experienced with technologically driven services (mainly young people).

- Technological driven measures often faced technological barriers, such as malfunctioning websites and software problems. In a few cases the innovativeness and /or complexity of the measure acted as a barrier. For example in Brighton: student designers lacked expertise for the innovative design, trial installations of the cycle ramp worked unsatisfactory, and changes in staffing caused continuity problems.
- The main conclusion is that barriers and drivers are often linked as a chain or network of barriers.
- 'Linkage' refers to the positional barrier or driver. In the case of barriers it means that a measure has no physical or programme linkages. However, an important driver is when a measure is linked to others. Linkages can refer to cycling and walking as a part of a multi modal mobility chain, or as a physical network of cycle and walking lanes, or be linked to other measures and programmes. For the latter type of linkages, learning from each other can play a substantial driver role. This is especially so in the case of 'cycling and walking', because many cities lack experience with these modes of transport.

Impact evaluation

Cycling infrastructure: lanes and parking

- Infrastructural interventions can help cycling to become a more popular mode of travel (e.g. 4% modal shift from car to cycle in Aalborg, higher cycle counts in Iasi) and improve attitudes towards cycling and the provision of cycling facilities
- In the long term, some of the infrastructure interventions were shown to be economically beneficial: Donostia- San Sebastian scheme's benefit cost ratio was 5.87 and Net Present Value for Szczecinek's and Vitoria-Gasteriz's schemes were €1,428,579 and €197,087,000 respectively. Gent's scheme was shown not to be profitable because the parking facilities were implemented as a trial and thus had a short (5-year) life span.

Cycles and buses

- Cycle and bus measures neither significantly increased cycle travel nor was the cycle rack on buses well-used. However, people became more aware of the measure and activities carried out as a part of the measure.

Cycle rental and loan scheme

- Cycle rental and loan schemes require relatively high initial investments and significant operating costs over the life span.
- Cycle rental points are highly visible and therefore could improve the green image of the city as well as encouraging more of the public to try cycling without a large commitment.

- Users of rental cycles tended to show high levels of satisfaction and acceptance and to value the services. Such services could be used as a step to more wide-spread cycling.

Safety improvement for pedestrians and cyclists

- Safety improvement measures in general resulted in improving the safety of pedestrians and cyclists as well as encouraging active journeys. In Brescia and Szczecinek, accidents reduced after implementing the measures, and cycling became more common in Aalborg, Gent, Ljubljana and Zagreb.
- Proper use of traffic signals, signage, and street furniture can prevent potential pedestrian accidents and promote safer driving behaviour.
- Soft interventions without infrastructure construction can encourage modal change.

Security

- Properly designed cycle parking plans can encourage cycling and increase the security of cycles. Information technology can help the recovery of stolen cycles.

Wayfinding

- A wayfinding system, either in physical or in data form, can be well-accepted by the general public and is a good exercise to encourage more sustainable travel behaviour.

Other

- The initiatives aimed at enhancing the perception of cycling led to an increased satisfaction with cycling and to people being more willing to cycle.

Recommendations

- Generally, the wide range of measures to support and encourage walking and cycling can be effective in changing attitudes and behaviours to achieve more sustainable outcomes and are to be encouraged strongly. The evidence of positive impacts is consistent and substantial
- Political support is the top priority to implement successful cycling and walking measures
- A long term city plan for sustainable transport with specific attention for cycling and walking is strongly recommended. The plan should include both hard and soft measures. Such a city plan would act as an official attractor/framework for all cycling and walking measures
- Cycling and walking are not to be seen as standalone activities, but as parts of the whole city infrastructure. Multimodal connections with bus stations, train stations, residential areas, and shopping and business districts are crucial.

- Strong involvement and communication between different partners/stakeholders as well as value-guided leadership are essential for the success of walking and cycling measures.
- When several cycling and walking interventions are implemented at or near the same time, the impacts of interventions can be far greater due to their synergistic effect.
- Public engagement is important to support a change in modal shift from private car use to cycling and walking.
- Evaluation of longer-term and wider effects is desirable because behavioural change takes time and health and economic impacts resulted from higher physical activity levels may be very large and can only be captured in the longer term

3.4 Cluster 4 – Logistics and Goods Distribution

Process evaluation

- The main conclusion is that barriers and drivers that hamper or stimulate the process of Logistics and Goods Distribution measures, are focussed on political, institutional, problem related, stakeholder involvement, positional, planning or organizational issues.
- Drivers and barriers on cultural circumstances, the availability of public funds or willingness of the business community to contribute financially, availability of technology, or space for experimentation zones were seen as being less crucial for the development of the measures.
- Barriers were often linked. This reflects the complexity of urban goods delivery.
- Political aspects acted as a very strong barrier. For example, the political context played a crucial role for the Sustainable freight logistics measure in Ljubljana. The reluctance of some Traffic departments of the City of Ljubljana (COL) which were not directly involved in CIVITAS affected the process of the measure implementation. As the measure could not proceed without COL cooperation, the implementation of the consolidation scheme was cancelled.
- On the other hand, political commitment is a strong driver and crucial to raising awareness, putting issues on the strategic agenda and getting support from local policies, stakeholders and end users. In the sub clusters 'New distribution schemes' (45%) and 'Access restrictions to freight vehicles' (14%), the involvement of stakeholders was mentioned as a driver.

- For most measures, institutional barriers were often related to time consuming bureaucratic procedures and to legislation restrictions.
- Although the innovative processes to stimulate collaboration between all affected stakeholders is one of the aims of this cluster, the involvement of stakeholders was often a major hampering factor. This can be explained as almost a quarter of the measures facing problem related barriers, such as a lack of shared sense of urgency among key stakeholders in the preparation phase.
- It is very empowering for a measure to be part of a city programme or a consequence of the implementation of a sustainable vision. For the Efficient good distribution in Iasi for example, the measure was part of a global city strategy, based on a sustainable vision for urban transport.
- Organizational barriers were mainly a hurdle at the implementation phase, and varied in nature, examples were insufficient partnership arrangements which made it difficult to apply a strategy, or the loss of information, communication and delays because of a departing measure leader. Organizational matters such as frequent and well organised meetings with the right people were mentioned as a driver for the process.

Impact evaluation

From the evaluation of the goods distribution measures documented within the four sub-clusters, the following conclusions have been made:

- Without the support of appropriate stakeholders, sustainable logistics measures are not likely to succeed. This has been a common issue for both CIVITAS II and CIVITAS Plus projects. As demonstrated by each sub-cluster, stakeholders (including local government organisations) may not engage with a proposed measure if they have no issues with the existing freight distribution network or if they feel the new measure will have a detrimental impact on their business activities.
- As demonstrated in Iasi, the provision of 'incentives' where business can negotiate facilities to improve freight operations, can encourage stakeholders to sign Freight Quality Partnerships which can improve the success of a measure.
- A detailed assessment of current freight logistics and business requirements is essential before implementing any measure as it provides a baseline for evaluation. Inadequate baseline data not only delays implementation but can cause problems with evaluation.
- Expansion of an urban consolidation scheme to a neighboring local authority could reduce the cost of subsidy by sharing the overhead costs. Operational costs could also

be optimized by subcontracting the operation to an established logistics provider that already has suitably located depots and fleets of clean vehicles.

- The bundling concepts used in consolidation distribution models could be adapted for non-traditional goods, which could include construction materials, and fresh and perishable goods. However further piloting is required to evaluate the potential demand and benefits. Integration with pre-existing services could be beneficial.
- The introduction of cleaner vehicles as part of freight distribution schemes for example electric trucks, electric cargo bike, the Cargohopper (mini electric train) and Beer Boat are likely to make significant savings to fuel consumption, emissions while reducing HGVs traffic in city centres. However the associated set up costs especially for the Beer Boat type of measure are likely to be too expensive for private investment and are only viable with public ownership.
- Cities should take the opportunity to unify measures where appropriate as demonstrated in Utrecht with measures 7.2 (City Distribution by Boat (beer boat)), 7.3 (More flexible access for cleaner freight traffic (Cargohopper)), and 7.4 (Distribution Centres for Fresh and Perishable Goods) to maximise the benefits.
- Regulating freight access in restricted areas e.g. Low Emission Zones, based on emission standards of vehicles or weight, could encourage freight operators to reconfigure their fleets in order to optimize access and meet the demands of their customers.
- Access restrictions need to be regulated to maximise their impacts. The installation of Automatic Number Plate Recognition Cameras (ANPR) can help enforcement.
- The development of in-vehicle and roadside support technologies for ‘freight’ drivers and vehicles could contribute to city wide re-routing strategies. New innovative technologies, which may include real-time data, not only take time to develop but there are no guarantees that they will be used. Communication strategies in close cooperation with transport operators could encourage usage.
- The experiences reported as part of Cluster 4: Logistics and Goods Distribution can be used to shape the future development of similar measures not only to ensure that the same mistakes are not replicated but to build on the progress that has been made.

Recommendations

From the evaluation of the goods distribution measures documented within the four sub-clusters, some general recommendations have been made:

- Urban freight transport should be seen as a complex system / network of activities and stakeholders with different, often conflicting, interests. This requires a participative approach, including all the key stakeholders (citizens are stakeholders). This participative approach will have to (i) conduct feasibility studies (including city specific

circumstances); (ii) lead to a shared problem recognition; (iii) explore alternative solutions; (iii) lead to implementation, monitoring and evaluation of measures.

- Participative / involvement processes are often complex and need a professional support. It is recommended that they are run by independent professionals.
- Stakeholder involvement should be maximized from the planning stage as partnerships underpin the success of sustainable logistics measures. Stakeholder collaboration may be stimulated through the acknowledgement of ‘real’ issues and from the provision of incentives, which could include the ability to negotiate improved delivery access. Time needs to be invested to build collaborative partnerships (Freight Quality Partnerships) to ensure that information can be shared and potential problems identified.
- Successful collaborative partnerships between appropriate stakeholders can lead to the formulation of high impact freight strategies that consider logistical needs for the city, businesses, transport operators and local residence.
- Strategies need to be implemented gradually and communicated widely using a range of media outlets to maximize dissemination e.g. local media, leaflets, posters and the internet. Any changes made to the local road network need to be communicated effectively through the use of clear signage to ensure that freight is redirected along the appropriate routes.
- Regulatory measures need to be enforced to ensure that the planned benefits can be achieved.
- More collaboration is required between different transport solutions operating within cities to optimize consolidation and bundling of deliveries.

3.5 Cluster 5 – Mobility Management

Process evaluation

- Within the sub cluster Mobility Agencies, the most frequently encountered barriers were organizational and technical. Technical barriers played a substantial role at all measure stages, and were mentioned for 36% of the measures at the preparation stage. Often they were found to be related to hierarchic structures within local administration and as well as in companies.
- The sub cluster Mobility Agencies shows the importance of drivers such as political support, involvement and a well-established organization. Most were identified as the

drivers behind the very successfully implemented measures in Gdansk, Utrecht and Brno

- In the sub cluster Mobility Plans, political and involvement barriers were mentioned for 30% and 43% of the measures respectively. Involvement was the most dominant barrier at the implementation and operation stages. Financial barriers were mentioned by around one fifth of the measures for all phases.
- The sub cluster Mobility Plans is characterized by the fact that organizational drivers are mentioned less frequently for the later measure stages, while the political barrier become more frequently mentioned. Very successfully implemented measures were supported by a combination of drivers. Examples were found in Brighton & Hove and Donostia-San Sebastian.
- The measures in sub cluster Mobility Marketing particularly faced institutional and organizational (both 33%), and cultural and involvement (both 27%) barriers at the preparation phase. Measures that have been implemented with moderate success, such as in Zagreb and Tallinn, faced mostly cultural barriers
- For Mobility Marketing, involvement and organisational drivers were mentioned at all stages. At the operation stage, a well-established involvement of stakeholders was regarded as a driver by almost half (47%) of the measures. The importance of these drivers can be found in the Coimbra measure 'Info mobility Centre and Mobility Marketing in Coimbra'.
- The two measures in Tallin and Vitoria-Gasteiz on Eco Driving with showed each measure to have specific drivers and barriers. However, well-established training programmes, equipment and communication as well as strategic / political support were identified as important drivers.
- The sub cluster demand management had five measures. The unsuccessful measures in Zagreb and Ljubljana and the moderately successful measure in Utrecht show the strength and relationship between political, financial and organizational barriers. The Bologna measure 'Road pricing policies' showed the power of these factors as drivers.

Impact evaluation

- A number of reported reductions in car use during the project. However, some or all of this decline could be due to the recession
- A number of measures could not progress fully because of financial constraints. In a number of projects there was a reluctance on the part of the Municipality to fully take on board and implement the recommendations of the project. This might be difficult to avoid, especially in difficult economic times – but it suggests that better cooperation is needed with the relevant municipal departments – making sure they are “on board” right from the start of the project – as they were in the case of the Low Traffic Zone in Bologna (3.1).

- Overall, the mobility management schemes had a significant and measurable impact, although targets were not always reached, in many cases they were exceeded, demonstrating significant added value.
- The 22 mobility agency measures were assessed to have made substantial increases in awareness of sustainable transport issues and in associated behavioural changes.
- Mobility plans: 'Hands on' initiatives, such as electric bikes in Aalborg (30), resulted in a high awareness level among employees, whereas information campaigns alone may have limited effect on travel behaviour. Also campaigns organised by the employees themselves create peer pressure for colleagues to join (the “nudge” factor). Inclusion of innovative measures such as social media can reach new audiences not picked up by the traditional measures, though the traditional measures should not be abandoned. Car-sharing measures seem to be relatively unsuccessful – though there is evidence (not presented here) that it works better with online communities.
- Mobility marketing campaigns are best organised by specialised marketing companies in close cooperation with the municipality and need to have a clear message. People should be approached in a personal way or as a well-defined group; peer pressure is more important than general information online or on paper. Think long-term, and incentives are helpful.
- The two eco-driving measures were very successful with significant short term savings, and in the case of the Tallinn bus company they will become a part of the formal driver training programme, and so will continue.
- For demand management measures, citizens and stakeholders must be informed, and considered as part of the solution and not as a problem (Zagreb 3.2). However, support may increase after implementation as citizens experience the benefits (Ljubljana 3.1). Trial schemes are desirable, and on a large scale rather than small technology demonstrations.
- Some cities seemed to lack imagination or initiative as regards up-scaling of measures, saying that up-scaling is not applicable when it may be.
- The inclusion of key stakeholders, a common understanding of the need to solve traffic and environmental problems, and a well-planned implementation process are key conditions for success.

Recommendations

- The measures were generally successful in reducing private car trips, particularly when they were targeted at specific groups. Eco-driving proved effective, and inclusion of key stakeholders from the start of a project was recognised as being important. As was the need for long time-scales, the full effect of some measures may take many years to occur and be detected.

- In the long term, sustainability will be achieved by a mixture of measures. This cluster, Mobility Management, is largely focused on reducing demand and changing modal split toward more sustainable public transport (PT). Whilst the measures have been substantially successful, there was often been significant resistance to their implementation, and it is important to recognize the balance between city policy controlled measures of traffic restraint and prioritization and the developing vehicle technologies which are increasingly delivering vehicles generating little pollution. It is important that measure objectives are very clearly focussed. Sustainability targets may be met in the future by vehicle technologies. Congestion will necessitate constraint on vehicle movements
- Strong political support is needed to overcome privacy issues. Lack of political support almost resulted in cancellation of measure Gent (8.6). Stake-holders should be involved from the start. Plenty of time should be allowed for design, approval, and implementation and testing. The best guide to how long something will take to implement is previous experience which may involve comparison with similar measures or advice from those who have done it before.
- Ideally all stakeholders should be involved in the proposal and bid stages of a project
- Impact on travel behaviour grows slowly, so the full impact of a scheme may not measurable within the project. Ideally, measurements of effects should continue long-term, and funding should be available for this if the full impacts are to be captured.
- Projects should start prototyping and testing as soon as possible, to ensure more robust results and to have time to improve the system (see Funchal8.1). Developing a system from scratch is risky, and contractors with previous experience in such work should be chosen.
- Gorna Oryahovitsa (4.4) disseminated its experience to a large number of Bulgarian cities, and to its seven twin cities in Belarus, Estonia, Germany, Hungary, Romania, Russia, and Turkey. Other cities should follow this example with their own twin cities. Not only would this give wider dissemination of results, but it is likely to be more effective because of the existing relationships within twinned cities.
- Many of the measures were sufficiently generic that they could be up-scaled to the entire city or more widely, as indicated above.
- Eco-driving is effective and should be included in national driver training standards, as well as in training programmes such as the Tallinn bus company programme. In the latter case the fuel savings accrue to the employer so the drivers need to be incentivised.
- Utrecht's (4.3) successful measure of paying drivers not to drive at peak periods ought to be trialled more widely elsewhere. The usual reaction of motorists to charges being introduced on existing roads is that they are being asked to pay again for what they have already paid for. Leaving aside the point that roads are never paid for – they have to be maintained – paying motorists not to drive at certain times or places would seem to be more acceptable – though there is the issue of where the funding will come from.

3.6 Cluster 6 – Traffic Management and Control

Process evaluation

- The number and frequency of drivers and barriers reduced from the preparation stage to the implementation and operation stages
- Public opinion and involvement may act as a strong barrier as well as a powerful driver. Donostia – San Sebastian stated the importance of providing clear information to the population to overcome negative reactions from drivers to car use restriction measures. Bologna faced public opposition partly caused by the local press that criticism of the STARS project. However, involving the public helped the measures, as in Bologna (Safer Road to School) where stakeholders took the role of ‘local champions’ and the enthusiastic approach strongly supported the implementation of the measure.
- Political aspects have the same character as public opinion aspects and act as a strong barrier as well as a powerful driver, especially at the preparation stage.
- Organizational aspects were the main driver for Safety Improvements in traffic. Political aspects were important at the preparation stage, especially as a driver.
- Technological aspects were one of the main barriers to a successful implementation of public transport priority.
- Technological driven measures often faced technological barriers. This may be expected because one of the innovative aspects was related to new technology in 62% of the measures in this cluster.

Impact evaluation

- A wide range of impacts could result from traffic management and control measures. As specific measures may be designed and implemented to address particular problems, evaluation of unique impacts relevant to particular measures could provide insights into the intended effects of such measure implementations
- For almost all measures, positive results have been generally achieved according to a wide range of indicators selected. While a few key indicators such as travel time, and accidents have been used for the majority of measures, some unique indicators

relevant to particular measures, such as recorded flow, operating speed, provided insights into the intended effects of such measures.

- Use of Information technology in transport monitoring and control, such as adaptive traffic light control for PT priority, dynamic traffic information displays, is effective.
- A number of transport monitoring and control measures, such as UTC systems, can effectively improve transport performance, including reduced travel time, accidents, and fuel consumption. However, because of the diversity of cities, public transport measures have to be adapted to existing conditions.
- Public Transport Priority measures improve the efficiency of transportation system and the Public Transport is more effective, when its information is given to travellers.
- Safety and performance improvements can be best achieved by a combination of measures to improve the traffic monitoring and public awareness of PT.
- Functional Transport Infrastructure, including road markings, plays an important role, as does effective traffic regulation, in improving safety for the pedestrians, especially school children.
- The impacts of the most measures on all categories of indicators such as transport efficiency, fuel consumption reduction, transport safety and society awareness, measured by observations and/or questionnaires were generally positive.
- Each Traffic Management and Control measure was focused on one or more specific traffic information and control services such as traffic surveillance, traffic light control, public transport priority and public safety awareness. When combined, a comprehensive traffic management and control system can be developed. Therefore, it is important to integrate measure implementations.
- Energy and environment impacts were only evaluated for a small number of measures. The analysis of energy impacts was mostly based on fuel consumption. Fuel savings achieved varied dramatically from 0% to 67%. The application of strategic traffic management in the city of Ustí nad Labem only brought quite small fuel consumption savings (less than 1%), which can be ignored if the uncertainty of the calculation is considered. Driver training achieved very significant energy consumption per vkm, which is a combined result for switching fuel from diesel to electricity and use of eco-driving principals. It should be noted that the PT priority measure in Ljubljana involved a major error in data collection and the results are indicative rather than conclusive. Analysis on the environmental impacts was mostly based on the indicator of emissions. Emission reductions achieved from three traffic management measures varied from 0% to 90% reductions in CO emission. The introduction of simulators for driver training is a very effective way to reduce both the fuel consumption and pollutant emissions (Coimbra).

Recommendations

The assessment of the traffic management and control measures vary in both scope of impacts and the effectiveness of the measures based on the selected indicators. This reflects the complex interactions between the measures and the transport context in the CIVITAS city. Therefore, for successful implementation of those traffic management and control measures, integration with existing infrastructure systems, services and policy in the city needs to be properly considered. Based on the implementation results of the 38 measures in this cluster, it is recommended that:

- The real-time information that drivers can receive, such as speed monitoring alerting, public transit message, young pedestrian crossing, etc, could have substantial impacts on their behaviour. Therefore, delivering the dynamic traffic message to the drivers by LED display or other means should be considered at the top of the traffic monitoring and control measures.
- A publicity campaign to raise awareness is key to improving transport performance, public transport usage and safety. Such campaigns should be held on a regular basis for specific target groups, particularly for school children and their parents.
- Public transportation priority measures are effective, and should be considered as a high priority for European cities.
- Some transport management and control measures are implemented at functional levels, such as traffic monitoring and Automatic Enforcement of Traffic Lights, are usually implemented as part of integrated measures and their impacts are difficult to quantify individually. It is recommended that detailed evaluation at functional level should be carried out for such measures so that the effectiveness can be better assessed based on the evaluation and the implementation objectives.
- Overall, there is a lack of analysis on the economic, energy and environment impacts of measures, particularly those for safety improvement. Cost effectiveness and environmental impacts are increasingly important for transportation, and have profound implications for assessment of measures. It is suggested that cost, energy and environment impacts should be considered and evaluated in detail in the future.

3.7 Cluster 7 – Public Transport

Process evaluation

- This cluster contains a number of measures that are to a large extent dependent on technology, like Public Transport Information & Ticketing and Public Transport Fleet management. This kind of measure faces mostly technological barriers, like integration and homogenization of systems, hard- and software issues, and (real time) data problems.
- The above problems are linked to other barriers such as organizational and involvement problems, and often lead to planning barriers.
- Technology can function as very powerful measure driver by the linkage with all kind of involvement and planning aspects. See for examples the measure in Iasi and Skopje in the sub cluster ‘Public Transport Information & Ticketing’.

- The sub cluster Public Transport Infrastructure, Network and Accessibility is characterized by measures that face often related institutional, financial and spatial barriers. Spatial adjustments often require extra investments and/or institutional adjustments. (See for example the measures in Donostia-San Sebastian and Perugia.) Thus, political drivers play an important role and, together with involvement drivers are the most named cited.
- Measures regarding Safety and Security of Public Transport sometimes rely on camera technology. This may cause juridical problems, for example in Ljubljana, or the problem that people feel uncomfortable, for example in Craiova and Gdansk.
- Safety measures often target specific groups like school children, elderly, disabled, etc. If these groups are not targeted well, this turns into a barrier for the measure. (See for example this sub cluster measure in Zagreb). The measure in Gent showed that targeting the right group in the right way will lead to a successful measure.

Impact evaluation

- Operational, financial and efficiency needs generally require that the technologies in the public transport cluster serve several measures and must be integrated with existing information and payment systems. They are also used for data collection for the public transport providers, detection of problems, monitoring passenger trips, optimising traffic, etc.
- Cities from the Eastern and South-Eastern Europe seem to have less experience with the newest technologies and they welcome support, help and experience from their project partners and other cities.
- Impacts of a small number of measures could not be determined as the measure implementation failed, or the implementation was only partial or only a study, such as in Brescia, Ljubljana. Some results are unrepresentative because of the underrepresented target group. In Zagreb, the target group of seniors was represented by only 28 respondents. Similarly, in Tallinn, the random sample did not include any school bus users, the target group; in Funchal, only 14 users answered the questionnaire. In Utrecht only 24 taxi customers were finally interviewed. Other mistake during evaluation was the way the respondents were approached – some cities decided to approach them only via email, what might cause that the group of public transport users who do not use Internet regularly is missing (Aalborg, Brighton and Hove). A similar problem occurs when public transport passengers receive a questionnaire and who wants s/he might fill it in (only a certain group of people is motivated enough to answer what might cause biased results; Craiova).

Public transport information

- Measures on public transport information were generally well accepted by the public (the acceptance level varied between 49% to 75%). A high level of respondents liked the information provided at the public transport stops and in vehicles (83% to 97%).
- Economic assessments were conducted for two measures. Providing real time information at bus stops for blind and partially sighted showed a high positive benefit-

cost ratio in Brighton and Hove (11:1). For the video surveillance system in Iasi, the costs outweighed benefits by more than 18 times. The benefits of passengers from increased safety did not balance the high costs of the system in the evaluation period.

Public transport ticketing

- The acceptance and satisfaction of the public transport users was generally high in this sub-cluster. In Iasi and Craiova, where passengers had no previous experience of vending machines and e-ticketing systems, acceptance increased substantially after the measures implementation.
- The measures on transport ticketing usually require substantial financial outlay. However, all CBAs for the measures in this sub-cluster (Zagreb, Brno, Iasi and Coimbra) showed that benefits outweighed costs.

Accessibility in public transport

- As was shown in Brno and Ljubljana, the measures on accessibility were targeted at a small group and so no large increases in ridership can be expected. However users from the target group appreciated these measures strongly.
- The CBA calculated in Brno indicated that the benefits substantially outweighed costs (NPV = 318,585 EUR over the period of 10 years).

Public transport infrastructure

- For infrastructure measures, a positive attitude is needed by the authorities, as they require substantial financial outlay and traffic restrictions during the infrastructure improvements.
- These measures increase public transport quality, and a high level of satisfaction of the public transport users can be expected. For example, in Szczecin, more than 70% of the respondents declared the measure increased the quality of the public transport services. Similarly, in Perugia, the respondents' satisfaction with the public transport services was 4.9 (on the scale of 1-7).

Public transport network

- All the cities which measured the impacts on the number of public transport passengers or modal split showed that the number of PT users increased or the share of public transport on modal split increased. The share of satisfied public transport users in surveys above 70%.
- There was a lower acceptance in Ljubljana even if car traffic slowed by 13%. According to a survey in Monza, 94% of respondents did not know of plans by the city hall to implement the demand shuttle bus.
- Calculated CBA results showed that costs outweighed benefits in all cases with the exception of European public transport quality standards in Donostia-San Sebastian. The negative values were because the measures needed substantial outlay, but impacted directly on only relatively small target groups

Safety and security of public transport

- This type of measures requires partnership between authorities and operators and often also legislation changes regarding protection of personal data (visual recording).

- The CBA values for systems in Ljubljana and Gdansk showed that costs were greater than the benefits, although the long term benefits of increased safety were difficult to quantify.

Public transport fleet management

- Measures in this sub-cluster contribute to the comfort of public transport users only indirectly, by improving management systems of the PT fleet, improving information systems and the working conditions of drivers.
- The indicators of transport quality show an increase in accuracy of timekeeping (in Iasi, 92% of arrivals were on time in 2012 and in Craiova, accuracy of timekeeping of buses increased by 25% and of trams by 20%), decrease in drivers' time losses (in Donostia, operating costs were reduced by 2.5%), accessibility of targeted areas has increased by about 30% in Funchal. Public transport employees appreciated better working conditions in Tallinn and Donostia-San Sebastian.
- CBAs were calculated in Iasi and Craiova, with positive results in the both cities (i.e. benefits outweigh costs).

Recommendations

Based on the conclusions of the work with the CIVITAS PLUS projects, the following recommendations are made:

Importance of partnership and involvement of stakeholders

- To integrate and use all the functions of implemented information and ticketing systems, a partnership between public transport operators and public authorities is essential. A positive attitude from the authority towards the public transport is a precondition for success, as well as involvement of key stakeholders.
- Technologies support passengers with specific mobility requirements such as blind people ("talking stops"). A close cooperation with representatives of these groups is essential for a successful implementation of such measures.
- Measure funding is an important issue to be agreed between public transport operators and the public authorities and a substantial subsidy is usually needed. Good financial planning is a necessary factor.

Public transport technologies

- Technology compatibility between different technological systems and other measures is crucial, for example the expert system, GPS data outputs, communication system, driver communication, ticketing, positioning, real time passenger information, etc. It is recommended that the expert planning and management system is installed on a server, able to be used from any computer.
- Some European countries have only little experience with the newest technologies in public transport services. Sharing experience with other cities is recommended

The tender process

- Cities tender complications and a clear national or European legislation might help to minimize these problems.

Measurement of impacts

- The experience and expertise available to design evaluation methodologies is crucial
- Support to exchange methodologies and experience regarding evaluation among cities might be helpful, including exchange and use of results of other surveys conducted in the city by different institutions (usually universities or research institutions).

Coordination of measures' objectives and setting the measures' design

- Objectives of the measure should be embedded in policy documents so that synergy between different measures is maximized.

3.8 Cluster 8 – Access and Parking Management

Process evaluation

- Most barriers and drivers were identified during the preparation phase when 68 barriers were mentioned for the 29 measures, 45 were mentioned during the implementation phase and only 29 during the operation phase. The equivalent situation for drivers was 52 during the preparation phase, 40 during the implementation phase and 21 during the operation phase.
- Political aspects acted as very strong barriers as well as powerful drivers, and were both the most mentioned barrier and driver during the preparation phase.
- Parking measures are not popular and this led to low political commitment. However, when political commitment was in place, it was a very powerful and important driver.
- The involvement and awareness of residents was seen to be essential for the success of this type of measure, and participation of the target group was most important.
- Technological barriers and drivers were mentioned less than for other clusters, as measures in the access and parking management cluster were less dependent on leading edge technologies. However, technology could be an important hurdle or stimulator in the operation phase.
- Finding suitable locations for Parking and Park+Ride facilities formed a significant barrier for this type of measure. Often the barriers were planning related.
- A wide range of barriers, very specific to the circumstances and environment were evident for the ITS measures. However, the drivers showed a clearer picture of political support and, although mentioned less, technology was a powerful driver.
- Measures on Access Management and Limited Traffic Zones often have unpopular consequences for the public, i.e. financial, spatial, etc. Therefore, political support and excellent communication with the public are powerful drivers. At the operational stage, the quality of the data collection, measurement and technology are important.
- The Research and Development measures conducted in Donostia-San Sebastian (one measure) and in Usti nad Labem (three measures) faced many barriers. Problems with public opinion in Donostia-San Sebastian dominated, while in Usti nad Labem the measure was embedded in a complex 'measure environment' with a lack of political

support, an increasing number of motor vehicles in the city but with limited parking opportunities, the requirement of a complex transport solutions, and difficulties with the forecasting abilities of the traffic model used.

Impact evaluation

The principal conclusion from this review is that parking and access management studies are inherently similar across different cities and that there are many opportunities for knowledge sharing. The results of access management and parking measures strongly showed that cities which follow the lessons learned in CIVITAS can be confident of positive results. Nonetheless, in cities there is a great deal of competition for the same space, so the final design of parking and access management measures must be local. Trade-offs need to be made between:

- residents and businesses
- cars and public transport
- pedestrians and cycles (and cars and public transport)
- the economy and the environment
- locals and visitors
- freight and amenity

The design of traffic, parking and access policies and measures will depend on the stage of economic development of the city and on its historic and future land use. There is no one correct balance between all the rationally competing interests: different cities will have different requirements and even different neighbourhoods in the same city will have a different 'right answer'. Moreover, this 'right answer' will change over time: the balance between allocation of space and time to the competing interests in a city must be kept under review. Also, the urban system is dynamic¹: when access changes, it has impacts on the environment, economy and society, as measured in this report. The changes that take place as a consequence will create a new urban dynamic that requires a further round of access and management reviews.

Recommendations

Parking

A full evaluation of the needs is required to inform discussions between politicians and local stakeholders before implementing. The current round of CIVITAS findings showed examples of where such evaluations and consultations had led to schemes being strengthened and refined over time as well as those where the lack of civic agreement caused schemes to be cancelled. Once schemes are in place, monitoring and enforcement are important, as is a review of whether the scheme is delivering the required results and whether any unintended consequences such as too much parking in areas on the boundary of the parking zone need to be addressed. In the previous round of CIVITAS, Toulouse encountered this problem, with

¹ http://programm.corp.at/cdrom2008/papers2008/CORP2008_37.pdf

occupancy rates as high as 125% of provision and with illegal parking of "nearly 20%" near the controlled parking zone.

Park & Ride

The critical success factor for park & ride is siting the parking area so that drivers are not being asked to make a large detours in order to use the P&R. Further, P&R should be introduced where there is genuine traffic congestion, so that drivers have an incentive to use it and the city gains real benefits. Also, the journey time by public transport should be competitive with the car journey time. For this reason, park and ride is often developed in conjunction with other measures, such as public transport priority and increased city centre parking charges and access management. Integrated ticketing to serve both parking and public transport, across different operators is important. Smartcards are an ideal application for this. In Brescia, a magnetic ticket was developed alongside the smartcard so that occasional users could have easy access. Marketing the park and ride to car users is important, and on the strategic highways, advising of the availability of P&R and of delays for cars on routes into the city and of parking congestion in the towns can be helpful. It is ideal if these signs give real time information, but static signs can also influence driver behaviour.

Applications of new technologies

ITS will only be effective where it is delivered in response to the city's needs. ITS applications which have been proven elsewhere, and there have been many examples of cities asking suppliers to develop ITS from first principles instead of simply installing systems already tested. The CIVITAS network of cities can assist with the procurement paths which have proved most effective. Similarly, it is more practical to adopt enforcement rules and protocols which have been used elsewhere than to generate new approaches. Some cities in this present round of CIVITAS have described problems in having bye-laws passed to permit enforcement or use of schemes, or having to undergo long trials of equipment, or even of the police not wanting to take on the burden of enforcement by camera. If standards and processes used elsewhere can be adopted, it should reduce or avoid these barriers. The ITS systems must be understood by users. For example, in the tourist city of La Rochelle in the last round of CIVITAS, an innovative system of downloadable GPS maps was developed for coach parking, but coach drivers were not aware of it though, when interviewed, they felt it would be useful.

Access Management

The rationale for access management schemes must be clear and based on measurement. Politicians and other stakeholders must be consulted and engaged in the design and implementation of the scheme. A valuable lesson in this regard from the previous round of CIVITAS was the importance of distinguishing between the needs of different stakeholders: in La Rochelle, business views varied, bars and restaurants supporting access management, shops and offices were neutral, and hotels and services were nervous about customer parking. A good example from the last round of CIVITAS on how to reassure consultees was in Norwich, where closures were first introduced on an Experimental basis, allowing

politicians, stakeholders and the public time to see the real impact and decide after a trial whether the scheme should continue - in the event, one closure became permanent and the other did not.

Limited Traffic Zone

Since LTZs are a wider-based version of parking and access management, often with associated park & ride and public transport improvements. Consultation and political and stakeholder agreement is essential. Active promotion of measures proved very effective in increasing awareness, behavioural change and support for the schemes. Co-ordination of measures is recommended.

Research & Development

- Make best use of CIVITAS good practice developed from case studies from all the CIVITAS programmes.
- Make best use of EU databases of research and development.
- Distil wider research, e.g. Gent summarised key points from its recommended guide.
- Promote the results of studies, so that they act as the first step in engaging politicians, residents and other stakeholders.
- The key lessons from these measures relate to implementation. The successes were delivered through innovations in policy and delivery, as well as through new technology. However, success was almost always dependent upon consultation and engagement.
- A shared commitment to improving conditions in the city centre can allow some parts of the planned measure to go ahead even when the full aspirations cannot be delivered.
- It can take time to achieve the objectives in the sensitive areas of parking and access.
- It is most practical to adopt standards, processes, technologies, bylaws and enforcement rules which have been used elsewhere in CIVITAS cities.

It is essential to form access and parking management measures on the basis of evaluation and measurement. It will be difficult to prove to objectors that the effects have been positive if no measurements have taken place before and after the scheme. More important, the measure will be better designed if it is based on a clear measurement of the baseline situation.

4 CONCLUDING COMMENTS

CIVITAS PLUS has been an extensive programme which has made a significant contribution to urban sustainability. Only part of that contribution has been captured by the Evaluation activities. The benefits of using the measure applications as a foundation to build a European wide community of cities and citizens who have an awareness and commitment to sustainable cities have been substantial.

4.1 Key Findings

4.1.1 Impact evaluation

- There is evidence of considerable potential for car pooling and car sharing services to reduce vehicle mileage in urban areas. However, the success of the measures varied with specific local circumstances such as space constraints, cost/shortages of parking spaces, and factors such as the high cost of car ownership (e.g. insurance and/or high taxes for new cars). Levels of take-up of the services have generally been rather low and costs not recovered. Key to overcoming this is the development of a clear strategy in a policy framework and applications of new technology to increase service quality and reduce service running costs.
- The results support conclusions from previous CIVITAS programme that applications of alternative fuels have great potential to reduce vehicle emissions and are attractive to public transport operators. However, investment costs are generally high, especially for those applications which need to build refuelling stations. Successful applications of alternative fuels depend on issues of taxation, legislation and regulation, supply reliability, and general technical and operational competency. More hybrid testing was carried out in the CIVITAS Plus than previous CIVITAS work. Fuel consumption was generally reduced for hybrid vehicles, taking advantage of the regenerative braking system. Costs of hybrid vehicles (in particular, buses) were higher than for the diesel equivalent, which may restrict future growth in the public transport market, but there are no costs implications for adapting the current infrastructure.
- More cycling related measures were implemented in CIVITAS Plus which has demonstrated increased interest from local governments to promote active travel modes. The various measures have been effective in increasing cycle use and reducing the accident rates for cyclists, although longer term accident records are needed. The results show great support from public to extend road network for cycling and walking. Safety is still a main issue for active travel modes particularly for cycling.
- Increased interest is seen by cities to develop new goods distribution schemes such as consolidation of delivery services which have proved to have great potential to reduce

vehicle emissions. However, without the support of appropriate stakeholders, sustainable logistics measures are not likely to succeed. This has been a common issue identified in CIVITAS Plus and in previous programmes. The urban logistics measures were less successful than anticipated for several reasons. Meeting sustainability targets can be costly and goods distribution is a very competitive business with tight profit margins. The city authorities probably underestimated what would be required to progress the measures adequately. Future projects will have to develop improved partnerships with a clear appreciation of the financial implications of any measure and how problems with them may be overcome.

- The mobility management measures, focusing on travel information and support for travel planning, were very successful in raising the awareness of organisations and the public to the benefits which could accrue from a range of sustainable actions. These measures contributed significantly to behavioural changes. Information campaigns alone may have limited effects on travel behaviour. Inclusion of innovative measures such as social media can reach new audiences not picked up by the traditional measures, though the traditional measures should not be abandoned.
- Use of Information Technology is effective to support transport monitoring and control, such as adaptive traffic signal control, PT priority control at signalised intersections, and dynamic traffic information displays. The provision of priority to public transport vehicles was effective in reducing journey times and improving reliability.
- The acceptance and satisfaction of public transport users to electronic PT ticketing systems was generally high. For cities without previous experience with vending machines and e-ticketing systems, the acceptance levels increased substantially after the measure implementation. The measures on transport ticketing usually require substantial financial inputs, although most measures were estimated to have benefits which outweighed costs.
- Parking and access control measures were effective in managing traffic demand for travel to city centres. A main challenge faced was how to get support from a wider range of stakeholders. Parking and access management studies gave inherently similar findings across different kinds of cities. Thus, there are many opportunities for knowledge sharing. Cities which follow the lessons learned in CIVITAS can be confident of having positive results. However, a balance must be struck between all the different interests, and this will vary depending on the local context.

4.1.2 Process evaluation

- Successful implementation appeared to be significantly influenced by targeting the right groups and involving the right partners. The number of the barriers encountered at all measure stages governs the success of the measures, as is the case for stimulating

drivers during the implementation and operational measure stages. Actions play an important role during the operation phase of the measures.

- It appeared that barriers, actions and drivers at the macro level (i.e. political support, general attitudes, perceptions and beliefs) during the preparation phase made the difference concerning a success. During the implementation and operational measure stages, the measures were much more hampered or brought forward by barriers, drivers and actions on the micro (measure levels) such as the organizational and planning capabilities, financial (im) possibilities, technological issues, and spatial possibilities.
- Rarely one barrier, driver or action played a qualifying role. There were strong relationships, not only between the barriers, drivers and actions themselves, but also between the distinguished levels (micro, meso and macro). For example, technical problems at the implementation stage may cause a serious delay which demanded new planning even in the operation phase, or it can lead to a shift of the measure focus. That may in turn lead to a total reorientation of the measure which then causes serious delays.
- The more a measure has an impact on the present 'regimes' in terms of dominant ways of thinking and daily activities, the harder it is to realize, and the more pressure is needed (either from politicians, 'representative' groups or even individual frontrunners).
- The measure clusters to a large extent do not differ significantly from each other concerning barriers, actions and drivers. This is because the nature / focus/ emphasis of the measure is much more important than the theme or cluster. For example, a measure focusing on a trying out new information software for a new mobility centre will face other barriers than a measure with the emphasis on establishing a public transport corridor. However, both are considered under the 'Public transport' cluster.
- Measures that are subject to public debate (for example because of tax and pricing policies or because they are contrary to the public opinion, attitudes, etc.) are extremely sensitive to the political situation and therefore to the level of political support. The most stimulating political situation is a stable one able to support a clear vision laid down in a mobility plan. Thus, these kinds of measure are very much influenced by the macro level. Politics and public opinion are extremely important to these measures.
- Measures with a technical or RTD focus are often sensitive to having the proper knowledge and expertise at the preparation stage. During the other phases the barriers and drivers shifted towards institutional and operation problems or drivers and according actions. Examples of this are the use of new types of fuels which demands adjustments of (national) regulations or the fact that the technique is so new or complicated that politicians or other important stakeholders do not have faith in it.
- Measures with an emphasis on spatial aspects, for example new bike lanes, special parking lots for prioritised vehicles, alternative distribution times / routes, face a whole complex of barriers, drivers, actions and networks. This is because they have to deal with specific (topographic) geographical circumstances with a network of stakeholders with different opinions, interests and influence.

- Many measures focussed on social safety and access tried out camera systems. They often did not appreciate the privacy restrictions and laws / regulations which could have a large and often negative impact.

4.2 Evaluation Issues

4.2.1 Impact evaluation

Although significant achievements have been made in the impact evaluation of measures overall, there were variations in evaluation quality between cities and measures. Some issues have been identified:

Delays in measure implementation

Many measures experienced delays in measure implementation which reduced the time periods for system exposure to users and for data collection for measure evaluation. In the worst case, some measure implementations were completed so late that that there was little time left to collect meaningful 'after' data for impact evaluation.

Selection of measures

Thirty one measures did not have an impact evaluation. These measures were either not implemented or implemented too late for impact evaluations to be conducted. Risks associated with the measure implementations should have been more fully assessed at the measure selection/planning stages.

Deviations in the measure plans

Some measures were amended several times. Such changes and related delays in implementation, can lead to changes in the evaluation requirements. These may be difficult to overcome, particularly if some "before" data has already been collected. This requires careful control and review by the projects. Appropriate procedures have not always been in place to develop such control.

Interrelated Measures

A range of CIVITAS and non-CIVITAS measures were implemented in parallel. The measures are often interrelated which make it difficult to isolate the impacts of a single measure. Of the 5 CIVITAS PLUS projects, only Elan undertook evaluations at three levels: individual measure, package and city.

Evaluation Competence

There were large variations in the quality of evaluation between cities. In general, leading cities have delivered good quality results in terms of impact evaluation and reporting (e.g. Bath and Utrecht). From the results reported, some cities, especially learning cities, did not have the competences and experience to conduct rigorous evaluations of the effects of transport measures. Significant support may be needed to ensure sound evaluations are undertaken in future CIVITAS cities.

Resources for Evaluation

Resources needed for evaluation can easily be underestimated at the planning stage. From the results reported, the resources available for evaluation were often inadequate. This in turn led to a lack of sufficient data for impact evaluation (e.g. small sample of interview surveys, or single day traffic observation).

Quality of Baseline Data collection

Impacts are evaluated on a basis of determining changes between before and after conditions. The quality and relevance of both baseline and after data is equally important. Better consideration needed to be given to the baseline against which the change needs to be evaluated. This relates to both measure and city level, particularly in the context of the current economic downturn.

4.2.2 Process evaluation

Variable quality

The quality of the process evaluation varied considerably between projects, cities and even between the measures in the same cities.

Relatively too little attention paid to process evaluation

Process evaluation was heavily emphasized in documents provided by the EU-representatives, the project leaders and by POINTER. However, in practice, the main emphasis remained always on the impact evaluation, especially on city and measure level caused by the following reasons:

- Unfamiliarity with process evaluation in general and its application to the field of mobility in particular.
- Lack of expertise on conducting process evaluation and related methods such as Learning Histories, Structured in depth interviewing, etc.
- Too little time was allocated for process evaluation.
- Variations in the use of language could have played a role in completing the forms properly.

- There seemed to be little exchange of experience and knowledge on process evaluation between the leading and learning cities.
- Process evaluation in particular was seen as a burden, and there was no direct benefit for the city to carry out a proper process evaluation.

4.3 Recommendations

4.3.1 Impact evaluation

Within the cluster and measure reports there are many detailed recommendations. However, there are several areas of recommendations which can be identified at a higher level:

- A city should not implement more measures than can be handled effectively by local evaluation teams to avoid them being overloaded resulting in poor quality impact evaluation results
- Evaluations based on evidence from field work rather than desk work (modelling) should be prioritized for demonstration. The EC should develop detailed guidance to help cities to plan measures for CIVITAS demonstration.
- Adequate resources should be allocated for evaluation activities to ensure sufficient data collection, in-depth analysis, comprehensive interpretations and reporting.
- Progress of measure implementation should be monitored and controlled more effectively to ensure that measures are implemented as planned and that sufficient relevant data are collected for impact assessment
- Consistent approach should be used in 'before and after' data collection
- Measures should be considered in the wider context of a city's policies, with a clear strategy, an understanding of the relationships between measures and the building of appropriate organisational partnerships.
- Cost is, and will remain, a major factor in any individual's transport decisions. Although a comprehensive cost benefit analysis is not appropriate for all measures, costs (e.g. capital and operating) should be addressed for all measures.
- Consideration should be given to a more radical reconsideration of impact evaluation process (see Annex A)

4.3.2 Process evaluation

- Measures are not stand alone activities, but have to operate within a complex social, political, economic and physical context. A preparation study (system analysis) is essential.
- Participative approaches are needed in the case of a very complex measure environment, with many competing interests, opinions, and possibilities. Such approaches are themselves complex, and need to be guided by experienced professionals.
- The measure organization (consortium) has to be stable and must contain sufficient knowledge, expertise and capabilities.
- Measure leaders should be very aware of the exact aim(s). Measures that confront dominant political and public views, opinions, and attitudes face probably a large number of more difficult barriers than popular measures such as aim at, for example, social safety in transport.
- City and measure leaders should realize that the transferability potential of a measure is to a large extent determined by the context in which the measure is to be implemented and less by the measure itself.
- Measures should be explicitly incorporated into policy documents.
- Financial risks should be spread the, so as not to rely on CIVITAS funding only.
- Even one change in a measure can bring about a chain of consequences. Risks should be understood, monitored and addressed.
- It is important to realize that learning is much more than information exchange, and it is highly recommended that measures and cities learn from each other.



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Annex A: OUTLINE APPROACH TO IMPACT EVALUATION

1. Purpose of Impact Evaluation

- i) To provide evidence of success or failure to support future decisions in the measure city and elsewhere'
- ii) To provide sufficient understanding of the performance of measures, individually and together, so as to improve its implementation as necessary.
- iii) To assess the nature and the extent of impacts of a measure or measures (e.g. technical, economic, social and environmental) on different target groups (system/service operators, end users, local governments, and society).
- iv) To achieve better understandings of why the measured impacts have occurred.

2. CIVITAS Measures: Characteristics

- i) The characteristics of CIVITAS measures are constrained by the time available to implement them within the programme period. (More substantial measures which are of high cost, generally involve significant new infrastructure, and take many years to implement are generally not included in CIVITAS because of the nature of the CIVITAS calls. Consideration should be given to the greater inclusion of such measures in the future.
- ii) Many measures are small scale, location specific or only implemented partially and impact evaluations will have limited value.
- iii) The key impact that CIVITAS measures should deliver either individually or in combinations is a change in attitude towards more sustainable travel. This may relate to end users and other stake holders, and should in turn be translated into behavioural change. (There are many other technical measures, such as management system changes, which do not immediately impact on traveller end users but which are cost effective in terms of efficiency). These are important, but the major changes in urban sustainability will result from attitudinal/behavioural changes.

3. CIVITAS Measures: What We Might Expect From Impact Evaluation

- i) Attitudinal changes and the reasons for such changes need to be comprehensively understood. This includes related behaviour changes (current and projected). Understanding this is crucial to confirming and/or developing political support within a city and for wider transferability.

- ii) There can be clear rigorous and statistically sound evaluations for technical measures, such as changes in fuel technologies, or the impact of enforcement on speeds.
- iii) The extent of innovation in CIVITAS is limited by many factors which include the time available to the projects and political/technical risks. Therefore, innovative measures are generally site specific (e.g. beer boats in Utrecht), new to a city, or are of small scale. This would imply that changes in attitude are often the most important impacts.

4. CIVITAS Measures: A Coherent Approach to Impact Evaluation

- i) CIVITAS cities should have appropriate **metrics** including traffic flows, journey times/delays, model split, etc. These should be available for each year of the programme as a minimum and form a background to understanding change.
- ii) Major user **attitudes/behavioural surveys** are required. These could be large scale interviews/questionnaire surveys at the start of the project and towards the end of the project (Panel surveys could be used). These surveys would need to be statistically rigorous with sound sampling procedures, etc. The main objective of the surveys would be to identify attitudinal and behavioural changes over the programme period and the reasons for such changes related to the CIVITAS measures. They would also enable the broader context of attitudinal/behavioural drift and non CIVITAS actions to be understood and the results should be related to the results of the metrics. This approach does not rule out the specific measure surveys which may be necessary where measures are small scale and local. Such large scale surveys would be expensive, but this would be mitigated by:
 - a) Bring together the many small sums spent on 'poor' impact measurements of individual measures.
 - b) An overlap with the cities' awareness raising studies could make more resource available.This approach could require a high degree of professionalism and confirmation of this would overcome the considerable problems of lack of expertise in many cities.
- iii) Additionally, the impacts of technical measures should be determined from detailed data bases, for example, changes in fuel consumptions.
- iv) Economic and financial analysis should be conducted where possible, with clear and logical forecast and time frames.

The above is a summary of an approach. It should generate compact outputs which are sound, and which are able to be delivered in a way which is most likely to lead to widespread improvements in urban sustainability. It should overcome the problems of resources being

dispersed to measures with little chances of producing valuable results, because of too little funds, lack of local evaluation competence, and measure characteristics for which traditional before and after studies are inappropriate.