



CIVITAS



# CIVITAS MEASURE DIRECTORY

**10 YEARS OF CIVITAS  
FROM AALBORG TO ZAGREB**

A REFERENCE GUIDE TO  
SUSTAINABLE URBAN MOBILITY  
RESEARCH AND DEMONSTRATION  
MEASURES IMPLEMENTED BY  
EUROPEAN CITIES BETWEEN  
2002 AND 2012



THE CIVITAS INITIATIVE  
IS CO-FINANCED BY THE  
EUROPEAN UNION

---

## About CIVITAS

The CIVITAS Initiative (“City-Vitality-Sustainability”, or “Cleaner and Better Transport in Cities”) was launched in 2002. Its fundamental aim is to support cities to introduce ambitious transport measures and policies towards sustainable urban mobility. The goal of CIVITAS is to achieve a significant shift in the modal split towards sustainable transport, an objective reached through encouraging both innovative technology and policy-based strategies.

In the first phase of the project (2002 to 2006), 19 cities participated in four research and demonstration projects; and in CIVITAS II (2005 to 2009), 17 cities participated across a further four projects. The initiative has just reached the end of its third phase, CIVITAS Plus (2008 to 2013), in which 25 cities were working together on five collaborative projects. In 2012, the CIVITAS Plus II phase was launched, with seven European cities and one non-European city collaborating across two new projects. In total, more than 60 European cities have been co-funded by the European Commission to implement innovative measures in clean urban transport, an investment volume of well over EUR 300 million.

But CIVITAS does not stop there. The so-called demonstration cities are part of the larger CIVITAS Forum network, which comprises more than 200 cities committed to implementing and integrating sustainable urban mobility measures. By signing a non-binding voluntary agreement known as the CIVITAS Declaration, cities and their citizens benefit from the accumulated know-how, experience and lessons learned of every participant. The CIVITAS Forum Conference brings together politicians and technical experts once a year in one of the network’s cities.

If your city is interested in joining the CIVITAS Initiative, or if you have questions, please contact the CIVITAS Secretariat via [secretariat@civitas.eu](mailto:secretariat@civitas.eu).

---



# OVERVIEW OF CIVITAS THEMATIC AND SUB-THEMATIC CATEGORIES

## CAR-INDEPENDENT LIFESTYLES (CIL)

Reducing motor traffic means introducing mobility services that promote new forms of car use and/or ownership and a less car-dependent lifestyle. CIVITAS explores innovative ways to break the car habit and to share successful strategies among cities.

**Car pooling.** Car-pooling schemes encourage car owners to cut congestion by inviting people who are making the same trip to share a vehicle. Typically such schemes are led by workplaces and include intelligent transport systems (ITS) and infrastructure solutions such as online booking schemes, "park-and-pool" venues and reserved parking for car poolers. Some car-pooling schemes incorporate the use of (retrofitted) clean-fuelled vehicle fleets. Schemes may be integrated with public transport systems (e.g. park and ride) while infrastructure solutions such as high-occupancy vehicle (HOV) lanes may be implemented. For promotional efforts, please use "Mobility marketing and awareness raising" under "Mobility management".

**Car sharing.** Car sharing differs from car pooling in that it is a car-rental scheme for people who need only occasional use of a vehicle. The cars are typically owned by a third party, whether it be a commercial business or democratically controlled company, public agency, cooperative or ad hoc grouping. Some car-sharing schemes incorporate the use of (retrofitted) clean-fuelled vehicle fleets. The application of intelligent transport systems (ITS) to support car sharing is considered here. For promotional efforts, please use "Mobility marketing and awareness raising" under "Mobility management".

**Public bicycles/bicycle sharing.** Includes push- and powered-bike rental schemes, as well as their security. For bike-related promotions and awareness-raising schemes, please use "Mobility management and awareness raising" under "Mobility Management". For bicycle-related strategies and services/enhancements, please use "Walking and cycling enhancements/services" under "Demand management strategies".

## CLEAN FUELS AND VEHICLES (CFV)

Increasing the use of alternative fuels and of clean and energy-efficient vehicles, and enhancing their integration into the urban transport system are key to reducing both local air and noise pollution and global greenhouse gas emissions. CIVITAS seeks to explore innovations in this field and to share best practices among cities.

**Clean fuels and fuelling infrastructure.** "Clean fuels" include biodiesel, biogas/CNG (compressed natural gas), LPG (liquid petroleum gas) and bio-ethanol. This category also includes the special filling-station infrastructure for clean fuels.

**Hybrid, clean and electric vehicles.** This category includes hybrid, clean, electric and energy-efficient vehicles, besides measures to reduce engine noise. It does not exclude electric scooters and bicycles. Also includes new forms of financing contracts for clean and energy-efficient vehicles.

**Cleaner fleets.** Encompasses buses, trams, trolleybuses, municipal utility vehicles (for waste collection and hauling, etc.)

tractors and public and private car fleets. Fuel conversion/retrofitting may also be considered here. For clean-fuelled car-share fleets and/or retro-fits, please use "Car sharing" under "Car-independent lifestyles". For cleaner freight fleets and heavy goods vehicles, please use "Fleet management, including cleaner fleets" under "Urban freight logistics".

## COLLECTIVE PASSENGER TRANSPORT (CPT)

Urban congestion can be addressed by stimulating high-quality and innovative energy-efficient collective passenger transport services, including intermodal integration with other transport modes. CIVITAS encourages new ways to maximise the potential of local public transport systems.

**Accessibility.** Collective passenger transport encompasses buses, trams, bus rapid transit (BRT), automated people movers (APM), waterborne public transport (PT) and taxi sharing/tourist taxis. Accessibility pertains to the quality of being accessible or of admitting approach. This category concerns equitable access and looks into the accessibility of PT, including measures addressed to people with reduced mobility, lower-income groups, school students and senior citizens. Examples may also include special demand-responsive buses/minivans that are specifically for mobility-impaired passengers or those who rely on bicycles. For Internet-based systems providing passenger information and options, please use "Intelligent transport system (ITS)–based enhancement of public transport" under "Transport telematics". NB: the issue of seniors' safety in public transport (i.e. security) is dealt with under "Enhancing passenger security" under "Safety and security".

**Ticketing and tariffs.** Includes e-ticketing, on-street and on-board vending machines, smartcards as well as integrated ticketing systems that involve several transport modes and operators.

**Intermodality.** Concerns the integration of urban public transport (PT) services (e.g. bus and tram) with other modes of personal and collective transport such as automated people movers (APM), bicycling and private cars through bike-/park-and-ride schemes and national/regional rail. It also therefore encompasses public-private cooperation. Covers infrastructure investments such as stops or terminals that link multiple modes of transport. For bike-carrying buses, please use "Accessibility" under "Collective passenger transport".

**Service improvements.** Includes quality and service improvements such as network expansions, service frequency increases, investments in infrastructure and rolling stock, staff training (e.g. driver training in customer service or safer driving techniques) and management reorganisation. It includes innovations such as dial-and-ride or demand-responsive services. (For demand-responsive services targeting customers with reduced mobility, use "Accessibility" under "Collective passenger transport"). For the implementation of high-quality mobility corridors (e.g. bus ways/lanes), please use "Access management and road pricing" under "Demand management strategies". This category does not include ticket dispensing machines which are addressed under "Ticketing and tariffs". For "technical reliability" please use "Enhancing security" under "Safety and security". For real-time travel information on board public transport (PT), at PT stops or to passengers directly, as well as data management and monitoring centres, please

use "Intelligent transport system (ITS)–based enhancement of public transport" under "Transport telematics". For clean-fuelled and energy-efficient PT fleets, please use "Cleaner fleets" under "Clean fuels and vehicles". For intelligent traffic lights, please see "Intelligent transport system (ITS)–based enhancement of public transport" under "Transport telematics".

## DEMAND MANAGEMENT STRATEGIES (DMS)

Local traffic levels can be reduced by implementing demand management strategies based on economic incentives, regulatory measures (including zoning and spatial planning), and tele-services. CIVITAS fosters experimentation in demand management measures with a view to spreading the lessons learned among cities.

**Access management and road pricing.** Includes the introduction of strategic plans and/or the management of restrictive or limited traffic zones (LTZ) for personal and/or freight vehicles. These plans may realise high-quality mobility corridors where public transport, bicycle lanes and pedestrians have priority over individual motorised or freight traffic. They also may include congestion charging, road pricing schemes, bonus-malus schemes encouraging sustainable transport, signalisation changes and other enforcement of accessibility rules. They do not include ITS, as these are addressed through "Intelligent transport systems for traffic monitoring management and enforcement" under "Transport telematics". Pedestrianisation and bicycle-related enhancements are addressed under "Walking and cycling enhancements/services" within "Demand management strategies". It also does not include parking pricing, which is addressed under "Parking management" within "Demand management strategies". For plans that more generally address accessibility/mobility, see "Mobility planning" under "Mobility management".

**Walking and cycling enhancements/services.** Includes improvements to city areas that make access to living spaces more equitable such as pedestrian zones or shared-space concepts. Also includes cycling strategies; new cycle routes and network improvements (such as cycling tunnels, bridges or dedicated lanes on busy roads); bicycle racks, parking facilities or storage space; secure bike-and-ride/parking facilities (e.g. at public transport stations); resource centres for cyclists (e.g. showers, repair shops); and bike lifts in hilly areas. For improved illumination of pedestrian and cycle crossings and traffic signalling, please use "Safer roads, bike paths and footpaths" under "Safety and security".

**Parking management/pricing.** Concerns the management of city parking spaces, including their pricing, as a means to reduce congestion and/or pollutant emissions. Also includes measures to simplify paying for parking such as by cell phone. For the use of information systems tackling illegal parking, please use "Intelligent transport systems for traffic monitoring management and enforcement" under the "Transport telematics" category. For parking facilities that use variable message signs to inform drivers of parking availability, use "Real-time road user information" under "Transport telematics".

## MOBILITY MANAGEMENT (MM)

Cities can bring about more efficient urban transport by influencing travel behaviour and modal choice through mobility management plans, marketing, communication, and education and information campaigns. CIVITAS explores fresh ideas for such soft measures in order to spread the most successful approaches among cities.

**Mobility planning.** Includes efforts to establish travel or mobility plans mainly for the employees and clients of companies, public administrations (e.g. hospitals, authorities), large institutions and harbour regions; for students of schools and universities, as well as for disruptive events (e.g. trade fairs, concerts or public works projects) and specific housing areas. Noise reduction besides sustainable mobility/accessibility may also be a target of these plans. Mobility plans for people with impaired mobility may also be considered here, but infrastructure improvements are dealt with under "Safer roads, bike paths and footpaths" under "Safety and security". Company bus schemes should be included here but for company car sharing and car pooling, please use the respective categories under "Car-independent lifestyles". For freight management, please see "Distribution schemes" under "Urban freight logistics". For parking management, please see the respective category under "Demand management strategies".

**Mobility marketing and awareness raising.** Includes surveys, promotions, awareness raising and training schemes for mobility-impaired people, potential and existing cyclists, pedestrians and eco-drivers of buses, cars and lorries or potential car-share/pool targets. They may be aimed at schools, commuters and senior citizens (e.g. in times of roadworks) and implemented through proactive and passive street-side activities (such as signage/info points), big events such as Mobility Week, internal company promotions (e.g. for travel plans), taxi drivers, web portals, dedicated telephone hotlines, school assemblies, mobility information centres or physical forums. For infrastructure investments, please use "Walking and cycling enhancements/ services" under "Demand management strategies" or "Public bicycles/bicycle sharing" under "Car-independent lifestyles". For real-time road user information and/or Intelligent transport system (ITS)–based enhancement of public transport, please see "Transport telematics".

**Multi-stakeholder consultation/public participation.** Concerns chiefly the process of involving citizens, road users, city actors, NGOs, road authorities and any other stakeholders in the preparation of programmes, plans and policies for sustainable mobility (e.g. sustainable urban mobility plans, traffic and transport or mobility strategies) relying on public hearings, street surveys, forums, breakfast meetings etc. Also includes the development of decision support tools that can improve the effectiveness of citizens' participation (e.g. for environmental impact assessment). For general awareness-raising campaigns, please use "Mobility marketing and awareness raising".

## SAFETY AND SECURITY (SS)

An urban transport system requires developing a safe and secure road infrastructure and means of travel for all users. CIVITAS looks into new ways to ensure the safety of urban travellers, including pedestrians and cyclists, in order to make sustainable transport options feasible and attractive.

**Safer roads, bike paths and footpaths.** Includes reduced-speed zones, traffic surveillance (which may be undertaken by accident monitoring centres), better road and (enhanced) pavement markings, signage, dropped kerbs, safer cycle crossings and junctions, improved illumination of crossings and traffic signalling, special attention to the vicinity of schools (e.g. road safety labelling), safety improvements to public transport stops, and innovations such as optimum road surface materials, lighting and street furniture, besides intelligent speed adaptation (ISA). Measures to reduce noise may also be considered here, besides safety and accident prevention plans and pacts. For improving road safety through cycling and walking infrastructure enhancements or shared space concepts, please use "Walking and cycling enhancements/services" under "Demand management strategies". For safety improvements to public transport, use "Service improvements" under "Collective passenger transport". For the application of freight restrictions as a means to improve the safety of urban roads, please use "Access management and road pricing" under "Demand management strategies". For safety-related promotions and awareness-raising schemes, please use "Mobility marketing and awareness raising" under "Mobility management".

**Enhancing passenger security.** Includes the preparation/introduction of security strategies/action plans, safety and security audits, monitoring and surveillance (including face-recognition systems for offenders) and measures to assure the night- and day-time security of public transport, staff and passengers including youngsters, marginalised groups (such as immigrants, lesbians, gays, transgenders) and/or seniors, for example through on-board and bus/tram stop video surveillance, increased personnel (controllers) and enforcement. For citizens with special needs and their access to public transport, please use "Accessibility" under "Collective passenger transport". For bicycle security, please use "Public bicycles/bicycle sharing" under "Car-independent lifestyles". Efforts to improve the technical reliability of equipment may also be considered here in due course. For security-related promotions and awareness-raising schemes, please use "Mobility marketing and awareness raising" under "Mobility management".

## TRANSPORT TELEMATICS (TT)

Urban passenger transport can be made faster and more efficient by enhancing the use of innovative transport telematics systems for traffic management and traveller support, including solutions based on satellite applications. CIVITAS supports innovative telematics systems so that the most effective approaches can be shared among cities.

**Intelligent transport systems (ITS) for traffic monitoring, management and enforcement.** Includes traffic and congestion management and monitoring, system integration and reliability, for example through traffic control and management centres. Enforcement related to public transport (PT) lane incursions by private vehicles, their illegal parking or access to restricted or limited traffic zones (LTZ) using red light or access control cameras connected to automatic number plate recognition (ANPR) systems is also included. The sub-category also includes GPS-based route guidance systems for cyclists and pedestrians who might be interested in public

and tourist services. For information systems supporting freight management, please use "Distribution schemes" under "Urban freight logistics". For traffic surveillance systems intended primarily to enhance road safety, please use "Safer roads, bike paths and footpaths" under "Safety and security". For IT solutions for parking management or payment for parking, use "Parking management/pricing" under "Demand management strategies".

**Real-time road user information.** Encompasses the use of road-based variable message signs (VMS) regarding traffic and car park/park-and-ride capacity at locations ranging from highways to local roads and also park-and-ride facilities. Also includes traffic reports to drivers' cell phones. Includes IT-based travel information services covering multiple modes of transport, as well. For traffic control/management, please use "Intelligent transport systems (ITS) for traffic monitoring management and enforcement" within "Transport telematics". For real-time passenger information on public transport, use "Intelligent transport system (ITS)–based enhancement of public transport" under "Transport telematics". For ITS solutions related to car pooling, please use "Car pooling" under "Car-independent lifestyles".

**Intelligent transport system (ITS)–based enhancement of public transport.** Includes software to create public transport (bus, trolleybus and microbus) route and schedule databases, HDSPA-3G over WIFI to enhance communication with drivers, besides automatic vehicle location (AVL) and real-time passenger information systems on board, at bus, boat and tram stops, as well as to cell phones and the Internet (e.g. for the benefit of citizens with reduced mobility), relying, for example, on the GALILEO satellite-based GPS and EGNOS (European Geostationary Navigation Overlay Service). Also includes intelligent traffic lights and infra-red priority schemes for PT buses and trams. For smartcard ticketing services, please use "Ticketing and tariffs" under "Collective passenger transport".

## URBAN FREIGHT LOGISTICS (UFL)

Reducing urban air pollution and congestion includes promoting efficient freight logistics services and new concepts for goods distribution. CIVITAS encourages innovative approaches to efficient urban freight shipment and the sharing of successes among cities.

**Distribution schemes.** Encompasses measures that look to improve the efficiency of goods (including chemicals, gas and construction materials) distribution relying on information systems that support (clean) road vehicles as well as boats (e.g. zero-emission boats). This includes logistics schemes/policies/plans, which may encompass improved load rates (freight consolidation), goods distribution centres and tracking systems, home deliveries and deliveries to park-and-ride sites, piping, and partnerships with logistics providers. For freight restrictions, please use "Access management and road pricing" under "Demand management strategies".

**Fleet management, including cleaner fleets.** Includes measures related to fleet management that enhance their technical reliability and/or the introduction of cleaner and less noisy freight fleets.

# TABLE OF CONTENTS



MATRIX OF MEASURES AND THEMATIC (SUB)CATEGORIES  
OVERVIEW OF CIVITAS THEMATIC AND SUB-THEMATIC CATEGORIES

INTRODUCTION	7
HOW TO USE THIS DIRECTORY	8
MEASURES CONDUCTED IN CIVITAS I, CIVITAS II AND CIVITAS PLUS	11
Aalborg, Denmark	12
Barcelona, Spain	15
Bath, United Kingdom	17
Berlin, Germany	19
Bologna, Italy	21
Bremen, Germany	25
Brescia, Italy	27
Brighton & Hove, United Kingdom	31
Bristol, United Kingdom	34
Brno, Czech Republic	37
Bucharest, Romania	39
Burgos, Spain	40
Coimbra, Portugal	44
Cork, Ireland	46
Craiova, Romania	48
Debrecen, Hungary	51
Donostia-San Sebastian, Spain	52
Funchal, Portugal	57
Gdansk, Poland	60
Gdynia, Poland	62
Genoa, Italy	62
Ghent, Belgium	65
Gorna Oryahovitsa, Bulgaria	70
Gothenburg, Sweden	72
Graz, Austria	74
Iasi, Romania	77
Kaunas, Lithuania	81
Krakow, Poland	81

La Rochelle, France	85
Lille, France	90
Ljubljana, Slovenia	92
Malmo, Sweden	97
Monza, Italy	101
Nantes, France	104
Norwich, United Kingdom	105
Odense, Denmark	108
Pecs, Hungary	110
Perugia, Italy	111
Ploiesti, Romania	114
Porto, Portugal	116
Potenza, Italy	118
Prague, Czech Republic	119
Preston, United Kingdom	120
Rome, Italy	123
Rotterdam, The Netherlands	125
Skopje, Former Yugoslav Republic of Macedonia	130
Stockholm, Sweden	132
Stuttgart, Germany	136
Suceava, Romania	137
Szczecinek, Poland	139
Tallinn, Estonia	141
Toulouse, France	144
Usti nad Labem, Czech Republic	148
Utrecht, The Netherlands	151
Venice, Italy	155
Vitoria-Gasteiz, Spain	157
Winchester, United Kingdom	160
Zagreb, Croatia	162
ANNEX: SUSTAINABLE MOBILITY GLOSSARY	167

# INTRODUCTION



The CIVITAS Measure Directory serves as a reference guide to 663 sustainable urban mobility research and demonstration measures co-funded to the tune of EUR 250 million by the CIVITAS Initiative and implemented by European cities between 2002 and 2012. It highlights the achievements of CIVITAS as a research and demonstration programme over the 10 years since its inception.

CIVITAS is very much about transferring know-how and lessons learned among its member cities and beyond. With this directory, the initiative aims to share CIVITAS experience with all European municipalities working towards more sustainable urban mobility. It is a book intended for cities looking to learn from one another. Technical experts and transport practitioners will benefit from its comprehensive overview of, and introduction to, CIVITAS measures. However, the directory is also intended as a tool for all those involved in CIVITAS outreach who promote the take-up and exploitation of CIVITAS results and support on-going CIVITAS collaborative projects. This includes the European Commission, the CIVITAS support actions, national and regional CIVITAS Forum Networks, besides other key “multipliers” like NGOs.

This directory was published at the end of the third phase of the initiative in 2014. It provides short descriptions of all measures implemented during CIVITAS I, II and Plus and is the first hardcopy resource of its kind, incorporating a simple and straightforward means of access through its city/measure matrix. Now identifying and describing specific demonstration measures from the past 10 years to potential take-up cities couldn't be easier! Effectively this directory contains the legacy of the first 10 years of CIVITAS, a formidable collection of reference data for future CIVITAS cities and projects to build on.

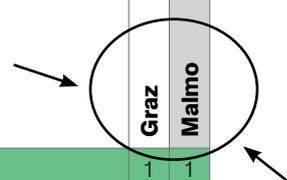
The directory is a sister publication to “Living Laboratories: 10 years of CIVITAS from Aalborg to Zagreb,” which acts as a colourful counterpart describing city achievements and which is specifically aimed at policymakers. The content contained within this guide is sourced from the more comprehensive measure descriptions available online on the CIVITAS website, project reports and feedback from the cities themselves, and fills the gap that occurs when one cannot always be online to access the CIVITAS website. The virtual interface for the directory is available at [www.civitas.eu](http://www.civitas.eu) under the menu item: “Mobility solutions” and the sub-heading “Exploring mobility solutions”.

# HOW TO USE THIS DIRECTORY

Like any conventional directory, this guide offers reference data following an A to Z convention. At its heart are the 58 CIVITAS demonstration cities of the first three CIVITAS phases. This means you, the user, can quickly look up a city which may be similar in one way or another to yours, and quickly browse their sustainable urban mobility successes (and failures). Those achievements are structured according to eight CIVITAS thematic categories and their subcategories and these are introduced on page 4. To sketch the local context, we have added a short introduction to each city.

To look up a city's achievement in a particular field, be it company travel planning or freight consolidation, cycling promotion or park-and-ride schemes, you can consult the measure **matrix** on page 3. This matrix is the key to accessing CIVITAS measure data. The matrix overviews CIVITAS results by **city** and by **thematic category**. So if, for instance, you are interested in efforts undertaken in the field of "Urban freight logistics" and specifically "Fleet management", simply follow the row headers until you identify the relevant theme/sub-theme and then scroll along the table to determine the city or cities active in that field.

		Graz	Malmö
URBAN FREIGHT LOGISTICS	Fleet management	1	1
	Distribution schemes		3
TRANSPORT TELEMATICS	Real-time road user information		
	ITS – based enhancement of public transport	1	4
	Intelligent transport systems (ITS) for traffic	1	
SAFETY AND SECURITY	Safer roads, bike paths and footpaths	1	
	Enhancing passenger security		1
MOBILITY MANAGEMENT	Multi-stakeholder consultation/public participation		
	Mobility planning	1	
	Mobility marketing and awareness raising	2	6
DEMAND MANAGEMENT STRATEGIES	Walking and cycling enhancements/services	1	1
	Parking management/pricing	1	1
	Access management and road pricing	1	1
COLLECTIVE PASSENGER TRANSPORT	Ticketing and tariffs		
	Service Improvements	1	
	Intermodality		
	Accessibility		
CLEAN FUELS AND VEHICLES	Hybrid, clean and electric vehicles		
	Cleaner fleets	2	2
	Clean fuels and fuelling infrastructure	1	1
CAR-INDEPENDENT LIFESTYLES	Public bicycles/bicycle sharing		
	Car sharing		1
	Car pooling	1	
	Total	15	22



In this example you will see that both Graz and Malmo are among those cities to have implemented fleet management measures. Simply then look up the city of your choice within the directory listings, to access the detailed measure description. To make it easier for you, the colour codes used in the matrix for the eight CIVITAS thematic categories have been repeated within the city profiles for the measure descriptions, where the measures are listed in alphabetical order per category.

Within the measure description you will learn about the situation in the city “before” and “after” implementation. We have sought to highlight the benefits (both quantitative and qualitative) as well as the challenges and lessons learned for each measure implemented. To ensure comparability, we have structured these descriptions following a similar format:

1. The situation before CIVITAS and the problem the measure sought to address
2. The content of the measure and whether it was a practical or policy-related initiative
3. The innovative aspect of the measure
4. The involvement of the public (where it occurred) as well as other organisations
5. Links to a broader planning or policy framework (e.g. sustainable urban mobility plan), if any
6. Quantifiable results obtained through the measure, presented where feasible as proof-points
7. The main lessons learned and the contribution of CIVITAS to future urban mobility developments within the city

Please be aware that the above structure could not always be followed in those cases where the information was hard to come by or simply not available.

Because CIVITAS is very much about transferring know-how and lessons learned among its member cities and beyond, we have also included the contact details of the responsible person within each city for the sustainable urban mobility measures. The next step (i.e. contacting them) is up to you!

Please also note we have numbered each measure. This is useful where a city has participated in two phases of the initiative (i.e. Aalborg, Ljubljana and Tallinn). At the beginning of these cities' profiles, we have listed which measures belong to which phase. For each CIVITAS city the profile also indicates whether they took up a leading or a learning role (cities coordinating a CIVITAS project are by definition a leading city). Within CIVITAS, measures often work in concert with others, therefore where measures were closely related to each other, we have cross-referenced the measure descriptions (e.g. see measure 1 and 2 in Aalborg).

Finally, if you aren't sure under which thematic category a specific topic which interests you falls, we have compiled a sustainable urban mobility glossary to guide you. It tells you under which categories measures in specific fields are listed. You will find this glossary in the Annex.

Your suggestions for improving this directory are more than welcome! Please share them with us via [secretariat@civitas.eu](mailto:secretariat@civitas.eu).





# Measures conducted in CIVITAS I, CIVITAS II and CIVITAS Plus

Mette Skamris  
Stigsborg Brygge 5  
9400 Nørresundby  
msh-teknik@aalborg.dk  
Tel: +45 99 31 23 50  
Fax: +45 99 31 23 14  
www.aalborgkommune.dk

Aalborg is an industrial and university city in the north of Denmark. Aalborg is the third largest municipality in the country with a population of 200,000 at the time of the CIVITAS project. The city joined CIVITAS twice, to consolidate its role as a leader in local sustainable development with a particular emphasis on cycling mobility and intelligent transport system solutions. The promotion of sustainable modes of transport has been at the centre of Aalborg's transport policy for decades.

CIVITAS Phase: I – VIVALDI  
Duration: 2002 – 2005  
Measures: 1, 9  
Role: Learning city

CIVITAS Phase: Plus – ARCHIMEDES  
Duration: 2008 – 2012  
Measures: 2-8, 10-17  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Establishing a car-sharing scheme.** In order to reduce levels of car ownership in Aalborg, the city established seven car-sharing sites with a total of 11 shared vehicles as part of the first phase of the CIVITAS project. By spring 2010, four sites and eight cars remained in the scheme.

In order to ensure that the car-sharing scheme met the requirements of all users, input was obtained from around 200 potential users by means of telephone interviews and dialogue with operator Hertz Delebilen.

At the end of the project there were a total of 149 users. Total fuel use for transportation in Aalborg was reduced by approximately one percent. A total of 48,700 km were travelled by shared cars in the first year of the scheme. By selecting environmentally friendly cars, Hertz Delebilen managed to keep the energy consumption level at 2.4 megajoules per kilometre. The average for the private vehicle fleet in Aalborg is 3.1 megajoules per kilometre.

**2. Workplace car sharing.** Through this measure Aalborg wanted to improve the car-sharing scheme that it launched during the first phase of CIVITAS (see measure 1). The

municipality wanted to introduce more car-sharing vehicles for a new user segment, namely private and public employees.

After research on potential users of and barriers to car sharing, the city of Aalborg and the car-sharing company developed a campaign. A promotional leaflet and letters were distributed to companies.

Although the target for marketing materials changed from companies to young people shopping for their first cars, the membership and the use of the system did not significantly change as a result of the CIVITAS project. Possible explanations for these negative results are the rise in price and the change in location of the car-sharing bays that occurred during the project.

### PUBLIC BICYCLES/BICYCLE SHARING

**3. City bike scheme.** To increase the use of bicycles for short trips within the city and to increase the number of cyclists, the city implemented a City Bike scheme. From spring till autumn the 200 city bikes at 21 City Bike stations were located in areas where commuters enter the city by car, and close to tourist attractions. The bikes were secured with a lock that required a deposit of a DKK 20 coin that was released once the bike was returned.

Various leaflets and promotion materials were produced and several events took place to promote take-up of the service. The City Bike scheme had its own website and Facebook page.

There was a lot of demand for the City Bike scheme and only a small share of the bicycles were lost during the first year. Five percent of the users of the scheme would have travelled by car if they had not used the city bikes, but the most users would have walked. In Aalborg, CIVITAS contributed to improving the green image of the city, as stated by more than 80 percent of City Bike users.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**4. Using biofuels in public transport and delivery vehicles.** The city of Aalborg wanted to explore the opportunities for using a high blend of biofuel (higher than 10 percent) in standard vehicles. With the support of CIVITAS, the city put 50 buses and 50 postal vehicles on a biodiesel blend, introduced a free biofuelled shuttle bus between parking areas and touristic destinations and tested 10 electric cars as part of a national trial. The biodiesel demonstration reduced CO<sub>2</sub> emissions without having to modify vehicles.

Due to the technical nature of this measure, citizens were not involved.

A total of 1,000 tonnes of CO<sub>2</sub> emissions were avoided with this measure, and other emissions showed no significant increase. In the Danish market, the tested electric vehicles yielded 50 percent savings in energy costs compared to petrol cars and 25 percent compared to diesel versions.

## COLLECTIVE PASSENGER TRANSPORT

### TICKETING AND TARIFFS

**5. Travel smartcard.** To counter the decline in public transport passenger numbers, the city of Aalborg tested and introduced an electronic ticketing system on buses. It was a stepping stone to a wider application of smart travel cards. This measure included the design and implementation of two new facilities: (1) a fully integrated contactless smartcard technology system linked with the bus computer infrastructure; and (2) a Travel Card Light solution to extend the use of electronic ticketing to public transport taxis. The measure was innovative in that the more a passenger travelled, the cheaper each trip became.

As part of a national plan developed in recent years, the Public Transport Authority of North Denmark was involved in the implementation of the Travel Smartcard in Aalborg. The travel card was one of the prominent actions in the municipal traffic action plan from 2009.

In an online survey, 77 percent of users indicated satisfaction with the Travel Smartcard; and 32 percent said they would use public transport more due to the travel card. Twenty-nine percent of passengers experienced technical problems more than once, but 86 percent of the passengers were satisfied with the new fare system.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Environmental zone.** With the support of CIVITAS, Aalborg implemented an environmental zone with restricted access for heavy goods vehicles. For heavy goods vehicles and buses (over 3.5 tonnes), only those complying with the required Euro IV standards were allowed to drive into the zone. The environmental zone was the second of its kind in Denmark.

The restrictions were generally accepted by freight companies, mainly due to the good communication and early involvement of the companies.

As a result, the share of trucks with Euro IV or better increased from 28 percent to 54 percent in two years. The share of trucks with engine standard Euro II or earlier was reduced from 26 percent to 15 percent. The overall conclusion from the evaluation is that a low-emission zone is a sensible option for cities if national policy allows it and if the city has the required stakeholder support.

### PARKING MANAGEMENT/PRICING

**7. Changing parking behaviour.** The city of Aalborg introduced a parking information system before a large-scale modernisation of the city centre. Due to the age of the technology, it was not possible to upgrade the system with new parking locations. Through this CIVITAS measure Aalborg extended and improved the real-time parking information system for the parking network in the city centre.

Giving reliable parking information to reduce “cruising” (i.e. traffic from cars searching for parking spaces) has been part of the city’s parking strategy during recent decades.

Due to the reduction in cruising, CO<sub>2</sub> emissions dropped 71 tonnes per year. The number of users who thought the new system made it easier to find a parking space increased by 27 percent.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**8. Establishing a travel information centre.** Before the first phase of CIVITAS, there was a clear need to improve the efficiency and quality of services offered to public transport users by providing real-time passenger information. CIVITAS supported the installation of a travel information centre, which included self-service information kiosks throughout the city and an e-mail information service.

The key stakeholders were Nordjyllands Trafikselskab, the company responsible for the regional bus service, and the Technical Department of the city of Aalborg, responsible for local bus services. The travel information centre was created as part of an integrated package of measures in Aalborg, including the provision of real-time passenger information (see also measure 18), the introduction of bus priority at certain intersections, and the creation of an automatic bus location system.

Members of the public were well aware of the new opportunities. A total of 24,000 pages were viewed at the terminal kiosk each month, with itinerary and schedules being the key search items.

**9. School cycling campaigns.** At the start of Aalborg’s second CIVITAS project, traffic from children being driven to school by car was posing increasing environmental and safety risks. With this measure, the city tested new ways of communication to get children to bike to school. The school cycling campaign targeted students 11 and 13 years of age. It combined traditional materials such as posters and leaflets with communication through mobile phones and the Internet.

As a starting point, City Hall conducted a survey among school children to learn how they get to school and how they perceive road safety on their way to school.

Sixty-four percent of participating children said they had fun taking part and around 20 percent stated that the campaign had made them feel more like biking to school. The parts where the children had to go out on their bikes or had the possibility to upload photos on the Internet were rated particularly positively. Aalborg’s lesson learned was that using the Internet and mobile phones in an active way created a direct, more convenient path of communications with schoolchildren.

### MOBILITY PLANNING

**10. Commuter travel plans.** In 2005, the Technical and Environmental Department in Aalborg elaborated the first

commuter travel plan in the city. Based on this experience, the city of Aalborg used CIVITAS support to make more commuter travel plans for public and private companies to encourage car pooling, cycling and public transport use.

The recommendations in the commuter travel plans were based on surveys of employee travel behaviour and what they saw as inducements and barriers to more sustainable transport.

Employees of firms that implemented concrete initiatives (e.g. lending of electric bikes, installation of bike sheds, and offering of bicycle repair services) were more aware of the initiatives and the commuter plan than people who worked for companies that focused solely on information giving and awareness raising. Aalborg concluded that it should have waited longer to carry out the evaluation. More time would have allowed the initiatives to mature and make impacts on travel behaviour.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**11. Cycling motorway.** Before Aalborg's second CIVITAS project, national figures suggested a decline in cycling over the previous few years. Aalborg was worried that the city was following this trend and wanted to address some barriers to cycling. A high-quality commuter cycling route between the city centre and the university was created following three principles: free flow conditions for cyclists, traffic safety and visibility, and service.

To begin, Aalborg held a planning workshop with cyclists and residents and other stakeholders. With this, the city generated new ideas and secured support for the measure. The stakeholder workshop constituted a basis for engagement in and common understanding of the project.

The whole 5 km stretch of the corridor was rebuilt and upgraded from an ordinary cycle lane to a first-class cycle highway. The number of cyclists on the route increased 20 to 30 percent in two years. The counts from 2012 indicate that the increase is stable, and historic trends and counts from other places in the city indicate that the increase is related to the implementation of this measure.

**12. Provisions for soft modes.** At the start of Aalborg's second CIVITAS project, parts of the city's waterfront were being redeveloped as leisure areas. The city wanted to avoid an increase in car traffic and instead make the waterfront more of a walking and cycling zone. Part of the area was designed with the following features: removal of traffic lights; road width of only 6.25 metres; a 30 km/h speed limit; different kinds of pavement for different modes; and design elements like trees and light bollards.

The measure was not implemented as part of a broader planning or policy framework.

As a result of the changed use of the harbour front, the number of vehicles on the street increased by nearly 13 percent, as expected. However, the average speed level in the area

decreased by 3.1 km/h and the 85th percentile decreased by 5.8 km/h.

**13. Speed reduction zones.** Cyclists are particularly at risk of accidents and injuries when speed levels are high. Aalborg designated five speed reduction zones to improve safety and perceptions of safety in an area where the accident rate had been higher than the city average. The specific sites were determined through pre-implementation studies of accidents and speed levels.

A campaign informed residents about the benefits of the measure and invited them to take part in an online survey about perceived levels of safety, awareness and attitudes towards the initiative. Articles in the newspaper updated the public on the on-going roadwork. Speed reduction zones were foreseen in Aalborg's Traffic Safety Plan and the Speed Action Plan from 2005.

In zones where the measure involved only speed-limit signage, there was a slight increase in speed. Before this project, there were no signs and people drove at the speed they felt was appropriate.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**14. Decreasing congestion using telematics.** Aalborg rush hours witnessed bad congestion and high energy consumption. Therefore, the city introduced an advanced signal control system on the most congested part of the main ring road, optimising traffic flow from a network approach. The system allowed for central monitoring and offered more possibilities for operating the traffic signals.

Due to the technical nature of this measure, citizens were not involved.

As a result of the Adaptive Traffic Signal Control System, transportation time decreased by an average of 25 seconds (8.5 percent) per trip during peak periods. No positive effects were noticed during off-peak hours. Due to smoother driving patterns, the estimated fuel consumption decreased by 2.45 percent, saving some 33,000 litres per year on this section of the ring road. Aalborg's lesson learned was that sufficient time and resources are needed to guarantee proper functioning of the physical equipment (loop detectors, wires etc.). This is needed to ensure a positive impact.

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**15. Modernising travel information.** Aalborg was keen to make reliable public transport information easily accessible to help users plan their journeys well. The city improved two existing web services with applications that make it easier to access information about sustainable mobility. One innovative

feature allowed people to log in to a personalised page, find out when buses were leaving from the nearest bus stop and plan their journey from their doorstep. Other information, such as news and the weather forecast, was provided as well.

The measure was not implemented as part of a broader planning or policy framework.

One year after the modernisation, the websites had, respectively, 88 percent and 93 percent more users. These numbers continued to rise over the following years. Aalborg's lesson was not to hesitate in giving private companies access to the data collected by authorities. It only helps to spread the information to end users by opening more channels.

**16. On-board bus travel information.** To increase user satisfaction, the city of Aalborg tested and implemented on-board travel information on 50 buses. On-board flat screen monitors displayed the destination of the bus, upcoming stops and transfer options to other lines, as well as the weather forecast, news and advertisements.

Prior to the measure's implementation, North Jutland's transport company carried out a pilot project where feedback from users was gathered and later incorporated into the tender for public transport in Aalborg.

After CIVITAS, the measure was upscaled from the 50 buses operating in the CIVITAS corridor to the 100 buses from North Jutland's transport company. According to Aalborg, the success or failure of on-board travel information is dependent on the reliability of the underlying real-time passenger information system and the quality of the information in the system.

**17. Mobile travel information.** With the support of CIVITAS, Aalborg developed two mobile phone applications: a mobile phone portal with travel information and short message service (SMS) ticketing; and a Java application that gave real-time information from the user's 30 nearest bus stops (allowing "From here" and "Take me home" travel planning based on the user's GPS position).

The Java-based application was developed in cooperation with the National Journey Planner.

As a result of CIVITAS, the "Take me home" application was downloaded 3,143 times in one year and it had about 425 daily unique users. A recommendation from this measure was to explore the option to release "raw" real-time passenger information data instead of developing an application or mobile service yourself. This will make it possible for creative developers to design applications and services that will benefit the public.

Barcelona City Council  
Pl. Sant Jaume 1  
08002 Barcelona  
info@ambmobilitat.cat  
Tel: +34 93 402 70 00  
www.bcn.cat

Located on the east coast of Spain, Barcelona is the capital of Catalonia, an autonomous region in the northeast part of the Iberian Peninsula. At the time of the CIVITAS project, the city had a population of 1.5 million. In economic terms it is one of the most important cities in the Mediterranean and Europe's ninth largest container port. Barcelona has an extensive motorway network and is a hub of high-speed rail links with cities in France, Spain and Portugal.

CIVITAS Phase: I – MIRACLES  
Duration: 2002 – 2005  
Role: Leading city

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**1. Buses operating on compressed natural gas.** In 1995, trials with two buses running on compressed natural gas (CNG) confirmed the reduction in emissions and noise from these vehicles compared to diesel-fuelled vehicles. With CIVITAS support, the city's transport operator introduced 70 CNG buses, with corresponding infrastructure improvements, and evaluated the vehicles in terms of environmental and energy performance under real operating conditions. Before then, no Spanish public transport operator had deployed CNG buses.

CIVITAS funding was supplemented by strategic investments by other stakeholders.

The measure achieved reductions of polluting emissions of between 82 and 98 percent and a reduction in fuel costs. CIVITAS allowed Barcelona Metropolitan Transport to become the pioneer CNG bus operator in Spain, and one of the first in Europe to obtain ISO 14.001 environmental certification.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**2. Tramway development as part of an integrated public transport system.** As traffic between the city centre of Barcelona and the wider metropolitan area had significantly grown before CIVITAS, the public transport offer in the southwest of the city needed expansion. With the support of CIVITAS, the metropolitan transport authority worked with six municipalities to put into operation the first modern tramway in

Barcelona in the southwest of the city. The CIVITAS measure was innovative as it combined the latest vehicle technologies with a radical reallocation of street space from roads to pedestrian areas, cycle routes and green space.

For the first time in the city, the tender was organised using a “build, operate and transfer” contract with the participation of the public and private sectors in both the construction and operation stages.

During average workdays, the tram carried almost 35,000 passengers per day. Surveys revealed that one-third of passengers were making trips they did not previously make and the tram system has achieved a shift of at least 3,300 car journeys. This CIVITAS measure boosted sustainable travel and social inclusion in the city, as the tram encouraged people to walk and cycle more and was fully accessible to mobility-impaired people.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**3. Multi-use lanes and night-time delivery.** At the start of the CIVITAS project, Barcelona had been actively investigating solutions for managing on-street deliveries in such a way as to minimise congestion. The city introduced a multi-use lane system, including the conversion of 44 on-street parking spaces into unloading spaces which serve as a priority bus lane during peak times. Barcelona also carried out a night-time delivery demonstration and developed a web-based guide showing the location and occupancy level of the loading zones in the pilot area. Because night-time deliveries had never been trialled in the city, the municipality had to introduce experimental traffic regulations.

Freight operators’ needs were determined through a series of meetings of a freight partnership led by the municipality.

The multi-use lane system improved circulation speeds and reduced journey times by 15 percent, primarily because of a decrease in illegal parking. The night-time delivery demonstration showed that quiet deliveries to supermarkets were possible and that two night deliveries per week could replace seven trips using smaller lorries in day-time traffic. The CIVITAS project unveiled the high willingness of local operators to trial and invest in new concepts and gave the city more insight into local problems encountered during deliveries.

**4. Restricting vehicle access along La Rambla.** At the start of the CIVITAS project the pedestrian volumes on La Rambla were five times higher than vehicular traffic, but the proportion of service vehicle traffic was too great for a full pedestrianisation of the street. The CIVITAS measure introduced an automatic vehicle detection system to restrict access during the day to authorised vehicles such as buses, taxis, residents’ cars, service vehicles and users of the car parks located along La Rambla. The measure also included the use of automatic number plate recognition (ANPR) for traffic speed control, which was a first for the municipality.

The political decision to go ahead with the scheme was conditional upon a satisfactory outcome from a series of consultations with neighbourhood associations, car park operators and hotels. The measure was carried out as part of the city’s Programme for Traffic Calming, which was an important driver for the implementation.

Traffic volumes were reduced by 40 percent during the controlled hours and by 10 to 15 percent throughout the day, which represents a considerable improvement in pedestrian comfort and safety.

## TRANSPORT TELEMATICS

### REAL-TIME ROAD USER INFORMATION

#### 5. Multi-operator real-time passenger information.

Before CIVITAS, only two large bus operators in the metropolitan area of Barcelona had automatic vehicle monitoring (AVM) systems in place, so it was impossible to offer complete, integrated information about bus arrivals at stops served by multiple operators. With the support of CIVITAS, the metropolitan transport authority implemented a common AVM system for the 20 private bus operators in the wider Barcelona area and installed real-time information panels at bus stops. The measure was innovative, as it incorporated GPS technology to give a more accurate vehicle positioning than the existing AVM systems in the city.

All bus operators were involved in the measure, and passengers were surveyed on their tram and bus use and their need for real-time passenger information.

Panels displaying real-time arrival information for all operators were demonstrated at four bus stops, and monitoring at one stop showed an increase in passenger usage of 2 percent. Barcelona’s key lesson was that the implementation of an AVM system for small and medium-sized bus operators requires a large-scale commitment that can only be assumed by an authority with responsibilities for integrating passenger services across a metropolis or region.

# BATH UNITED KINGDOM

BATH

Colin Rees  
Bath and North East Somerset Council  
Riverside South, Temple Street, Keynsham  
Bristol BS16 9JP  
colin\_rees@bathnes.gov.uk  
Tel: +44 12 75 39 51 01

Located in the southwest of England, the city of Bath had a population of 80,000 inhabitants at the start of CIVITAS RENAISSANCE. A UNESCO world heritage site since 1987, Bath is famous for some of Europe's finest Roman remains and 18th-century architecture. The city in the valley of the River Avon is a major tourist attraction. Bath has two universities and several schools and colleges. A large service sector, growing information and communication technologies and creative industries provide employment for the population of Bath and the surrounding area.

CIVITAS Phase: Plus – RENAISSANCE  
Duration: 2008 – 2012  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. City Car Club.** City Car Club first set up a car-sharing scheme in Bath following the successful introduction of such a scheme in the neighbouring city of Bristol as part of the first phase of CIVITAS (VIVALDI, 2002–2006). With the support of CIVITAS, City Car Club expanded the scheme in Bath with the introduction of six hybrid electric cars and their associated parking bays. The measure was innovative because it was the first UK car club to introduce hybrid electric cars.

City Car Club involved Bath and North East Somerset Council and the University of the West of England in the implementation of this measure.

During the lifetime of the project, membership more than quadrupled and 75 percent of members were positive or very positive about the introduction of the hybrids. CIVITAS allowed Bath to act as a national example, as similar hybrid cars have been introduced in other UK cities where City Car Club operates.

### PUBLIC BICYCLES/BICYCLE SHARING

**2. Cycle hire.** Before CIVITAS, Bath's road system and parking spaces had reached their full capacity. In order to encourage cycling and to improve the modal shift from private cars, the city introduced a public bicycle hire scheme provided by Comunicare srl. with four docking stations and 35 to 45 bikes, as well as an electric cycle hire network (see measure

3). The measure was innovative because bike hire was not well developed in the UK when the CIVITAS project commenced.

Face-to-face meetings were held with owners of premises next to the sites selected for the docking stations. After implementation, the scheme was promoted through positive media coverage, leaflets in hotels and guest houses, and the city centre tourist office.

Comunicare aimed to have 50 to 60 percent of the bicycle fleet used at least once during peak hours, but only an average of 2.18 trips per day were made during the demonstration period. Bath's lessons learned are that bike sharing needs more widespread promotional activity in a country where the concept is not widely understood. In addition, more stations are needed, together with a simpler pricing structure, registration process and access procedure.

**3. Powered cycle hire.** At the start of the CIVITAS project, Bath's road system and parking spaces had reached their full capacity, but the hilly topography of the city was likely to present a barrier to cycling. To foster a modal shift from the private car to the bicycle, the city planned to develop a network of stations for hiring electric bicycles. It would complement the conventional bike-sharing system of measure 2, and would have been the first electric cycle hire operation in the UK.

Because of severe economic difficulties experienced by the lead partner Powabyke, the demonstration project could not be introduced during the timescale of the CIVITAS project and was terminated.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**4. Low-carbon bus trial.** Before this trial all public transport vehicles in the area were diesel powered. Local bus operator First tested a hybrid diesel-electric double deck bus on the city's park-and-ride routes for 18 months. The vehicle was one of Europe's most advanced diesel-electric hybrid buses and unlike other types of hybrids, was capable of operating through Bath's historic city centre on electric power only.

Stakeholder consultations were held with Bath and North East Somerset Council, the University of the West of England, the supplier of the demonstration vehicle Wrightbus, and the Vehicle and Operator Services Agency. Drivers and mechanics were trained to operate and maintain the vehicle, which was showcased to the public during a three-day exhibition of CIVITAS measures in Bath. The measure provided valuable input for the "showcase" bus routes proposed within the Bath Transportation Package.

Reductions in harmful emissions ranged from 28 percent to 93 percent, while fuel consumption dropped by 28 percent. The number of people who thought the bus was noisy was halved, and operating costs were reduced by approximately 5 eurocents per kilometre. CIVITAS allowed Bath to test the viability of this innovative solution for expansion across the city and at the end of the project, all the Bath park-and-ride services were converted from diesel to hybrid buses.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**5. Personal rapid transit.** In 2005, the city developed the Vision for Bath that identified transport as one of the principal issues to be addressed because the road system and parking spaces were at full capacity. This CIVITAS measure comprised an in-depth study by Ultra Global Ltd, a developer of personal rapid transit (PRT) systems, to examine the feasibility of introducing a personal automotive taxi system running on its own guideway network in Bath. It was the very first analysis of PRT in a historic city environment and it required a new approach to network design in terms of finding viable routes and an acceptable visual design.

As the aesthetics of the system were of utmost importance, an international design competition was undertaken in 2009, as well as local public engagement events. The measure was not part of a wider policy or planning framework.

The final report by Ultra details the projected demand, including recommendations on station locations and vehicle size, and defines key sizing data for the system (i.e. number of vehicles and station size). It also gives recommendations for the overall project design. Thanks to CIVITAS, the city of Bath played an important role in the further development of this fairly new form of transport, as the results of the study can help inform similar historic urban environments elsewhere in the world.

## DEMAND MANAGEMENT STRATEGIES

### WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**6. Bath wayfinding and information system.** In 2005, the city developed the Vision for Bath that identified transport as one of the principal issues to be addressed because the road system and parking spaces were at full capacity. Through new pedestrian signage, bus shelters, and branded communication products, Bath developed a new wayfinding and information system to reveal the city in a way that improves the experience of all the city's users. This was innovative because it was a new wayfinding system developed exclusively for Bath.

During the design phase, the city established and consulted two external stakeholder groups representing the wider interests of different organisations in Bath. The prototypes were tested in a new pedestrian area (see measure 7) and have been further developed following stakeholder comments. The measure was implemented as part of the city's Vision for Bath, the World Heritage Site Management Plan 2003–09, and the Bath Package of Transport Initiatives.

Public perception of transport information improved by 19 percent for walking routes and by 45 percent for on-street public transport information. For Bath, CIVITAS was a means to raise the international profile of the city across Europe and to enhance the external image of the city.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**7. Safe and secure road infrastructure demonstration area.** At the start of the CIVITAS project, the city of Bath was concerned about its traffic problems and the resulting impacts on the environment, air quality and poor accessibility to employment and leisure opportunities. St James Rampire, an area in central Bath, was chosen as a demonstration site to create a new public space and test several measures that improve pedestrian safety and comfort. New light-emitting diode (LED) street lighting was trialled in order to reduce energy usage and costs in comparison with conventional street lighting arrangements.

During the design phase of the CIVITAS measures, the city established and consulted two external stakeholder groups representing the wider interests of different organisations in Bath. The measure supported the road safety objectives of the Sustainable Urban Local Transport Plan.

The new design of the area led to a decrease in vehicle movements (17.5 percent) and energy consumption for lighting (38 percent), while increasing public perceptions of road safety (56 percent) and personal security (29 percent). The knowledge on efficient street lighting, pedestrian safety and road surface that the city gained during the CIVITAS project is now being used as best practice for future street schemes in Bath.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**8. Demand management for goods vehicles.** At the start of the CIVITAS project, the contribution of freight traffic to poor air quality, noise and damage to historic buildings was disproportionate to the volume of freight traffic in the city. With the support of CIVITAS, the city set up a trial with variable message signs triggered by high vehicles that warned drivers of an upcoming weight restriction. The measure was innovative, as it involved automatic number plate recognition cameras to identify vehicles that breached the restriction.

Extensive consultation was undertaken with freight operators, residents, local businesses and heritage organisations, among others.

Heavy goods vehicle traffic was reduced by 43 percent in the demonstration area, resulting in a daily reduction of 2.2 kg of NO<sub>x</sub>. In Bath, CIVITAS was an engine for enhanced quality of life, as heavy goods traffic was diverted to more appropriate routes into and around the city centre.

## INTELLIGENT TRANSPORT SYSTEM (ITS)–BASED ENHANCEMENT OF PUBLIC TRANSPORT

**9. GALILEO-based real-time public transport information system.** At the start of the CIVITAS project, the real-time passenger information system in Bath relied solely on the US military Global Positioning Satellite (GPS) system. In this measure, ACIS, the market leader in real-time information systems in the UK, carried out research and developed a prototype for a telematics system using both GPS and the European GALILEO satellite system. The measure was highly innovative, as the GALILEO system was still under development at the time.

At an early stage, ACIS held stakeholder discussions with the bus operator concerning the fitting of vehicles with the on-vehicle computer to facilitate the trial in the city of Bath. However, as the first GALILEO satellites were only launched in 2011, it was not possible to implement the trial.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**10. Urban freight consolidation.** In the first phase of the CIVITAS Initiative (2002–2006), the neighbouring city of Bristol had introduced a freight consolidation operation. In the third phase of CIVITAS, Bath and North East Somerset Council established a shared freight consolidation depot in partnership with Bristol County Council. It was the first urban freight consolidation centre in the UK which served two cities.

A comprehensive survey of retailers in central Bath was undertaken to establish a baseline position for deliveries into the area and to ascertain expected demand for a freight consolidation operation. The freight consolidation operation assisted in a key aim of the Bath Package: to improve the pedestrian environment in central Bath.

At the end of the project, 20 retail outlets were participating in the scheme, and the number of deliveries they received was reduced by 76 percent. The electric vehicle used to dispatch the goods into central Bath achieved a 56 percent reduction in energy consumption. Participation in CIVITAS presented Bath with the opportunity to work with other historic European cities, and take a leading role in demonstrating how cities can preserve their historic heritage through clean urban transport solutions.

Burkhard Horn  
Am Köllnischen Park 3  
D-10179 Berlin  
burkhard.horn@senstadt.berlin.de  
Tel: +49 30 90 25 16 50  
Fax: +49 30 90 25 16 75  
www.stadtentwicklung.berlin.de

The German capital Berlin, situated in the centre of the European Union, is an important node in the Trans-European Network. At the time of the CIVITAS project, Berlin had a population of some 3.4 million inhabitants covering an area of almost 900 km<sup>2</sup>. The city comprises a large number of urban districts and boroughs that are very diverse in character. Due to its excellent public transport network, Berlin has the lowest car density in Germany, with fewer than 350 cars per 1,000 inhabitants.

CIVITAS Phase: I – TELLUS  
Duration: 2002 – 2006

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Introducing trucks powered by compressed natural gas.** At the start of the measure's implementation, there was a significant lack of information and a general fear associated with compressed natural gas (CNG) engines, as well as doubts regarding their performance. With the support of CIVITAS, the Berlin Gasworks Corporation GASAG offered awareness-raising campaigns and financial incentives to fleet operators in order to foster the introduction of 100 CNG-powered lorries for inner-city freight distribution in Berlin.

Involved stakeholders included the Berlin Senate, the Chamber of Commerce and Industry, the city port authority, and the Federal Department of the Environment, as well as car dealers (see measure 5). The measure was implemented as part of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

GASAG awarded subsidies for 206 new CNG-powered distribution lorries, the introduction of which resulted in lower emissions of NO<sub>x</sub>, and the virtual elimination of particulate emissions. This CIVITAS measure laid the groundwork for the establishment of the city centre environmental zone in 2008.

### HYBRID, CLEAN AND ELECTRIC VEHICLES

**2. New forms of financing contracts for compressed natural gas vehicles.** Before CIVITAS, only a few companies considered leasing compressed natural gas (CNG) vehicles, as the offer was not well known and existing leasing models were

not attractive for fleet operators. With the support of CIVITAS, the Berlin Gasworks Corporation GASAG developed a new leasing model. A website on CNG-vehicle leasing helped potential customers find partners. The measure was worthwhile as it unveiled a market demand for CNG vehicle leasing.

At an early stage, challenges were identified for leasing companies, including the need for promoting the offer (see also measure 5). The measure supported the emission reduction goals of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

At the end of the implementation period, five leasing companies presented themselves on the website, which had some 400 visitors per month. Several companies agreed to lower their rates. CIVITAS helped to change commercial strategies, strengthened cooperation with the private sector and supported the provision of better product information.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**3. Future tendering, management and quality assurance of urban public transport.** Before CIVITAS, the existing public transport market was served by municipal companies and the federal railways, which were both highly subsidised. With the support of CIVITAS, a business management exercise and a series of workshops were implemented to develop conceptual approaches for public transport under competition. At the time, the future liberalisation of the transport market and the challenges arising from it were highly controversial issues in Germany.

The exercise involved nine representatives of public and private transport enterprises, authorities, passengers and management organisations. The measure was implemented as part of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

The measure led to two scenarios for 2015, one with solid coordination by the transport authority and another in which control was mainly in the hands of competing companies. The measure also supported new quality standards for tendering and guidelines for local public transport plans. The city learned that these workshops improved cooperation between stakeholders and deepened their understanding of the future competitive structures of public transport.

## DEMAND MANAGEMENT STRATEGIES

### PARKING MANAGEMENT/PRICING

**4. Introducing a mobile payment system for parking.** At the start of the project period, a large number of on-street parking ticket machines were in use in Berlin. A new parking system using mobile phones (Handy Parken) was designed and tested. Temporary special permits were needed for this pilot project, as federal traffic regulations obliged car drivers to pay in advance and place their parking tickets inside their cars.

The potential target groups were consulted during a workshop before implementation (see measure 5). The measure was implemented as part of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

More than 6,800 users registered, and approximately 600 mobile parking transactions were carried out per day. The system was made available in all areas with parking management. The status of CIVITAS as an EU project contributed to the success of the negotiations with the public administration and potential operators in view of the difficult legal situation.

## MOBILITY MANAGEMENT

### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**5. Customer and user participation for CIVITAS measures.** Lack of direct customer orientation at the product launch phase often hinders customers' acceptance of innovative measures for cleaner and better transport in cities. Through information giving, events and debates, P.O.P. Consulting, an association for organisation and staff development, collected customer feedback for all CIVITAS measures. This action helped introduce the user perspective in all CIVITAS innovations at an early stage.

A dissemination campaign for youngsters was complemented by a debate between young citizens and members of the House of Representatives in Berlin. The measure was implemented as part of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

About 40 schools were involved in the campaign. The services provided by P.O.P. Consulting were rated "excellent" by two of the demonstrators of the other CIVITAS measures, "good" by one demonstrator, and "poor" by another. Berlin learned that the success of a participation process depends heavily on the kind of measure and the size and organisational culture of enterprises involved in the measure.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**6. Dynamic real-time bus and tram information.** Prior to measure implementation, the Berlin Transport Corporation possessed a dynamic passenger enquiry and information system on its underground network. The measure aimed at expanding the system to surface public transport, with 100 information panels at 40 tram stops and four bus stops. As Berlin's bus and tram network is much bigger and more complex than in other cities, the operator needed to create a customised computerised operation control system before they could implement the measure.

The Berlin Transport Corporation (BVG) mobilised a group of experienced long-time customers to test the new interfaces

on their reliability, functionality and readability. The measure was implemented as part of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

The system proved highly reliable and was very well received by passengers. CIVITAS helped the city of Berlin to introduce customer-friendly services that soon became a standard feature of public transport systems.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**7. Developing a container tracking system** (not realised). Prior to implementation, moving company Zapf Umzüge already conducted much of its long-distance house moving business by rail container transport. Cost reductions and positive environmental impacts were expected from a shift to a larger share of rail transport. With the support of CIVITAS, a new telematics-based container tracking system was developed to make intermodal freight transport more attractive to companies.

The measure was implemented as part of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

Zapf selected and tested the system, but when it came to the decision to equip 200 containers, no container rail transport was available at either of the two inner-city logistic centres. Berlin's lesson was that unfavourable overall developments may jeopardise innovative projects and that sometimes it is helpful to suspend them for some time. However, CIVITAS has helped to generate political will, especially for the promotion of clean vehicles.

**8. Establishing an inner-city logistics centre** (not realised). Before CIVITAS, the tri-modal (ship-rail-lorry) logistics centre Westhafen was not intensively used by haulage companies. With this CIVITAS measure, local gas provider GASAG aimed to promote the advantages of the logistics centre to haulage companies and to citizens, as well as promote the introduction of distribution lorries running on compressed natural gas for transport between the logistics centre and the freight recipients.

The local port operator and Zapf Umzüge, one of the biggest German moving companies, were involved in the measure. The measure was part of the Integrated Transport Plan (Stadtentwicklungsplan Verkehr, StEP) adopted in 2000.

The measure was not realised due to unfavourable developments in the modernisation of the canal system and freight-based railway services. Berlin's lesson was that unfavourable overall developments may jeopardise innovative projects and that sometimes it is helpful to suspend them for some time. However, CIVITAS has helped to generate political will, especially for the promotion of clean vehicles.

Cleto Carlini

Piazza Liber Paradisus 10  
307006 Bologna

cleto.carlini@comune.bologna.it

Tel: +39 51 219 30 72

Fax: +39 51 219 30 45

www.comune.bologna.it

Located in the centre of Italy, Bologna is a city of 373,300 inhabitants covering 14,085 km<sup>2</sup>. Because the city was built during the Middle Ages, it is characterised by very narrow streets with their famous arcades or porticoes. Despite this compact layout, the city centre is still the focus of much public, commercial and cultural life.

CIVITAS Phase: Plus – MIMOSA

Duration: 2008 – 2012

Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Improving the car-sharing scheme.** To improve traffic flows in the city, Bologna wanted to improve and expand its car-sharing service. With the help of CIVITAS, 17 new sharing locations were opened with new low-emission cars, a restyled car-sharing website, and technological solutions to stop reserved car-sharing parking spots from being used by unauthorised vehicles. Innovative features of the new scheme included the one-way service that allows drivers to take the car from a location and leave it in a different place; a multi-day service that makes it possible to book a car from one to four consecutive days at a reduced fare; and a long-time service with a discount for bookings of more than four consecutive days.

Regular consultation days were organised involving car-sharing customers to create a ripple effect. A car-sharing conference was attended by about 20 professionals, and the public was informed through dissemination campaigns and leaflets.

An online survey among car-sharing users revealed that 81 percent of respondents appreciated the new locations and 61 percent the new cars. Due to the economic recession usage declined in terms of registered hours, even though the number of customers increased from 636 contracts in 2010 to 846 in 2012 (+33 percent) and from 767 membership cards to 1,097 (+43 percent). Bologna published a guide outlining the main steps in the implementation of car sharing.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Clean public transport vehicles.** Bologna wanted to improve the environmental performance of its public transport bus service. Based on a well-to-wheel analysis carried out under this measure, the public transport operator TPER decided to build up a small hybrid bus fleet tailored to the local context. Two serial-hybrid buses were introduced that were equipped with innovative super capacitors that replace conventional electric batteries.

Personnel training activities for maintenance staff were carried out.

The average daily consumption, measured in real service conditions and during summer, is about 80 litres for a daily service of 200 km. Compared to traditional hybrid vehicles, the new hybrid buses yielded considerable cost savings because they have no batteries, which need to be replaced every three years at a cost of EUR 15,000.

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**3. Cleaner private vehicles.** The city of Bologna wanted to boost its efforts to encourage private car owners to shift from petrol to liquefied petroleum gas (LPG) and compressed natural gas (CNG). The city provided financial incentives for clean(er) cars while exempting them from circulation restrictions under the Air Quality Agreement. For its part, the municipality procured 41 methane and LPG vehicles, thus increasing the share of clean vehicles in its fleet to 50 percent. Together with the Emilia-Romagna Region (RER), the municipality promoted an innovative programme to promote electric vehicles, with financial incentives worth EUR 300,000. It also built two on-street charging points for electric vehicles.

The e-mobility programme was based on unprecedented agreements signed by the RER, the national electricity company Enel and the multi-regional utility Hera, which allowed for e-company interoperability and plug-in device standardisation. The city of Bologna launched an information campaign to spread awareness of the incentives available to shift to methane or LPG. The city made the promotion of private vehicle renewal a priority in 2007 as part of its urban traffic plan.

The measure increased the share of LPG- and CNG-powered vehicles in the city's private fleet to 16 percent in 2011, an increase of 87 percent from 2007. Approximately 900 electric bikes were purchased in one year and the measure got new funding in early 2013.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**4. Park-and-ride system.** To reduce on-street parking and satisfy the mobility needs of its public transport passengers, the city used CIVITAS support to improve its park-and-ride (P&R)

services. The measure consisted of three main components: introduction of a P&R car park and improvements to existing ones; better public transport connections; and the design of an electronic system for booking parking spaces in advance.

An information campaign promoted the improved service.

Users perceived the presence of the bus service (71 percent) along with the fare convenience as the main advantages of the P&R zones. The measure resulted in a 163 percent increase in users of the parking areas, with revenues rising by 34 percent from 2008 till 2011. Car park occupancy increased by 65 percent from 2009 to 2010 and 34 percent from 2010 to 2011. A key to the success of this measure was the fare policy that offered free parking to bus and bicycle users.

### TICKETING AND TARIFFS

**5. Integrated public transport fare system.** Supported by CIVITAS, Bologna introduced in 2010 an integrated public transport fare system for trains and buses called STIMER/MI MUOVO. It included public bike and car sharing as well as the park-and-ride service.

The system was launched together with a big information campaign on the new fares and the validation system.

There was very positive feedback on the integration of services (bus and train), which clearly encouraged the use of public transport. The sales of intermodal bus+train passes increased 33 percent from 2010 to 2012.

**6. On-board ticketing.** Together with the new electronic ticketing system (see measure 5) CIVITAS supported the introduction of an on-board ticketing system that uses an on-board computer and validator already installed on buses. After a testing phase on three bus lines, the service was activated on all suburban lines and 600 drivers were trained on system functionality.

The main barrier was the additional pay requested by drivers to issue the tickets as they considered it an extra duty; an agreement with the trade unions foresees a payment of 30 percent of total ticket value to the drivers.

According to a survey of 50 bus drivers on the first three activated bus lines, the measure improved quality and accessibility to extra-urban bus services because of the possibility to buy the ticket on board.

**7. Recharging system for public transport season tickets.** With the aim of improving the attractiveness of contactless smartcards for season tickets, Bologna created a wide network of self-service recharging points. These include selling points integrated in bank terminals (ATMs) and online services on the public transport company's website.

The bus service operator and the banks were involved in the process. A widely promoted information campaign reached users through various channels, including direct mailings to pass holders, website postings and information at ticket offices.

The measure resulted in customers saving time and a record 5,636 public transport passes were renewed through ATMs within a year. The measure also achieved a reduction in operational costs of ticket offices (i.e. a personnel saving of 4,360 hours or EUR 100,000 per year — 12 percent of total personnel costs at ticket offices).

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**8. Flexible access restrictions to the city centre.** Prior to CIVITAS, the control of access to the limited traffic zone (LTZ) via electronic pillars had not been very effective. In order to decrease access by unauthorised vehicles to eight semi-pedestrian zones within the LTZ, this CIVITAS measure updated the access control system with new software and mechanical features. Under the new scheme, smartcards with different institutional categories allowed for differentiated access and prevented the illegitimate use of passwords.

A communication campaign was carried out in the form of letters sent to citizens (around 3,000 people including residents and parking space owners). These explained how the new electronic pillar system worked. The system was integrated with Bologna's new mobility multi-service smartcard ("MI MUOVO", see measure 5).

The measure evaluation showed a 42 percent reduction in access to limited zones between 2009 and 2012. That equalled around 250 fewer vehicles entering the zones each weekday.

**9. MobiMart research.** Bologna aimed to develop a mobility credit market system, MobiMart, that gave credits to travellers who adopted desirable travel behaviour. The feasibility of the system and the methodology to quantify CO<sub>2</sub> emissions with credits was tested in four experiments involving a flexible transport service (FTS), car sharing, car pooling and urban cycling. The development of the scheme involved various innovative elements such as the definition of acceptable certification methods, conversion criteria and trading rules, validated protocols and guidelines on how mobility credits are issued.

The municipality reached voluntary agreements among different stakeholders for the mutual recognition of transport-related mobility credits. More than 2,000 users were directly engaged in the pilot activities (746 cyclists, 35 potential car poolers, 1,050 car-sharing users and 199 potential FTS users).

Three out of four pilots were successful in terms of CO<sub>2</sub> savings and citizen participation, while just one (car sharing) faced barriers that hindered the achievement of valuable results. Two of the four pilots obtained certification of sustainable mobility credits for 753 voluntary emissions reductions (VERs). The conversion methodology, based on the guidelines issued by the Italian Cartesio network, is considered the main output of this measure.

**10. Reducing pollution from motorbikes.** The city looked for solutions for better access control of motorbikes in the city

centre as the deployed cameras were not capable of detecting their small licence plates. The measure aimed at setting up an automatic control and enforcement system to restrict motorbike access based on emissions levels.

Unfortunately, the measure was abandoned due to the non-compatibility of motorbike licence plate data and the envisaged enforcement system. Information collected may still be useful for possible implementation in the future.

**11. Road pricing policies.** In 2006, Bologna was the first city in Italy to implement a road pricing policy based on an intelligent transport system (ITS). As part of CIVITAS, Bologna conducted a study to develop an ITS that can identify and distinguish vehicles according to different parameters such as model, size and emissions level. To make the access control system for the limited traffic zone (LTZ, see measure 8) more flexible, the road pricing scheme foresees the possibility for occasional users to enter the LTZ by paying an access toll. Also, a new semi-pedestrian area was introduced within the LTZ.

Different stakeholders were involved in the process and many awareness-raising actions, such as public events, conferences and media actions, were undertaken to increase social acceptance of road pricing. A training course on the new software was organised for users and new operators. The revision of the ITS finalised Bologna's road pricing strategy as part of the city's Urban Traffic Master Plan.

Measure implementation led to a 2 percent reduction in car and motorbike access to the LTZ and a decrease in all pollutant emissions (CO, CO<sub>2</sub>, NO<sub>x</sub> and particulates). Vehicle access to the new semi-pedestrian area dropped by 69 percent between 2006 and 2012.

### PARKING MANAGEMENT/PRICING

**12. Pricing and monitoring policies for parking.** Limited parking places and narrow streets led to many problems such as illegal on-street parking. With the support of CIVITAS, the city of Bologna worked on technological developments for more efficient information management, reservation and enforcement methods. This included new limited traffic zone (LTZ) access permits with bar codes, a complete revision of parking fees, an update of all parking meters, vertical signs and payment vouchers, and a new system to issue fines with portable devices (see measure 20). Bologna also became the first big Italian city to realise the complete centralisation of parking meters through the GSM network.

The awareness and acceptance of on-street parking management by citizens was evaluated via a telephone survey with a random sample of 500 citizens.

The number of fines for double parking decreased from 869 in 2009 to 297 in 2011. About 56 percent of citizens had a positive opinion about paying for on-street parking as a way to reduce congestion in parking spaces in relevant areas.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**13. Policy planning and cooperation.** Before CIVITAS, Bologna had made efforts to involve citizens in its Urban Traffic Master Plan with an initiative called “Bologna, a Changing City.” CIVITAS helped to enhance this collaboration through new and innovative modalities.

A diverse range of awareness campaigns took place including exhibitions, bike days, European Mobility Week events, bike tours supported by interactive websites, brochures, DVDs and social media outreach. Surveys and meetings aimed at fine-tuning the communication strategy.

The measure implementation resulted in increased interaction with residents. Up to 3,000 people took part in each European Mobility Week and over the project lifespan people’s awareness of CIVITAS initiatives increased 269 percent. This resulted in Bologna winning the European Mobility Week Award in 2011.

### MOBILITY PLANNING

**14. Mobility managers.** Before CIVITAS, Bologna set up a mobility management office to support big companies. With the support of CIVITAS, the city sought to engage more companies, including those with fewer than 300 employees, by offering software to manage employees’ travel behaviour data. The measure also included online tools, project resources, awareness events and information sessions. An innovative e-bike scheme was set up for municipal employees with 100 dedicated racks alongside free electric charging points.

The Italian Ministry of Environment and Emilia Romagna Region gave additional funding for mobility management in companies.

The number of public transport passes sold through mobility management agreements increased by 50 percent between 2007 and 2011. As a result, emissions were reduced by 35 percent compared to 2008 (average value of all pollutant types), including 5 tonnes of CO<sub>2</sub> per year.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**15. The “Safer Road to School” project.** Transporting children to school by car had led to traffic problems in Bologna. To develop sustainable alternatives, CIVITAS supported innovative measures such as separated bike paths, traffic calming, school travel plans, trainings and “pedi-bus” services.

Schools, parents and district representatives were broadly involved in various stages of implementation, and dissemination activities and awareness-raising events were implemented.

The number of students involved in the cooperation process increased by 28 between 2008 and 2012. More than 20 percent of students in the involved schools participated in the first edition of pedi-bus.

**16. Urban traffic safety planning.** CIVITAS helped to enhance the city’s efforts to improve road safety. With a particular focus on the 30 km/h speed limit, Bologna tested a range of road safety interventions. Continuous monitoring of black spots bolstered accident and injury data.

The city involved citizens and stakeholders to a greater extent in its mobility planning by various communication campaigns. The road safety strategy was part of Bologna’s Urban Traffic Safety Plan adopted in 2003.

Measure results included a 46 percent reduction in accidents at crossings with traffic islands, and a 34 percent reduction in accidents at crossings with traffic lights. Thanks to the designation of a Tempo 30 zone, traffic flow declined by 26 percent. This measure contributed to a 21 percent decrease in accidents and a 22 percent drop in traffic injuries between 2007 and 2010.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**17. Automatic enforcement at traffic lights.** Italy’s national plan for road safety stated that 83 percent of road accidents resulted from bad driver behaviour, and 35 percent of fatal accidents were caused by speeding and running red lights. CIVITAS supported Bologna in testing an automatic enforcement system to help detect traffic light offences and issue fines. The city installed a system called Stars in 24 pilot areas with a dedicated information technology back office.

Publicity campaigns informed citizens of the system and initial results were disseminated at mobility conferences. The measure was part of Bologna’s Urban Road Safety Plan adopted in 2003.

An evaluation indicated that the Stars system was the most efficient, cost-effective technology dealing with traffic light infringements. It led to a 21 percent reduction in accidents and a 28 percent reduction in injuries at the intersections where it was installed. The experience underscored the importance of proactive communications. After all, the aim was to improve road safety and not to boost revenue through fines as some drivers may have suspected.

**18. Mobile gates to control reserved bus lanes.** Bologna used a mobile ITS to bolster an existing electronic system enforcing intrusion into bus lanes. The mobile equipment was moved between different stretches of bus lanes to reduce violations on the entire bus network and improve public transport services.

However, the national legal system did not allow the use of such mobile camera installations and this resulted in the termination of the measure.

**19. New traffic control centre.** CIVITAS helped to realise a new traffic control centre called CISIUM that connected and integrated various intelligent transport systems to facilitate

optimal real-time traffic management. This included displaying data from the traffic control centre on traffic flows on Google Maps and at the airport arrival terminal. Bologna was one of the first cities in Italy to provide a traffic service on Google Maps with information coming directly from the municipality.

A dissemination campaign informed road users about the new system and results obtained. Real-time traffic information was made available to citizens through different channels.

The measure improved traffic control in the urban area, and the traffic fluidity at intersections, where waiting times were reduced by a few seconds. The enhancement in bus prioritisation at traffic lights led to shorter travel times on bus routes, with a reduction in delays and an increase in slightly early bus departures. Bologna's CISIUM project was recognised with the CIVITAS Award in 2010.

**20. Reducing illegal on-street parking.** Before CIVITAS illegal on-street parking badly impeded public transport circulation (see also measure 12). With the support of CIVITAS, Bologna developed a unique electronic mobile enforcement system called SCOUT. It allowed traffic police to photograph illegally parked cars and to identify the owner through number plate recognition technology.

Together with the police, training courses on how to use the system have been organised for employees of the public transport operator, which is also responsible for the management of public parking.

The measure resulted in a 53 percent reduction in illegal street parking, improved the regularity of public transport and reduced congestion on bus routes. From 2008 to 2010, the number of parking fines decreased 68 percent. Due to the photographic and GPS evidence that the SCOUT system provides, legal challenges to fines were reduced.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**21. Urban freight delivery plan.** CIVITAS supported the third and final phase of the freight delivery plan, consisting of three main elements: an analysis of how freight distribution was evolving in the city, the promotion of a van-sharing system with a common electronic platform and the introduction of new access policies to the city centre (see measures 8 and 11).

Stakeholders were involved in different stages of the analysis and 21 operators were contacted to join a small-scale freight consortium.

Unfortunately, only two new freight distribution operators joined the consortium despite the municipality's high expectations and efforts. The van-sharing system was not used much, as operators were afraid to lose market shares and revenue. Still, the measure highlighted the limitations of the initiative and yielded lessons for further developments on a city freight delivery strategy.

Michael Glotz-Richter  
Wegesende 23, Block E  
28195 Bremen  
michael.glotz-richter@umwelt.bremen.de  
Tel: +49 42 13 61 67 03  
www.bremen.de

This German city is a well-known port and trade centre on the banks of the river Weser. With a population of 548,000 at the time of the CIVITAS project, Bremen was the second biggest city in North Germany. Besides its port and industrial facilities, Bremen's economy depends on car manufacturing, electronics, steel making and aircraft production. Bremen is also a centre for the food-processing industry and has a growing service sector.

CIVITAS Phase: I – VIVALDI  
Duration: 2002 – 2006  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Doubling car-share use.** Within the CIVITAS project, Bremen wished to improve and introduce innovations in its existing car-sharing scheme. Nine enlarged car-sharing locations were installed with 33 vehicles and car sharing was integrated with the services of the local public transport operator.

Tailor-made offers for specific target groups and a simple tariff structure achieved a more balanced demand and efficient use of the cars. Technological improvements like the Cambio smartcard allowed for open-end booking and automatic cancellation.

The results could be clearly defined: car-sharing use increased by 43 percent between 2002 and 2005 and doubled by 2010. Bremen's car-sharing service was even selected as an urban best practice example for the World Exhibition in Shanghai in 2010, which had the theme "Better City — Better Life". Based on the CIVITAS experience, Bremen developed a car-sharing action plan. The aim was to have 20,000 subscribers by the year 2020 via measures such as dedicating more public parking spaces to shared cars.

**2. MOBIL.PUNKT: Interchanges between car sharing, public transport and cycling.** Before CIVITAS, some inner-city areas of Bremen coped with severe parking problems. Bremen tested on-street car-sharing stations as part of a holistic promotion of alternative modes, designated by the special brand name "mobil.punkt".

The mobil.punkt stations in Bremen served as pilots and were copied by many German cities. Evaluation in 2005 made clear

that they were used predominantly by private customers, and mainly by those with no vehicle in the household. Customers used mobil.punkt in two ways: to avoid buying a second car, or to avoid car ownership altogether.

The mobil.punkt concept was given a best practice award by the Association of Spatial and Urban Planning (2010), the German Minister for Construction and Urban Development (2008) and the German Motor Club ADAC (2006).

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**3. Promoting compressed natural gas vehicles for private use.** To respond to the EU objective on alternative fuels, CIVITAS helped Bremen launch its own promotion campaign on compressed natural gas (CNG), with the target to introduce 250 new CNG vehicles between 2003 and 2005.

Financial incentives of EUR 1,000 per new CNG private car, and EUR 2,500 per company car were proposed by the local energy provider and the energy agency. Monitoring of the promotional work showed an increased level of awareness: after 2.5 years, more than 25 percent of Bremen citizens knew about the campaign as well as the environmental and economic advantages of using CNG.

By the end of the project period about 70 percent of approved applicants (297) had purchased a CNG car and four CNG fuelling stations were installed. The fleet of CNG vehicles in Bremen showed a 23 percent reduction in CO<sub>2</sub> emissions (compared to petrol); a 77 percent reduction in NO<sub>x</sub> emissions (compared to diesel); and a 99 percent reduction in PM10 emissions (compared to diesel) over the project period.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**4. Planning of a tram-train: Intermodal infrastructure use.** With the support of CIVITAS one of Bremen's tram lines was extended along an existing railway track.

This was a cost-effective solution as there was no need for a new corridor for tram tracks nor for the reallocation of road space. Moreover the tracks could still be used for freight transport. Several public information meetings were well attended and had a positive impact on the project.

With the extended tram line, public transport journey frequencies increased by 12.4 percent and the number of tram users increased by 7.5 percent during the project period. Bremen concluded that this shift from bus to light rail in suburban regions was an efficient means of improving the public transport system, while reducing energy consumption, emissions and noise from public transport. Despite the high investment costs, a positive effect can be expected in the long run, as patronage increases and the operation of public transport becomes cheaper.

## TICKETING AND TARIFFS

**5. The BOB ticket, an innovative pricing strategy for infrequent public transport users.** Before CIVITAS, 70 percent of all citizens rarely used public transport. CIVITAS supported the introduction of the BOB ticket, a chip card for infrequent public transport passengers that was designed by the public transport operator and the Bremen transport association.

It allows easy access to public transport without the need for prepaid tickets or cash and gives access to integrated information services for sales, annual subscriptions, timetables, fares and local car sharing. The card was introduced with a poster campaign that appeared to be very successful.

Within just six months, 13,000 people were registered. By the end of the project period, ticket sales had reached 25,000, and by the end of 2010, the figure was 70,000. Waiting times for tickets were reduced and the attractiveness of public transport improved.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Making cycle-friendly neighbourhoods.** Urban neighbourhoods of Bremen tended to be designed as 30 km/h zones, often combined with a system of one-way streets to discourage through traffic.

In order to make cycling more attractive, CIVITAS supported the adaptation of one-way streets to allow contraflow cycling and for short and attractive connections without high investments.

An evaluation carried out by the University of Bremen indicated the success of the CIVITAS measure, with specific results for each of the streets of the project. The majority of residents stated that the appearance of the streets improved and that living conditions were more attractive. The appearance of the street and the planting of trees were appreciated most, followed by measures dedicated to cyclists, pedestrians, public transport users and car drivers.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**7. Intermodal travel information centre.** Before CIVITAS, there was a lack of accurate information on alternatives to the car in and around the city. CIVITAS supported the development of the Intermodal Travel Information Centre (ITIC) at a major public transport interchange in Bremen's city centre on the edge of the pedestrian zone.

Various services and free items are offered at the ITIC, including sales of tickets for public transport operators throughout the region, estimation of travel times and fares for taxis in intermodal trips, information on bike-and-ride facilities and maps with walking connections between stops and final

destinations. Visitors to the centre can join Cambio, the local car-sharing organisation, on site, and cars are available in the same building.

The ITIC measure is a success story: it has become the most important information centre where customer care is offered in a modern, pleasant and centrally located setting.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**8. Introducing compressed natural gas trucks.** The City Logistics project was designed within CIVITAS as a demonstration project aiming at a more sustainable and efficient delivery of goods in the city centre while increasing acceptance of low-emissions vehicles among carriers and shopkeepers.

CIVITAS helped introduce economic and environmentally friendly trucks running on compressed natural gas (CNG). It also supported the extension of bundled transport into the city centre and the development of telematics solutions for the optimisation of freight flows. Within the project period, a monthly reduction in truck mileage of about 9,000 km and a monthly saving of 1,100 litres of diesel fuel were achieved.

Difficult market conditions for freight services and the lack of CNG trucks were obstacles for the project. The city learned that the increased efficiency of "conventional" logistics operators and customers' demands for specific delivery times would make it very hard for the City Logistics operator to succeed without additional public subsidies.

Municipality of Brescia  
Via S. Donino 30  
25128 Brescia  
Tel: +39 30 297 73 02  
Fax: +39 30 297 73 03  
urp@comune.brescia.it  
www.comune.brescia.it

The city of Brescia is the second largest city in the Lombardy region with 190,000 inhabitants at the time of the CIVITAS project. In summer, it is a touristic destination due to its proximity to Lake Garda and in winter because it is close to the Alps. Brescia is also an important industrial centre, well known as the main producer of reinforced concrete rods and for its role in arms manufacturing.

CIVITAS Phase: Plus – MODERN  
Duration: 2008 – 2012  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Car sharing.** Prior to CIVITAS, the increased number of private cars led to worsening air pollution and a shortage of parking spaces in Brescia. CIVITAS helped to launch a car-sharing service with vehicles powered by hybrid and bi-fuel engines. The design of the scheme was based on a comprehensive analysis of potential users and their geographical distribution, the city characteristics and its mobility culture and the socio-economic distribution of citizens and businesses. The main question was how big the fleet should be in relation to the size of the city.

A promotional campaign accompanied the introduction of the service. Since the launch, the service manager Muovosviluppo srl has signed agreements for reduced prices with organisations such as IKEA, Brescia University, the Catholic University of the Sacred Heart, and some public institutions.

The car-sharing fleet had six cars, half powered by natural gas. Seven reserved parking places were designated around the city. Before the end of the CIVITAS project, the service counted more than 290 subscribers. The key to its success was the full integration within the Italian network ICS (Initiative Car Sharing). This linked the services of several different cities and provided an Italian standard.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

#### **2. Clean and energy-efficient public transport fleet.**

Before the CIVITAS project, the urban fleet of local transport company BST had 73 vehicles running on compressed natural gas (CNG), and they covered about half of the kilometres driven by the total fleet. With the support of CIVITAS, BST purchased 28 new CNG buses and four hybrid buses, resulting in a more comfortable and less polluting fleet.

The direct involvement of inhabitants was guaranteed through a customer satisfaction survey of 1,200 actual and potential users. An important event was organised in 2009 with a presentation of 20 new CNG buses to authorities and citizens by means of a press conference during a trial trip. The measure fitted with Brescia's mobility strategy, which prioritised the development of a better public transport system.

The proportion of kilometres travelled by clean buses increased by 18 percent between 2008 and 2011, adding up to 73 percent of total kilometres. In the demonstration area, the number of passengers grew by 5 percent. CIVITAS made an important contribution to BST's effort to purchase clean buses despite the economic crisis.

### HYBRID, CLEAN AND ELECTRIC VEHICLES

#### **3. Renewable energy production for the hybrid bus fleet.**

Before CIVITAS, the local transport operator BST had installed a photovoltaic plant to produce energy, but this system did not allow for an increase in the number of hybrid buses running on solar power. In the framework of CIVITAS, BST enlarged the existing facilities in order to produce enough renewable energy to power the batteries of the hybrid buses in the municipal fleet. It also helped meet the increased electricity consumption needed to compress gas for new buses running on compressed natural gas (CNG) (see measure 2).

A constructive partnership was created between BST (and the holding Brescia Mobilità) and Brescia municipality to develop common activities to reduce CO<sub>2</sub> emissions, including the designing of the new plant. The measure fitted with BST's policy and more generally with the city's policies on sustainable development.

During the first year (May 2011–April 2012) the new system produced 97,736 kWh, almost double that of the previous power plant. Also in the first year, 52 tonnes of CO<sub>2</sub> were saved. The city learned that the availability of funding is crucial to allow for in-depth research on the safety and innovativeness of the system itself.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**4. Intermodality with public transport.** Prior to CIVITAS, the public transport network in Brescia consisted mainly of bus services. As a metro line was to be introduced in the city by

2013, this CIVITAS measure sought to promote intermodality, especially between bicycles and public transport. With all relevant stakeholders, a new public transport network and intermodal scheme was designed, using simulations to determine the best locations for the new metro stations and the best scenarios for the new network. The integration of different systems, bike-sharing network, automated-metro line, train and bus services was innovative for Brescia.

The organisation of a target group of leaders in various areas was important to help disseminate information and harmonise methodologies and to develop a working hypothesis and objectives. Partners for this project were the public transport company, the university, a communication agency and authorities overseeing parking and bike-sharing facilities.

The measure helped develop a replicable methodological approach for the reorganisation of the local public transport network to adapt to an innovative means of transport — in this case, the metro line. The use of small simulations was essential for transport enhancements near the metro stations (i.e. to enhance safety for cyclists and pedestrians at crossings).

### SERVICE IMPROVEMENTS

**5. On-demand public transport services.** Before CIVITAS, Brescia operated an on-demand transport service for students and people with disabilities (the "Accabus"). CIVITAS supported upgrading this service to ensure accessibility in low-demand areas at off-peak times (night) and to take into account the needs of specific groups. The "Brindo con Prudenza" action was a dedicated on-demand bus service to avoid car use by young people consuming alcohol during the weekend.

The measure was not successful. There were no subscribers for Brindo con Prudenza. Dedicated software was purchased to personalise the on-demand service but was not considered suitable for the Accabus. From an economics point of view, the city learned it is important to assess and verify all aspects of a proposed solution, including personnel and funding required, before implementation. Moreover, before deciding to substitute an efficient and high-quality service (such as Accabus), it is important to understand if a new software tool can really improve benefits.

### TICKETING AND TARIFFS

**6. Development and upgrade of e-ticketing.** Prior to CIVITAS, the public transport network in Brescia consisted mainly of bus services. CIVITAS helped introduce an e-ticketing system with smartcards that promoted intermodality between buses and the new metro line planned for 2013. It could also be used for bike-sharing services and public parking (see also measure 7). The Omnibus smartcard service covered the whole municipality of Brescia and 14 surrounding suburbs.

The municipality of Brescia worked with the local transport operator BST and the urban parking and bike-sharing operator Sintesi. Citizens could take part through a customer satisfaction survey. With this measure the city met an objective in the Regional Plan for Intelligent Mobility Development that aims

to promote the use of intelligent transport technologies for enhancing information services for citizens.

The city distributed 6,000 cards to bike-sharing users and 1,250 cards to other service users. The cards were very reliable with just 2 percent returned broken. Thanks to these results, the municipality of Brescia decided to distribute free Omnibus cards to all citizens older than 16 years (about 100,000) in 2012.

**7. Integrated ticketing for park and ride and public transport.** Complementing measure 6, CIVITAS supported a better integration between the park-and-ride (P&R) services and other modes of transport by electronic mobility cards. In addition to the new Omnibus card, this measure allowed for an update of the ticketing system for parking and for testing a new integrated technology (software and hardware). This comprised new double-face tickets for occasional parking users who combined parking and public transport. Allowing interoperability between parking and public transport was new and innovative for the city.

Electronic validation devices for the P&R facilities and other mobility services were tested, followed by a field check with volunteers.

More than 7,000 Omnibus cards were distributed among users of parking, bike sharing and public transport. The city learned it is crucial to give time for internal testing while developing a new technology. This minimises equipment failures and problems with software or hardware.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**8. Access restrictions for freight vehicles.** Prior to CIVITAS, freight transport was causing severe congestion and parking problems in Brescia. In this CIVITAS measure, the city analysed the state of the art of freight distribution in Italian cities and elsewhere in Europe. It conducted a feasibility study for a local urban freight distribution centre, and elaborated an urban logistics plan. Time windows for freight delivery were changed, accessibility to several places was regulated with automatic bollards, delivery areas were defined and new fees were implemented. This conceptual approach was innovative for the city and its region.

This plan was developed with stakeholders engaged through roundtables, leaflets, booklets and advertisements. The new restrictions for urban freight distribution were introduced by a municipal decree that also included pedestrianisation of the city centre.

A survey among the most important commercial operators in Brescia (15 companies) showed that during CIVITAS these operators were interested in the distribution centre option. Brescia learned that a strong willingness of the municipality is needed to overcome not-in-my-backyard resistance to the changes.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**9. Communication and educational campaign.** With the help of CIVITAS, the city and local transport company BST spread the culture of sustainable mobility amongst citizens. The company distributed informative material about sustainable mobility to young people, and promoted existing projects in primary schools, the national Running Words programme for bus passengers and the European Mobility Week for all citizens.

The primary school project, EDU, organised meetings with teachers and trainers, while Running Words actively involved citizens by means of a local story contest on travelling. This highlighted the emotional experience of travelling and encouraged people to talk about mobility. Several organisations were involved every year in European Mobility Week activities.

As a result of this measure, the proportion of third- and fourth-grade students taking part in the EDU project increased from 23 percent during the 2007–2008 academic year to 35 percent in 2011–2012. The number of participants in the Running Words project doubled from 11 published tales in 2009 to 23 in 2011, despite the declining national trend (down 30 percent between 2009 and 2010). The direct involvement of stakeholders, including through targeted dissemination campaigns, was crucial in spreading the information throughout the city.

**10. Mobility marketing.** CIVITAS helped the city improve its public transport communication and information, making it more accessible, understandable and attractive. The measure comprised the distribution of redesigned timetables and maps, installation of new glass display boards and improved web resources. Innovative aspects of the measure included translation of the materials to English, French and Russian and the production of targeted leaflets and maps for youngsters.

Information campaigns were addressed to users and potential users of public transport, with attention paid to the information's accessibility and quality.

More than 80 percent of the students attending junior high schools were reached by a targeted information campaign and more than 52 percent of residents in the area where public transport service information was spread were reached. The city learned that it is important to optimise the information channels already available while producing new and targeted material as well.

### MOBILITY PLANNING

**11. Travel planning for schools and businesses.** Before CIVITAS, the city saw a need to coordinate mobility management activities for a coherent vision of sustainable mobility. With the support of CIVITAS, the area mobility manager of the municipality of Brescia conducted travel behaviour surveys of the main companies and schools in Brescia, developed home-to-work travel plans, and promoted bike tagging. The measure also involved the set-up of an experimental car-pooling service, with on-board data logging to register passengers and calculate fares. This was tested at one school.

The municipality organised training courses for the companies' and schools' mobility managers. The public was informed about the measure during European Mobility Week.

Approximately 2,600 employees from 25 big companies were surveyed. There was a trend towards more sustainable travel from 8.5 percent in 2010 to 15 percent in 2012, mostly due to the economic crisis. Twelve companies were involved in the elaboration of a home-to-work plan, and demonstration activities were developed for six. The car-pooling experiment was not successful, as users did not appreciate the installation of an on-board data logger.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**12. Accident risk analysis and development of a road safety monitoring centre.** With the intention of reducing road accidents, Brescia implemented two tools within CIVITAS: a road safety monitoring centre supported by a web platform and an urban road safety plan (PSSU). The innovative approach consisted in the definition of a new road accident data analysis and mapping system. The development of the PSSU also represented an innovation for Brescia and was an outstanding result in Italy, where such planning tools were not commonly used.

Involvement of different stakeholders was a key to success. They included the police, different municipal departments, and the National Statistical Institute.

The PSSU was used by the municipal administration to prioritise road safety actions such as the systemisation of road interventions, speed checks, intervention on pedestrian crossings and junctions, new technical solutions at traffic lights and so on. Another significant result was the updating of the road accidents database.

**13. Development of bicycle safety.** The Cycle Mobility Plan elaborated in 2000 (within the 1998 Urban Transport Plan) focused almost exclusively on building new cycle lanes to create long and safe cycle routes for citizens. However, no attention was given to the renewal of existing cycle routes. With the support of CIVITAS, the city renewed about 95 km of existing cycle routes, installed signs, installed about 1,100 lockable bike racks, and published and distributed cycling maps.

The actions were carried out in close collaboration with the local cyclists' association. This measure was in line with the administration's policy focused on the promotion of cycling through the improvement of comfort, quality and safety.

At the end of CIVITAS, 80 percent of the total bicycle network had been renewed and more than the planned 170 signs had been installed. Thanks to the publication and distribution of 5,000 cycle maps, information about possible itineraries was enhanced and the level of awareness about cycle itineraries renewal increased from 16 percent to 21 percent. An important lesson was that an in-depth investigation of the existing cycle

network is fundamental to increase its quality and should be done with the relevant stakeholders, such as the cyclists' association, to understand the users' real needs.

## TRANSPORT TELEMATICS

### REAL-TIME ROAD USER INFORMATION

**14. Mobility channel.** Historically the city had not developed intermodal services and its citizens had a mono-modal attitude. CIVITAS helped Brescia's local transport company BST offer a variety of services via mobile phone to promote public transport and make available up-to-date information on a variety of modes. The Brescia Mobility Channel delivered personalised mobility information on a large variety of topics: buses, park and ride, bike and ride, cycle paths, green areas, available parking spots, and points of interest such as shopping, tourism, culture, education and entertainment. Information was updated in real time.

The Mobility Channel was the result of a collaboration between BST, parking and bike-sharing operator Sintesi, the application designer and Brescia municipality. The measure was related to other initiatives promoting intermodal transport in anticipation of the launch of a metro line in 2013 (see also measures 4, 6 and 7).

In September 2012, an iPhone application published in November 2011 had been downloaded more than 3,350 times and the one for the Android operating system (published in July 2012) more than 650 times. The people interviewed gave the service a rating of 4 out of 5. Close collaboration with the designer and regular testing of acceptance by users were keys to success.

# BRIGHTON & HOVE

## UNITED KINGDOM

Tom Campbell  
Brighton & Hove City Council  
King's House Grand Avenue  
Hove BN3 2LS  
tom.campbell@brighton-hove.gov.uk  
Tel: +44 12 73 29 33 28  
www.brighton-hove.gov.uk

Brighton & Hove is a thriving city by the sea and is the largest urban centre on England's south coast, lying approximately 50 miles south of London with 8.5 million visitors a year. The city had a population of 273,000 at the time of the CIVITAS project and is a popular base for London commuters. It benefits from excellent travel links to the east and west of the country and north to London. It lies on the national rail network and is just 25 miles south of Gatwick international airport. Brighton & Hove is also a major tourist, leisure and conference destination. The vision for the city is a place with a coordinated transport system that balances the needs of all users and minimises damage to the environment. The transport strategy to deliver that vision was developed within the framework of the Local Transport Plan.

CIVITAS Phase: Plus – ARCHIMEDES  
Duration: 2008 – 2012  
Role: Leading city

### CAR-INDEPENDENT LIFESTYLES

#### CAR SHARING

**1. Car-sharing scheme improvements** (not realised). Brighton & Hove wanted to expand existing car club schemes to less densely populated areas in the city, to further promote energy-efficient vehicle use and improve the mobility of individuals living in these areas. However, a feasibility study determined that the expansion project was in fact not feasible and therefore the project did not go ahead.

### COLLECTIVE PASSENGER TRANSPORT

#### ACCESSIBILITY

**2. Public transport information for blind and partially sighted people.** The council introduced more than 20 talking bus stops for blind and visually impaired passengers in 2007. The system linked into the real-time information signs at bus stops, allowing blind and visually impaired people to hear announcements about which buses are coming at what time. As part of the CIVITAS project 12 additional talking bus stops were installed. Brighton & Hove was the first in the country to introduce talking bus stops and has won several awards for the system.

In addition, the measure was able to fund a further 200 key fobs (free on board), which are used to operate the system. This enabled a larger number of residents to gain access to the information and improve their confidence whilst travelling alone.

The talking bus stops were an important step in encouraging independence and confidence among blind and visually impaired people who want to use local buses. The measure had a favourable cost benefit ratio of 1:11 and 100 percent of users surveyed at the end of the project wanted to see an expansion of the system to other bus stops within and beyond the city.

#### TICKETING AND TARIFFS

**3. Multi-modal ticketing.** To offer passengers a simpler and more seamless way of travelling, an integrated ticketing system (through the use of a smartcard called "The Key") was introduced by Brighton & Hove Bus Company.

The scheme was designed to encourage a modal shift from private car to bus, and thus an increase in air quality and improvement in the general city environment. At the end of the CIVITAS project, there were 30,000 users.

### DEMAND MANAGEMENT STRATEGIES

#### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**4. Bike-off anti-theft scheme.** Brighton & Hove has historically suffered from a high number of cycle thefts and initial research showed that people who experience bike theft are less likely to purchase another bike and cycle again. The Bike-Off project implemented a range of innovative cycle parking measures in conjunction with a high-profile publicity and awareness campaign at 10 high-risk sites to help combat cycle theft. This included communicating good cycle locking practice to existing and new cyclists and installing secure cycle parking to facilitate good locking practice.

As a result of this measure the levels of formal parking (bicycles locked to stands) increased across all sites by 28 percent; and there was a 71 percent increase in good locking practice (using two locks) at sites. The results showed a strong relationship between the measure implementation and improved locking practice, leading to improved bike security.

**5. Clear zone.** Brighton & Hove implemented physical provisions to enhance the quality of the environment in which people go about their social, work and shopping activities. Research was undertaken to better understand the social and emotional benefits of balanced street design. Methodologies for assessing and evaluating these benefits were then developed.

Local artists were commissioned to work with transport planners to inject life into a previously neglected cut-through.

The improvements helped reduce traffic and connect the seafront with the area of The Lanes. Brighton & Hove City

Council recognised that consideration of all benefits was critical if they were to make fully informed decisions on the costs and benefits of investing in well-designed streets.

**6. Cycling provisions.** This measure introduced innovative engineering measures along the city's cycle network to reduce stop-start cycling conditions, improve cycling journey times and reduce conflicts between cyclists and other road users. These measures included a shared surface through a reinvented mini-park, innovative ramps, road markings to enable cyclists to turn left at an otherwise straight-ahead-only junction, and on-street cycle parking at 10 city centre locations.

Prior to implementation, local businesses and passers-by were asked for their views on what should be provided. For example, chairs were placed on the street so that local businesses and residents could experiment with different seating arrangements for the mini-park.

Evaluation for this measure focused predominantly on cycle counts. Since the mini-park measure, for instance, cyclist numbers through the area have increased by 17 percent. Brighton & Hove's lesson learned was that working in partnership with university students on the cycle ramp project helped generate new ideas.

**7. Personalised travel information website.** Before CIVITAS, in 2007, Brighton & Hove City Council had developed and launched a travel information website with a journey planner. The JourneyOn website enabled users to obtain personalised information about their journeys, including optimum routes, time required, calories burnt (by mode) and topography. To improve access to information, a mobile version of the website was developed as part of CIVITAS. In addition, two cyclist counter displays were installed at two key locations.

The JourneyOn mobile was launched in January 2012. By 31 October 2013, 65,840 visits were made from mobile devices (smartphones and tablets), 32 percent of the total (206,949).

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**8. Commuter and school travel plans.** The main aim of this measure was to reduce the number of single car journeys by employees travelling to and from work. It also sought to reduce the impact of the "school run" (parents driving their children to and from school) to achieve a sustained increase in safe journeys to and from school.

These aims were achieved by working with businesses and schools on plans detailing a range of measures to encourage more employees, children and parents to walk, cycle, use public transport or car share. The measure was implemented as part of the Local Transport Plan.

As a result, car trips to and from schools within the CIVITAS corridor declined by 13 percent during the lifetime of the measure compared to an 8 percent reduction in schools outside of the corridor. A lesson was that a successful travel

plan campaign relies heavily upon building robust relationships with key personnel in the targeted businesses and schools. Another is that if campaigns are linked to existing targets or actions of the involved institutions, the measure will have better longevity.

**9. Monitoring air quality.** To shift travel to school towards more sustainable modes, the city tried an innovative educational measure. Static and mobile air quality monitoring equipment was used to record and analyse the impact of vehicle emissions during this project. The data from the equipment was displayed in real time on the premises of schools participating in the project. Results were used as the basis for an educational initiative on the effects of emissions and pollution in schools.

Three selected schools in Brighton participated.

The school surveys showed 100 percent awareness, and between 70 percent and 92 percent acceptance of the project following the monitoring activities. During the week of project activities and after Walk to School Week, monitoring was done to gauge modal shift, but the sample size was not large enough to produce a reliable result. However, future activities at these and other schools could produce more significant and robust results.

**10. Personalised travel plans.** Brighton & Hove had a long tradition of personalised travel planning (PTP) which provided a range of individualised, tailored information and incentives to encourage travel behaviour change in a densely populated area. Brighton & Hove expanded its PTP project from 10,000 households per year to 15,000 households in 2009. Of these, 5,000 were part of the CIVITAS measure. In 2010, 20,000 households were covered, 5,000 as part of the CIVITAS measure.

Participation in the CIVITAS project enabled Brighton & Hove to test new community engagement techniques using social media. The aim of these interventions was to reach new audiences who were not picked up through the door-knocking campaign, now known as "traditional" PTP.

The active contacts in the the community participation process included representatives from the Ramblers walking club, the local library service, the local history society and the Active for Life project. The group was highly motivated but the absence of a broader set of community representatives (e.g. from schools, children's groups, churches etc.) reduced the potential spread of the message. Area surveys suggested an overall 0.7 percent decline in the overall number of trips by car in each of the 2010 and 2011 PTP areas.

### MOBILITY PLANNING

**11. Electrical vehicle charging points.** Before CIVITAS, the city had no on-street electrical vehicle charging points. To encourage more people to drive environmentally friendly electric cars and help test the belief that the scarcity of charging points was holding back the take-up of electric vehicles, eight on-street points were installed in Brighton & Hove. All of these

were powered by sustainably generated electricity. To promote the scheme, several incentives were given: free registration to the scheme, free parking while recharging, and registration opened up to anyone in the UK. At the time, it was the first project of this scale in the UK outside of London.

The measure was implemented as part of the Local Transport Plan.

In March 2013 the scheme had 43 registered users, including residents and businesses. Two tonnes of CO<sub>2</sub> had been saved by the fall of 2013.

than the freight quality partnership, and to achieve even greater results a more effective method for engaging with freight operators could be used. To successfully initiate a freight quality partnership it is necessary to give freight firms an incentive.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**12. Road safety campaign.** To increase road safety awareness and influence people who are statistically most at risk of traffic injuries, the city launched a road safety campaign. This was followed by safety engineering measures at four high-risk sites on the road network. The engineering measures included removing or repositioning street furniture to de-clutter the pavement, improving pedestrian crossings and visibility lines, and increasing the visibility of approaching cyclists at junctions.

The initial research identified the groups most at risk and the sites where collisions had occurred most frequently. The reasons why were also explored. Campaign and engineering designs were based on these findings.

The evaluation for this measure focused on specific target groups and compared social indicators of awareness and acceptance of the publicity campaign, alongside traffic and accident data at the sites of implementation. As the hard changes to infrastructure and street furniture were relatively small in scale, the changes in traffic and accident data were not noticeable.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**13. Efficient goods distribution.** Brighton & Hove aimed to establish a freight quality partnership to optimise the effectiveness and efficiency of local freight movements. The work carried out within the measure included a review of best practice from European and United Kingdom cities and surveys of businesses and freight companies located within four distinct areas of central Brighton. The measure was supported by the implementation of a semi-pedestrianised design in the East Street area of Brighton to reduce the impact of freight.

Dialogue with stakeholders such as local businesses and transport operators was an essential part of this measure.

In East Street the number of light goods vehicles dropped by 13 percent; heavy goods vehicles by 6 percent; and traffic in general by 42 percent. The hard measure was more successful

Alistair Cox  
Brunel House  
St Georges Road  
Bristol BS1 5UY  
alistair.cox@bristol.gov.uk  
Tel: +44 11 79 22 29 40  
Fax: +44 11 79 03 67 16  
www.travelwest.info

Bristol is the largest urban area in South West England and is a centre of industry, commerce, education and culture. At the time of the CIVITAS project, the city had a population of around 400,000. Car ownership and car use in the city are among the highest in the country. The city is relatively hilly and is divided by the River Avon. The north of the city has experienced rapid growth, while large-scale redevelopments have also taken place in the city centre and around the historic harbour area.

CIVITAS Phase: I – VIVALDI  
Duration: 2002 – 2006  
Role: Leading city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Clean vehicles strategy including new and retro-fitted vehicles.** Prior to CIVITAS, the municipal fleet had 22 vehicles running on liquefied petroleum gas (LPG) whilst the remainder were diesel powered. Public transport used diesel buses as well. To improve air quality, local bus operators retrofitted the exhausts of more than 60 diesel buses and introduced four hybrid-electric buses. Meanwhile, 50 vehicles running on LPG and five electric pool cars were introduced in several public and private fleets. The measure was innovative as it involved the development of a new hybrid diesel-electric engine for the local bus fleet.

The city council involved many transport and fleet operators in this measure, and received advice from the non-profit organisation Energy Savings Trust. The measure was carried out as part of the city's Air Quality Management Strategy and the Clear Zone concept introduced within the CIVITAS project.

The LPG vehicles and the retrofitting of diesel buses led to a reduction in particulate matter, but there was a slight penalty in terms of increased fuel consumption and therefore CO<sub>2</sub> emissions. The electric cars showed admirable cost and emissions savings. In Bristol, CIVITAS contributed to the development of a market for clean and efficient vehicles, as 50 vehicles owned by residents, taxi drivers, city council employees and three small businesses were converted.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**2. Dial-a-Ride.** At the start of the CIVITAS project, 9,500 people were registered to Bristol's Dial-a-Ride service offering door-to-door journeys on demand in two-thirds of the city at the cost of a bus fare. As part of CIVITAS, the service was extended to a new area of the city and a new booking and scheduling system was tested. An innovative feature was the introduction of a vehicle running on liquefied petroleum gas (LPG) in the new area.

User satisfaction was assessed during two passenger forums. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

The number of registered members increased to 10,500. Even with increased fuel use, the LPG vehicles showed a significant reduction in emissions of NO<sub>x</sub> (75 percent), although this was accompanied by a slight increase in CO<sub>2</sub> emissions. In Bristol, the CIVITAS Initiative contributed to social inclusion, as for many users journeys would be difficult, if not impossible, without the service.

**3. Introducing the concept of taxi sharing.** This CIVITAS measure targeted an area of the city that was particularly poorly served by public transport and where busy roads and waterways cut off residential areas from employment opportunities and leisure venues. In this area CIVITAS initiated a taxi-sharing service that enables people to travel by taxi within their local area at low cost, providing them with better access to local services and facilities. At the time, taxi sharing was a brand-new mobility concept in which buses and taxis are treated as complementary rather than competitive services.

User satisfaction was thoroughly analysed through a survey and several in-depth interviews. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

The scheme was successful as it attracted 125 members in six months, 44 percent of whom were over 55 years of age. They joined the scheme due to restricted personal mobility. In Bristol, the CIVITAS Initiative contributed to social inclusion, enabling elderly people and people with disabilities to access local services.

### INTERMODALITY

**4. Southmead Interchange project.** The Southmead Hospital site is bordered by roads with heavy traffic flows, which made it difficult for pedestrians to access the site safely. This CIVITAS measure promoted sustainable modes of travel to the hospital by creating a new pedestrian crossing near to the hospital entrance, relocating a bus stop to be nearer to the crossing, installing electronic real-time information in the hospital and at nearby bus stops, and producing an access map highlighting sustainable transport modes for hospital visitors and personnel. Two dedicated car-sharing parking bays were introduced at the hospital and several on-site and off-site infrastructure improvements were made.

For this measure, the city council signed a partnership agreement with local bus operator First and the North Bristol National Health Service Trust. The measure was carried out as part of the Clear Zone concept introduced within the CIVITAS project and was a result of the city's emerging access to healthcare agenda.

As a result of the measure, the Southmead Hospital site's rating in a detailed accessibility audit improved from "below average" to "good". In Bristol, CIVITAS served as an engine for behaviour change, as the production of a new Southmead Hospital travelmap gave the opportunity to promote sustainable transport as a viable alternative to the car for visitors to the hospital.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**5. Residential traffic management (home zones).** Before CIVITAS, the residential area The Dings was blighted by a severe commuter parking problem that was likely to worsen as new developments on adjacent, vacant land were realised. With the support of CIVITAS, the city council designed a master plan to introduce a home zone in The Dings, redesigning the area as a space for social use. At the time, home zones were a relatively new concept in the UK.

The charity Sustrans provided advice on the development of the project and there was intensive involvement and close cooperation with the community (see measure 12). All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

The new layouts created a unique local environment that not only kept cars moving slowly, but gave equal priority to motor vehicles, cyclists and pedestrians. The CIVITAS project showed that streets can be designed with unconventional street features without comprising safety, and demonstrated the positive impact that residents can have on local transport projects.

### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**6. Bristol Cycle Resource Centre.** Before CIVITAS, bike security was identified as a serious issue in central Bristol, and company travel plans revealed a demand for secure cycle parking. Therefore the city built the Bristol Cycle Resource Centre (CRC), a secure bike park with secure lockers for work and cycling clothing; showers and changing facilities; on-site service and repair facilities; a cafe and refreshments stand; a notice board for local cycling and transport information; and a small meeting room.

The city council formed a partnership with Bristol's premier cycle retailer and the Mud Dock café that operated the centre. The measure was carried out as part of the Clear Zone concept introduced within the CIVITAS project.

Utilisation of the CRC was far less than expected and it was

found not to be commercially viable to implement a cycle resource centre without any income from other commercial activities. CIVITAS did, however, help Bristol City Council to show their citizens that they are taking cycling seriously.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**7. City Navigators.** Long before CIVITAS, Bristol recognised the need to strengthen links between transport and tourist information for visitors, particularly in relation to major events. The city introduced the Info Bus, an electric bus that provides location-relevant information to travellers at key sites such as public transport interchanges. Information is conveyed in person by staff and with displays, paper-based materials and electronic systems. To conserve battery power, the electronic display equipment on the bus was powered by a liquefied petroleum gas (LPG) generator.

Prior to the introduction of this measure, stakeholders were consulted on the level and quality of transport information available. Their dissatisfaction, particularly with public transport information, was one of the main drivers for the introduction of the Info Bus. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

In the first year and a half, the Info Bus was present at 17 events. Some 80 percent of users found that the information was useful in planning their journeys and 50 percent said it introduced them to a service of which they weren't aware. As 60 percent of respondents agreed that the information provided had influenced the type of transport they were going to use, the measure was found capable of significantly influencing modal shift.

**8. The TravelSmart scheme.** Before CIVITAS, the Bristol region was predominantly car based, with car ownership and car use amongst the highest in the country. With the support of CIVITAS, the charity Sustrans conducted an individualised travel marketing campaign in the city, contacting people in their households and providing information and follow-up actions to those who are likely to change their travel behaviour towards walking, cycling and public transport use. At the time, TravelSmart was a relatively new concept, particularly in the UK where only a few small-scale pilot schemes had been undertaken.

To support Sustrans, the city council provided the information materials, and the local bus operator supplied timetables, trial tickets and home visits to citizens interested in bus transport. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

The programme successfully achieved shifts towards more sustainable modes of transport (including public transport) without significantly altering journey times or route distances. The CIVITAS Initiative provided Bristol with the opportunity to import the TravelSmart method that had been successfully applied in other parts of Europe, and prove the versatility of the method across different regions.

**9. TravelBristol Info Centre.** At the start of CIVITAS, the need for a transport information centre was identified in order to improve access to transport information for residents and visitors to Bristol. The TravelBristol Info Centre was established to promote sustainable transport through improved information and services. An innovative feature of the measure was the integration of intelligent transport systems into a central data management and dissemination hub.

Bus operator First provided information and ticketing for commercial bus services, and the city council provided a range of other travel and transport information. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

As a result of the measure, local bus ticket sales increased by 88 percent year on year and National Express ticket sales increased by 210 percent compared to sales made at the previous ticket office. As 29 percent of respondents stated that the information provided had influenced the type of transport that they intended to use, the measure was found capable of significantly influencing modal shift.

**10. Widening Access: Promoting e-commerce.** Prior to the CIVITAS Initiative the level of e-commerce in Bristol was somewhat low, particularly amongst specific groups such as older people. With the support of CIVITAS, the city introduced Widening Access, a wireless hotspot providing equipment and Internet access to local residents, along with an online GIS database of community education opportunities. A home-shopping trial was designed to enable housebound clients of the social services to shop independently.

The city involved the students of a computer recycling course in testing the signal of the hotspot and installing wireless equipment in people's homes, with some technical support from the organisation Bristol Wireless. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

As a result, a third of the 40 participants stated that the Internet reduced their need to travel to the bank and 39 percent claimed it reduced their need to travel to work and shops. Nearly half claimed that journeys to educational classes and to visit family and friends were reduced. With this CIVITAS measure, the city of Bristol demonstrated the potential of the Internet for reducing the need to travel.

## MOBILITY PLANNING

**11. Harbourside travel plans.** At the start of the CIVITAS project, Bristol was one of the UK's leading cities in the development of employee travel plans. The CIVITAS project offered an opportunity to extend the benefits of travel planning to some of the major tourism and leisure destinations situated on Bristol's developing Harbourside. Through cooperation and collaboration, the Harbourside leisure and tourism destinations established mutually beneficial visitor travel plans that are inclusive and sustainable.

A core group of major destinations was established to develop and implement an area-wide travel plan. All CIVITAS measures

were carried out as part of the Local Transport Plan adopted in the year 2000.

As part of the travel plan measure, a cross-harbour ferry service was introduced and 30,000 visitors' maps were distributed. In Bristol, CIVITAS acted as a catalyst for stakeholder involvement, as the core group established during the project continued to meet regularly and contribute to the development of safe and sustainable transport facilities in the area.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**12. Community travel workers.** The project plan for home zones in Bristol (see measure 5) required significant effort to encourage inhabitants of The Dings residential area to actively participate and share their views during the planning and design process. The charity Sustrans employed two community travel workers (CTW) to involve the residents. The measure was innovative as the CTWs managed to create a network of community representatives by ensuring that each street had a recognised contact person.

Communication and involvement were further developed via meetings, newsletters, street events and a successful series of door-to-door surveys. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

The CTWs were successful in engaging 74 percent of households in The Dings, contributing towards 82 percent of residents supporting the concept of a home zone before implementation and 92 percent who were happy with the new street layout and their level of involvement.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**13. Intermodal trip planner.** At the start of the CIVITAS project, Bristol City Council was involved in both a European and a national project on public transport trip planning, but within CIVITAS the city wanted to include walking and cycling into a truly multimodal information service. The resulting intermodal trip planner provided users with full door-to-door itineraries in either text or graphic form, with the option of personalising search criteria, such as accessibility to people with reduced mobility. The trip planner was the first of its kind in the UK.

To acquire all of the relevant background information it was necessary to work with a number of different teams within the city council, such as the Information Technology Team, the Public Transport Team, and the Walking, Cycling and Access Team. All CIVITAS measures were carried out as part of the Local Transport Plan adopted in the year 2000.

After two years, the application had achieved an average of 719 hits per month, with an increasing proportion of cycling and walking requests. CIVITAS helped Bristol to build the foundations needed to encourage modal shift amongst its citizens.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**14. Freight consolidation scheme.** At the commencement of VIVALDI there was little cooperation between organisations involved in goods distribution at the local level within the city's clear zone. The freight consolidation scheme was designed to serve retailers in Bristol's core area, and a six-month trial involved 20 retailers. The service was the first of its kind in the UK to focus on a city centre.

From the early stages of the scheme, the city involved retailers and other stakeholders, who showed a certain degree of scepticism because of the absence of a UK model to follow. The measure was carried out as part of the clear zone concept introduced within the CIVITAS project.

The measure resulted in a reduction in delivery vehicle movements of over 50 percent from the third month of operation. It also led to emissions reductions of up to 600 kg of CO<sub>2</sub>, 25g of NO<sub>x</sub> and 300 g of particulate matter. The results of the initial phase of the scheme were so positive that Bristol City Council decided to extend the duration and scope of the scheme.

Iva Machalova  
Kounicova 67  
601 67 Brno  
civitas@brno.cz

Tel: +42 54 217 41 09  
Fax: +42 54 217 44 25  
www.civitas.brno.cz

Brno is the second largest city in the Czech Republic with a population of nearly 400,000 at the time of the CIVITAS project. An important centre for the region of South Moravia, Brno is within 200 km of Prague, Vienna and Bratislava. It has well-developed public transport infrastructure, and it seeks to promote a sustainable mobility culture and to reverse a decline in the number of public transport users.

CIVITAS Phase: Plus – ELAN  
Duration: 2008 – 2012  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Energy-efficient trams and trolleybuses.** Before CIVITAS, there were no regulations or monitoring for the heating system in trams and trolleybuses. With the support of CIVITAS, the Brno Public Transport Company tested a system to reduce the peak energy usage of 20 electric vehicles. It installed the system in 380 trams and trolleybuses. The innovative aspect of the measure was a new remote heating control, which includes an automatic warning system that switches off the heating when it reaches the level of reserve capacity.

The system was presented to the public during European Mobility Week and at the CIVITAS Forum. It was also presented at a meeting of experts from public transport operators.

The measure contributed to an annual 6.2 percent reduction in reserve capacity, a slight decrease in the temperatures of trams and a cost reduction of EUR 132,000 in 2.5 years. The cost of the measure was just EUR 59,000, and it was continued beyond the CIVITAS period. The system was approved by the Czech Rail Authority, which means that all public transport operators can use it in any vehicle with electric traction.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**2. Demand-responsive bus service.** Before CIVITAS, the existing public transport system offered limited capacity and comfort for the 15,000 disabled people in Brno. Brno Public Transport Company complemented its fleet with five new low-floor minibuses that are accessible to people in wheelchairs and that could also be used during off-peak hours to replace large buses on low-demand regular lines. The minibuses were able to transport at least six wheelchairs at the same time thanks to their folding seats that can easily be converted into standard seats.

A meeting with the focus group of disabled citizens revealed that they appreciated the direct connections with the city centre and the hospitals provided by those minibuses, especially during the winter when it is difficult to use other services such as the low-floor trams, trolleybuses or buses.

Although the investments for the new minibuses were high, their operational savings were very significant: they were 2.5 times more fuel efficient than a standard low-floor bus. The vehicles did not result in the hoped-for 10 percent increase in the number of transported disabled people. This is probably due to the fact that the number of low-floor vehicles (trams, trolleybuses, buses) in the regular public transport fleet had been increased, giving disabled passengers other travel options than the minibuses.

### INTERMODALITY

**3. Best-practice intermodal infrastructure planning.** Brno led the development of a network of European cities on participatory intermodal infrastructure planning to identify and promote best practice. With ELAN partner cities Ghent, Porto, Ljubljana and Zagreb, the city of Brno sought solutions on how to support sustainable transport, improve the quality of public transport and attract more passengers. They also sought to identify the best ways to engage citizens.

Group workshops were open to all CIVITAS partners and external experts.

As a result, two training workshops for technicians, architects, transport operators and city administrations were prepared. The workshops were expressly designed to include members of the general public. Then interviews with passengers and users of interchanges were conducted in each partner city in order to gain sociological insights.

### TICKETING AND TARIFFS

**4. Prompt ticket machine repair.** Before CIVITAS, technical defects in the city's 152 ticket vending machines contributed to the unreliability and unattractiveness of the public transport system. Brno Public Transport Company installed a wireless modem in each vending machine that automatically informed a control centre of any problems. This enabled defects to be fixed quickly and efficiently. After the completion of the test

phase on 10 machines, 159 machines were equipped with the new technology.

The number of defects decreased by 50 percent, much better than the target of 10 percent. The initial expectation was that the number of tickets sold in vending machines would rise by 5 percent. This goal, however, was not met due to the economic situation and the rise in tariffs approved by the city of Brno.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**5. Integrated mobility centre.** Brno set up its integrated mobility centre (IMC) with the aim of providing a high-quality, one-stop service that enhances communication with customers. Real-time passenger information panels were installed at public transport stops in the area. The IMC was a completely new service in terms of size and scope.

The centre attracted 9,320 clients from its opening in September 2011 to the end of August 2012. Ticket sales from vending machines in the IMC were approximately 0.05 percent of total ticket sales. The hope that the IMC would increase public transport ticket sales was not fulfilled (see also measure 4). However, the measure was continued after the end of the project.

### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**6. Mobility dialogue.** Before the measure, the planned volume of transport services was based on demographical data and the experience of transport planners, but there was no systematic feedback from customers. CIVITAS helped elaborate a long-term transport plan for the period from 2010 to 2024 that rectified this by establishing new approaches to mobility dialogue with customers. This document was updated every year.

The transport plan and its annual specifications were elaborated by a working group of experts from the city council, Brno Public Transport Company and KORDIS JMK (the coordinator of the integrated public transport system of the South Moravian region).

Basic data regarding customer needs and opinions was gathered by means of a so-called transport barometer survey, which had been carried out annually by KORDIS JMK before the CIVITAS project. Brno's lesson was that cooperation between stakeholders is necessary to implement citizens' engagement actions, especially when this is not a common practice.

# BUCHAREST ROMANIA

Florin Dragomir  
RATB  
B-dul Dinicu Golescu 1  
sector 1, Bucharest  
florin.dragomir@ratb.ro  
Tel: +40 21 307 41 90  
Fax: +40 21 312 39 82  
www.ratb.ro

The Romanian capital Bucharest lies on the Dambovitza River and is one of the main industrial centres and transport hubs of Eastern Europe. At the time of the CIVITAS project, the city had a population of about 2 million inhabitants and it faced an increasing mobility need because of the economic changes and because of the development of new residential zones in the surrounding areas.

CIVITAS Phase: I – TELLUS  
Duration: 2002 – 2006  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Energy-efficient trams and trolleybuses.** Before CIVITAS, Bucharest was confronted with some major traffic problems, including high energy consumption and noise and air pollution. At the same time, Bucharest had a long tradition of electrified public transport. With the support of CIVITAS, the municipally owned operator RATB modernised the public transport fleet by introducing 60 new trolleybuses and eight trams fitted with energy-saving devices. The measure also included the modernisation of 35 percent of the tram infrastructure.

An environmental study carried out by the Romanian Authority for Vehicles made RATB decide to go for trolleybuses rather than buses running on liquefied petroleum gas (LPG), and the city council agreed. The measure supported the objectives of the Bucharest Transport Master Plan, adopted in 1999.

The introduction of the new trolleybuses and trams, along with infrastructure modernisation and improvements to existing vehicles, led to a reduction of more than 10 percent in the total energy consumption of electric transport traction. In Bucharest, CIVITAS served as an engine for new investments in public transport, as RATB had entirely renewed its trolleybus fleet with 300 energy-saving vehicles and had introduced 56 energy-saving, partially low-floor trams by the end of 2009.

## COLLECTIVE PASSENGER TRANSPORT

### TICKETING AND TARIFFS

#### 2. Introduction of smartcards for public transport.

Prior to the CIVITAS project, local operator RATB's existing ticketing system was out of date and did not correspond to the company's changing commercial and management conditions. Within CIVITAS, RATB introduced smartcard ticketing for regular users. The measure was one of the first steps in fare integration with METROREX, the underground operator, and allowed for future integration with another six public transport operators. From the start, the cards could be used to pay for other non-transport services and small purchases.

After measure implementation, RATB planned to cooperate closely with local banks and service suppliers to extend the use of the contactless cards to other payment services. The modernisation of the RATB ticketing system was part of the larger strategy of fare system improvement contained within the Bucharest Transport Master Plan.

Due to changes in political support during the lifetime of the project, system implementation was achieved only after the end of the CIVITAS project. Bucharest learned that political support is important to develop an attractive public service in the city.

## DEMAND MANAGEMENT STRATEGIES

### PARKING MANAGEMENT/PRICING

**3. Parking restrictions in central Bucharest.** During the 1990s, the number of private cars dramatically increased in Bucharest and on-street parking in the city centre was contributing to the obstruction of emergency vehicles and freight deliveries, longer transit times and high levels of traffic-related pollution. With the support of CIVITAS, the city constructed parking facilities, restricted on-street parking and introduced access restrictions to the historical city centre. The parking facility was built through a public-private partnership, a first for the city of Bucharest.

Implementation was preceded by opinion surveys, followed by traffic and air quality measurements carried out by the CIVITAS team in Bucharest in collaboration with the Romanian Authority for Vehicles and the Environmental Protection Agency of Bucharest. The measure was carried out as part of the Bucharest Transport Master Plan, adopted in 1999.

As a result of the measure, on-street parking was banned in the city centre and traffic flow was improved in the neighbouring area. The status of CIVITAS as a European project was an incentive for introducing access restrictions to the historical centre earlier than initially planned.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**4. Automated vehicle location system.** Before CIVITAS, the positioning and dispatching system for the public transport fleet in Bucharest relied on obsolete technology that was becoming increasingly problematic as traffic conditions worsened. Within CIVITAS, municipal operator RATB tested Global Positioning System (GPS) technology on 15 buses, and integrated it with the new ticketing system (see measure 2). The measure included a study on prioritisation at junctions with traffic lights according to traffic conditions, scheduling and vehicle load, which was an innovative measure for the city.

Working groups for the design, installation and maintenance of the system, as well as for commercial issues and software were established. The measure was carried out as part of the Bucharest Transport Master Plan, adopted in 1999.

The trial of automatic vehicle location as an isolated measure did not result in better adherence of buses to the time schedule. However, this CIVITAS measure prepared the way for a large-scale roll-out of GPS technology on all 2,000 vehicles of the RATB fleet, as well as a real-time public transport information system (see measure 5). Now, the entire fleet of RATB use GPS devices integrated with the ticketing system.

**5. Implementing a real-time passenger information system.** The new automated vehicle location system that was to be developed during the CIVITAS project (see measure 4) presented the municipal operator RATB with the opportunity to improve the quality of bus and tram information for passengers. With the support of CIVITAS, RATB installed real-time information displays at 26 tram stops. At first, the system relied on inductive loops to monitor tram positions, but the system was capable of being integrated with the prioritisation system for trams at crossings (see measure 4), which was an innovative measure for the city.

Working groups for the design, installation and maintenance of the system, as well as for commercial issues and software were established. The measure was carried out as part of the Bucharest Transport Master Plan, adopted in 1999.

Due to the success of the measure, RATB decided to upscale the measure with on-board real-time information displays in 1,000 buses and 100 trolleybuses. Bucharest's lesson learned from this measure is that up-to-date and correct information for passengers increases their level of satisfaction with public transport.

José María Díez  
Edificio Citur 1ª Planta C/Nuño Rasura nº7  
09003 Burgos  
civinet-espana-portugal@civitas.eu  
Tel: +34 94 728 88 67  
www.aytoburgos.es

Burgos is situated in north-central Spain in the region of Castile and Leon, halfway between Madrid and the French border. At the time of the CIVITAS project, the city had a population of 170,000. It is known for its cultural, historic and artistic heritage. The city enjoys good transport links with cities in Spain, France and Portugal, contributing to its varied and dynamic industrial development.

CIVITAS Phase: II – CARAVEL  
Duration: 2005 – 2009  
Role : Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Setting up a car-pooling scheme for workers.** The use of private cars by employees travelling to work to the industrial zone of Burgos was causing major congestion problems. As the regular bus service was not able to respond to all employees' needs, a short- and long-distance car-pooling scheme was developed and promoted with a variety of incentives. This measure was innovative, as car pooling was not a common practice in the city and new technology was used for sharing information on distances and passenger routes.

Information dissemination campaigns were organised at the beginning of the project, as well as periodically to assist in awareness raising among potential users. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

By 2009, some 200 people were involved and 45 trips were being carried out per day. In 2007, 97 percent of people had a good opinion of the project; and 100 percent in 2008. Thanks to CIVITAS, the city could benefit from the experiences of the partner city Stuttgart with their highly successful "Pendlernetz" system.

### PUBLIC BICYCLES/BICYCLE SHARING

**2. BICIBUR: Creating a city bike scheme.** During the 1990s, cycling as a means of daily transport was virtually non-existent in Burgos, despite the city's ideal topography and layout. As a way of promoting bicycle use, the BICIBUR bike-sharing scheme was established to provide easy access to visitors and residents. The measure was designed to offer

members of the public the possibility of using a bicycle without charge for a few hours to travel around the city.

A marketing campaign was organised to promote the system to the public. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

Between 2006 and 2008, the system registered over 3,100 members and loaned out over 20,000 bikes. There was a 300 percent increase in bicycle use by the end of the CIVITAS project. Thanks to CIVITAS, Burgos was the forerunner in Spain when it comes to bike sharing, gaining a lot of national media coverage and serving as an inspiration for many other cities in Spain and beyond.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**3. Support for clean fuels and clean public and private fleets.** To set a good example, the city council decided to work towards a municipal transport fleet in which 45 percent of the vehicles ran on cleaner fuels. With the support of CIVITAS, the council acquired eight new compressed natural gas (CNG) buses and 27 biodiesel vehicles, built a fuel station offering biofuel and CNG, and developed a strategy for collecting used cooking oil.

An awareness-raising campaign was organised using television, radio and print media, encouraging citizens to recycle used oil. The measure was part of an ambitious strategy approved by the city council in February 2005 to change public transport in the city and to set a good example by using only biofuelled vehicles.

Average emission levels from the municipal fleet fell by 1.42 g per kilometre for CO<sub>2</sub>; 15.85 g per kilometre for NO<sub>x</sub>; and by 0.61 g per kilometre for particulate matter. The city's bus fleet is now 100 percent clean. For Burgos, CIVITAS was a catalyst to gain national recognition, as the city received two prestigious awards for its efforts.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**4. Identifying ways to improve access for people with reduced mobility.** At the start of the CIVITAS measure, Burgos had just begun working towards guaranteeing access for all citizens and visitors with impaired mobility. With the support of CIVITAS, an inventory and an action plan were drawn up to overcome difficulties encountered at bus stops and on particular streets, for instance through voice messaging systems and low ramps.

More than 75 suggestions were received from neighbourhood associations and individuals and more than 20 meetings were held to explain the new scheme and timetables (see measure 5). The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

As a result of the measure more than 80 percent of identified points of inadequate access have been upgraded for people with disabilities; the public transport fleet has been made 100 percent accessible by the introduction of ramps and other facilities; and the National Association of Disabled People rated the accessibility of the city's public transport fleet as "very good" at its annual meeting in 2008. Thanks to CIVITAS, public transport in Burgos was rated "very good" in terms of accessibility by the national organisation of the blind.

### SERVICE IMPROVEMENTS

**5. Clean high-frequency mobility services.** A public satisfaction survey demonstrated that the public made little use of public transport because of uncomfortable buses, lack of information, poor services, poor frequency and inadequate accessibility. With the support of CIVITAS, the city improved the frequency and timetables of public transport based on demand, installed real-time travel information panels and improved accessibility and safety on urban buses.

More than 75 suggestions were received from neighbourhood associations and individuals and more than 20 meetings were held to explain the new scheme and timetables. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

As a result of the measure, there was an increase of more than 7 percent in the number of passengers using public transport by the end of the project. Some 73 percent of passengers had a good opinion of public transport, compared to 38 percent in 2004. The city learned that the exchange of opinions with neighbourhood associations, individuals and other municipal departments was the main factor in the success of this project.

**6. Collective mobility services for employees.** Prior to the measure, collective transport represented only 20 percent of trips to the industrial zones around Burgos and roads were congested during peak hours. The municipality designed a new transport management scheme whereby large companies were encouraged to share their own privately operated bus services and timetables and operating costs were shared as well.

Public information campaigns were targeted at users and the media along with direct marketing activities to promote the measure. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

Results of the measure include an increase of 5 percent in the occupancy rate of collective buses. More than 200 companies and more than 5,000 employees were involved. The service is widely accepted and congestion has been eased due to fewer unnecessary trips. With this measure, CIVITAS has encouraged cooperation between companies, realising important cost savings and benefits for mobility and the environment.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**7. Converting the historical centre into a pedestrian zone.** Heavy traffic was identified as a key problem in the city centre, greatly detracting from the attractiveness of the area and its quality of life. The measure was therefore designed to pedestrianise 4 km<sup>2</sup> of the historic city centre and redirect traffic flows.

As an earlier attempt to restrict traffic in the historical centre had failed due to the negative responses of several stakeholders, over 30 stakeholder meetings were held with local retailers, hotel owners, neighbourhood associations, municipal services, taxi firms, ambulances, and so on. The measure was implemented as part of the renovation of the historic city centre.

The city converted 75 percent of streets in the historical centre into pedestrian zones with a 100 percent access restriction. There was a 30 percent increase in the number of pedestrians in the zone, and a 200 percent increase in the number of cyclists in the zone. This CIVITAS measure radically changed the entire layout of the centre of Burgos.

### PARKING MANAGEMENT/PRICING

**8. Parking strategy and management.** Prior to measure implementation, parking in Burgos was very disorganised and unregulated. Off-street parking was not used due to inadequate signposting and relatively high charges, and street parking was free. The measure therefore sought to set up a new zoned parking scheme with adjusted prices; prevent bad parking via increased controls and fines; and establish new parking areas for goods vehicles.

A comprehensive strategy was drawn up with stakeholders such as neighbourhood associations, associations for the disabled and certain municipal departments. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

As a result of this measure, there was a more than 30 percent increase in off-street parking, and illegal parking fell from 200 cases per day to fewer than 20 in the main streets of the city. Parking information panels have provided guidance for more than 4,000 cars, sparing the average user more than 1 km of driving to find a free parking space. Thanks to CIVITAS, citizens' perception of how the city centre is managed was improved greatly by these measures, with dissatisfaction falling from 76 percent to 33 percent.

### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**9. Improved bicycle network to increase bicycle use.** During the 1990s, cycling as a means of daily transport was virtually non-existent in Burgos, even though the topography and layout of the city were ideal for bicycle use. A bike lane extension project was developed, which, for a medium-sized city like Burgos, was an important step towards establishing an integrated bicycle network.

Implementation was supported by public information campaigns and direct marketing activities to promote the advantages of cycling as a sustainable pollution-free mode of transport. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

As a result of the measure, some 230 new bike racks were installed and an additional 15 km of bike lanes were developed, bringing the total length of safe cycling routes to 48 km. Thanks to CIVITAS, bicycles are now a common sight on the streets of Burgos.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**10. New mobility services for tourists.** Although the historic city of Burgos had been attracting increasing numbers of visitors, very little information was available for tourists on travelling to cultural or historical sites of interest. With the support of CIVITAS, the Tourism Department encouraged sustainable mobility for visitors through incentives, tourist routes, visitor information points and a tourist taxi initiative using cleaner fuels.

Hoteliers, taxi drivers and tourist information services were encouraged to participate in the scheme. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

The measure resulted in good acceptance of tourist taxis (96 percent of comments received were positive), good awareness of the public transport offer and of alternative means (85 percent), nine tourist taxis running on cleaner fuels and more than 400 tourists having used the bicycle loan system. CIVITAS has helped the city of Burgos to change citizens' minds and habits. It has helped to generate and maintain political support and funding commitments, as well: several measures have been extended beyond the project timeframe.

**11. Sustainable mobility marketing.** The city of Burgos developed a series of integrated measures within the CIVITAS project that have defined its mobility strategy. The city's mobility policy has been accompanied by various marketing and publicity campaigns encouraging the public to opt for less-polluting, quieter and cleaner forms of transport.

The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

The outcomes of the measure included good project visibility (51 percent of citizens recognised the CIVITAS logo), an increase of more than 300 percent in the use of bicycles as a daily means of transport, an increase of more than 15 percent in the use of sustainable modes as the main way of getting to work and for everyday trips, and good awareness among citizens of the need for modal shift. In 2007, Burgos was named CIVITAS City of the Year, being the European city that had been the most successful in spreading awareness of the need for advanced, sustainable transport.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**12. Creating a mobility forum.** Prior to the implementation of this measure, Burgos City Council involved the public by means of communications through the media and contributions to the political debate, but this was not a sufficient way of involving citizens in the decision-making process and encouraging a culture of consultation and active problem solving. The Mobility Forum was designed as a permanent website to further the debate on mobility, to encourage public participation in decision making from an early stage, and to improve public information services.

Stakeholder meetings were held to discuss mobility problems and identify solutions. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

The Mobility Forum received 250 comments on the website, held more than 80 meetings with stakeholders and hosted five larger events. CIVITAS served as a catalyst to introduce stakeholder meetings as a completely new approach for the city council.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**13. Safe city access for pedestrians from suburban areas.** The city of Burgos had expanded by approximately 20 km around the river Arlanzón, absorbing outlying villages. Access to these new neighbourhoods was by main roads, as former footpaths have been obliterated. With the support of CIVITAS, pedestrian paths and cycle lanes were built. Traffic calming measures, such as 20 km/h zones and speed bumps, were introduced and traffic lights were improved.

Citizens were involved from the start through several meetings in collaboration with neighbourhood associations, and some measures, like the improvement of the traffic lights, were proposed by them. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

Over 200 people in the pilot area now use bicycles for daily trips. A reduction of 13 percent in the number of accidents was recorded from 2005 to 2007. CIVITAS served as an engine for increased safety, and perceptions of road safety improved for all road users, including drivers, cyclists and pedestrians.

**14. Safety and accident prevention plan.** The measure was implemented in response to the high accident rate in Burgos, due to heavy traffic flows in the city and unsafe behaviour of road users. Activities included road safety campaigns in schools and workplaces; data collection regarding the frequency and location of accidents; improvements to road signs; speed calming measures; and improvements to the timing of traffic lights at pedestrian crossings.

Stakeholder groups such as teachers, students and elderly people were involved through awareness-raising workshops, and traffic calming measures were based on the input of affected neighbourhoods. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

Measure implementation led to a huge decrease in the number of injuries among children to fewer than 200 per year. The city has continued its efforts to improve safety and security after the end of CIVITAS, as it remains one of the main concerns of the council.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**15. Creating a traffic visualisation system.** Due to the rapid expansion of the city towards new peripheral zones and the creation of new roads, the existing traffic monitoring and control system did not meet present-day needs anymore. Under the CIVITAS project, the video surveillance of traffic flows was optimised by the introduction of a new system. As part of the modernisation and refurbishment measures, improvements were made to traffic light controls, dynamic information panels, panels indicating free parking spaces in public car parks, traffic monitoring cameras and access controls in pedestrian areas.

Success of this measure is chiefly attributable to the positive participation of all stakeholders: several meetings were held to explain the system and seek agreement on critical points. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

Congestion had been reduced by the end of the project and more than 87 percent of citizens were aware of the existence of the traffic control centre. The control centre and scheme have been visited by many people, ranging from children and university students to technicians from the USA and Japan.

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**16. Passenger information tools for public transport.** A frequent complaint made by users of urban transport was the lack of clear and easily understandable information on bus routes, timetables and cycle lanes. In an effort to improve the provision of public information, the city installed real-time traffic information panels along the main roads and touch screens providing intermodal mobility information in several strategic locations and an intermodal mobility website.

Widespread social acceptance was achieved by holding several meetings to explain the system and seek agreement on critical points (such as goods distribution). Marketing campaigns depicted a new city centre free from cars. The measure was implemented in the framework of the city's new Civic Mobility and Accessibility Pact.

The information tools were well received by the public because they are practical, save time and fuel, and reduce pollution in the city. Burgos has exported the participation concept it used in CIVITAS to other cities in Spain and abroad.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**17. Clean vehicles and fixed delivery times.** In Burgos, goods stored in numerous central warehouses outside the city were distributed daily using small vans, causing congestion, noise, parking problems and traffic in pedestrianised zones. With the support of CIVITAS, access to clean zones in the city centre was restricted and the use of cleaner vehicles was promoted.

An agreement was signed with goods distribution companies to arrange delivery timetables. The measure was implemented in relation to the new access restriction scheme designed by Burgos City Council to offer the public more open, pedestrianised spaces free from traffic, pollution and noise. It was also linked to the development of a new freight distribution centre using cleaner, electric vehicles.

The measure resulted in fewer vans and lorries crossing sensitive city-centre areas and was supported by more than 88 percent of citizens and more than 90 percent of goods distribution companies. This CIVITAS measure turned the city into a national example of a car-free city centre.

Luís Santos  
Guarda Inglesa Apartado 5015  
3041-901 Coimbra  
luis.santos@smtuc.pt  
Tel: +35 12 39 80 11 00  
Fax: +35 12 39 44 19 66  
www.smtuc.pt

Coimbra, former capital of Portugal in the 12th century, had a population of 148,000 inhabitants at the time of the CIVITAS project. The wealth of the city mostly stems from one of the world's oldest universities, the University of Coimbra, with 23,000 students.

CIVITAS Phase: Plus – MODERN  
Duration: 2008 – 2012  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Feasibility study for new mobility services in Coimbra.** Prior to CIVITAS, car-sharing studies were not available in Portugal and the concept was hardly known, even among professionals and local authorities. CIVITAS supported a technological and economic feasibility study on how car-sharing services could be implemented as well as the possibility of using electric and hybrid cars. By studying car sharing, Coimbra was an innovation leader not only in the region but in the country.

The system proposed in the study implied the direct involvement of the municipality and the urban public transport operator SMTUC.

The study showed that such a system would have a positive balance of operating revenues over operating costs (+EUR 0.04/vehicle-km). It showed that the chosen vehicles were also much more fuel efficient and climate friendly than conventional vehicles. Although the financial crisis put car sharing on hold, CIVITAS helped to improve the participation of the municipality and its mobility councillor, who linked the measure to the national electric mobility project (Mobi.e).

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Exploring alternative fuel choices.** Prior to CIVITAS, there had been little use of biodiesel in the Portuguese public transport sector. CIVITAS helped Coimbra's public transport operator SMTUC to test the use of biodiesel for its public transport fleet. The trial was divided into three stages in which

different fuel mixtures were tested on four buses over 20 months.

Personnel that coordinated and carried out the trials were trained before the trial phase.

The average operating costs proved to be lower and reductions in emissions varied from marginal (CO) to 20 percent (particulate matter). Calculations showed that the introduction of a 30 percent biofuel blend in the entire SMTUC bus fleet could give operating savings of EUR 420,000 per year, or approximately 268,000 liters of diesel. CIVITAS gave Coimbra a positive experience with biofuels, and the city considered a full-scale experiment involving a majority of the SMTUC bus fleet with priority given to biofuel produced from recycled oils.

**3. Production of renewable energy for trolleybus lines.** With the support of CIVITAS, the city developed a technical, environmental, economic and financial feasibility study for the construction of a small hydropower plant in an existing river dam to supply the electricity for Coimbra's trolleybus and electric minibus fleets. Further research led to the development of a small hydropower operation computational model which was very suitable for dissemination activities.

The economic and financial modelling estimated a simple pay-back period of 8.5 years, with more electricity generated than needed for the local transportation services. Selling the surplus electricity to energy companies could contribute significantly to municipal revenues. This feasibility study turned out to be the CIVITAS measure with major media coverage and it was well accepted in the scientific community. Due to the great importance of this project for the city, the city laid plans for implementing a small hydro plant and has begun investigating opportunities for financial and partnership arrangements.

## COLLECTIVE PASSENGER TRANSPORT

### TICKETING AND TARIFFS

**4. New ticketing system.** Coimbra wished to make public transport faster, more comfortable and easier to use. In order to attract new users, CIVITAS supported the development of an integrated ticketing system. The smartcard Coimbra conVida, launched in February 2012, gave access to multiple public transport systems and other mobility services and products.

This system was considered a technological innovation because it encouraged different transport operators to work together more effectively and promoted greater intermodality.

Measure implementation led to an increase in average operating revenues (+EUR 0.02/vehicle-km) due to a shift from private cars to public transport (public transport users increased by 1.2 percent). There has also been an increase in park-and-ride system usage and a 10 percent growth in e-tickets sold. The city recognised the benefits of the open system and initiated negotiations with surrounding municipalities and public transport operators to extend the scope of the pass.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

#### 5. Travel information centre and mobility marketing.

Prior to CIVITAS, Coimbra was experiencing a steady decline in public transport usage. With CIVITAS support, the city set up an infomobility centre offering more and better travel information and services to citizens and visitors and providing a place where all regional transport operators could be represented. It became the point of reference for many mobility initiatives and the initial operational setting for a new trip planner called RUMOS.

The involvement of the municipality was critical to achieving commitments among all stakeholders, as well as in the negotiation process concerning financial issues.

Results exceeded all expectations: the centre received 34,000 customers in 2011, and customer feedback showed 95 percent user satisfaction and 100 percent satisfaction among transport operators. The city learned that rigorous planning and follow-up are fundamental but time-consuming and that meetings about good practices on sustainable mobility and urban development must involve all stakeholders.

### MOBILITY PLANNING

**6. Mobility management in Coimbra.** Neither Coimbra nor any other city in Portugal had experience with travel plans for managing mobility. With the support of CIVITAS, the city developed a travel plan for Coimbra's oncological hospital and mobility management activities for the other two hospitals in the city. Most of the actions involved policy setting for hospital staff, but some measures targeted patients and visitors and hospital logistics (deliveries and hospital vehicles). The innovativeness of the measure lay in the recognition of mobility management solutions as a practical and valuable means of dealing with the city's mobility challenges.

For this measure the municipality worked with the three hospitals and the urban public transport operator SMTUC.

A modal shift of 10 percent from private cars to public transport was achieved at the oncological hospital. Other results during the measure's first year included 15 percent energy savings in transport for hospital staff and savings of 273 tonnes of CO<sub>2</sub> emissions. Thanks to CIVITAS, the development and implementation of these travel plans and mobility management actions catalysed a change in mentality among planning technicians and local decision makers.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

#### 7. Safety-oriented driver training in Coimbra.

CIVITAS supported the implementation of a modern training centre at the public municipal urban transport operator SMTUC, equipped with a state-of-the-art driving simulator.

The high-tech simulator gave bus drivers access to the most innovative training methods available, including virtual simulations of real driving conditions.

An initial reference group of 25 SMTUC drivers was trained using the simulator in order to evaluate the impacts of the driving training sessions.

Results of this evaluation showed a 15 percent reduction in the average operating costs when compared to training using real buses, a substantial improvement in average fuel efficiency (15 percent) and a 33 percent reduction in total number of incidents compared to real operation vehicle use. At the end of the CIVITAS project, a process of licensing the driving centre for the training of public transport drivers from other companies was in the works and partnerships with some specialised organisations were under consideration.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

#### 8. Travel information tools for traffic data management.

Before CIVITAS, Coimbra relied on low-quality radio technology for traffic data management. To make the public transport system more attractive, CIVITAS supported the development of new Global Positioning System (GPS) software that improved real-time travel information via different devices. The city developed a mobile application and installed electronic real-time information panels throughout the city, including in the lobbies and waiting rooms of hospitals because of the high visibility and attendance of such places.

The measure achieved positive impacts on average operating revenues, operating costs, average network speed (+2.4 percent) and the awareness level of public transport users. The city learned many lessons during implementation, including the importance of involving stakeholders in the specification and launching of the products. To preserve the credibility of the information systems it is vital to undertake rigorous, frequent quality checks of the information supplied to users.

Ian Winning and Sarah Danaher  
City Hall, Anglesea Street  
Cork  
traffic@corkcity.ie  
Tel: +35 32 14 92 44 52  
www.corkcity.ie

Cork is the second largest city in the Republic of Ireland and the administrative centre of Ireland's biggest county, County Cork. The city boasts one of the world's largest natural harbours. The main businesses within the city are banks, insurance companies, legal firms, retail outlets, consultancies and service industries. There are over 90 schools and several higher-education and training colleges in the city, which are major traffic generators.

CIVITAS Phase: I – MIRACLES  
Duration: 2002 – 2005  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Biofuel use by Cork City Council.** Prior to measure implementation, Cork City Council owned approximately 250 vehicles, all running on petrol and diesel. With the support of CIVITAS, a wide range of alternative fuels were researched, and 17 municipal vehicles were converted to run on rapeseed oil. Up till then, pure vegetable oil had never been used in local authority vehicles in Ireland.

Prior to conversion, the drivers and their supervisors were informed of the changes and trained, while the general public was informed through various media. The measure was implemented as part of a broader energy conservation policy framework adopted by the city council in response to concerns about climate change and other environmental issues relating to energy consumption.

Six percent of city council fleet vehicles were converted to run on plant oil, resulting in CO<sub>2</sub> emission reductions of approximately 55 tonnes per year. Partly thanks to lobbying efforts by the city council, duty exemption for biofuels was introduced in spring 2005.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**2. Introducing park-and-ride facilities.** Prior to measure implementation, park-and-ride (P&R) facilities had operated temporarily from three different sites in the city, and it was felt that a larger, strategically located, purpose-built facility

could have a far greater impact on traffic reduction. The city built a new P&R facility and introduced bus priority measures along the route to the centre, variable message signs on the approaches, video surveillance and supervised cycle parking. At the time, park and ride was a relatively new concept in Ireland and Cork was the first city to provide such a facility.

The public and key organisations gave their feedback on the initial design. The measure was implemented in accordance with the objectives of the National Development Plan, the City Development Plan and the Cork Area Strategic Plan.

Within 50 weeks of operation, income had started to meet operating costs. Up to 1,400 vehicles per day (2,500 passengers) were removed from the approach roads to the city centre, with a perceptible reduction in queuing on the adjacent national road. A further facility was subsequently designed for the north side of the city, which has been operational since early 2006. In Cork, CIVITAS acted as a catalyst for planned major city improvements such as the construction of new P&R facilities.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**3. Restricting car access to Cork city centre.** Before CIVITAS, the pavements along Cork's primary shopping street, St. Patrick's Street, were in need of extensive repair and widening to safely accommodate the high volumes of pedestrian traffic. With the support of CIVITAS, the promotion of sustainable modes was incorporated in the redesign of the street, for instance by reducing the number of traffic lanes for motorised transport from four to two and installing attractive cycle racks and access-control bollards on some side streets.

There was extensive consultation with special interest groups representing the blind, wheelchair users, street traders and taxis to ensure that the streetscape would cater for their varying needs. The project was being driven by a series of plans to enhance the city's cultural, recreational, commercial and environmental characteristics (e.g., the Cork Area Strategic Plan, 2001), and by the preparations for Cork as European City of Culture in 2005.

Mid-way through the CIVITAS project it was decided to extend the so-called clean zone to adjacent streets. The reduction in the overall level of car traffic through the inner cordon was 3.3 percent on the do-nothing scenario, while pedestrian and cyclist numbers showed a 15 percent and 47 percent increase respectively. Cork's lesson learned is that CIVITAS helped to generate political support and additional funding for the creation of a new bollard-controlled pedestrianised zone.

### PARKING MANAGEMENT/PRICING

**4. Paying for parking by phone.** Prior to measure implementation, Cork City Council operated a parking disk system for on-street parking, which required substantial resources to enforce and contributed to congestion by

the lack of turnover of spaces. With the aid of CIVITAS, an innovative parking payment system using mobile phones was introduced in a small area of the city centre. The unique feature of the system was the subscriber database that allows unique identification of users and is capable of discriminating favourably towards environmentally friendly vehicles.

Implementation required some negotiations with the traffic wardens about their terms and conditions of employment. The public was informed through radio and newspaper adverts and leaflets. The measure was not implemented as part of a broader policy framework, but reflected the city council's on-going commitments to work more efficiently.

After the first year the park-by-phone system had 100 users per day, 70 percent of whom rated it as easy to use. After implementation it was considered desirable to greatly expand the area covered. CIVITAS allowed Cork City Council to learn more about the best way to implement park by phone and also helped to ensure political support for implementing the measure.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**5. Promoting alternatives to the private car.** The many narrow streets in Cork's city centre were inappropriate for the increasing volumes of traffic. This measure encouraged more sustainable transport choices through publicity campaigns, the development of the Cycle Network Plan for Cork, cycle safety training and walking buses for primary schools, debates in secondary schools, and a car-pooling matching service for city council personnel. Innovative features include the focus on cycleways — a relatively new phenomenon in Ireland — and early consultation with those likely to use or be affected by the system.

The actions were based on the results of various surveys and an extensive public consultation process on cycle parking. The cycle network design was developed as part of the Cork Area Strategic Plan (2001) and was complemented by the parallel Green Routes project.

As a result of this measure, 316 cycle parking spaces were installed, representing an increase of more than 2,000 percent. The number of cyclists across the inner cordon rose by 47 percent and the number of cycles parked in the city centre rose from seven to 105 in three years. CIVITAS funding provided much-needed momentum to help realise existing plans for significant improvements for cyclists.

Municipality of Craiova  
Stefan cel Mare 12  
200130 Craiova  
imagine@primariacraiova.ro  
Tel: +40 25 141 62 35, ext. 360  
www.primariacraiova.ro

The historic city of Craiova in southwest Romania had a population of about 298,000 inhabitants at the time of CIVITAS. The city is a commercial and cultural centre and known for its university. Its main industries are gas and petroleum refining, petrochemicals, and thermal power and hydropower production. It is situated in an open-pit mining region and plays an important role in state administration.

CIVITAS Phase: Plus – MODERN  
Duration: 2008 – 2012  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Encouraging car pooling to and from industrial areas.** Before CIVITAS, many industrial areas on the periphery of Craiova could be reached by bus, but not frequently and some only during peak hours. With the support of CIVITAS, the city set up a software programme for the western industrial area of Craiova to organise car pooling for people who are within walking distance of each other. As a result, 33 car-pool groups were created. The municipality provided these car poolers with a special parking place, limiting access to vehicles transporting at least three people.

There was a close collaboration with the companies of the industrial area.

The measure was implemented only two months before CIVITAS concluded, but in this short time, good results were apparent, with cost savings realised and users eager to continue the experiment. The number of cars used by participants decreased from 122 to 33 during the trial period. The city decided to implement the measure at other industrial sites, and in several other areas of the town. As a lesson, the city would recommend to foresee enough time for the preparation of all the needed parking arrangements.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Alternative fuel in Craiova.** The city wished to increase the use of alternative fuels in the urban transport fleet. CIVITAS supported an experiment with a fuel mixture of up to 20 percent

biodiesel and a testing batch of 10 buses. The aim was to decrease emissions by up to 2 percent. This measure was only demonstrated for a short period of time (two weeks) due to the difficulties in acquiring the biodiesel needed for the evaluation of 10 buses for a longer period of time as originally foreseen.

Drivers and maintenance technicians were trained to work with the new fuel.

The 10 buses operating in the city on 20 percent biodiesel demonstrated a reduction of 9 percent of CO<sub>2</sub> emissions and an increase of 16 percent for NO<sub>x</sub> emissions. The average reduction of all emissions was nevertheless 9 percent. Based on these experimental results, the experience of other cities and other research over the years, the public transport company expressed its wish to continue the experiment on a larger scale and to evaluate the possibility of using it for the oldest part of the fleet.

**3. Energy saving on tram lines.** Prior to CIVITAS, Craiova had an old tram system and some of its vehicles were not being used because their engines had high electrical consumption. CIVITAS helped to increase public transport capacity by putting the old trams into operation after modernisation investments. The old drive system was replaced with the innovative chopper system and classic auxiliary services were powered by a static source. The software allowed the online visualisation and management of four defined electric measurements — line current, engine current, line voltage and filter voltage.

Technicians and tram drivers were trained to ensure proper maintenance and use of the new equipment.

The measure implementation led to a 35 percent reduction in electric power consumption per tram endowed with the chopper driving system. Lower energy and maintenance costs led to lower average operation costs. Surveyed users also felt more comfortable when travelling by chopper-equipped trams due to smoother starts and stops (a 1 percent improvement in service quality was perceived).

**4. Transition towards clean fleets in Craiova.** Craiova had to renew its public transport fleet. With the support of CIVITAS, a realistic funding scheme was defined to procure 100 new ecological buses, including possible funding resources. The acquisition of new buses by accessing different grants and programmes was a new conceptual approach in the city of Craiova.

The tangible results consisted of 17 new clean buses and the definition of technical requirements for new clean buses based on a large European analysis. The environmental outcomes of replacing non-Euro buses with Euro IV buses would give an expected decrease in emissions of CO<sub>2</sub> by 1 percent, CO by 76 percent, NO<sub>x</sub> by 36 percent and particulate matter by 96 percent. Passengers perceived an improvement in service quality, and a higher level of comfort and safety. Based on these outcomes, the municipality of Craiova decided to prioritise the acquisition of new clean buses and decided to purchase 50 new clean buses as part of the general investment plan.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**5. Software tools for mobility management actions in industrial areas.** Prior to CIVITAS, the Craiova public transport company RAT offered transport services on a contractual basis to 23 big companies in the city. With the support of CIVITAS, this service was upgraded for big companies based on a more detailed analysis of their individual needs. It was found that the best way to optimise special transport in industrial areas was to use a mix of new software tools with digital maps and dedicated GPS software. These maps were installed at the central control and dispatch centre and were developed for the first time in Craiova (see measure 9).

The companies were closely involved in the planning and design phase of this measure.

The number of companies that used the service increased by 50 percent and the perception of quality of service improved by 8 percent. The implementation of the measure led to 12 contracts concluded between RAT and companies from industrial areas. The city learned that a better marketing approach by diversification of transportation mode is part of the success: instead of long-term contracts, RAT Craiova accepted daily requests for transportation on demand. The use of the platform will be gradually extended to other business partners.

### TICKETING AND TARIFFS

**6. Integrated e-ticketing system.** Prior to the measure, Craiova traffic management was based on radio frequency emitter-reception data, which made it difficult to control and manage public transport. CIVITAS helped to develop a new e-ticketing technology coordinated by a dedicated management centre. The innovative technology made it possible to integrate bus and tram services into a common ticketing system, which was very convenient for public transport users.

Craiova studied good practices and experiences of other European cities, and also engaged stakeholders such as the local police, students, retired people, and an external consultant. This process helped in finding the best way to satisfy e-ticketing requirements.

Within this measure, 80 buses and 27 trams were equipped with e-ticketing validators and 30 ticket vending machines were installed. The many advantages for RAT included the possibility of real-time data collection on passenger profiles, the collection of money in advance and better network management through better knowledge about the number of passengers on each line.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**7. Access restriction policies.** With traffic volume increasing in Craiova, the city used CIVITAS support in an effort to regulate access to the centre and provide better mobility and comfort for citizens. As a first experiment at the beginning of the CIVITAS project, rising bollards were installed at certain access points, and community police officers could remotely control them with mobile devices. Access restriction was a new concept for Craiova's traffic management so the municipality decided to introduce it gradually to give citizens time to get used to it.

Several stakeholders were involved, including the environment agency, local police, retailers, shop owners and the fire department. It was very important to overcome cultural barriers to access restrictions. A follow-up study on traffic and passenger flow resulted in the development of city plans and an overall transport strategy.

The experiment showed a high potential for access restrictions, which encouraged the municipality of Craiova to undertake large-scale rehabilitation and apply for funding from the European Union.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**8. Public transport security programme.** Before CIVITAS, crime and other antisocial behaviour on public transport posed a threat to passenger safety. CIVITAS helped launch the campaign "Always here for you to travel safely." This measure included surveillance cameras in 10 stations and on 15 buses, and legislation was enacted to strengthen penalties for offenders.

A promotional campaign was launched to inform citizens of the measure, and local police were a crucial partner. The video surveillance system was part of an integrated system for monitoring activities related to public transport, so the entire system was designed to be useful both for the public transport company and passengers. Perceptions of security increased by 6 percent and those surveyed felt better protected from pick-pockets. Crime levels decreased by 50 percent. Key to these positive results was the careful location of cameras, so as to overcome the initial public perception that the municipality was spying on citizens.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**9. Information tools for fleet management.** To coordinate traffic information more efficiently, the city of Craiova and CIVITAS developed an innovative fleet management system using vehicle tracking based on the Global Positioning System

(GPS). Eighty buses and 27 trams were equipped with a GPS system and 20 stations were provided with digital real-time information panels. This was an innovative measure because the research regarding GPS equipment was combined in a common tender with the e-ticketing and video surveillance measures (see measures 6 and 8) to ensure full integration.

The collaboration of CIVITAS partners in the design and the procurement phase was essential for the success of this measure. The implementation required a complex but rewarding effort in terms of coordination of all the actors involved: municipality, tender winner, and communication and power supply companies.

Passenger satisfaction with waiting times increased by 70 percent and satisfaction with the information panels by 98 percent. Operating costs decreased by 41 percent. The new electronic integrated system increased the efficiency of urban transport activities and saved time and material, and human and financial resources.

#### **10. Priority traffic light regulation for public transport.**

The high density of vehicles in Craiova had led to an increase in traffic and stress for drivers, pedestrians and passengers. CIVITAS helped realise a traffic priority system, called green wave, to save time for trams. The city constructed roundabouts in the city's main intersections in order to streamline traffic and included electronic priority control devices in the on-board computers of nine trams.

The traffic police and traffic light departments were actively involved. The responsibility of the traffic light command now lies with the tram drivers; 18 of them were trained.

Average tram speeds increased by 14 percent in peak hours and by 13 percent in off-peak, and the average occupancy increased by 1 percent in peak hours and by 7 percent in off-peak. The city recommended taking into account its urban development strategy to avoid the delay or shortening of the measure implementation and operation period. Also, compatibility between existing systems and the new one is key for long-term implementation.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

#### **11. Policy option for freight distribution schemes.**

Before CIVITAS, Craiova had introduced a tax on freight vehicles entering the town. About EUR 3 was charged for the transport of perishable goods or construction materials and about EUR 6 for other categories. With the support of CIVITAS the municipality aimed to develop, implement and test a new scheme for goods distribution within the town. Special attention was given to the city centre in order to decrease the number of entries and allow Craiova to collect more information on downtown freight traffic. Craiova conducted an in-depth analysis of the situation and of solutions adopted by other cities. Due to the complexity of the scenario and the interplay with other measures (e.g. access restrictions described in measure 7; the rehabilitation of the historical centre), the city decided to merely improve the existing scheme by making a separate zone of the historical centre with a higher fee.

Relevant stakeholders were involved in every step of the measure: retailers, shop owners, local police, fire fighters and the environmental agency. The new scheme was developed in concert with the city's plan for a pollution-free centre.

The number of freight distribution vehicles was reduced by an average of 20 percent compared to the three-year average prior to implementation. The measure managed to decongest the crowded intersections in the city centre. As a lesson, the city would recommend doing a survey with local distributors about how they see a new scheme and to base the distribution scheme on the capacity, weight and environmental performance of the affected vehicles. And in restricted areas, it is especially important to allow great flexibility for the organisation of social and cultural activities.

László Krajczár  
Piac str. 20  
4024 Debrecen  
krajczar@ph.debrecen.hu  
Tel: +36 52 51 15 56  
www.debrecen.hu

Debrecen is the second largest city in Hungary, with a population of 207,000 at the time of the CIVITAS project. It is the centre of the North Plain Region and has a widely recognised role in the country's economic, academic, commercial, cultural and healthcare networks.

CIVITAS Phase: II – MOBILIS  
Duration: 2005 – 2009  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Developing a car-pooling system for students.** The student population (about 25,000) in Debrecen was very car oriented, partly because public transport fares had become more expensive. CIVITAS helped to realise a low-cost pilot project "Utítárs" together with the student organisation, to promote private ride sharing.

Students could register via the municipal web page and place ads either looking for or offering rides for specific journeys. The project was promoted widely via TV, radio, leaflets and the university intranet.

When the project period ended, 100 users had registered and 204 ads were posted. The success was primarily due to the fact that the students were involved in the development of the system and that the University of Debrecen supported the initiative and allowed the service to be marketed through the university intranet. However, to make car pooling a real success throughout the country, some legal issues need to be addressed and the system must offer more information and features.

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**2. Creating conditions for alternative fuel use in public transport.** Before 2004, Debrecen did not have a sustainable public transport plan. CIVITAS helped to introduce alternative fuels in public transport and evaluated the technical feasibility of using biogas and biodiesel, with the aim to establish a unique integrated system for alternative fuel production, supply and use.

Strong cooperation was established between the city's mayor and the different transport stakeholders. On the basis of study results about technical, financial and legislative parameters, the local bus operator purchased three buses that run on compressed natural gas (CNG) and it converted seven diesel buses.

The features, emission impacts and operating characteristics of alternative fuels have been extensively measured and compared with the conventional fuels. Test results revealed that biodiesel can be used to replace traditional fuel by 20 to 50 percent.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**3. Access and parking management in the city centre.** Before CIVITAS, the two main access roads of Debrecen were heavily congested during peak periods. With the support of CIVITAS, a soft control system monitoring traffic flows in combination with a park-and-ride facility outside the centre was developed.

The city installed 50 electronic display countdown timers at 15 junctions and modified the traffic light cycles there. Static information signs and variable message signs were installed to inform about the availability of park-and-ride facilities.

The measure is part of a long-term development strategy and was considered successful in improving traffic speed and traffic security without many promotional costs.

### SERVICE IMPROVEMENTS

**4. Safety and security training for public transport drivers.** Prior to the CIVITAS measure, most of the training sessions for public transport drivers were focused on their physical competence. CIVITAS supported the development of new eco-trainings.

These trainings sought to teach bus drivers how to operate public transport vehicles more safely and to decrease costs through fuel-saving driving techniques. Training seminars with theoretical and practical parts were organised, covering new safety technologies, safe and fuel-efficient driving, good communication benefits and de-escalation training.

This new knowledge could be easily applied in daily operations and was therefore positively evaluated by all the participants.

## DEMAND MANAGEMENT STRATEGIES

### WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**5. Conference centre accessibility scheme and pedestrian zone.** CIVITAS supported the development of the downtown area, including the extension of the existing pedestrian zone towards the city's conference centre.

# DONOSTIA-SAN SEBASTIAN SPAIN

This ambitious project needed three long years of preparation, from the call for tenders to contract a designer to the approval of the construction permit. Unfortunately, due to on-going financial problems, the city's annual budget was not able to meet the cost of the construction during the CIVITAS project period. As a result, some planned evaluations, like citizens' acceptance of the pedestrian extension, have not been carried out.

Once realised, however, the pedestrian zone offered a new quality of city life and was an important step for keeping Debreceen liveable and attractive.

**6 Integrated and extended cycling network.** Prior to CIVITAS, the growing popularity of biking in the city resulted in an urgent need for better cycling infrastructure and secure bike facilities. The city decided to integrate all cycling-related developments into a strategic development plan: an innovative and challenging decision as the city had no bike culture at all and many barriers had to be overcome.

A new mobility advisory council invited representatives of cyclists' organisations to share their expectations about appropriate measures. An on-street survey identified the benefits and barriers and citizens' overall opinions.

The resulting bicycle plan included the creation of 48 km of cycle lanes and 51 secure bicycle racks at 33 locations around the city. The establishment of the Urban Mobility Working Group, the installation of secured racks and the promotion of this new mode of transport were generally considered the three most important results of the project.

Gerardo Lertxundi  
Fernando Sasiain 7  
20015 Donostia-San Sebastian  
glertxundi@dbus.es  
Tel: +34 94 300 02 00  
www.donostia.org

The city of Donostia-San Sebastian in the Basque Country in northern Spain was home to approximately 180,000 inhabitants at the start of the CIVITAS project. The city overlooks the sea in a spectacular bay embraced by small mountains. The manor buildings from the Belle Epoque and the attractive pedestrian areas are part of the city's charm. The city is keen to safeguard the progress made toward sustainable mobility in the past and to build upon its achievements.

CIVITAS Phase: Plus – ARCHIMEDES  
Duration: 2008 – 2012

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Car-sharing scheme.** Before CIVITAS there was a long tradition of citizens owning their own cars. With this measure the municipality wanted to change people's mentality by promoting smart car use for the first time. After a research period and a tender procedure, the city issued a 25-year contract with operator IBILEK to provide a car-sharing service in the city.

Donostia-San Sebastian launched the car-sharing service in cooperation with the Basque government and other major cities in the Basque Country.

After the CIVITAS project there were six vehicles in operation, four of which were electric and two hybrid plug-ins. By the end of the CIVITAS project, only two months after the car-sharing system started operating, only three customers had registered for the service, with a total driven distance of 100 km. Nevertheless, this situation was likely to change after more intensive promotion. A public survey showed that among those who knew about the system, 81 percent assessed it as positive. One lesson was that more targeted promotions are needed for this kind of service. Donostia-San Sebastian aims to attract 100 to 250 registered users of its car-sharing service.

### PUBLIC BICYCLES/BICYCLE SHARING

**2. City bike scheme.** Before CIVITAS, the number of cycling trips in Donostia-San Sebastian was growing. To maintain this trend, the municipality introduced a public bike-sharing scheme. The service consisted of 150 bikes and nine docking points and is available between 7:30 a.m. and 9:00 p.m. seven days a week.

The number of registered users increased steadily. In the first year of operation (2008) 1,534 users were registered, and by the end of the CIVITAS project (2012) the figure had risen to 5,678 users.

The measure managed to encourage users to also make more use of their own bicycles: among the users of the public bikes in 2011 there was an increase of 25 percent of trips on private bicycles as compared to 2010. After CIVITAS, the city considered the expansion of the service to more areas in the city as well as the possibility of extending the service hours.

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**3. Biofuels and clean vehicles.** Before CIVITAS, Donostia-San Sebastian had the ambitious plan to introduce high biodiesel blends and new vehicle technologies in its public transport fleet. During the CIVITAS project, the urban public transport company CTSS tested biodiesel at progressively higher blends. In December 2008, a biodiesel mixing station was launched where buses could fuel up with tailor-mixed blends depending on the technical needs of their engine.

A survey among users revealed that environmental issues are perceived as very important, with an average score of 8.7 out of 10. Even so, none of the surveyed passengers declared environmental performance as the reason for their modal change.

The measure achieved its main objective: improving the environmental performance of the public transport fleet. The ratio between benefits and costs was calculated at 0.96, meaning that the costs are somewhat larger than the benefits. The price of biodiesel in relation to conventional diesel is an important factor for the future of biodiesel.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**4. Advanced park-and-ride network.** Before CIVITAS, Donostia-San Sebastian was eager to better integrate trips made by car and public transport. Therefore the city developed a new management and pricing strategy for park and ride (P&R) and promoted this service to drivers. Four areas were selected as P&R sites and car drivers were offered free parking and bus travel to the city centre for Christmas shopping in 2009.

This measure was part of a package of measures to reduce the number of cars entering the city centre. It is most closely related to the measures on a new parking pricing and zoning strategy (see measure 5) and on a P&R guidance system (see measure 17).

The P&R scheme was not fully implemented due to strong public and political opposition, therefore no significant results were achieved. This measure highlighted the importance of

building a sound political consensus before implementing what some could interpret as parking restrictions. One lesson was that it is important to provide clear information about measure objectives, including overall sustainable mobility issues. Communication with media is especially important, to ensure the information is used to boost the measure rather than attack it.

**5. Changing parking behaviour.** At the start of the CIVITAS project a single tariff for on-street and underground parking was in place. The new parking strategy sought to decrease car traffic to certain destinations through differentiated tariffs and a new zoning structure. Four pricing zones were defined following a radial criterion, with higher rates in higher-demand zones. The measure also included preferential and reserved areas for high occupancy vehicles (HOV) to promote car pooling.

An information campaign explained the new parking policy to residents of the affected neighbourhoods. As part of the measure, the parking regulation bylaw was modified to reflect changes in the parking policy.

The extension of the paid parking area was assessed as negative by a majority of the population (59 percent before the implementation and 75 percent after it started operating). This was a surprising result, considering residents had more parking space after the regulations than before. However, visitors from other districts may see their parking options limited. The number of cars entering the CIVITAS corridor was reduced by more than 7,500 cars per day.

### SERVICE IMPROVEMENTS

**6. High-quality bus corridors.** At the start of the CIVITAS project, Donostia-San Sebastian had a high bus-riding rate — around 150 trips per person per year. With the support of CIVITAS, public transport operator CTSS introduced new enhanced bus services along two high-quality corridors. All buses met the ambitious UNE EN-13816 quality standard. Public transport priority and 12 km of dedicated lanes formed the backbone of the high-quality service, and real-time passenger information was also provided (see measure 15).

This measure provided significant benefits in the form of better air quality and lower carbon emissions, resulting in better health and quality of life for Donostia-San Sebastian citizens. In 2011, for example, 88 tonnes of CO<sub>2</sub> were saved as compared to the business as usual situation. CIVITAS allowed CTSS to become a model and a reference in Spain for other companies in terms of quality, as it was the third Spanish company to obtain the UNE-EN 13816 certification.

**7. New business district bus service.** Before CIVITAS, the business districts were poorly served by public transport, and private cars were the preferred mode, encouraged by the availability of large, free car parks. The city wanted to make bus services more convenient for potential public transport users by increasing frequency and introducing an adapted timetable.

The needs of different user groups were assessed leading to the decision of the bus company to offer an increased service of direct bus lines from the centre and residential areas rather

than minibuses for the last mile. Industrial area managers promoted the improved bus services to all the companies of each business district.

The use of public transport to reach the business districts increased: 123,000 extra travellers were attracted in 2010 and 230,500 in 2011, with 2006 levels as a base. At the same time, car traffic entering these areas decreased by almost 2,500 cars per day. With the new business area routes, CIVITAS found an economically viable way to introduce new services during peak hours — a difficult task in times of economic hardship.

## DEMAND MANAGEMENT STRATEGIES

### WALKING AND CYCLING ENHANCEMENTS/ SERVICES

#### 8. Extension of infrastructure for cycling and walking.

At the start of the CIVITAS project, Donostia-San Sebastian wanted to see more people travelling around the city by bike while maintaining the high modal share of walking. To make both mobility options more attractive, the city increased the road space dedicated to them. Cyclists got 22 km of new cycling lanes and important new shortcuts. New pedestrian routes totalling 3.6 km in length were introduced along the Urumea River and in other green areas. Parking racks for 600 bicycles were installed. The new infrastructure was promoted with updated maps of the cycling network and walking routes in the city centre.

Cyclists' associations were involved through the mobility advisory board, and took part in the development of both cycling and walking routes. The measure is related to the city's Sustainable Urban Mobility Plan, which aims to extend the cycle network in order to link disconnected neighbourhoods with the city centre and to help connect flat and hilly areas.

There was a 33 percent increase in cycling in three years and a moderate reduction in car use of 0.1 percent as compared with the situation before the CIVITAS project started. It should be highlighted that this achievement was made in a context of a steady increase in car travel, thus it can be considered a positive result. Walking levels, however, seem to be slowly declining despite efforts to boost them.

**9. Vertical transport.** At the start of the CIVITAS project, the hilly topography of Donostia-San Sebastian presented a significant barrier for people to bike or walk to the city centre. As half of the inhabitants lived in hilly parts of the city, the municipality extended its existing vertical transport solution with seven lifts and an escalator to make trips for cyclists and pedestrians easier and more convenient.

The lifts were included in the map of pedestrian routes that was produced to promote walking in the city. Neighbourhood associations were invited by the city's participation department to inform decisions about different aspects of the vertical systems (location, range, future users, etc.) The measure was part of the city's Vertical Transport Plan and was related to the expansion of the cycling and walking networks (see measure 8).

Vertical transport was recognised as important by the majority of the population. A huge majority (98 percent in 2011) approved of the system, giving it an average score of 8.9 out of 10. This wide acceptance was followed by significant usage levels, reaching 4,879 daily users in 2012. An overall analysis of the data revealed that vertical transport is more used when located in highly populated neighbourhoods connecting hilly areas with important commercial areas and/or public transport nodes.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**10. Personalised travel plans.** Before CIVITAS, Donostia-San Sebastian had no experience with a personalised travel planning approach. Within this measure 300 households that were using their private cars for trips within the city, received personalised travel advice, and over 200 were provided with a free public transport pass and other incentives to try out sustainable transport options.

The measure was presented to the general public in September 2010 during European Mobility Week and received good coverage in the regional press. A direct mailing campaign was sent to 3,000 households, followed by 2,000 telephone calls.

As a result, 132 people tried out the alternatives, 77 percent of whom continued to use them in the three months after the free trial period. In Donostia-San Sebastian, CIVITAS served as an engine for behaviour change. The measure was calculated to have reduced the number of car trips in the city by 1.5 percent. The city decided to upscale the measure to other city corridors with the objective of reaching areas where there had been no convenient alternatives to the private car until then.

### MOBILITY PLANNING

**11. Travel plans.** Daily journeys between home and work or school account for a significant part of urban travel and congestion. Donostia-San Sebastian took a proactive approach, targeting pupils and employees to opt for sustainable modes. The city made a travel plan for 10 schools and five business districts.

A company specialised in organising events for children held over 60 sessions at the participating schools to promote walking, cycling and road safety to pupils, teachers and parents. It aimed at other stakeholders in the targeted areas, as well, including shopkeepers and neighbourhood organisations. The municipality worked with the managers of the business areas to develop mobility plans with the involvement of employees.

A survey revealed that walking levels significantly increased after the implementation of the school travel plans (from 60 percent to 70 percent of all trips to school), while the share of the other modes declined. No significant results were observed in the business areas, because the commuter travel plans were not fully implemented by the end of the project. The

financial crisis delayed the company implementation of most initiatives requiring investment; only “interaction, information and awareness” actions achieved any progress.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

### 12. Mobility management for the university campus.

Donostia-San Sebastian wanted to reduce private car traffic to the city’s university and encourage people to use sustainable alternatives. Therefore the University of the Basque Country developed a mobility management plan containing awareness-raising campaigns and programmes for students and personnel to make collective and energy-saving means of transport more attractive and easier to use.

The sustainable mobility concept has been included throughout the university educational and curricular system. Sustainable mobility analysis has been included in master’s degrees such as the sustainable development postgraduate course and another on Local Agenda 21 management.

Behaviour change on the campus resulted in an estimated savings of over 300 tonnes of CO<sub>2</sub> emissions annually. Thanks to a successful car-pooling scheme the average occupancy rate for cars increased from 1.3 to 1.6 occupants per car. Not only did CIVITAS act as an engine for behaviour change in the university community, it also improved perceptions of accessibility and security among cyclists.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**13. Road safety measures.** After having published its Road Safety Strategy in 2004, the city of Donostia-San Sebastian wanted to commit citizens and mobility agents to road safety. With the active involvement of 30 associations, the city drafted its Road Safety Pact. This called for awareness-raising campaigns, post-accident attention services, an observatory for monitoring progress, coordination of traffic safety data from all stakeholders and the implementation of nine radar systems along arterial roads to enforce speed limits.

For this participatory approach, the city involved stakeholders such as associations for drivers, cyclists, motorists, people with disabilities and the elderly. The Road Safety Pact was in line with the European Road Safety Charter and was based on the city’s Plan for Traffic Safety and Security from 2007.

The area covered by the radar system showed a 14 percent reduction in the number of deaths and injured people. Donostia-San Sebastian’s lesson learned was that, although this kind of restrictive measure tends to get negative reactions from car drivers, the increased perception of security among both pedestrians and cyclists manages to tip the balance in favour of those affected.

**14. Safe districts and limited speed zones.** Donostia-San Sebastian wanted to reduce the average speed limit for

motorised traffic and provide safe crossings for cyclists and pedestrians in selected areas called safe districts. Therefore the city of Donostia-San Sebastian developed road safety plans and implemented 30 km/h zones for three neighbourhoods with dense car and bicycle traffic. This was an innovative measure that took advantage of the opportunity made available by recent changes to Spanish law regarding Tempo 30 zones.

The city organised an intensive promotional campaign in each of the three neighbourhoods. This measure was implemented as part of the city’s Road Safety Strategy published in 2004, and was closely related to another CIVITAS measure that included the Road Safety Pact and the installation of speed radar control (see measure 13).

In the Tempo 30 zones a speed reduction of between 3 and 8 km/h was measured during peak hours, depending on the area of implementation. Also, significant reductions in the number of deaths and injuries were achieved: 11 percent, 7 percent and 1 percent respectively in the three Tempo 30 zones. Donostia-San Sebastian’s lesson learned was that on-going dialogue with civic associations during the preparation and implementation stages is needed to build consensus on the approach and to achieve success.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)–BASED ENHANCEMENT OF PUBLIC TRANSPORT

**15. New fleet management system.** Donostia-San Sebastian had set ambitious goals for improving the quality of its public transport and, as a result, increasing its passenger numbers significantly. With CIVITAS, the public transport company CTSS introduced a new planning and fleet management system for its vehicles, personnel and public transport network. The measure was innovative, as it automated the time-consuming and highly specialised work of expert employees.

The existing CTSS planning employees were involved in the process of implementation in order to use the existing knowledge and make sure that the system would meet the labour conditions of the drivers.

As a result of the measure, drivers’ planning timetables were optimised, with less time lost during operations. Operating costs were reduced by 2.5 percent in relation to the total company costs, leading to annual savings of EUR 600,000 to 700,000. In Donostia-San Sebastian, CIVITAS wrought a significant change in the way services are scheduled and drivers’ hours assigned.

**16. Park-and-ride parking guidance system.** To reduce on-street parking and to boost the use of park-and-ride (P&R) facilities (see measure 4), the city of Donostia-San Sebastian implemented an integrated parking guidance system to help drivers in their search for parking spaces. The guidance is provided through variable message signs that provide information about the location and occupancy rates of both inner-city underground parking facilities and P&R facilities.

This measure was anticipated in the city's Sustainable Urban Mobility Plan and has the objective of reducing transfers through the city and minimising "cruising", or traffic from motorists looking for parking spots. Ultimately, it sought to reduce congestion.

After implementation, 78 percent of the population assessed the measure as positive and 62 percent believed that it helped to improve the parking situation. Parking management measures, such as the P&R guidance system, in combination with other measures aimed at promoting sustainable modes of transport, resulted in significant impacts on the transport system of Donostia-San Sebastian.

**17. Real-time information for bus passengers.** The quality standards for the high-quality bus corridors that the city was implementing (see measure 6) required the provision of real-time passenger information. The city used CIVITAS support to make this available on buses, at bus stops, via SMS and on a new website that was also accessible to the visually impaired. The measure included the creation of new data sources, such as a passenger counting system and an automated vehicle location system.

Future plans included a discussion forum on the website for travellers related to the bus services.

The traveller information system was very successful, with more than 3,500 daily requests for real-time information via SMS or the website. The information provided is highly reliable, with 98 percent of all information requests assessed by users as correctly answered. Surveys reveal that information issues are perceived as very important by users, with an average score of 8.47 out of 10.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**18. Efficient goods distribution.** Before CIVITAS there was no coordinated action plan or management amongst the various stakeholders in urban freight. Creating a new and efficient system for goods distribution in the old city centre and the Ensanche area was the focus of this measure. The proposed actions included changes in the time windows for delivery and improved enforcement of time regulations using cameras. The measure established an urban distribution centre that operates with bicycle delivery vehicles; allowed night distribution for larger shops; and made changes in the direction of some streets and in the relocation of parking for motorcycles.

CIVITAS gave the city the opportunity to increase stakeholder involvement in city planning and strategy development. The Freight Quality Partnership was established among representatives of shopkeepers' associations, the transport sector, the municipal police and the mobility department. It met four times a year. This action was aligned with the city's freight distribution policies, which are described in the Sustainable Urban Mobility Plan.

The implementation of this measure contributed to increased efficiency in urban goods distribution in two highly populated neighbourhoods. The new goods delivery regulation contributed to a reduction in the average journey length of delivery vehicles from 4.5 km to 4.1 km. The new last-mile delivery service with electric cargo bikes contributed to savings of up to 26,849 km per year. As a consequence, a yearly reduction of 23 percent in energy consumption was achieved and the transport companies reduced their operating costs by more than EUR 6,800 per year.

Claudio Mantero  
Fundoa de Baixo – Sao Roque  
9020-242 Funchal  
claudiomantero@horariosdofunchal.pt  
Tel: +35 19 62 33 35 77  
Fax: +35 12 91 70 55 56  
www.horariosdofunchal.pt

Funchal is the capital of Madeira, an archipelago in the Atlantic Ocean. At the time of the CIVITAS project, the town had 104,000 inhabitants. Funchal is the commercial centre of Madeira, which is a Portuguese region with political and administrative autonomy and a local parliament and government. The beautiful mountainous setting that attracts many tourists poses a particular challenge to the development of the public transport network and the promotion of alternative modes such as cycling.

CIVITAS Phase: Plus – MIMOSA  
Duration: 2008 – 2012  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Green public transport line.** During the years before the CIVITAS project, the waterfront area in the west part of Funchal had become an attractive residential and tourist area, and it suffered from congestion due to increased traffic levels. To encourage public transport use among residents and tourists, the municipality and the public transport operator connected the waterfront area to the city centre with a low-emission, high-performance bus line with Euro V buses. To promote the service to tourists, tourist kits were distributed to hotel managers, who in turn could give their guests hotel-branded public transport tickets.

Meetings with hotel managers were held to engage them in the promotion of the bus line. The measure was integrated into the city's wider efforts to provide better pedestrian, cycling and bus access to the key touristic parts of the city.

This project achieved a 10 percent increase in operating revenue and a 13 percent reduction in costs. Pollutant level reductions ranged from 13 percent to 43 percent. The measure secured funding from the European Regional Development Fund and provided ideas for a follow-up European project called SEEMORE. As the measure demonstrated the effects of a high-quality public transport service in a tourist area, it provided a national and European model that can serve as an example elsewhere.

**2. Sustainable fleet.** The rugged and steep topography of Funchal is demanding on bus engines, and this meant high

levels of fuel consumption and pollutant and noise emissions at the start of the CIVITAS project. After introducing an electric bus line in 2006, the city used CIVITAS support to procure five minibuses to complement the fleet in peak hours and replace larger buses off-peak. The city also purchased three new hybrid cars for the public transport operator and one different model to reinforce the municipal fleet. Up till then, the use of alternative fuels and energy-efficient vehicles was not very common in the city.

The measure was accompanied by a marketing campaign for clean vehicles among private car users (see measure 3), and workshops were held to raise awareness and acceptance among companies with large vehicle fleets. The measure supported the objectives of the National Plan for Energy Efficiency and allowed the local public transport operator to develop a strategy to renew the fleet.

Emissions decreased by 14 to 26 percent in the public transport fleet and by 12 to 22 percent in the municipal fleet. The minibuses achieved a 1.2 percent decrease in fuel consumption. In 2011 the city received the City Star for its Sustainable Fleet Strategy, an award connected to the European Regional Policy.

## HYBRID, CLEAN AND ELECTRIC VEHICLES

**3. Electric and hybrid vehicles.** Before CIVITAS, few electric and hybrid vehicles were circulating in the region around Funchal. The city used CIVITAS support to promote a positive attitude towards cleaner transport through a 50 percent parking discount for owners of electric or hybrid vehicles, a promotional campaign and a bike rental service that included electric bicycles and scooters.

The promotion of clean vehicles was one of the highlights of the European Mobility Week events in Funchal. The measure supported the objectives of the national strategy to promote hybrid and electric vehicles in private fleets, and contributed to the municipality's commitment to the Covenant of Mayors.

In three years, the parking discount was used more than 800 times. A steep increase in petrol prices in 2012 stimulated interest in the discount tariff and increased the circulation of hybrid and electric vehicles in the city.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**4. Bus and bike.** Funchal has a very hilly landscape except for a small flat area on the west and central coastal line. This discourages people from cycling. With CIVITAS support, Funchal introduced a bus and bike scheme enabling cyclists to hang their bicycles on the back of buses free of charge in order to comfortably reach the hill tops. It was the first time that Funchal tried to integrate bike and bus use in one service.

During the preparation phase of the measure, the public transport operator was able to secure the patronage of local stakeholders including sports associations and cycling-related

companies. The Bus and Bike programme is part of the city's concept for sustainable mobility defined by its Action Plan for Sustainable Energy (PAES Funchal, developed under the ISLE-PACT project).

The measure resulted in a 0.7 percent increase in bike usage. With 56 bicycles transported via public transport in one year, results fell short of expectations, but there was some evidence that several public transport users were considering using the service in the future. As the city started out with a very low share of cycling and behaviour change takes a long time, the city regarded the slow but positive trends observed as a promising step towards the development of a cycle-friendly city.

**5. Control system for dial-and-ride services.** The Santa Luzia area near the city centre was a dense area with a 50 percent higher aging index than elsewhere in Funchal. Due to the narrowness and steepness of the roads, Santa Luzia was not served by public transport before the CIVITAS project. The city tested and launched a dial-and-ride service in this area. Whereas traditional demand-responsive services operate in low-density areas, Funchal tested it in a very dense area.

To tailor the service to market demand, the public transport operator conducted a door-to-door survey among residents in Santa Luzia.

Users gave the service an overall rating of 10 out of 10. In the first half year of operations, only 1.5 passengers were transported per trip, which resulted in high emission levels per passenger. The city expected passenger numbers to increase as the service would be expanded to other areas of the city. In any case, the concept of dial a ride enhanced the overall mobility quality of Funchal and enabled the city to offer public transport services to all citizens regardless of social and physical challenges.

## INTERMODALITY

**6. Park and ride with public transport school service.** Before CIVITAS, attempts to develop P&R in Funchal failed because of the low frequency of P&R shuttles and bad tariff integration between the car park service and transport service. With the support of CIVITAS, Funchal integrated four peripheral parking lots within the public transport area through an integrated tariff. An innovative feature of the measure was the establishment of a new bus service connecting the parking facilities with the main school in the city to solve the problematic traffic situation during school peak hours.

The municipality played a crucial role in establishing cooperation with car-park managers and schools in the target area. The measure supported the goals of the Energetic Regional Plan 2002, including the aim to implement a differentiated parking tariff to promote peripheral parking advocated in the local parking policy.

After the first year, the service attracted 6,000 new public transport passengers. The P&R service was found financially sustainable, but the new school services could only be maintained if the number of users increased. CIVITAS helped

in this measure, as it was informed by the P&R experiences of Funchal's MODERN partner city Utrecht, the Netherlands.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**7. Awareness-raising campaigns for sustainable mobility.** In the years before CIVITAS, there was a drastic increase in car ownership and a steady decrease in public transport use in Funchal. With the support of CIVITAS, the city conducted four awareness-raising campaigns to encourage schoolchildren to use sustainable modes, promote the pedestrian areas in the city through a city treasure hunt, encourage citizens to travel by bus, and foster eco-driving skills among citizens. The innovative aspect of this measure was the full integration of private and public transport and school schedules.

At the implementation stage, workshops were organised by the municipality to target drivers and the wider public, including through school mobility projects.

The city treasure hunt attracted 1,500 participants. Surveys among participants showed that they were familiar with eco-driving, perceiving it as a way to save fuel (31 percent of respondents in 2010 and 31 percent in 2011) and lower CO<sub>2</sub> emissions (47 percent in 2010 and 43 percent in 2011). The city found that the bus campaign was easy to organise, innovative and inexpensive. It created a synergy among schools and environmental associations enabling the latter to reach a large audience. During the CIVITAS project, the campaign was already successfully replicated in the city of Tallinn.

**8. Eco-driving for the public transport fleet.** Funchal's steep hills made driving around the city expensive in terms of financial and environmental costs. Together with the public transport operator, the city offered eco-driving training to public transport drivers and drivers employed by the city. It then monitored the bus drivers' performance and gave them incentives to optimise fuel efficiency. Until then, eco-driving had been a little-known concept in Funchal.

Citizens did not participate in developing the procedure but were informed of the measure to create more awareness of the issue of fuel consumption.

The eco-driving campaigns towards municipality drivers contributed to a 6 percent decrease in fuel consumption. Bus drivers consumed 3 percent less fuel and highlighted a progressive and positive trend towards eco-driving behaviour, with 9 percent fewer sudden turns, 11 percent less speeding, 12 percent less severe braking; and 13 percent fewer sharp accelerations. This CIVITAS measure revealed drivers' interest in receiving feedback on their driving behaviour and their motivation to improve their driving.

## MOBILITY PLANNING

**9. Public urban transport planning centre.** Before the CIVITAS project began, data generated by the public transport operator's contactless ticketing and GPS monitoring system was not integrated in a way that facilitates transport planning and decision making. This CIVITAS measure aimed at building a new monitoring and control centre that would enable proper control of the public transport fleet, feed into the city's mobility policy, and provide public transport users with better information. An innovative feature was a tourist itinerary application in the travel planner tool that encouraged users to explore the island by public transport.

Implementation of the urban transport planning centre mainly consisted of establishing institutional agreements between stakeholders to feed the software with relevant data. This measure was part of a wider policy for long-term mobility planning in Funchal.

Thanks to the planning centre, the complaint response time was reduced to less than one month. Senior managers had access to much more information, which enabled wiser decisions.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**10. Control of limited traffic zone in the historical centre.** Before CIVITAS, access to Funchal's limited traffic zone (LTZ) in the city centre was inefficiently restricted by manually operated padlocked bollards. Unauthorised vehicles regularly accessed the restricted zone. Funchal used CIVITAS support to test a new system in two pilot zones. Remotely controlled with the aid of a licence plate recognition system, the new approach was the first of its kind in the region.

Implementation was preceded by a communication campaign that ensured compliance from citizens and put in place the required legal framework.

As a result of this measure, the number of entries into the LTZ were more than halved and noise decreased by 4 decibels during the day. Thanks to this CIVITAS measure, the city of Funchal was now able to collect new data, including entries into the LTZ, parking duration and vehicle classification.

**11. Location-enabled mobile search and guidance system.** Before CIVITAS there were no GPS mobile phone-based guidance applications — even Google Maps was empty for Funchal at the time. Within CIVITAS, Funchal developed a mobile pedestrian navigation system via GPS technology that helped residents and tourists find walking routes and points of interest in the city. The service followed a social-media approach: End users could contribute by designing and publishing their own itineraries.

The service was made accessible through the Internet and

through Android and iPhone applications. CIVITAS introduced this type of service in the city and it was later followed by others providing similar services.

**12. Urban mobility control and monitoring centre.** Before CIVITAS, not all sources of mobility-related information were being shared by different entities, and mobility decision making was not always based on reliable data or mobility simulations. Funchal developed an urban mobility control and monitoring centre that had the capacity to process and disseminate data on the mobility system. This Mobility Observatory was the first integrated system of its kind in Madeira.

By signing mobility pacts, the municipality and partners in the field of mobility agreed to collaborate and follow the guiding principles for the operation of the observatory in order to contribute to a more sustainable mobility strategy. This measure was part of a wider policy for long-term mobility planning in Funchal.

The achievements of this measure were general acceptance from the stakeholders, a contribution to municipal and regional strategic plans and the provision of a basis for 10 mobility management decisions. To support the observatory, 80 indicators were defined and 29 of them were monitored at the end of the CIVITAS project. This CIVITAS measure enhanced political recognition from the whole municipality of the need for more sustainable transport and mobility.

### REAL-TIME ROAD USER INFORMATION

**13. Mobility services via SMS.** With more than 40,000 cars entering Funchal every day, disruptions on the irregular and narrow city streets caused significant traffic congestion problems. Before CIVITAS, most alerts and other public announcements about traffic were paper based and did not reach a wide audience in a timely manner. With the support of CIVITAS, the city of Funchal developed a subscription-based service offering timely information to drivers and public transport users via SMS and e-mail. This service was the first SMS-based information broadcast system in Madeira and foresaw the possibility of integrating other information and services in the future: parking availability, event details, ticketing, bookings and payment services.

Two highway operators and the public transport operator Horarios do Funchal also used the platform to provide information via SMS and e-mail. The service was to become an integrated part of the Mobility Control and Monitoring Centre to be set up during CIVITAS (see measure 12).

As real-time information was not yet available at the end of the CIVITAS project, the impact of this measure could not be determined. However, a survey carried out during Expo-Madeira 2010 showed that 63 percent of potential users of the service considered it as useful or very useful. The involvement and interest of the key stakeholders in this measure highlighted the willingness of the parties to improve mobility in Funchal. This ensured the future development of the service over the long term.

Malgorzata Ratkowska  
Ul. Nowe Ogrody 8/12  
80-803 Gdansk  
malgorzata.ratkowska@gdansk.gda.pl  
Tel: +48 58 526 80 82  
www.gdansk.pl.

Gdansk is the largest city in the Pomerania region of northern Poland with about 458,000 inhabitants at the time of the CIVITAS project. The city is a popular tourist destination and an important industrial centre with food processing, petrochemical and chemical industries as the dominant sectors.

CIVITAS Phase: Plus – MIMOSA  
Duration: 2008 – 2012  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### PUBLIC BICYCLES/BICYCLE SHARING

**1. City bikes.** Despite being one of the leading cycling cities in Poland, Gdansk lacked the ability to change people's attitudes towards cycling. With the support of CIVITAS, the city aimed at promoting cycling as the coolest alternative way to commute, while also educating the public about how to ride safely and comfortably. All the necessary procedures for implementing a bike rental system were put in motion.

In partnership with a bike manufacturer, designers and young residents, a collection of cycling clothes, new city bikes and artistic cycle racks was designed through several competitions. The "Gdanska Moda na Rower" ("Gdansk Cycle Chic") outdoor exhibition was very successful.

Implementing the measure helped to increase the share of cycling in the city's modal split by 10 percent. An important lesson was that providing infrastructure is not enough to facilitate sustainable mobility: there is also the need to influence behaviour while at the same time not compromising safety.

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**2. Alternative fuels.** Before CIVITAS, the city's public transport ran on fossil fuel, which led to greenhouse gas emissions and pollution. CIVITAS supported research to raise awareness and explore options for the use of less-polluting fuels. The research covered a review of the state of the art on taxation issues, fuel supply, fuel distribution, vehicle fuelling, adaptation and maintenance.

Based on study results, Gdansk launched a dissemination

campaign with stakeholders and a range of surveys were prepared. These actions resulted in a political agreement on a future pilot project that would yield concrete data on the likely financial impacts for public transport operators, among others.

The city's lesson was that dedicated research is needed to discover more environmentally friendly alternatives to traditional fuel systems. Also, creating awareness can lead to positive, sustainable habits.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**3. Encouraging sustainable school trips.** When CIVITAS was launched, more and more parents in Gdansk were bringing their children to school by car, which contributed significantly to congestion, pollution and safety risks during rush hour. CIVITAS helped to develop a series of educational activities to change mobility habits among children and their parents. Activities included a series of press releases on safety issues, handing out gadgets, and two art competitions. The introduction of walking buses at six pilot schools was a key challenge and very innovative for the city.

The programme "Return home safely" was organised in close cooperation with the police.

The number of school-home trips by car dropped more than 20 percent and the number of children driven from school five times a week dropped by 12 percent. More than 95 percent of parents who took part in the walking buses were very satisfied with their children's participation. However, implementation of the walking bus initiative required a long process of persuading the schools and the parents to take part.

### **4. Mobility management: Advertising and promotion.**

The sustainable mobility services of Gdansk were underutilised due to a lack of awareness among inhabitants. This CIVITAS measure focused on developing promotional and advertising activities to make people aware of sustainable modes and trigger behaviour change. Activities included bike parades, traffic rules competitions, bike shows and cycling licence exams for children. The "Bike Fridays" campaign was one of the most important elements of the annual cycling campaign and helped in the development of methods for precisely defining target groups.

The action was supported by city authorities, politicians, sports celebrities, young citizens and NGOs, but also by the police and municipal guards. Communication by all partners was key to success, as was the cooperation with a large number of experienced organisations and institutions.

Market surveys afterwards showed that people could recall 20 percent of campaign topics and 40 percent of the specific campaign items. An upward trend in frequent cycling for leisure was recorded along the coastal strip area, with trips increasing by 7 percent in 2011 alone. With this measure, CIVITAS served as an engine to create synergies which generated better outputs of actions and campaigns.

**5. Mobility Week in Gdansk.** At the start of the CIVITAS project, the private car was predominant in Gdansk's mobility culture and annual car-free days to raise awareness had little impact. CIVITAS helped to realise a big Mobility Weekend in 2010 as a warming up for the European Mobility Weeks (EMW) organised from 2011 onwards. The measure particularly targeted daily drivers and children. An integrated programme of actions and information campaigns on sustainable options and voluntary modal shift included electric vehicles, a bicycle town, educational events, a retro bus show, bicycle clinics, "bicycle fashion" contests, workshops for children on anti-vandalism and more.

About 10,000 people participated in various events, which were realised with the help of 50 volunteers from different organisations. More than 40 different media outlets covered the events, and exhibitors came from all over Poland.

Within the four-week periods following the campaigns, a 5 percent modal shift away from the private car was recorded. Surveys showed 40 percent of people could recall specific campaign items, and 10 percent could do it spontaneously. The city found that the methodology developed for organising EMW events constitutes a set of best practice examples which can be easily transferred to other cities.

**6. Promoting tram travel.** The city had identified better use of the tram lines as key to making the city accessible during rush hour. The city modernised the tram fleet and developed the tramways network. Under the slogan "Change Your City", the city also developed promotional strategies, particularly for young people, such as discounted tickets or free transport days. Media communications were carried out. The innovative approach included a modern way of marketing with blogging competitions, YouTube videos and social media platforms.

Promotional strategies were based on the results of several online surveys and workshops with different stakeholders.

The promotional activities led to a positive shift of attitudes towards public transport, which led to an economically viable number of passengers. Public transport providers and city authorities realised that constant communication with the public and mobility management measures are required to maintain positive results.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**7. Anti-vandalism for safe and secure public transport.** Gdansk was experiencing a high level of vandalism on public transport. The objective of this CIVITAS measure was to reduce vandalism and bad behaviour while at the same time enhancing and promoting the use of public transport by increasing security. A video surveillance system with 50 video monitors was installed, and a "Clean Public Transport Stops" campaign was organised, innovative in Poland.

Different alternative strategies on how to deal with offenders were discussed with the police, schools and other authorities.

Workshops on dealing with problematic passengers and misbehaviour on public transport were given to public transport drivers.

There was a more than 20 percent decrease in the number of acts of vandalism in 2012 as compared with 2009. Passengers' sense of safety and security increased by nearly 25 percent.

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**8. Safe cycling infrastructure.** This CIVITAS measure aimed to develop safe and secure cycling infrastructure, backed by campaigns to increase the modal share of cycling (see measures 1, 4 and 5). Cycle racks with 420 parking places were installed at the main access points to the beach and the technical infrastructure along the coastal strip was improved. Several social campaigns with brochures and an updated map of cycle paths raised awareness of cycling and leisure facilities in the city.

Before implementation, the city held a massive survey and a workshop together with the Cyclist Federation to find out what kinds of small investments or actions could increase safety and modernise infrastructure.

The measure resulted in a 50 percent reduction in accidents and a 9 percent increase in the use of recreational areas. More than 20 percent of the respondents appreciated the investments. This measure was an innovative endeavour in Poland because it demonstrated the impact that infrastructure improvements coupled with information campaigns could have on behaviour and perceptions of safety and well-being.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**9. ITS deployment.** Before CIVITAS, there was no integrated traffic management or any other central traffic control facility. This CIVITAS measure investigated a traffic management system and control centre for the congested central corridor of the city together with a feasibility study on a central control room for lateral feeder routes to the main corridors.

The project was discussed with relevant city authorities and the Gdansk University of Technology. The study "Traffic Management System with Particular Consideration of Mass Events" was presented to the traffic management authority as compatible with the TRISTAR traffic management programme for the metropolitan area around Gdansk.

The measure led to a research and implementation plan to help the city implement an intelligent transport system to improve accessibility and curb congestion.

Alicja Pawlowska  
24 10 Lutego street  
81-364 Gdynia  
a.pawlowska@zdiz.gdynia.pl  
Tel: +48 58 764 40 02  
Fax: +48 58 620 97 98  
www.gdynia.pl

Comune di Genova  
Palazzo Tursi, via Garibaldi 9  
16124 Genoa  
comunegenova@postemailcertificata.it  
+39 10 55 71 11  
www.comune.genova.it

Gdynia is located in northern Poland, near Gdansk, and had a population of 255,000 at the time of the CIVITAS project. The city's development strategies are closely linked with its maritime economy. Spatial development is determined by its geographical context: Gdansk Bay and the surrounding forestry reserves.

Genoa is the capital of the region of Liguria in northwest Italy, with a population of 630,000 inhabitants at the CIVITAS period. The city boasts one of Europe's largest historical centres and was designated as a UNESCO World Heritage Site in July 2006. The city is spread out between the sea and the mountains, with a comparatively long and narrow coastline.

CIVITAS Phase: I – TELLUS  
Duration: 2002 – 2006  
Role: Learning city

CIVITAS Phase: II – CARAVEL  
Duration: 2005 – 2009  
Role: Leading city

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**1. Creating a clean urban transport area.** Prior to the CIVITAS measure, Gdynia's city centre was permanently congested. CIVITAS contributed to the modernisation of the main street, Swietojanska Street, through the installation of traffic organisation features, improvements to the trolleybus infrastructure, the purchase and installation of 961 bollards to prevent illegal parking and the installation of 12 bicycle stands.

The CIVITAS project was widely accepted by citizens thanks to strong political support and broad communication. The measure was part of the integrated local transport policy, described in the Strategic Plan for the Development of Gdynia, Gdynia's Transport Policy and the Integrated Development Plan for Public Transport in Gdynia for 2004–2013.

Thanks to this CIVITAS measure, the number of trolleybus passengers increased by 13.2 percent, the number of private vehicles in the city centre decreased, illegal parking was prevented, the number of restaurants and cafes increased significantly (from 11 to 18 and from three to 17 respectively) and traffic flow decreased by 9 percent. Gdynia feels that CIVITAS enhanced cooperation among organisations, as well as political and public awareness.

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Expanding the Genoa car-sharing service.** Car sharing is a key element of Genoa's Urban Mobility Plan. With the support of CIVITAS, the existing car-sharing service was extended in order to fully integrate it within the urban transport system, with at least 25 percent of the fleet being hybrid cars or vehicles powered by biofuel.

Car sharing was also introduced in the city's municipal fleet. A special car-sharing service was implemented for disabled drivers and for goods distribution ("van sharing").

During the project period, the scheme attracted more than 2,200 users, resulting in 1,000 fewer cars on the road, saving 6,000,000 km/year. There were 17.2 percent fewer kilometres driven compared with the situation before car sharing: this represented savings in fuel consumption of about 477,000 litres per year and an annual reduction of 1,067 tonnes of CO<sub>2</sub> emissions. These good results are mainly attributable to an improved distribution of the service over the entire city, a good communication and promotion strategy and a set of policies adopted by the municipality to limit the impact of private car circulation.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Transition toward a clean vehicle fleet including water-bound transport.** CIVITAS supported the transition towards a more eco-compatible fleet and cleaner public transport services while at the same time promoting the use of multimodal public transport as described in measure 3.

Within the carefully developed strategy, 104 new clean vehicles were purchased, the trolleybus line was renovated, an innovative marine transport service was introduced and a recharging station for electric buses was constructed.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**3. Agency for on-demand transport and other mobility services.** CIVITAS supported the installation of the Flexible Transport Services Agency, a coordination centre bridging the gap between conventional public transport and new on-demand services.

Thanks to this agency, nine new flexible services were developed in the Liguria region involving seven different transport operators. The establishment of an on-demand minibus service, collective door-to-door taxi services and flexible transport services for people with disabilities were very successful initiatives: some 100,000 passengers were carried in 2008.

Public awareness was raised by intense campaigns, and institutional cooperation between operators and other stakeholders was improved. Usage of private cars decreased and parking demand was reduced. The success of the concept was acknowledged by recognising the agency as a European leader within the CIVITAS Thematic Leadership Programme initiative.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**4. Clean high-quality bus corridors.** CIVITAS helped to realise better public transport reliability in Genoa. A network of 5 km of fully integrated high-quality bus corridors was established including bus prioritisation lanes, better access and updated road management throughout the city.

Real-time passenger information was installed at over 100 stops and two bus stops were converted to ensure access to people with reduced mobility.

Bus frequencies and punctuality improved, lowering travel times and increasing traveller satisfaction. Cost savings were made, allowing for reinvestment in service improvements.

**5. Integrated access control and road charging scheme.** To deal with the city's high levels of congestion and pollution, two CIVITAS measures focused on altering private transport demand, as also explained in measure 14.

Firstly, an innovative pricing scheme based on the mobility credits model was applied to freight distribution in the limited traffic zone of the historical city centre. Secondly, the existing access control scheme in this zone was enlarged and upgraded with some control equipment such as automatic number plate recognition technology. It recorded each vehicle

entering the controlled zone, allowing the implementation of a mixed pricing/enforcement scheme, depending on the users.

The access control system resulted in a reduction in the number of vehicles accessing the historical centre limited traffic zone.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**6. Sustainable mobility marketing and eco-points.** To promote the use of multimodal public transport, CIVITAS helped to realise the Eco-point programme.

This new fare policy and mobility marketing plan introduced loyalty schemes and exclusive privileges for holders of an annual public transport pass. New ticket types were also introduced and promoted, in particular for young people.

More than 5,000 public transport passengers participated in the Eco-points programme. The number of loyal public transport customers holding an annual public transport pass had increased by around 36 percent.

### MOBILITY PLANNING

**7. Decision support for environmental impact assessment of traffic planning.** Prior to the measure, various tools to evaluate the environmental consequences of traffic planning were being used in Genoa but they were not fully integrated. CIVITAS helped in realising the extension of the existing tools and the creation of new modules and interfaces to link the different components into a unique modelling platform.

A fully integrated decision support tool for environmental impact assessment was validated and enables decision makers to identify the best solutions possible. Simulation outputs from the model can be readily understood by citizens and are therefore also useful for politicians.

**8. Integrated mobility initiatives for the San Martino Hospital.** Prior to CIVITAS, an extensive mobility survey on movements within the hospital area revealed very bad accessibility to one of the biggest hospitals in Italy. The home-work trip plan for employees was developed with the support of CIVITAS.

It comprised a number of different and integrated measures, including a car-pooling system, better connections from specific points in the city, the extension of the public transport system, the creation of a travel information platform and the use of non-polluting vehicles within the hospital zone.

The data of the survey were used to create baseline indicators for the evaluation of this measure: average journey times to the hospital were shortened, access to the hospital improved, the use of private cars decreased and parking demand fell. Access to the hospital improved as well: average journey times were shortened and public transport services increased by 10 percent.

**9. Integrated mobility strategy for trade fairs.** To encourage more sustainable travel choices to and from its exhibition area, the city of Genoa carried out a comprehensive mobility survey among visitors, residents of the trade fair area and owners of commercial activities (3,000 interviews).

A brochure was made describing transport and parking facilities. Information displays were installed in the main railway stations, offering the best options for those with reduced mobility.

During the project period, the measure achieved a reduction of 20 percent in the amount of car traffic caused by trade fairs and a reduction in the average length of fair-related trips. The accessibility of the exhibition area improved, as confirmed by 40 percent of the visitors.

#### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**10. Establishing the Mobility Forum.** CIVITAS helped to realise the Mobility Forum, a permanent institution with a high political profile devoted to the dissemination of the CIVITAS initiatives in Genoa.

The Mobility Forum has all the resources required to plan, organise and promote new measures and innovative transport behaviour. The web-based e-consultation tool (on-line Mobility Forum) has been in operation since April 2006, allowing mobility stakeholders to exchange their views. A Mobility Forum telephone line has been set up and an infomobility bus was always present in the city areas where CIVITAS measures were being implemented.

#### TRANSPORT TELEMATICS

##### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**11. Introducing a bus lane control system.** The development of a control system, including monitoring devices and relevant warning signs, had to tackle the problem of unauthorised use of bus lanes by private cars.

The design of the system included the definition of a "white list" of authorised vehicles. In addition, a public information campaign was launched directly targeting specific groups of drivers.

More than 50,000 fines were imposed in 2007, resulting in a decrease in illegal use by 71 percent and increased bus lane efficiency. A key for success was the authorisation from the Ministry of Transport to use these devices, as well as some agreements of the city of Genoa on privacy laws.

**12. Monitoring centre for road safety and accident prevention.** CIVITAS supported Genoa's objective to reduce the number of fatalities on the road by at least 50 percent in 2010.

A monitoring centre was established in order to gather data about traffic characteristics and road accident black spots from the different actors in the field. The resulting database resulted in a powerful road safety analysis tool that helps put local plans into operation. It was also important to build a new safety culture among local authorities, schools and citizens' associations. A key feature is the possibility to highlight the low-cost, high-benefit outcomes of road improvements that reduce traffic accidents.

#### REAL-TIME ROAD USER INFORMATION

**13. Creating an intermodal passenger information platform.** Before CIVITAS, conventional travel and traffic information services were not integrated in Genoa. A new passenger information platform was developed within CIVITAS in a broad participatory process among stakeholders.

The new platform offered real-time information on public transport, car sharing, the availability of parking spaces, and actual road conditions. This included dynamic traffic information for main routes via webcam and on-board GPS. Extra information pages were published in relation to special events such as festivals and trade fairs, attracting around 1,000 hits per day.

The platform attracted 2,500 users a day in 2010 and 200 users were registered for the special services offered to people with reduced mobility.

#### URBAN FREIGHT LOGISTICS

##### DISTRIBUTION SCHEMES

**14. Toolbox for freight initiatives.** With the aim of optimising the collection and delivery of services, CIVITAS helped to create a toolbox for freight initiatives.

Coherent regulations for commercial vehicle access to target areas were elaborated and a van-sharing service proved successful. The scheme was developed with the participation of local stakeholders (shopkeepers, artisans, transport associations).

A mobility credit system was tested as well, limiting access based on a predetermined number of mobility credits. However, further research into the needed technological support systems for such a credit system appeared to be useful before further implementation.

Patty Delanghe  
Botermarkt 1  
9000 Gent  
patty.delanghe@gent.be  
Tel: +32 92 66 29 82  
Fax: +32 92 66 29 97  
www.civitasgent.be

Ghent is Belgium's third largest city with about 247,000 inhabitants at the time of the CIVITAS project. Ghent is a bustling historic city with art and culture of the highest quality, an overflowing calendar of events and numerous shops, bars and restaurants. Over the past couple of years, Ghent has regained its former attractiveness after making considerable efforts to curb the use of private cars, calm traffic in the city centre and improve bicycle mobility. The city had already prepared its first Sustainable Urban Mobility Plan in 2003.

CIVITAS Phase: Plus – ELAN  
Duration: 2008 – 2012  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Innovative car sharing.** Prior to the CIVITAS project, the nine existing car-sharing stations in Ghent had not yet been exploited by businesses. They needed to be marketed in order to get more user groups involved, reinforce the growth curve of car sharing and facilitate a change in mobility behaviour. During the CIVITAS project, a new station was opened within the project corridor and car-sharing operator Cambio targeted new user groups by implementing new communication and promotion concepts. The measure involved a new business concept with pool cards to get new business clients for the car-sharing scheme.

Citizens living in the project corridor were contacted to promote the service, as were 250 companies. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

As a result, around 11 percent of the contacted companies joined the pool-card system, five times more than the target level. The number of Cambio users grew by 68 percent. In Ghent, CIVITAS helped boost the take-up of car sharing.

### PUBLIC BICYCLES/BICYCLE SHARING

**2. IT-based bicycle theft prevention.** The city of Ghent offered rental bikes to students at a very low price, but many of these bikes were stolen or went missing. To address the theft problem, an information technology-based anti-theft system was developed. StudentEnMobiliteit (SM), a non-profit

organisation founded by the city, the university and institutes of higher education, carried out a measure with several elements: student bikes were engraved with traceable numbers, secure bike sheds were installed for rental bikes; and a concept was developed for a "bait bike", a bicycle equipped with a hidden "track jack" system that, if stolen, could be traced electronically to locate the bicycle and offender.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

All 6,000 student bikes were engraved, and there was a minor decrease in bike theft. However, the number of recovered bikes has increased. In order to give a safe shelter for students' bikes two covered bike sheds were built on the premises of the university.

### 3. The "House of the Bike" and bicycle activities.

Prior to the CIVITAS project, there was no main contact point where cyclists could access specialised information or small-scale services. With the support of CIVITAS, a back office with services for bike hire, minor repairs and information for incoming and outgoing train commuters was set up. Called the "House of the Bike", it became the main contact point for cycling information in and around the city of Ghent. The premises of the "Students and Mobility" bicycle hire programme were expanded and a bicycle-sharing programme was introduced. The city also installed bicycle storage boxes for commuters and bicycle bins in densely populated neighbourhoods.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

The CIVITAS measure contributed to a monthly rate of 4,000 visits to the city's bicycle website, an occupancy rate of 80 percent for the bicycle boxes, and demand for bicycle bins surpassing supply. Participation in the pilot project helped quell residents' opposition to the installation of bicycle bins in their neighbourhoods. However, interest in the new types of lockable bicycle sheds was lower among certain target groups, including higher-education students and regular cyclists, than it was among citizens in general.

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**4. Extended biodiesel production.** There was a tax exemption in Belgium for diesel mixtures containing 4.29 percent biodiesel and a tax exemption for public transport organisations for mixtures up to 100 percent. However, there was no biodiesel available at filling stations because there was no obligation to add biodiesel to normal diesel. With the support of CIVITAS, the city sought to extend current tax exemptions on biodiesel to organisations outside the field of public transportation. It encouraged the use of B30, a mixture with 30 percent biodiesel, by captive fleets of public organisations such as the postal service. In addition, separate pumps had to be developed to provide B30. The measure was both a new economic instrument (reduction of extra costs) and a new policy instrument.

During the CIVITAS project, Ghent organised a forum for potential biodiesel users, and took actions to overcome policy, legal, financial (tax) and technical barriers. It also sought to remove obstacles to the distribution of B30. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Unfortunately, most of the barriers were not overcome. Two lessons were learned: 1) it is very hard to introduce biofuels without a good, clear and transparent legal framework; and 2) good preparation, with very low costs, makes it possible for any car to run on a B30 biodiesel blend.

## CLEANER FLEETS

**5. Clean public transport strategies.** The public transport company De Lijn wanted to reduce its climate footprint by reducing electricity consumption by low-floor trams. It started by conducting an energy audit on a single tram fitted with metering devices. Afterwards, measures were proposed to reduce energy use by heaters, including reducing cold air import, and reducing ventilation when temperatures are cold and when doors are open. The innovative aspect of this measure is the CIVITAS-branded tram, which measures energy use by heaters and pneumatic air suspension when the vehicle is operating.

The new heating and ventilation strategy led to 31 percent energy savings for heating, and an analysis indicated that the cost of the audit and the remedies could pay for themselves by 2014. Over a period of 24 years the benefit would be worth EUR 1.34 million.

**6. Energy management of public fleets.** Prior to the CIVITAS project, the replacement of some standard vehicles with clean ones was not considered adequate to reduce energy use in public fleets. In a joint measure, the CIVITAS ELAN cities reviewed the energy use of the municipal fleets, with the aim of introducing clean vehicles, establishing sustainable fleet management to meet local air quality objectives, and following the most recent developments on the theme of biofuels. The innovative aspect of the project was that the CIVITAS ELAN cities worked together in a joint action, with each choosing an energy manager.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

The measure led to a series of recommendations, including: providing eco-driving trainings; setting up yearly technical checks of cars (e.g. tyre pressure); creating a procurement policy requiring environmental criteria for new cars (e.g. minimum Euro IV engine standard, installation of diesel particulate filters); increasing the efficient use of the fleet coordinated by a central fleet manager; introducing car sharing; and introducing new technologies.

**7. Semi-public clean car fleet.** The city of Ghent, in cooperation with car-sharing organisation Cambio, aimed to reduce the use of fossil fuel in their car-sharing fleet by using more sustainable alternatives, and promoted clean and energy-efficient vehicles to a broader public.

Cambio improved the environmental performance of its fleet by introducing eight electric cars, providing eco-driving courses to 35 Cambio users and extending its calls for tenders with stipulations about environmental performance. Local NGO Max Mobiel integrated three vehicles running on compressed natural gas (CNG) and one electric vehicle into its own fleet. Taxi service V-tax was persuaded to integrate shuttle buses running on liquefied petroleum gas (LPG) into its fleet.

During the project, Cambio carried out a feasibility study to see whether biodiesel, hybrid or electric vehicles were the best option in terms of user friendliness, design and technical standards. It introduced eco-driving principles via newsletters and via eco-driving sessions, and surveyed Cambio users about the integration of more environmentally friendly cars in the fleet. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

A total of 95 Cambio users drove an electric Cambio car, and they were positive (36 percent) or very positive (64 percent) about this experience. The fuel consumption at Cambio decreased by 15 percent and eco-driving training produced short-term impacts by reducing fuel consumption by 8.5 percent. CNG filling stations were installed for the Max Mobiel fleet and the replacement of V-tax shuttle buses with an LPG version had a positive impact on fuel consumption and emissions.

**8. Upgrading the city car fleet.** Prior to the CIVITAS project, Ghent relied too much on fossil fuels. This CIVITAS measure aimed to reduce emissions from the city fleet by increasing the efficiency of fleet use, reducing the number of vehicles, reducing the use of fossil fuels in the city fleet, introducing cleaner vehicles, promoting car sharing and offering eco-driving training.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Eco-driving had the short-term impact of a 7 percent reduction in fuel consumption, while overall fuel use decreased by 24 percent. Greater awareness and a more positive attitude towards sustainable transport led to a 30 percent reduction in driven kilometres in the car fleet.

## HYBRID, CLEAN AND ELECTRIC VEHICLES

**9. Introduction of hybrid buses.** In order to develop a fleet of easily accessible vehicles that meets the highest standards of energy efficiency, Ghent replaced its high-floor trolleybuses with 20 energy-efficient and innovative articulated hybrid buses. These buses were designed for optimal emissions performance and fuel efficiency.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

The CIVITAS measure contributed to a 17 percent reduction in fuel costs, a 16 percent decrease in fuel use, a 17 percent reduction in CO<sub>2</sub> emissions, and public acceptance of hybrid buses (57 percent of surveyed people were aware of the new vehicles, and 65 percent preferred them).

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**10. Intelligent enforcement of park and ride.** Before the CIVITAS project, the park-and-ride (P&R) facility did not make a clear distinction between fairground visitors and those using public transport. Furthermore, the parking facility was not integrated with public transport through the posting of real-time arrival and departure times, preferential ticket rates or an integrated ticketing and access system. To prevent unauthorised use of parking spaces, the city wanted to design and implement an intelligent P&R guidance system, closing off the parking lot entrance with a barrier gate and issuing a parking ticket to every motorist entering the parking lot.

However, due to the development of the surrounding site into a factory outlet centre and other activities, the location of the P&R became uncertain and the measure was not implemented during the CIVITAS project. The city council decided to continue work after CIVITAS by installing better signage so drivers could find the P&R.

### SERVICE IMPROVEMENTS

**11. Improved public transport service levels.** In Ghent and the surrounding areas there were four tram lines and 54 bus lines. In order to improve the quality of the main public transport corridor between the railway station and the city centre, a range of measures were to be undertaken: providing real-time passenger information (RTPI), reorganising tram and bus stops and redeveloping the tram axis between the train station and R40 ring road. Furthermore, the city of Ghent upgraded the quality of services in a number of hotspots in the network throughout the city in order to decrease public transport travel times and to improve access to stops. The innovative aspects of this measure concern the holistic way in which the improvements to the public transport service transformed the corridor into a strong mobility axis of the city.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

The CIVITAS measure contributed to increased commercial speed, the installation of an RTPI system at 94 stops and the reorganisation of 110 bus stops. CIVITAS was a catalyst for change in Ghent, as another 25 stops were planned to be redeveloped after CIVITAS.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**12. Pedestrian area access restrictions.** Prior to the CIVITAS project the Ghent Mobility Company had issued several thousand access licences for the pedestrian area, which created a traffic and parking nuisance and a decline in the perception and feeling of safety. Furthermore, the pedestrian area was all too often used as an easy way to shorten travel time and distances. In order to reduce the

number of infringements and make the pedestrian area safer and more liveable, the city overhauled the licence scheme and introduced an automatic number plate recognition access control system. This would be used to gather information on the use of permits and help the Ghent police enforce access regulations to the pedestrian area and certain roads within the area.

The measure was on-going at the end of the CIVITAS project, so no final evaluation was done. However, some lessons were already apparent: strong political support is needed to overcome privacy issues, police should be involved from the beginning of the project, and more time should be foreseen for the installation of cameras.

### PARKING MANAGEMENT/PRICING

**13. Parking and public space management.** Prior to the CIVITAS project, the area around Ghent's main train station and the CIVITAS corridor had high traffic levels and parking space was limited. Ghent strove to ease parking pressure; promote the use of sustainable transport modes; limit parking for businesses in the project corridor and especially around the train station; introduce new criteria for residential parking; and introduce car-free housing concepts in the city. With these goals in mind, Ghent opened an underground parking lot and changed the parking policy around the main train station: long-term parking was prohibited and car drivers could buy a half-day ticket good for a maximum of five hours.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

As a result of the CIVITAS measure, parking pressure in the main station area diminished. As a consequence of studies carried out in this measure, parking management within new projects has become a hot policy issue. This has contributed to several new development plans in the inner city and in suburban areas. After the CIVITAS period, a new parking policy for the development of new houses and offices around the main railway station was to be implemented. It calls for a significantly lower number of parking spaces for new buildings.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**14. Comprehensive mobility dialogue and marketing campaign.** Citizens in Ghent already had access to mobility information at different locations, such as websites and information points, and from various transport operators. The objective of this measure was to provide individuals with one-to-one travel advice and practical support. It aimed to market sustainable travel modes to certain target groups in order to achieve a modal shift. The innovative aspect of the measure was that the campaign was target oriented (families, companies) and area oriented (residential areas).

During the project, a leaflet was distributed to all inhabitants, personal coaching in transport planning was offered to citizens, and activities and events were organised to persuade

citizens to switch to sustainable transport. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Target groups of car users could never be reached and there were difficulties in reaching people interested in personal travel advice and to find candidates who wanted to switch from the car to sustainable transport. Ghent's lessons learned were that: 1) an evaluation method should be presented before the start of the campaign; 2) people should be approached in a personal way; 3) citizens should be approached at key moments in their lives to change their mobility habits; and 4) the message of the campaign should be clear.

**15. Walking promotion.** Before the CIVITAS project, Ghent was already running campaigns to encourage citizens to see walking as a sustainable mode of transport. With the support of CIVITAS, Ghent combined existing and new promotion campaigns and carried out minor infrastructural work. The innovative aspects of the measure were the different activities that were combined: 1) promoting walking through campaigns (a photo competition and a 1,000 steps objective campaign) and through the distribution of a walking map; and 2) analysing the current state of the roads with a focus on pedestrians in order to improve poor pavements (with the support of the city's Pavement Action Plan).

During the CIVITAS project, a lot of data were collected through a variety of audits and several questionnaires. The entire surface of the city of Ghent was analysed. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Ghent's lessons were that strong agreements must be made in advance so that all measure partners stick to the time plan/schedule and so that various departments within the city council have valuable expertise related to walking.

## MOBILITY PLANNING

**16. Holistic event management.** Ghent aimed to limit traffic problems related to events through the introduction of a holistic event management system that increased accessibility to events, provided alternative modes of transport to and from events and decreased the use of private cars. The innovative aspect of the measure was the integrated approach taken to make events more accessible. This meant that every mode of transport was part of the tool and all available information on mobility before, during and after an event was gathered in one website.

Five event organisers, cultural venues and organisations were contacted, and they all organised mobility activities in the framework of CIVITAS. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

A survey on the event tool got a low response rate, but the comments were all positive. A modal shift of almost 4 percent towards more sustainable transport modes was observed.

**17. Mobility management for companies.** Prior to the CIVITAS project, mobility plans for companies in Ghent were

produced on an ad hoc basis with little effort in organising common alternatives for commuting. Therefore, the city supported local companies that volunteered to implement mobility plans and promoted the use of sustainable transport for home-to-work trips. Once an agreement was made, the city council and the company would analyse the existing mobility characteristics of the company and the mobility behaviour of employees, and then draft a list of possible solutions and actions.

Ghent City Council organised a two-week awareness-raising event for employees called the CIVITAS Mobi-weeks in 2009. This initiative was repeated with groups of volunteers from different companies in 2010 and 2011. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Out of 15 contacted entities, 13 ended up with a company travel plan or were working on it, which means that the target of 50 percent was easily reached. The mobility plans and campaigns created a modal shift of 6 percent towards more sustainable transport modes. Employees participated well in the Mobi-weeks, but the target of 10 percent was not reached. With the support of volunteers, the initiative was going to continue after the end of Ghent's involvement in CIVITAS.

**18. Mobility management for schools.** Since 2012, Ghent City Council has supported primary schools in developing school travel plans (STPs). The objective of this measure was to implement school mobility plans in all secondary schools situated in the project corridor and then to extend the measure to as many secondary schools in the whole city as possible. An STP is a unique school plan that encompasses all the issues relevant to journeys to and from the school and includes concerns about safety and health, and proposals for ways to make improvements.

During the school years 2009–2010 and 2010–2011, CIVITAS school competitions were held involving respectively six and two schools. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Compared to the modal split before the campaigns, car use decreased by more than 5 percent, motorcycle use by around 0.5 percent and walking by 1.5 percent, while cycling increased by 1 percent and public transport by 7 percent. In general 51 percent of the students were aware of the mobility campaign, 49 percent were not.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**19. Participatory redevelopment of the main station area.** The redevelopment of the whole area around the main train station in Ghent started in 2006 and was due to finish in 2020. It included the redevelopment of the train station, new terminals for public transport, new bicycle sheds and underground parking. To increase support from citizens and stakeholders for the redevelopment project and the acceptance of sustainable transport policies, the city developed an information centre. The new office passed on the latest news on the reconstruction and on the CIVITAS initiative to

citizens through letters, printed communications (periodicals), a website, audio-visual products and press releases. The measure also deployed innovative communication tools such as a three-dimensional digital model.

All the stakeholders involved in the construction project contributed to the communication campaign both financially and with outsourced personnel. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Forty-six percent of commuters, 51 percent of residents and 46 percent of retailers accepted the governmental strategy, which meant that the level of acceptance had decreased by 4 percent and that the target level of 70 percent was not reached. Furthermore, 47 percent of commuters, 32 percent of residents and 30 percent of retailers either had no opinion or accepted the approach for the redevelopment project and sustainable mobility campaigns. This did not meet the target of 60 percent.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**20. Security enforcement in public transport.** Due to many incidents leading to casualties and damage to public transport vehicles, safety and security needed to be reinforced in public transport. Bus travel was made safer and more secure by working with students in a cooperative and participatory programme (Trammelant), increasing the number of "lijnspotters" (a second person accompanying the driver to limit incidents), training personnel, investing in secure infrastructure and prioritising and listing hotspots.

The measure was based on an already existing safety plan by public transport company De Lijn. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

As a result of the measure, the number of incidents decreased significantly and there was a positive perception of the project's impact among the managers of De Lijn. Ghent's lessons learned were that: 1) Trammelant could potentially be replicated; and 2) it is important that the controllers and bus drivers are motivated and have educational skills.

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**21. Safe cycling corridor.** At the start of the CIVITAS project, Ghent had widespread cycling infrastructure, including both leisure and functional cycling routes. However, these routes often showed gaps or unsafe crossings or junctions. This measure worked on developing safer and better cycling routes in the CIVITAS corridor by improving major crossings on the route from the main train station towards the city centre and the university area. A winter cycling campaign was set up, distributing gloves to cyclists with the slogan "every cyclist counts!". During the CIVITAS project, the first Belgian cycle street was implemented, where cyclists have priority and cars are only "guests".

During a meeting at which four redesign scenarios were discussed, 88 percent of the participants showed interest in the "cycle street" concept. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Cycling increased by 36 percent in two years. Although cyclists were convinced of the usefulness of the cycle street, they had some remarks (e.g. cyclists were not always aware that they were allowed to cycle in the middle of the street even when a car approached).

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**22. Route planner for bicycles.** Prior to the CIVITAS project, route guidance systems were available for cyclists, but they did not always give information on the safest route. Therefore, a new guidance system was developed in Ghent that calculated both the fastest and safest routes. The innovative aspect of the measure was the web-based route planning system using the Global Positioning System (GPS), which made it possible to determine a personal route with personal preferences and export it to one's GPS device.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

As a result of the measure, citizens and students were more interested in and familiar with the bicycle route planner. More than 2,000 people requested routes each month. Despite a positive attitude towards the bicycle route planner, only a minority had already used it.

### REAL-TIME ROAD USER INFORMATION

**23. Sustainable multimodal traffic management.** Prior to the CIVITAS measure, Ghent was confronted with a significant number of people queuing in front of parking entrances, even though the guidance system in the parking facility offered alternatives to parking garages that are full. This resulted in unnecessary congestion on the roads. With the support of CIVITAS, the Ghent municipal parking company started to replace the existing parking guidance system with an all-inclusive and proficient traffic guidance system. The innovative aspect of the measure was the sustainability-oriented multimodal traffic management system: the dynamic system integrated variable message signs for traffic information, traffic light management and the parking guidance system.

The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

Since it was difficult to measure the impact of this specific measure on the traffic flow and congestion problems in the city centre, this was not measured. However, 10 percent shorter queues around the Kouter parking facility and a growing appreciation for the new traffic guidance system were noticed.

The city was determined to implement a third phase after the CIVITAS period, in which scenarios were to be connected to automatically gathered real-time information from the road network.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

#### 24. Institutional platform for city freight management.

Before CIVITAS the distribution of goods in Ghent's city centre was limited to certain timeframes and certain parking spaces. Once these were taken, goods distributors would park on the street, causing traffic jams and dangerous situations. The objective of this measure was to organise a discussion platform on sustainable goods delivery that would look for solutions to limit the nuisance caused by goods distribution.

Members of the platform (good distributors and shopkeepers) were queried for insights on freight bottlenecks in the city. The measure was implemented as part of the city's Sustainable Urban Mobility Plan.

As a result of the measure, extra loading spaces were added, improper use of loading spaces reduced and participants in the platform expressed satisfaction with the realised work. Several lessons were learned: frequent control on the use of loading spots is crucial, free 15-minute parking tickets facilitate the control, and differences between ordinary parking spaces and loading ports should be made physically clear.

Stefka Dodurova  
5 Georgi Izmirliiev sq.  
sdodurova@yahoo.com  
Tel: +35 96 186 00 06  
Fax: +35 96 186 02 03  
www.g-oryahovica.org

The municipality of Gorna Oryahovitsa in the north of Bulgaria consists of two towns and 12 villages on an area of 318 km<sup>2</sup>.

At the time of the CIVITAS project, it had 52,000 inhabitants, 35,000 in the administrative centre. In recent years, the city has become a national hub for train, road and air travel, resulting in an increase in freight traffic. Situated between sub-Balkan valleys and the Danube River, Gorna Oryahovitsa attracts numerous tourists to various archaeological sites.

CIVITAS Phase: Plus – RENAISSANCE  
Duration: 2008 – 2012  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Alternative fuels and clean vehicles in Gorna Oryahovitsa.** Before CIVITAS, the city suffered from air pollution caused by the public transport fleet and an increase in car use. Moreover, the constantly growing number of people driving on compressed natural gas (CNG) complained about the lack of a fuelling station in the city. The city assisted a private investor in building a methane refuelling station and planned to retrofit five diesel buses from the public transport fleet to run on CNG. For the first time, environmental specifications were integrated in the public procurement tender for the public transport operator. This took place during the CIVITAS project.

The city assessed public awareness of clean fuels through a representative survey with 850 members of 300 households, and organised several events to raise awareness on the topic. The measure was part of the city's strategy to have an alternative fuel supply and the plan for a clean public transport vehicle fleet, which were both designed in the course of the project.

Unfortunately, the bus operator had to cancel the retrofitting of the vehicles, as the economic crisis forced the CNG station investor to stop construction. However, the awareness-raising campaign did increase the proportion of citizens with knowledge of alternative fuels from 55 percent at the start of the project to 90 percent at the end. This CIVITAS measure unveiled high public support for alternative fuels and clean vehicles, building a strong case for a transition strategy towards clean vehicle fleets.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**2. Demand management strategies in Gorna Oryahovitsa.** At the start of the CIVITAS project, a lot of freight traffic passed through the centre, motorisation levels were rising and parking was not well organised, resulting in traffic problems, noise and deteriorating air quality. Within CIVITAS, the city worked out a traffic management and parking scheme based on research into traffic problems and potential solutions. In order to test the proposed changes in traffic organisation, the city developed a traffic planning model, which few towns in the country possessed at that time.

Apart from carrying out traffic counts and feasibility studies, the city collected input from 300 households and organised an informational and educational campaign "Safety for our children" in three schools. The resulting traffic management and parking schemes were integrated with a package of soft measures in the city's new Sustainable Urban Transport Plan (see measure 3).

By rerouting heavy vehicle traffic out of densely populated areas, redesigning two important crossroads, adapting traffic light cycles and installing traffic calming measures in several places, the city reduced road traffic by 30 percent, road accidents by 20 percent and nitrogen oxide (NO) emissions by 10 percent. Parking restrictions were introduced, but the city council did not support the introduction of paid parking in the city. Thanks to strong support from citizens, stakeholders and the city's mayor, the city of Gorna Oryahovitsa will continue to reorganise problematic intersections.

while acceptance among other stakeholders was high (70 percent). CIVITAS allowed Gorna Oryahovitsa to take on a leading role in the development of sustainable urban mobility, as the city shared its experience gathered through the elaboration of the plan with a large number of cities in Bulgaria and abroad.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**3. Introducing the Sustainable Urban Transport Plan.** At the start of the CIVITAS project, limited and partial changes in traffic organisation were occasionally implemented to solve specific problems. But without an integrated approach these measures failed to counteract the emerging trend towards increased motorisation and heavy traffic. With the support of CIVITAS, the city designed a sustainable urban transport plan (SUTP) to preserve its favourable modal split and accident rate. The municipality of Gorna Oryahovitsa was the first Bulgarian city to elaborate, adopt and enforce such a long-term strategic document.

The draft plan was developed in several iterations and in active consultations with the stakeholders' representatives: the general public, non-governmental organisations, politicians, local businesses, public authorities, transport operators, etc. The measure created an integrated long-term transport policy out of the multiple urban and economic development plans that the city had previously adopted.

Due to the active involvement of stakeholders and an awareness-raising campaign, almost 50 percent of the public were aware of the plan. Public acceptance was fair (40 percent),

Lisa Sundell  
Box 2403  
SE-403 16 Gothenburg  
lisa.sundell@goteborg.se  
Tel: +46 31 368 25 40  
Fax: +46 31 711 98 33  
www.goteborg.se

Gothenburg is the second largest city in Sweden, with a population of 500,000 inhabitants at the time of the CIVITAS project (800,000 in the greater Gothenburg region). It is the fifth largest city among the Nordic countries. Situated on the west coast of Sweden, Gothenburg is the largest port in the Nordic region and a centre for trade, transport and industry. It has a long history of being an environmentally proactive city.

CIVITAS Phase: I – TELLUS  
Duration: 2002 – 2006  
Role: Leading city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Introducing clean waste collection vehicles.** Before the CIVITAS project started, the collection of municipal solid waste was performed by diesel-fuelled trucks. The engines of these trucks were only used for moving the vehicle for 40 percent of the time, and for operating the waste collection procedure for 30 percent of the time, while the rest of the time it stood idle. This resulted in excessive noise and emissions at pick-up points. With the support of CIVITAS, the waste and recycling company Renova developed an electric and compressed natural gas (CNG) hybrid waste collection vehicle in close collaboration with leading suppliers. It also tested four trucks in the centre of Gothenburg. The measure was innovative as Gothenburg was one of the first Swedish cities to replace their diesel-fuelled waste collection trucks with a greener alternative.

Due to the technical nature of the measure, no stakeholders were involved other than the manufacturers of the vehicle. The measure was a result of Gothenburg's policy of requiring CNG-fuelled vehicles to be used for waste collection and the local environmental zone established in 1996.

The trial resulted in an elimination of noise during idling and a significant reduction in noise while loading. Emissions decreased by between 50 and 65 percent and fuel consumption fell by 49 percent. In Gothenburg, CIVITAS facilitated the investment in prototype technology, allowing the city to reach its ambitious environmental goals.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**2. Introducing an environmentally optimised river shuttle** (not realised). There were river shuttles operating in the centre of Gothenburg for most of the 1900s, but water transport had not known a similar environmental development as land-based public transport. To meet increased demand for public transport and to connect the northern river bank with the central areas of Gothenburg, the city decided to introduce an environmentally optimised ferry shuttle. The technology for the shuttle was innovative, as it had already been tested on buses, but had not yet been used on marine vessels of this size.

The measure supported two very important goals of the 2005 update of the Sustainable Transport Strategy: focusing on more sustainable transport modes and supporting new technologies in vehicles.

The measure was abandoned as, among other problems, the introduction of new high-speed buses led to a significant decrease in the number of passengers on existing river shuttles. Gothenburg's lesson learned is that ferries are a viable option for public transport only if they are faster and more convenient than other transport means.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**3. Environmental zones for heavy goods vehicles.** The 15 km<sup>2</sup> environmental zone established in Gothenburg in 1996 proved an effective means to ensure minimum environmental standards for heavy goods vehicles and buses in the city centre. Within the CIVITAS project, Gothenburg extended the low-emission zone to include areas on the north bank of the river where greater numbers of goods lorries circulated. It also tested an on-board measurement system for NO<sub>x</sub> emissions. The measure was innovative as it also included a proposal for new criteria for granting access to the environmental zone, which are based on national legislation and required cooperation with the other three Swedish cities that had an environmental zone at that time.

Before measure implementation, the city carried out a survey of affected haulage companies and suppliers to assess their views on the environmental zone and the proposed changes. The measure was part of Gothenburg's strategy to meet the environmental quality standards stipulated by the national government.

The extension of the zone has been calculated to reduce NO<sub>x</sub> emissions by 40 tonnes per year and emissions of particulates by 1 tonne per year. In Sweden, CIVITAS contributed to increased cooperation between the cities and the Industry Ministry.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**4. Promoting public and private clean vehicles.** Existing clean vehicles and alternative fuels were not being actively marketed by local vendors prior to measure implementation. Sales were also hampered by a lack of awareness among car drivers about the existence of filling stations selling alternative fuels and their economic benefits. The city aimed to foster the introduction of 1,500 new private clean vehicles on the roads and 250 clean vehicles in the municipal fleet through awareness-raising measures. They organised seminars for car dealers, car owners, leasing companies and environmental consultants. The measure was innovative, as it introduced targeted communications measures into the development of the clean-vehicles market.

Telephone, e-mail and website consultation were offered to companies, local authorities and members of the public. The measure contributed to the city's goal for 90 percent of the municipal fleet to be clean by 2008, and 5 percent of all new cars sold in Gothenburg to be clean.

The measure resulted in greater interest in clean vehicles, an increase in the number of clean cars on the streets, and an 82 percent increase in the number of clean vehicles in the municipal fleet. In Gothenburg, CIVITAS revived consumer interest in clean vehicles in a market that had seen a slow and difficult development.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**5. Consumer-driven goods management from a mobility centre base.** At the start of CIVITAS, the Lundby district was one of the largest districts in the city of Gothenburg and attracted a high number of commuters due to the large amount of workplaces. With the support of CIVITAS, a new municipal mobility centre offered free consultation to companies on available transport alternatives and how to cut transport by consolidating orders for office supplies. The Lundby Mobility Centre was the first mobility centre in Gothenburg.

At an early stage the personnel from the Lundby Mobility Centre realised that it was very important to use different communications according to who the receiver of the information in the company is. The measure was part of the city's efforts to increase cooperation and optimise heavy vehicle loads within the environmental zone.

The majority of the 17 companies involved have decreased their frequency of deliveries by 30 to 80 percent. However, because only a few companies have taken part it is hard to demonstrate any measurable effect on emissions in the city. In Gothenburg, CIVITAS has strengthened communication between suppliers and customers.

**6. Incentives for improving load rates in inner-city freight distribution.** Before CIVITAS, the centre of Gothenburg had suffered for many years from severe congestion due to heavy goods vehicles unable to find space to load and unload. In a pilot area of Gothenburg's existing environmental zone, the city introduced additional access criteria based on vehicle loads, and gave incentives for suppliers, hauliers and retailers to coordinate and consolidate deliveries. The measure was innovative, as it aimed to reduce the number of deliveries to the area without introducing severe restrictions on volume of goods, availability or vehicle type.

The pilot project was designed as a voluntary scheme in cooperation with the transport industry and other cities with an environmental zone. The measure contributes to the Transport Plan towards more sustainable means of transport by aiming to reduce the number of vehicles as well as the number of vehicle kilometres driven in the city.

The measure was well received by drivers, transport companies, the municipality and businesses. However, while five out of eight vehicles had a better volume result than before, only two were able to fulfil the demand of at least 65 percent volume capacity use. One of the most important lessons learned for Gothenburg is that, in order for such a scheme to become successful on a large scale, the restrictions imposed must be combined with incentives.

**7. Incentives for purchasing clean heavy duty and distribution vehicles.** In many European cities, most of the clean vehicles were owned by the public sector. There was a lack of experience and understanding of how to encourage private companies to purchase compressed natural gas/biogas (CNG/CBG) vehicles instead of conventional vehicles. With the support of CIVITAS, FordonsGas Sverige, an operator of CNG/CBG fuelling stations, promoted alternative fuel technology to the buyers of logistics and transport in private companies. Innovative aspects of this CIVITAS measure include the implementation of a fast alternative-fuelling system for heavy and distribution vehicles; and the creation of financial incentives for introducing CNG to the heavier segment of the transport fleet.

FordonsGas cooperated with three logistics companies to introduce two large and 16 lighter distribution vehicles. The Swedish Government has decided that 25 percent of all purchased vehicles must be clean starting in 2005. The measure supported the city's Sustainable Transport Strategy's goal to support new technologies in vehicles and it was an essential means to reach both national and European air-quality norms.

The measure resulted in an annual reduction in NO<sub>x</sub> emissions of 3.55 tonnes. By engaging in dialogue with customers, the CIVITAS project has increased customer interest in clean transport within the private sector.

Gerhard Ablasser  
Bauamtsgebäude 5. Stock  
Europaplatz 20  
8020 Graz  
gerhard.ablasser@stadt.graz.at  
Tel: +43 31 68 72 35 80  
Fax: +43 31 68 72 35 89  
www.graz.at

Graz is the second largest city in Austria. It is the capital of Styria and the province's cultural, economic and university centre. Graz was the first city in Europe to implement a speed limit of 30 km/h for the entire city (with the exception of major roads).

CIVITAS Phase: I – TRENDSETTER  
Duration: 2002 – 2006  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Increasing car occupancy rates.** To reduce congestion in the city centre, CIVITAS helped to improve car occupancy rates in areas not well served by public transport, including the provision of park-and-pool facilities for commuters heading out of the city.

The city wanted to install a high-occupancy vehicle (HOV) lane, but since such lanes have no legal framework in Austria, the dedication of an existing bus lane was a more feasible way of proceeding. Therefore, the HOV lane was officially designated as a bus lane that can also be used by taxis and vehicles with three or more passengers. Other roads with bus lanes were assessed as potential HOV lanes.

However, monitoring showed that the disadvantages for public transport surpassed the advantages for cars. If just 5 percent of all cars used the lanes, a 35 percent negative impact on buses could be expected. At traffic signals, where bus priority would be shared by cars, this was a particular problem.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Biodiesel taxi fleet and service station.** With a fleet of 220 cars, Taxi 878 is the biggest taxi company in Graz. Within the CIVITAS measure, all drivers were given a one-day training on environmental issues as part of the company's efforts to reduce its environmental impact.

In combination with the training the company began switching its fleet from diesel to biodiesel cars, and made its filling station available to the public in order to promote the use of cleaner fuel.

Most Taxi 878 drivers are not employees but franchisers, which added an extra challenge to the shift. A central decision to use another fuel was not enough: facts and information had to convince individual members to voluntarily change fuels. The company's emergency backup generator ran on biodiesel at the end of the project, and 60 percent of the taxi fleet operated on biodiesel.

**3. Creating a biodiesel bus fleet.** The annual consumption of 3.8 million litres of fossil diesel by the city's buses resulted in large emissions of CO<sub>2</sub>. CIVITAS helped to demonstrate that biofuels are suitable options for city buses and car fleets.

The local public transport company carried out a series of technical, ecological and economic trials of 100 percent biodiesel operation. Following the success of these trials, its buses were converted to run on biodiesel or new biodiesel buses were purchased.

Graz also collected used cooking oil on a large scale for conversion into biodiesel, which, along with biodiesel produced from rapeseed, provided fuel for the entire bus fleet of 120 vehicles. The success of the measure was largely due to the fact that biodiesel fuel is tax exempted in Austria. Because of CIVITAS, Graz became a pioneer city in biodiesel usage in urban public transport buses.

## CLEAN FUELS AND FUELLING INFRASTRUCTURE

**4. Optimising the collection of used cooking oil.** Prior to CIVITAS, Graz had a system for collecting used cooking oil. CIVITAS helped to improve Graz's Okodrive scheme, including by converting used cooking oil from hazardous waste into low-emission biodiesel.

Three different campaigns were implemented: 1) Restaurants in Graz that had not previously participated in the cooking oil collection were visited and provided with information. 2) Leaflets about opportunities for recycling cooking oil were disseminated on public buses, and passengers could obtain containers for collecting used oil. Taxi drivers were also trained to provide their customers with information about sustainable mobility in general, and the recycling of cooking oil in particular (see also measure 10). 3) A campaign was targeted at 2,000 residents in selected apartment blocks, who were given leaflets about the scheme shortly before the collection bus visited their neighbourhood.

The waste oil was collected free of charge and sold to the local energy company as raw material. More than 250 restaurants participated in the project, collecting about 45 percent of the estimated potential. About 16 percent of the estimated potential was collected from private households. The main lesson learned was that the provision of mobility consultancy services in combination with the collection system proved to be too expensive and was therefore discontinued.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**5. Passenger-friendly bus and tram stops.** Before CIVITAS, Graz had 800 bus and tram stops, most of which were not user friendly. The main aim of this CIVITAS measure was therefore to improve stop infrastructure for public transport, including dynamic real-time passenger information and better access for people with reduced mobility.

The most important stops (at the end of lines, important links between public transport lines or other modes, stops close to the city centre and stops with inbound connections) were selected for refurbishment. Meetings were held with representatives of associations of disabled people to discuss possible solutions. They favoured systems for entering buses and trams with support from the driver rather than automated systems that often fail to operate in colder weather. A section on the public transport provider's website is now dedicated to people with reduced mobility.

Over 25 percent of public transport stops in Graz can now be regarded as high-quality stops, and 120 now feature real-time information displays. A main lesson learned was the importance of good communications with passengers with reduced mobility when looking for solutions.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Introducing strolling zones.** Before CIVITAS, various restrictions on car use had already been introduced, but heavy traffic made accessibility to pedestrian areas unsafe and unpleasant.

CIVITAS helped to introduce four new strolling zones for pedestrians while also offering access to cyclists and allowing some car use. Car parking spaces were reduced by 50 percent and the space reallocated for loading, cycle lanes and pedestrian routes.

The establishment of these strolling zones has improved quality of life in the city centre, increased the modal share of pedestrians and boosted commercial activity (bars, shops etc.). Traffic noise and emissions were reduced as well.

### PARKING MANAGEMENT/PRICING

**7. Lower parking tariffs for low-emission cars.** CIVITAS supported the development of a new parking tariff system, promoting both economic and air quality objectives.

The hourly parking tariff for all conventional vehicles was raised from EUR 1 to 1.20, while the tariff for low-emission vehicles was lowered to EUR 0.80. Registered owners of low-emission cars receive a so-called Umweltjeton, or environmental token, and an official sticker issued by the city council. Ticket vending machines were equipped to recognise these tokens and deliver a lower tariff.

The city recognised two complications hindering implementation. The fact that all drivers of low-emission vehicles had to register their cars at the Parking Department was a real barrier. Secondly, at the time of the project, car manufacturers had different standards to define low emissions, which was not helpful for a consistent city approach.

### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**8. Bike-and-ride parking and other facilities.** Before CIVITAS, the increase in the modal share of cycling had slowed down. CIVITAS supported a bike policy audit and the implementation of identified priorities and measures.

More cycling information was made available, including a map showing bike routes and repair facilities and the brochure *20 reasons to go by bike*. All new public transport stops as well as many streets were equipped with bike-and-ride facilities in the form of secure bike racks and sheltered parking at terminals. There are now over 500 cycle racks available. Bottlenecks were eliminated by building new bike paths and underpasses at railway crossings, including the spectacular underpass under Keplerbrücke. Finally, bike training for pupils 10 years of age were extended and offered in all schools in Graz.

One important innovation was the appointment of a bicycle policy coordinator who is able to focus exclusively on bicycle policies even after CIVITAS. Graz learned that although the objectives were reached, the modal share of cycling did not improve as much as expected. However, comfort for cyclists increased and Graz became the number one cycling city in Austria.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**9. Innovative marking and quality management for public transport.** In its efforts to boost the popularity of its public transport system, Graz strengthened the image of public transport through some unconventional marketing activities supported by CIVITAS.

These included the following actions:

- (1) Innovative marketing: Activities not normally associated with public transport were implemented, such as musicians playing for the passengers in buses, a mobile birthday party marking the 10-year anniversary of the public transport association and a raffle with the chance to win public transport tickets.
- (2) Door-to-door information on-line: A travel-planning web page was created, making it far easier for public transport users to obtain complete real-time travel information. The service proved to be popular and the number of users increased steadily, from 64,000 in September 2003 to 260,000 in June 2005.
- (3) Quality management assessments: So-called mystery shoppers assessed public transport vehicles, stops and

punctuality using a list of criteria. The number of complaints fell over time.

The city could recommend clandestine quality checks as an important element in improving the public transport system and increasing customer satisfaction.

**10. Taxi drivers as information multipliers.** With thousands of personal contacts each year, taxi drivers were identified as potential information multipliers: they are able to spread important messages about clean transport, especially if their own vehicles have been adapted to run on cleaner fuel.

With the support of CIVITAS, the Graz company Taxi 878 began to train its drivers on communicating about sustainable transport behaviour and the municipal collection of household waste oil (see measure 4). During the introduction of biodiesel in the taxi fleet some technical difficulties were encountered which affected the training programme and created an image of biofuel being “problematic” among many drivers. However, once biodiesel started to be used on a larger scale the image changed to being far more positive.

The lesson learned was the need to create a quality-assurance mechanism and carry out more practical on-the-job trainings.

## MOBILITY PLANNING

**11. Site-level mobility management.** Prior to CIVITAS, Graz already had a mobility management scheme. CIVITAS supported the extension of the scheme for events and the introduction of mobility management at two large companies and several schools.

In relation to events, the importance of pre-trip information was recognised as having huge potential in achieving a more sustainable modal share. This includes an integrated public transport and event ticket, as well as web-based information and access maps.

The so-called quick scan of the company or school premises identified the potential for mobility management activities. The main result in the two participating companies was a decrease in car use by about 15 percent in favour of more sustainable alternatives. In the schools, an increase in safety levels and a reduction of more than 50 percent in car travel was noted. Almost 500 pupils participated in the scheme to collect green miles.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**12. Reducing traffic speeds and car use.** Graz had 30 km/h speed limits on all streets in the city centre apart from a few where cars were still permitted to go at 50 km/h. Within the CIVITAS project, the speed limit on these streets was reviewed and they were incorporated into the 30 km/h network.

In order to enforce the new speed limits, 13 new devices were installed along the roads that showed drivers their current speed. The devices were moved around each month among

130 specially prepared locations in particularly sensitive areas. Some speed control campaigns were carried out by the police in cooperation with children, who used radar guns to measure the speed of passing cars.

The measure resulted in 80 percent of all roads in the city centre belonging to the 30 km/h zone, contributing to a big reduction in accidents and noise levels, and to a better coexistence between cars, pedestrians and cyclists. With the introduction of the zone, the number of accidents fell by 24 percent, meaning that about 250 people per year have been spared injury in traffic accidents.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**13. Dynamic traffic management.** Before CIVITAS, Graz had several traffic control systems operating in parallel, run by different operators and not interlinked. CIVITAS helped in the development of a new, dynamic system that incorporates information from different sources and uses different channels to distribute information.

This measure comprised an online presentation of the current traffic situation, strategic traffic control/management and an acceleration of public transport and information management. Although by the end of the measure not all data sources had been completely integrated, the system was partly in use and results were good.

The results of this measure have to be read together with measure 14. The rerouting or rescheduling of trips reduced congestion and kept traffic flow steadier, thus reducing emissions. Public transport journeys were also made faster, since some buses and most trams were prioritised at 40 percent of the traffic lights.

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**14. Public transport control and guidance system.** With the support of CIVITAS, the operational control centre for public transport and its tools were modernised.

In total, 270 trams and buses were equipped with on-board computers that allow for vehicle location tracking and give controllers a real-time overview of the network. A second, parallel radio system was installed to extend the coverage of the transport management system. More than 104 real-time information panels were set up for passengers at public transport stops. Finally, on-board passenger information was provided in both written and spoken form, improving services for those with hearing or visual impairments.

A lesson learned was that it is better to install the (invisible) control system first, and then, only when this is operative, to start installing the visible signage. Inaccurate or non-operative displays can be hugely damaging to the image of public transport.

## URBAN FREIGHT LOGISTICS

## FLEET MANAGEMENT INCLUDING CLEANER FLEETS

**15. Freight logistics plan for retail.** Prior to CIVITAS, reducing the high number of partially loaded trucks entering the city centre was identified as an answer to the problem of noise, dust, emissions and congestion. CIVITAS helped to develop a business and marketing plan on the basis of data regarding freight amounts and supply patterns and using logistics software.

Two logistics systems were developed. The first involved the reorganisation of the entire distribution system for the largest department store in Graz. Goods were consolidated in a distribution centre outside Graz and efficiently transported in containers to the store. The containers were also used to transport waste material out of Graz. The second project comprised the deployment of electric vehicles for distribution purposes in the narrow streets of the city centre. Partnerships were set up with retailers, the railway company, logistics consultants and the city.

The project led to a significant reduction in trips and emissions. Success factors in implementing green city logistics included an appropriate location for the warehouse, good communication among all partners, incentives such as special delivery times and the use of environmentally friendly transport vehicles or intermodal transport (including trams) to reduce the negative impacts of city centre deliveries.

Beatrice Fotache  
Bd. Stefan cel Mare si Sfânt no. 11  
700064 Iasi  
beatricefotache@yahoo.com  
Tel: +40 72 003 75 66  
Fax: +40 23 221 12 00  
www.primaria-iasi.ro

The city of Iasi, located in the northeast of Romania, is the country's biggest city after Bucharest with 305,000 inhabitants at the time of the CIVITAS project. Iasi is located in a plain area, but the city has a hilly landscape with an altitude varying between 40 and 400 metres. Iasi is the second largest academic centre in Romania with eight universities and about 60,000 students. Iasi did not have a sustainable urban mobility plan during CIVITAS, but planned to elaborate its first in 2014.

CIVITAS Phase: Plus – ARCHIMEDES  
Duration: 2008 – 2012  
Role: Leading city

## CLEAN FUELS AND VEHICLES

## CLEANER FLEETS

**1. Using biomethane in the public bus fleet.** Before CIVITAS, Iasi did not use alternative fuels in its public transport fleet. With the support of CIVITAS, Iasi modified 30 vehicles in the public bus fleet to operate on biomethane; studied emission levels at four strategic locations within the CIVITAS corridor; and promoted the use of biofuels. The innovative aspects of the measure are the use of new technologies to transform the buses and the new physical infrastructure solutions.

Surveys were conducted to assess awareness level and quality of service indicators. The results showed that awareness had increased to 45 percent in 2012 compared to 19 percent in 2009.

As a result, 30 modified vehicles in the bus fleet began operating on biomethane in January 2011. CIVITAS helped the city of Iasi to create a more healthy environment for its citizens, as the CO<sub>2</sub> level decreased in three out of four locations, with a maximum of 14 percent and a minimum of 4 percent.

## COLLECTIVE PASSENGER TRANSPORT

## ACCESSIBILITY

**2. Accessibility for people with disabilities.** Before CIVITAS, there were many shortcomings in the Iasi transport strategy in terms of provisions and accessibility for the visually impaired and disabled. In order to provide easier and safer

access to public transport, the city installed 40 audio warning units for visually impaired people at 16 main signalised intersections in the CIVITAS corridor; transformed 10 minibuses so that they could be accessed by physically disabled people; and made 50 stations and stops accessible to users with disabilities.

Several NGOs, as well as associations for disabled people, were involved in developing this measure.

More than 70 percent of surveyed disabled people said that the improvements allowed them to access public transport services more easily and facilitated their daily trips. Iasi learned how shelters should be designed so as to accommodate people with special needs.

**3. New school bus link.** Before CIVITAS, a lack of transport opportunities excluded certain groups, including children of the Romany community in the district of Iasi. The municipality created a new bus line that ensured that students belonging to the Romany community in the municipality of Ciurea had a good public transport connection to schools and universities in Iasi. This measure was innovative, as it targeted a specific user group (the Romany population).

The measure was conceived as a result of complaints by Ciurea citizens about the existing, privately organised minibus service. Campaigns were held to inform citizens about the new bus line, the frequency of buses, stops along the route, etc.

As a result, the monthly bus journeys made on this new line increased steadily each year from 542,997 in 2009 to 603,330 in 2011. One lesson learned during the implementation of this measure is that the transport capacity has to be adapted to citizens' needs in order to provide quality transport; that the price of tickets should be set according to the distance from the city; and that inside the city the normal fares should apply.

## SERVICE IMPROVEMENTS

**4. Business district shuttle bus.** Private cars with low occupancy rates going to business districts were one of the main contributors to congestion problems in Iasi. Therefore a business district shuttle bus was installed as an efficient way to reduce traffic and to cater for the needs of commuters to two specific companies. The innovative aspect of the measure was a new type of relationship established between companies and the public transport operator.

Surveys were carried out among employees of the two companies involved.

The number of public transport commuters increased from 71 percent in 2009 to 87 percent in 2011, while the percentage of private car commuters dropped from 26 percent to 11 percent. This change in travel behaviour was also revealed by the effective number of cars and carried persons, counted in the companies' parking lots.

## TICKETING AND TARIFFS

**5. Improved ticketing system.** Before CIVITAS, public transport ticketing was not up to modern standards. To increase passenger transport, the city installed 10 ticket vending machines that represented a new and modern technology for Iasi.

After the ticketing machines were installed, the CIVITAS team disseminated information and promotional materials on the benefits of the measure.

A cost-benefit analysis showed that the operating costs decreased by around 90 percent after kiosks were replaced with vending machines, giving the measure a net present value in the fall of 2013 of EUR 409,276. Iasi's lesson learned is that training regarding the maintenance of the vending machines must be very well organised for the greater and faster success of the measure. Apart from an easy-to-use interface — which is a must — trained personnel should show people at the beginning how to use the machines.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Access control to a historical centre.** Before CIVITAS, the historical centre in Iasi was open to all traffic and there was an urgent need to reduce traffic to increase the attractiveness of the area and to make it more people friendly. With the support of CIVITAS, the city restricted day access to emergency services, trams, cyclists and pedestrians. The City Commission of Traffic approved a speed restriction of 30 km/h and a weight restriction of 1.5 tonnes per axle.

Discussions were held with the post office and other companies that have business activities in the area, after which supply activities were prohibited within the time intervals 7 to 9 a.m. and 3 to 5 p.m. (see measure 16).

The percentage of people who considered the historical centre an unattractive place decreased from 75 percent in 2009 to 52 percent in 2012 and acceptance of access restrictions rose from 77 percent to 90 percent. The number of personal cars crossing this area was 92.4 percent lower at peak hours and 91.3 percent lower at off-peak hours in 2012 compared to 2009. Iasi learned that when restrictions are imposed on certain road sectors, the solutions for traffic redirection on adjacent roads must be carefully considered, so that the transition to the new situation is easily accepted by drivers.

**7. Bus priority measures.** Before CIVITAS, no special priority had been granted to public transport in Iasi and road condition communication for public transport was rudimentary, consisting of an antenna with a signal repeater. To reduce the differences in travel time between private cars and public transport, Iasi implemented a "green light corridor" consisting of 15 traffic control units and 54 radar traffic detection units. The city installed priority lanes for public transport vehicles and taxi-cabs.

The public transport company participated in meetings and site visits together with the municipality of Iasi to decide where traffic light priority units should be installed and where a lane would be reserved for public transport services.

As a result of this measure, 45 percent of passengers were satisfied with public transport services (an increase of 9 percent from 2010). The average speed of buses in peak hours improved by 5.93 percent (15.90 km/h) and in off-peak hours by 7.78 percent (19.40 km/h). The city had hoped for an improvement of 10 percent, but this goal could not be reached during the CIVITAS project due to on-going tramway works with an impact on bus operations.

## WALKING AND CYCLING ENHANCEMENTS/SERVICES

**8. City cycle routes.** Before CIVITAS, Iasi suffered from a lack of cycling infrastructure, making it difficult to build a cycling culture. To improve this situation, 11 km of cycling tracks were built. To set a good example, bicycles were used by dignitaries and public service employees. As Iasi did not have any bicycle lanes before, this measure was very innovative.

The measure was supported by a promotional cycling campaign that included maps, guides, brochures, positive bicycle images, events and a substantial and positive presence in the local press.

The number of people considering Iasi a dangerous place to cycle decreased from 78 percent in 2009 to 59 percent in 2012. The daily number of cyclists along a stretch with many facilities increased from 111 in 2011 to 148 in 2012. The measure helped Iasi to reach a modal share for cycling of around 8 percent by the end of the CIVITAS project. The city decided to extend the bicycle route to the entire city, CIVITAS being the starting point of Iasi's project to develop a metropolitan bicycle route network.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**9. Education and promotion programme.** As in many countries, there was a gap in Romania between the general awareness of environmental problems and travellers' recognition of their contribution to these problems. Therefore the CIVITAS partners in Iasi introduced a promotional campaign in the media and on public transport routes to demonstrate the benefits of using ecologically friendly transport modes. The campaign, run by a marketing company, was called "We move the future". It consisted of printed maps, guides, brochures, appearances on radio and television shows, press releases, a campaign website and presentations in schools and universities. The innovative aspect of the measure was the targeting of new user groups.

To increase the chance of successful implementation of the sustainable transport promotion measures, efforts were focused on citizens sensitive to transport issues, such as

students. Iasi worked together with schools and universities to organise the campaigns.

After the promotional campaigns, the percentage of people aware of the benefits of sustainable transport had increased from 26 percent in 2009 to 50 percent in 2012. A lesson was that the campaigns for promoting alternatives to private cars must be organised by a specialised marketing company. This way, you can achieve a planned, robust communication process. Another lesson was that the success of the measure depends on the people that lead the meetings with students.

**10. School travel plans in Iasi.** Before CIVITAS, there had been no campaigns or events at schools or universities to explain to young people the advantages of using sustainable modes of transport or how shifting to such transport can contribute to a cleaner city. Within this measure, meetings were organised to encourage school and university students to reflect on their own transport habits. For a better understanding of students' travel behaviour and of their travel preferences, surveys were carried out and school travel plans were created, each for a different category: elementary schools, secondary schools, high schools and universities.

Meetings with schoolchildren took place within civic education classes at least once a month. Relevant discussions were initiated by teachers and tutors. For higher education students, such meetings were organised by teachers every two months.

In elementary schools trips by private car decreased by 8 percent, in secondary schools by 9 percent, and in high schools by 3 percent. Iasi's lesson learned is that school and university students should be educated regarding the benefits of sustainable transport in such a manner that they draw the right conclusions by themselves, with external interventions having only a coordinating role.

**11. Travel information telephone service.** Before CIVITAS, there was no easy way for passengers to access information on public transport before or during their journey. This was a barrier to using public transport (see measure 15). To tackle this lack of knowledge, a telephone service named "telverde" was set up. This free service gave the caller the optimal travel route, which could include different transport modes for passengers.

Thanks to a parallel communication campaign providing information on public transport including this service, more and more people got to know about the free telephone line.

The telephone service was popular, as can be seen from the numbers of calls: 7,212 in 2010; 6,944 in 2011; and 3,006 in the first half of 2012. The success of the measure depended essentially on the efforts to consult and make people aware of the importance of the issue of sustainable mobility and of the impacts of intensive public transport use.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**12. Public transport user forum.** To improve public transport services, a new web portal was created in Iasi. It gave citizens access to public transport information and at the same

time it provided a forum for user feedback and suggestions. It was innovative because it was the first formal channel for communication and the exchange of information between public transport providers and users in Iasi.

By receiving feedback from customers the public transport company in Iasi was able to make adjustments to the public transport services, improving their quality and reliability.

The average monthly number of visitors to the website increased to 4,747 in 2010; 5,842 in 2011; and 6,235 in 2012. Iasi's lesson learned was that a public transport company must invest not only in infrastructure, but also in creating direct communication links to (potential) passengers.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**13. Bus management system.** Before CIVITAS there were no systems tracking public transport vehicles in Iasi. The implementation of a bus management system was meant to provide a better basis for the monitoring and planning of public transport in order to optimise it and make it more attractive to users. The city installed a GPS tracking system on 64 buses and 36 trams (out of a total fleet of 276 vehicles), and an incident management system for the more efficient handling of accidents and complaints.

The incident management module was integrated with the toll free telephone line (see measure 11).

The measure improved the quality and reliability of the transport services which was reflected in passenger ratings on quality of service (positive ratings went from 26 percent in 2011 to 35 percent in 2012). The cost-benefit analysis has recorded a positive net present value (EUR 6,290,299) because operating costs have decreased, and — mostly because of this measure — service punctuality has improved by 4 percent. Iasi's lessons learned are that the parties involved must work together to solve the problems that may appear; and that separate personnel training sessions should be organised for those who are very accustomed to using computers and for those who use them less often.

**14. Public transport planner in Iasi.** Before CIVITAS, passengers were unable to plan their public transport journeys easily (see also measure 11). With the support of CIVITAS, Iasi created a website with information on public transport in the city and on transport between the city and other destinations in the country. The site was broken down into two main sections: a transport planner that is displayed permanently on the left side of all pages for fast access, together with a map of the transport lines belonging to the public operator. A section with information on transport modes run by different operators is also there.

In 2012, 56 percent of the 200 interviewees had heard about the portal, among whom 70 percent had used it to plan their journeys or to find out information on transport services. The

number of website visits increased from 6,663 in 2010 to 7,034 in 2011.

**15. Video surveillance system in Iasi.** The objective of this measure was to increase the safety of passengers who use public transport in the context of increasing crime.

For this purpose, a video surveillance system (VSS) with 400 cameras was installed in 36 trams and 64 buses. Three video cameras were installed inside each vehicle and one in each driver's cabin (the latter was oriented towards the exterior). The cameras capture images and send them to a video recorder, which stores the content on a hard disk.

A campaign was organised to inform people of the system, increase the feeling of security of potential users, and discourage people from acting improperly or committing crimes.

Passenger ratings on quality of service increased from 10 percent in 2011 to 16 percent in 2012, and showed a slight increase in the respondents' degree of satisfaction with respect to drivers' and ticket inspectors' behaviour towards passengers. The net present value was negative (-EUR 409,276), but some of the advantages of the measure could not be monitored, for instance the sense of security experienced by passengers, the improvement in the quality of public transport services, and the decrease in the number of crimes committed inside public transport vehicles.

## URBAN FREIGHT LOGISTICS

### FLEET MANAGEMENT INCLUDING CLEANER FLEETS

**16. Efficient goods distribution.** The city of Iasi wished to encourage economic growth without increasing traffic and damaging the city's environment. With the support of CIVITAS, Iasi conducted a study for the design of a strategic goods distribution plan, which was then implemented. Based on the results of the extensive study, access control measures were implemented in the historic city centre where supplying activities were prohibited from 7 to 9 a.m. and from 3 to 5 p.m. (see measure 11).

As part of this measure Iasi formed a freight quality partnership with key stakeholders. The municipality of Iasi organised public consultation sessions and debates with business owners.

As a result, the number of goods distribution vehicles decreased during peak hours, from 109 vehicles in 2009, to 41 in 2011 and 33 in 2012. In off-peak hours, the number of goods distribution vehicles increased from 17 in 2009, to 82 in 2011 and 78 in 2012. Levels of NO<sub>2</sub> decreased in all four places where air quality was measured after implementation. Levels of CO decreased in three out of four places. Businesses' reactions to the proposals presented in the goods distribution strategy were positive. After their participation in negotiation meetings, these economic operators agreed to follow the provisions of the freight quality partnership.

Tadas Metelionis  
Kaunas City Transport Division  
Šv. Gertrudos g.7  
Kaunas LT 44290  
tadas.metelionis@kaunas.lt  
Tel: +37 06 860 70 82  
Fax: +37 03 720 00 09  
www.kaunas.lt

Kaunas is the second biggest city in Lithuania with 381,000 inhabitants during the CIVITAS project period (reduced now to nearer 360,000). Kaunas has a relatively young population, with 40,000 students. The city lies in the middle of Lithuania, and sees significant national and international traffic. It is considered the main logistics hub for Lithuania due to its location.

CIVITAS Phase: I – VIVALDI  
Duration: 2002 – 2006  
Role: Learning city

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**1. Optimising public transport timetables.** CIVITAS supported Kaunas in its efforts to improve the public transport system and attract new passengers.

The redevelopment of the public transport system using the PIKAS software can be regarded as innovative and a success. Kaunas was the first city in Lithuania to present coordinated timetables on the public transport website, and it attracted an average of 700 hits per day. Public transport routes were rationalised, resulting in a reduction in the number of minibuses and the deployment of more buses.

The introduction of an integrated ticketing system was combined with 169 new ticket punchers and revised sales procedures. All bus stops were renovated and equipped with information stands. The new system led to an increase in ticket sales by 45 percent for trolleybuses and 8 percent for buses during the project period. The measure had, however, no real impact on car usage.

Tomas Zwolinski  
Os. Zgody 2  
31-949 Krakow  
tomas.zwolinski@um.krakow.pl  
Tel: +48 12 616 87 48  
Fax: +48 12 616 88 01  
www.krakow.pl

Krakow is one of the oldest and largest cities in Poland. The city had almost 800,000 inhabitants at the time of the CIVITAS project and covers an area of 327 km<sup>2</sup>. Krakow is a prominent centre of culture and science and an increasingly popular tourist destination (UNESCO heritage).

CIVITAS Phase: II – CARAVEL  
Duration: 2005 – 2009  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Car pooling at the Technical University.** Car pooling was not known within the university community. CIVITAS helped to launch the “Let’s Ride Together” system after a public inquiry at the university on needs, awareness and transport patterns.

In the first operational year, the scheme attracted 700 users, and between 30 and 50 trips were registered monthly. The proportion of car-pooling trips increased, among employees from 1 percent to 5 percent; among full-time students from 0 percent to 7 percent; and among extramural students from 1 percent to 17 percent. Meanwhile, the parking demand in the university area decreased.

Alongside the success of the car-pooling scheme however, there was a simultaneous reduction in the percentage of public transport use to the university campuses. Three barriers were identified limiting the success of the car-pooling system: doubts about personal safety, unwillingness of many car owners to share their cars with strangers and differences in working hours.

### CAR SHARING

**2. Policy options for car sharing.** As Krakow had no car-sharing system in place, CIVITAS supported a feasibility study to investigate the financial possibilities, potential user groups and possible business models. This study took into account lessons learned from other European cities and the results of the car-pooling scheme developed by the Technical University (see measure 1).

The final document was presented to the city authorities with the recommendation that a car-sharing system should be developed as a new mode of transport for the city and as a test case for Poland.

Although only 11 percent of citizens were familiar with the concept, 46 percent of respondents stated their readiness to participate in a possible scheme once the idea had been explained to them.

## PUBLIC BICYCLES/BICYCLE SHARING

### 3. Introducing the bicycle rental scheme Bike-One.

To boost the popularity of cycling, CIVITAS support was used to trial a bicycle rental scheme integrated with existing public transport stops.

Bike-One was launched with 100 city-owned bicycles and 12 renting stations, supported by private funding. Cyclists had the opportunity to suggest locations for the rental stations. In the five-week trial period, 643 people registered and 204 people actively used the system for over 2,700 bike rentals, despite the cold weather.

Based on this positive trial, the system was relaunched after the winter and four more rental stations and 20 extra bikes were added. Because this initial success suggested a big potential for the system, the city aims to enlarge the system year by year and provide more payment options.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**4. Strategic study on clean public transport fleets in Krakow.** Krakow's public transport operator developed a strategy for fleet renewal and the transition towards clean vehicles. The CIVITAS project allowed for a comprehensive analysis of its economic and operational aspects before implementation.

Hybrid vehicles and those powered by compressed natural gas (CNG) and ethanol were acquired for testing. Krakow concluded that CNG buses can be recommended under three conditions: if the operator has its own filling station with a good capacity, if maintenance facilities for CNG vehicles meet safety and security regulations, and if the terms of the contract with the CNG provider ensure seamless fuel delivery at a good price.

In this case, the best way to transition toward a clean fleet was to replace old-generation vehicles with new diesel vehicles constructed in accordance with Euro V standards. Broad communication about the renewal of the fleet enhanced the overall image of public transport.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**5. Bike on bus: Leisure-related mobility services.** To encourage the citizens of Krakow to cycle more frequently to recreational areas, CIVITAS helped to introduce bike-carrying facilities on 15 selected bus lines in the summer season.

News about the introduction of the leisure-related mobility service was disseminated locally and nationally and attracted great interest from public transport operators in other Polish cities. Several hundred bikes were transported during the season.

In terms of operating costs and revenues, the bike-carrying service had a low impact on the selected bus lines.

**6. Creating a clean, accessible, high-quality public transport corridor.** On the city's inner ring road, many of the on-street bus and tram stops were not safe or comfortable for passengers, especially older people and those with reduced mobility.

With the support of CIVITAS, these stops were reconstructed as combined bus and tram stops and new audio and visual information displays that provided real-time travel information were installed.

A new traffic control system helped to improve traffic flow and speeds within a clean high-quality public transport corridor. Boarding and alighting times were cut by 10 percent. Passengers' perceptions of safety and accessibility improved by 5 percent.

## SERVICE IMPROVEMENTS

**7. Demand-responsive services.** With the support of CIVITAS, Krakow introduced a demand-responsive transport service in three districts, a first for Poland.

TELE-BUS was created by three partners: Krakow's public transport operator operated the service; the Agency for Flexible Services in Genoa helped design the service; and Softeco Sismat, also of Genoa, provided the necessary software. Clients contacted dispatchers by phone using a dedicated, toll-free number.

The new service developed gradually from 300 clients per month to a stable monthly average of around 1,700 by the end of the project period. The network size was doubled due to demand. Cost savings were achieved through cuts in regular bus services.

## TICKETING AND TARIFFS

**8. Integrated ticketing and tariffs.** Prior to the CIVITAS project, there were no integrated tickets for the national railway service and other modes of transport in the city centre. With this pioneering CIVITAS measure, the use of common tickets and tariffs for all transport services was tested.

Due to budget constraints, the pilot application was limited to one transport corridor (Krzyszowice–Krakow). Based on the success of the first trial, achieving a 9 percent market share, it was decided to extend the system to four additional corridors. The trial was then transformed into a commercial service, and all stakeholders (the national railway, local transport operator and Krakow authorities) expressed confidence in the success of the partnership.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

#### 9. Developing an integrated access control strategy.

Thanks to CIVITAS, Krakow was the first city in Poland to implement strict access restrictions in the city centre, based on a three-zone model (A, B and C).

The measure was implemented in combination with an updated parking management scheme. This eliminated 300 on-street parking spaces in an area inside the second ring road and near commercial underground car parks. A detailed project was launched to enforce these new access rules in parallel with a wide consultation process and stakeholder involvement.

Due to delays in large-scale investments in underground car parks and the Krakow Fast Tram, changes to city-centre access were postponed. Acceptance surveys indicated that residents and shopkeepers were not enthusiastic about access restrictions in the absence of modern parking solutions.

**10. Giving priority to public transport.** Prior to CIVITAS, traffic on the city's roads increased year by year. CIVITAS helped to identify new solutions to give greater priority to public transport through dedicated bus and tram corridors and priority traffic signals.

Monitoring in two test corridors proved that the solutions implemented had positive impacts for passengers: there were shorter intervals between services, faster speeds and more reliable operation. As a result, journey times were reduced by 15 to 20 percent on average and passenger numbers rose by 5 to 10 percent on average during the project period.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**11. Sustainable mobility marketing strategy.** CIVITAS supported the development of a marketing strategy to raise awareness of sustainable modes with a variety of initiatives: seminars for specific target groups, new ticket types, competitions for children, and mobility education for schools and companies.

The "Gadgets for Tickets" scheme was the first loyalty programme for public transport in Poland, linking the purchase of public transport tickets to gifts. It proved to be very successful, with more than 1,000 people enjoying prizes during the three-month testing period.

There was public acceptance of the campaign of 90 percent, indicating that infrastructure and service improvements must go hand in hand with marketing and information dissemination.

### MOBILITY PLANNING

**12. Integrated mobility plan for the Technical University.** The Technical University of Krakow was very car oriented. CIVITAS supported an innovative mobility plan based on an intensive survey.

The main outcomes were the appointment of a mobility consultant, a new information website, a cycling policy, a car-parking policy, improvements in accessibility by public transport and the organisation of a series of seminars and workshops.

During the project period, the proportion of trips in single-occupancy cars to the university campuses decreased 45 to 41 percent among employees and 50 to 30 percent among extramural students (in combination with measure 1). The share of bike use doubled among employees travelling to the university and over 1,300 people had visited the Internet database. Finally, 23 new bike racks (about 120 parking places) were installed on the university campuses.

### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**13. Establishing the Mobility Forum.** Krakow's strong political commitment to improving public participation in transport planning was clearly expressed by the creation of the city's Mobility Forum.

Under the presidency of the mayor of Krakow, stakeholders of transport planning processes, including municipality departments, public transport companies, associations of public transport passengers and cyclists, district councillors and shopkeepers' associations, met 10 times on different themes, and the outcomes of discussions were always made public.

Bottlenecks of the Mobility Forum were the insufficient number of meetings to have thorough discussions and the lack of interest from the media. Nevertheless, the Mobility Forum was warmly welcomed by citizens and meetings continue to be organised mainly by the Polish Association of Engineers and Transport Technicians.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**14. Monitoring Centre for Road Safety and Accident Prevention.** CIVITAS supported a study on the establishment of a traffic monitoring centre. The centre was envisioned as a resource and information management facility for high-quality data on road safety, road accidents and potential hotspots for accidents.

Based on this document and some testing, the collection of field data by the police proved to be the most efficient option. Data exchange and the standardisation of data collection processes contributed to a better understanding of the real causes of road accidents. New features and possibilities were introduced, such as the addition of extra categories for describing public transport accidents and collisions.

**15. Public Transport Security Action Plan.** As part of the city's efforts to promote the use of public transport, a security audit was carried out as the basis for developing a safety action plan in the framework of CIVITAS.

An analysis of accidents and interviews with passengers highlighted important elements regarding comfort and perception of safety: more user-friendly bus and tram stops, fewer cars close to public transport stops and better visibility at bus and tram stops.

The image of Krakow's public transport network as safe, economically efficient and environmentally friendly improved, especially among vulnerable groups (in combination with measures 5, 6, 7 and 10).

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**16. Enforcing access restrictions.** Krakow was one of the first cities in Poland to implement access restrictions in inner-city areas but the control system did not prove to be sufficient. With the help of CIVITAS an electronic vehicle recognition system was installed to deter cars from entering the restricted zones.

Following extensive market research and some testing, number plate recognition cameras were installed that are linked to software that detects illegal entries and automatically issues appropriate fines. The number plate recognition technology proved to be effective 80 to 89 percent of the time.

The number of illegal transit trips fell and analysis indicated that the income generated through fines imposed was quickly able to cover the cost of the optical recognition system.

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**17. Creating a travel information platform.** Krakow, together with CIVITAS, improved its existing communication channels by creating a dedicated Internet site with information on public transport services.

Measure implementation included a trip-planning module, information about the environmental impacts of using public transport and the actual traffic conditions.

With further developments in information technology, it is also possible to add new features to the site, based on users' opinions and suggestions, in order to attract more website users and, ultimately, more public transport customers. On average, there were 50,000 users per month during the project period.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**18. Improving goods distribution in the historical city centre.** Goods distribution was causing considerable disruption to the pedestrian and restricted area of Krakow's historical city centre. CIVITAS helped test some possible new distribution systems, including through a feasibility study on goods distribution with clean and energy-efficient vehicles.

A new distribution concept based on the mobility credits system from Genoa was tested as well, taking into account the views of stakeholders such as hauliers, shopkeepers, market square area managers and city logistics experts.

Matthieu Graindorge  
6, rue Saint-Michel BP1287  
17086 La Rochelle  
matthieu.graindorge@agglo-larochelle.fr  
Tel: +33 54 630 36 65  
Fax: +33 54 630 36 59  
www.agglo-larochelle.fr

The city of La Rochelle is situated on the Atlantic coast in western France. The Urban Community of La Rochelle includes the city and its 17 surrounding communes, which had a total population of 160,000 at the time of the CIVITAS project. La Rochelle has a commercial harbour and boasts Europe's largest marina for pleasure boats. With a significant number of small and medium-sized enterprises, La Rochelle's economic dynamism is a strong driver for change.

CIVITAS Phase: II – SUCCESS  
Duration: 2005 – 2009  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Deployment of a new car-sharing fleet including electric and hybrid vehicles.** La Rochelle had implemented an electric car-sharing scheme in 1999. Within CIVITAS, the Urban Community established a long-term public-private partnership with Proxiway (Veolia) for the management of the car-sharing service and two other electromobility services. The service was improved and integrated into the Yelo-branded public transport offer (see measure 10). The measure was innovative, as it was the first contracted management in France on electric and hybrid public transport services.

The car-sharing scheme was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

The improved service and simpler pricing strategy resulted in increased numbers of subscribers to the system and annual fuel savings of 125 litres. The CIVITAS Initiative came at a perfect time locally, when innovative and ambitious measures were necessary to reduce car ownership and to foster a new culture of mobility.

### PUBLIC BICYCLES/BICYCLE SHARING

**2. Developing bike sharing as part of the public transport system.** From 1976, La Rochelle had a bike rental system called vélos jaunes. With CIVITAS support, a bike-sharing system was introduced with 120 bikes, available 24/7 from 12 stations, accessible with the unique public transport

smartcard (see measure 11) and then fully integrated with the public transport system.

The School of Industrial Systems Engineering in La Rochelle helped determine the parameters of the new system. The implementation of a bike-sharing system was not properly defined as an action within the 2000–2010 Sustainable Urban Mobility Plan (SUMP), however an increase in bike trips was one of the objectives and the bike-sharing system contributed to this goal.

Outcomes are estimated at 3,000 to 9,530 car-kilometres avoided, 200 to 650 litres of petrol consumption avoided and 720 to 2,290 kg of CO<sub>2</sub> emissions prevented. The financial support from CIVITAS for equipment and innovative, environmentally friendly solutions had a high leverage effect at local level.

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**3. Introducing biofuel filling stations.** To promote the use of alternative fuels, a biofuel blend of 70 percent diesel and 30 percent rapeseed oil was used in vehicles of the Water Treatment and Waste Management Departments. This was innovative, because according to French law the use of biofuels was illegal, with the exception of specific agricultural purposes (hence the choice of departments for implementation).

The French Institute for Pure Plant Oil was involved in the monitoring of the fuel and vehicles. The measure was not a part of a broader planning or policy framework.

Emission reductions ranged between 5 and 18 percent for CO<sub>2</sub>, and between 34 and 41 percent for hydrocarbons. Fuel consumption rose by between 5 and 6 percent, but not enough to offset the positive impacts. The CIVITAS Initiative provided La Rochelle with an opportunity to experiment with biofuels well before the legal context was adjusted.

**4. Recycling cooking oil for biofuels.** Prior to measure implementation, 50 percent of used cooking oil was thrown away because of high collection costs. With the support of CIVITAS, the Urban Community opened a cooking oil recycling plant, inspired by a study visit to Graz, Austria. This measure was innovative, because according to French law the use of biofuels was illegal, with the exception of specific agricultural purposes.

A survey among 400 restaurant owners laid the basis for the measure. The measure was not a part of a broader planning or policy framework.

A total of 49 restaurants were involved in the collection system. CIVITAS served as an engine for national policy change, as in January 2009, authorisation was given by the French Government for the use of cooking oils as biofuel.

## CLEANER FLEETS

**5. Introducing clean public transport buses.** At the start of the CIVITAS project, local decision makers were willing to go further in the development of clean vehicles. To improve the environmental performance of the bus fleet, 10 new buses equipped for full compliance with enhanced environmentally friendly vehicle (EEV) standards were purchased. At the time, these were the strictest standards regarding environmental requirements at the European level.

The introduction of the clean buses was communicated to the public through the buses' livery. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000, although implementation was originally only planned for 2010.

Fuel consumption fell by 2.12 percent and polluting emissions by 65 percent. The financial support from CIVITAS for equipment and innovative, environmentally friendly solutions had a high leverage effect at local level.

## HYBRID, CLEAN AND ELECTRIC VEHICLES

**6. Developing clean collective transport.** As early as 1985, the Urban Community of La Rochelle introduced biodiesel in the public transport fleet and in 2003 it tested three electric minibuses, with unsatisfactory outcomes. With the support of CIVITAS, the city rented and tested two diesel-electric hybrid low-floor minibuses to ferry commuters between a park-and-ride facility and the city centre. This measure tested the impacts of the nascent hybrid technology regarding emissions of pollutants and energy consumption.

The city's School of Industrial Systems Engineering contributed to the extensive study of hybrid technology preceding the measure. The introduction of clean vehicles was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

Results were disappointing in terms of reliability, maintenance requirements and environmental performance. The CIVITAS efforts, however, did reveal the public's interest in and support for clean urban public transport.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**7. Better infrastructure for public transport.** In its urban mobility plan in 2000, La Rochelle put the accessibility issue on the agenda for the first time and gradually initiated a few improvements on the public transport network. Within CIVITAS, the La Rochelle Urban Community decided to define and adopt a long-term strategy aimed at enhancing, diversifying and coordinating its actions on accessibility in public transport, and at the same time comply with the French law on equal rights for persons with disabilities. Innovative equipment was installed and tested to increase the quality of public transport service. This included a visual aid system and audible announcements of real-time information in buses and at bus stops.

La Rochelle's Accessibility Scheme was elaborated with the strong involvement of associations dealing with people with special needs and adopted in 2006 by all the stakeholders. All actions implemented in the field of accessibility were validated following an in-depth consultation process with the associations. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

A total of 107 bus stops were made fully accessible and over 60 percent of buses in the city's fleet complied with accessibility standards by the end of 2008. Strong political support and effective consultation with all stakeholders were the main drivers for change in La Rochelle.

**8. Expanding the bike-bus scheme.** Since 1999, two bike-buses — articulated buses with a compartment for passengers and one for bicycles — had been running in the summer to take cyclists out of the city centre. Because of its success among inhabitants and tourists, bus frequency was increased and two new vehicles were deployed with a new design.

No citizens or other stakeholders were involved in the measure. The initiative was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

The number of bike-bus trips rose by 32 percent and virtually all users were satisfied with the service. By organising multimodality, the CIVITAS efforts marked a major step forward in La Rochelle's sustainable mobility-oriented services.

## INTERMODALITY

**9. New park-and-ride facilities.** The city's first park-and-ride (P&R) facility had proved successful in reducing the number of cars entering the city centre. Therefore, a second facility for commuters was built with a bike-sharing station, a collective taxi service, an information desk, a video security system and facilities for people with reduced mobility. For La Rochelle, the innovative aspects of the measure were the encouragement of multimodality and the use of new technology to make the P&R facilities accessible through the regular transport smartcard (see measure 13).

Through business travel plans (see measure 18), workplaces were involved in the measure. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

Within the CIVITAS timeframe the number of subscribers remained low (10), but after extending the measure in 2009, the service had 100,000 entries per year. By organising multimodality, the CIVITAS efforts marked a major step forward in La Rochelle's sustainable mobility-oriented services.

**10. Reorganisation of the bus network.** Prior to measure implementation the public transport system was unable to achieve a balance between supply and demand. The public transport network was thoroughly reorganised (see measure 16) and a new branding concept, Yélo, was developed with the aim of achieving complete multimodality. Branding of the complete transport offer was a novelty in La Rochelle.

Studies and negotiations were undertaken in cooperation with the county administration, public transport operators and the 18 local governments within the Urban Community of La Rochelle. The measure was not part of a broader planning or policy framework.

The Yélo brand has successfully created a new image for the multimodal offer of the city's public transport service. Quantifiable evaluation results were not obtained within the CIVITAS demonstration timeframe. CIVITAS allowed La Rochelle to move from a mobility policy based on independent alternatives to the private car towards a coherent offer of public transport modes.

## TICKETING AND TARIFFS

**11. Developing the smartcard system for various mobility services.** Season ticket holders in La Rochelle were previously obliged to go to the central bus station to renew their passes. With the support of CIVITAS, smartcard holders were given the opportunity to renew their season tickets via the Internet. New technology was used to make remote management of subscriptions possible and to make other mobility services accessible through the public transport smartcard. These included park-and-ride services and sea boats, with bike and car sharing considered for the future.

A small sample of public transport users was recruited to test the new system, and after the launch the public was informed through a huge promotion campaign on buses and at bus stops and selling points. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

A survey showed over 80 percent satisfaction with the new e-ticketing system. La Rochelle learned that smartcard ticketing, though technically complex, time-consuming and costly, is an efficient tool for operators and transport authorities to deal with complex tariff structures and the multiplicity of operators and services on a territory.

**12. Further integration of the ticketing system.** In the research phase for introducing a new, simplified public transport pricing structure (see measure 13), the Urban Community of La Rochelle identified the importance of having a dedicated ticket for each user category. That is why La Rochelle introduced the Pass Rochelais for tourists and a personalised smartcard for the 4,000 schoolchildren who had previously used standard magnetic tickets or personalised cards. The Pass Rochelais was quite innovative as it combined transport and tourism services, including unlimited public transport trips and discounted prices for museums and other city attractions.

For the development and implementation of the Pass Rochelais, a strong partnership brought together various stakeholders interested in encouraging the use of public transport and increasing patronage of cultural and leisure sites. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

As a result of this measure, the number of passengers using public transport increased and the number of visitors to the

main tourist sites increased. A survey showed 87 percent of Pass Rochelais users were very satisfied with the service. CIVITAS served as an engine for behaviour change in La Rochelle, as 63 percent of surveyed tourists said that they used their cars less thanks to the pass.

**13. Strategies for an integrated tariff system for public transport.** Before CIVITAS, there was a confusing range of prices for public transport in La Rochelle, with more than 80 ticket types available. Within CIVITAS, the Urban Community of La Rochelle conducted a complete analysis of the current pricing system, together with a comparison with other French and European cities, on the basis of which a new pricing offer could be proposed. The measure also led to the introduction of e-ticketing.

The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

The measure resulted in a simplified multimodal ticket structure with a dedicated ticket for each user category, for example the Pass Rochelais for tourists and smartcards for students (see measures 12 and 19). By making public transport more coherent, the CIVITAS efforts marked a major step forward in La Rochelle's sustainable mobility-oriented services.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**14. Access controls for tourist coaches.** La Rochelle experienced a lot of traffic congestion and pollution from tourist coaches crossing the city centre. With the support of CIVITAS, the city provided information on recommended routes, drop-off zones, parking possibilities and connections with public transport among coach drivers, tour operators, travel agencies and on the tourist office's website. This was innovative, as it involved new technology to provide real-time guidance to coach drivers through GPS.

The information given was based on consultations with coach drivers. The measure was not part of a broader planning or policy framework.

Ninety-two percent of surveyed coach drivers considered the brochure to be useful and all welcomed the possibility to download GPS references for recommended routes and parking areas. This CIVITAS measure provided the opportunity to start building a consensus as a basis for strong measures in the future.

**15. Extension of access control zones.** In 1971, a number of streets in the city centre were pedestrianised, with access restricted to inhabitants and delivery vehicles. At the request of city residents, it was decided to extend access controls to three other zones in the city. The measure involved some new technology, with the installation of rising bollards that are automatically retracted when a bus approaches and that can be operated from a central control room.

From the inception of the measure, residents and local professionals were informed and consulted in order to take into account their opinions and expectations. The measure was part of the city's walking strategy.

Perceptions of safety among cyclists and pedestrians improved, bus travel times were reduced and the zones became cleaner and less noisy. La Rochelle learned that strong political willingness is necessary when implementing access control zones, as it may be difficult to reach a consensus among the different stakeholders.

**16. Introducing dedicated bus lanes.** Particularly in the east part of La Rochelle, buses were often delayed due to having to share road space with cars. With CIVITAS support, additional bus lanes were created at traffic hotspots in the Urban Community to optimise bus times and ensure service reliability. An innovative feature of the measure was the implementation of rising bollards that retracted automatically when a bus approached the city's access control zones (see measure 15).

Many stakeholders were involved in the measure, including the hospital that sold some of its properties for the construction of the bus lane. Others involved included cyclists' associations, taxi associations and local businesses. The measure was a part of the general restructuring of the city's bus network (see measure 10).

The number of passengers increased, and travel times and service reliability improved. Unfortunately, traffic jams remained a problem in the shopping district. CIVITAS offered the necessary means to improve the image of the public transport system.

## WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**17. High-quality cycling route.** In 2002, the Urban Community of La Rochelle had set itself the target of connecting the northern and southern parts of its territory with a cycle path. The CIVITAS measure was concentrated on the northern part and entailed the construction of a continuous, secure and eco-friendly cycle path for commuting and leisure activities, while also improving signage and producing a cycle-lane map. The measure introduced new infrastructure solutions, in both the dense urban environment and rural areas.

The route of the cycle path was discussed with the regional authority, municipality representatives, local cycling associations and residents. The measure was part of a strategic plan on cycling in the urban community.

After a year, 26 percent of interviewed cyclists claimed that they had changed their principal mode of travel after the cycle path was opened. The financial support from CIVITAS for equipment and innovative, environmentally friendly solutions had a high leverage effect at local level.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**18. Business travel planning.** The travel planning approach was launched in 2004, as 70 percent of people working in La Rochelle used their own car to travel to work on a daily basis. La Rochelle decided to extend the measure to the entire city centre and supplement it with car sharing and car pooling, a new home-to-work travel pass and a late-night public transport service.

The Urban Community of La Rochelle forged a new partnership with the local business community to promote alternative modes of transport via thematic workshops held during European Mobility Week. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

Registered car-pool trips increased from 200 to 1,816 in two years, while use of the home-to-work travel pass increased and 86 percent of public transport users expressed satisfaction with their principal mode of transport. Strong political support and effective consultation with all stakeholders were the main drivers for change in La Rochelle.

**19. Developing a student travel plan.** A study carried out in 2003 concluded that the majority of students would be ready to change their mobility behaviour in the interest of environmental protection. This CIVITAS measure introduced a new transport smartcard for students. New technology was used to give students access to buses, coaches, the bike-sharing scheme, shuttle boats and park-and-ride facilities with a single smartcard (see also measure 13).

An agreement was made between La Rochelle Urban Community, the university and high schools, transport operators, the student social support service and the youth information centre, while students were asked to promote the offer by acting as "mobility ambassadors".

As such, the measure was not part of a wider policy or planning framework.

A total of 1,377 students purchased the pass, but the measure was more effective among students without easy access to a private car for daily travel. Enrolling students to promote mobility solutions to their peers was efficient, as they could find the most appropriate approaches for convincing their peers and create a snowball effect among students by setting a good example.

**20. Developing integrated transport management systems.** To make public transport easier for travellers, the Urban Community developed integrated transport management systems for coordinating and synchronising multiple transport modes with multiple operators. The measure was innovative, as it included the development of a prototype software system that would allow managers to simulate the consequences of their decisions on transport system evolution.

A working group involving all actors and transport operators, as well as service users, determined the various improvements

needed. The measure was not part of a broader policy or planning framework.

The measure resulted in standards for the procurement, development and implementation of software systems; recommendations for the procurement of hardware and equipment; and a decision support tool to help transport authorities to optimise the effectiveness and operational quality of their activities. In La Rochelle, CIVITAS helped to optimise the global coordination of the transport system.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)–BASED ENHANCEMENT OF PUBLIC TRANSPORT

**21. Creating a public transport database.** Faced with the challenge of rising volumes of traffic and a corresponding deterioration in air quality, the measure focused on the collection and processing of transport data in the larger La Rochelle area in order to optimise public transport management.

Rapid access to precise and reliable data was made available to the local authorities, facilitating decision making with respect to the bus network.

**22. Providing real-time information using SMS and electronic information panels.** Prior to the CIVITAS measure, the only information available to public transport passengers was in the form of printed timetables, and GPS location of buses was used only for operational management purposes. With the support of CIVITAS, this information was used to feed an electronic information panel at the central bus station and 36 bus stops and an SMS information service.

For the location of the real-time information terminals and their integration in urban space, the Urban Community of La Rochelle consulted district committees and the national architectural heritage association Architectes des Bâtiments de France. Part of the measure was envisioned in the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

In the first half year, 1,200 text messages on bus waiting times were sent and more than one in three passengers were aware of the service. By improving public transport services, the CIVITAS efforts marked a major step forward in La Rochelle's sustainable mobility-oriented services.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**23. Partnerships with logistics providers.** Before measure implementation, the ELCIDIS platform (see measure 24) concerned only carriers and all other transported goods were not taken into account. This CIVITAS measure aimed to motivate all traders to use the goods distribution system and encourage small and medium-sized enterprises and private

goods carriers to invest in clean vehicles. It also aimed to make specific arrangements with distributors regarding the use of clean vehicles and delivery hours.

As soon as the new ELCIDIS was made operational, past stakeholders who had stopped their cooperation were contacted in order to identify their requirements. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

As a result, cooperation was fostered between logistics operators, and the use of clean vehicles for goods distribution increased. The main lesson learned was that a global approach to urban freight and its integration into a global organisation of transport in the city are necessary. An overall strategy pulls together the various component activities and provides a clear direction for measure implementation work.

**24. Strategic extension of the ELCIDIS platform for city logistics.** After a three-year trial, La Rochelle decided to improve the efficiency of the existing ELCIDIS platform for goods distribution with electric vehicles. The CIVITAS measure aimed to enlarge the area of the city covered by the logistics system, diversify the activities realised in the hub, and promote the use of clean vehicles. The operational tasks were outsourced to a private company in a public-private partnership that was the first of its type in France.

The first activity was a detailed analysis of the requirements and attitudes of stakeholders, including freight carriers. In the course of this measure, a strategic goods distribution plan was drawn up for the city. The measure was part of the sustainable urban mobility plan that La Rochelle adopted in 2000 for a 10-year period.

Outcomes were increased efficiency, increased security, reduced emissions and the involvement of all partners in the search for solutions. CIVITAS served as a catalyst to overcome some severe barriers to the survival of the ELCIDIS hub that remained at the end of the trial project.

Yannick Jacob  
1 rue du Ballon BP n° 749  
59034 Lille Cedex  
yjacob@lillemetropole.fr  
Tel: +33 32 021 24 67  
www.lillemetropole.fr

Lille Métropole in northern France comprises the city of Lille along with Roubaix, Tourcoing and other suburban communities and had a total population of 1.2 million at the time of the CIVITAS project. The city had a major mechanical and textile industry in the past but it has become a distribution base for central northern Europe, given its location at a major international crossroads for road and rail transport.

CIVITAS Phase: I – TRENDSETTER  
Duration: 2002 – 2006  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Creating a clean municipal fleet with electric and compressed natural gas vehicles.** To tackle poor air quality and noise pollution from traffic, Lille Métropole decided to privilege clean vehicles in its fleet.

CIVITAS made it possible to accelerate the purchase of 34 electric and 157 (tuned) compressed natural gas (CNG) vehicles, as well as the installation of the needed infrastructure (see also measure 2).

Because most of the vehicles were shared among several drivers, a strict management of the needed recharging of batteries was necessary to minimise replacement of batteries and engines.

**2. Introducing biogas buses into the public transport fleet.** After a testing period (see measure 3) Lille Métropole decided to introduce biogas buses to its fleet.

CIVITAS supported this pioneering measure and by the end of 2005, 50 percent of the fleet consisted of biogas/natural gas buses. The supply of fuel was provided by a unique dual CNG and biogas compression station built adjacent to the organic recovery centre and bus depot.

Lille Métropole demonstrated in this way the technical, environmental and economic feasibility of fleet conversion on a large scale.

## CLEAN FUELS AND FUELLING INFRASTRUCTURE

**3. Creation of Europe's biggest biogas plant.** Before CIVITAS, biogas was already being produced at a local sewage treatment plant.

CIVITAS helped realise a new biogas plant, the biggest in Europe at that time. It opened in 2007 and delivered enough upgraded compressed natural gas to fuel 100 urban buses and 10 waste collection trucks a year, saving 4.5 million litres of diesel annually.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**4. Creating park-and-ride facilities.** In line with the objectives of the region's Urban Mobility Plan of 2000, CIVITAS supported the creation of a network of park-and-ride facilities.

A total of five new car/bicycle parking facilities were opened, with around 1,100 spaces, at various intermodal interchanges throughout Lille Métropole. Fewer cars entered the city centre, and more people used public transport.

Measurements showed an increase to approximately 75 percent capacity in those facilities connected to the metro. An important lesson learned was the need for strong political commitment as there was strong opposition from shops and residents against car restrictions in the city centre.

**5. Intermodal local and regional interchanges.** In order to improve its modal split, Lille Métropole wished to create better intermodal nodes.

Two intermodal exchange points were developed during the CIVITAS project. Implementation studies were carried out for the improvement of five other intermodal interchanges but construction did not start during the project period.

The high number of stakeholders, the complex administrative procedures and problems with property and land transfer caused major delays. Two intermodal exchange points were opened after the CIVITAS period, in the cities of Armentières and Don Sainghin.

### TICKETING AND TARIFFS

**6. Smartcard systems and integrated ticketing.** To boost the use of public transport, the fare strategies of the different modes of public transport in Lille Métropole needed to be integrated. Measures 4 and 5 shared this objective.

Supported by CIVITAS and based on Stockholm's experience, an implementation study identified all the technical, legal and financial challenges. The smartcard implementation was successful: the modal share of public transport rose from 7.5 percent in 1998 to 9.2 percent in 2003.

Cooperation among the various actors during the design phase appeared to be just as important as the technical aspects of the project.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**7. High-level service bus routes.** To counter the frequent delays and disruptions of its buses, Lille Métropole decided to design high-level service bus routes with the help of CIVITAS.

During the CIVITAS period, one high-level service lane was set up. Detailed implementation studies were carried out for three more and 12 were foreseen in the long term, resulting in a total network of 60 km. The first shuttle operated with CNG-powered buses running partly against the main traffic flow. It connected three park-and-ride facilities.

During the start-up phase in which service was free of charge, CITADINE transported 14,000 passengers daily. After fares were introduced for the park-and-ride facilities in 2005, the number of passengers averaged 12,000 per day.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**8. Company mobility planning.** In the framework of CIVITAS and in accordance with its Urban Mobility Plan, the Lille Métropole Authority (LMCU) took a leading role by implementing its own company mobility plan in 2002.

This resulted in the purchase of four electric scooters and 23 bicycles for commuting, the introduction of a car-sharing scheme and some financial incentives such as subsidised usage of park-and-ride facilities.

By December 2004, some 244 LMCU employees spent a total of EUR 6,500 to get subsidised public transport passes. New behaviour was encouraged, and the use of bicycles rose. The car-sharing scheme drew less interest due to the pronounced modal shift towards public transport.

**9. Micro-level urban mobility planning.** Micro-level urban mobility planning concerns the local implementation of the Urban Mobility Plan (or UMP). This CIVITAS measure worked on a pilot micro UMP for the Weppes area, in order to identify a methodology to ensure the smooth implementation of complex political and administrative decisions.

After a diagnostic audit, an orientation phase highlighted objectives and solutions were agreed. The third phase involved the proposal of operational improvements, priorities and applicable timeframes.

A micro mobility plan for the Weppes area was produced and served as an example for other areas in the Lille Métropole.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**10. Improving public transport security using technological tools.** More rapid interventions and improved cooperation between public transport operators and the police seemed to be needed to enhance the quality of public transport services.

CIVITAS helped realise the installation of a GPS radio contact system in the transport operator's emergency vehicles as well as GPS location equipment on public transport vehicles. This equipment permitted the emergency services to intervene earlier and make real-time information available to passengers. Staff levels were increased on all public transport vehicles and surveillance cameras were installed.

Almost 90 percent of surveyed passengers found this approach effective in ensuring security and preventing vandalism. The majority of passengers appreciated the presence of staff in uniform.

Vita Kontic  
Adamič-Lundrovo nabrežje 2  
1000 Ljubljana  
Tel: +38 61 306 10 95  
Fax: +38 61 306 10 21  
www.civitasljubljana.si

With 275,000 inhabitants at the time of the CIVITAS project and a surface area of 271.67 km<sup>2</sup>, the Slovenian capital Ljubljana is among the smallest European capital cities. Ljubljana is a national and regional centre for culture, trade and science where Western and Central Europe intersect and mix with Balkan and Mediterranean influences. It is home to a university with over 47,000 students. Ljubljana residents are quite car dependent and the city absorbs 130,000 incoming cars every day. Even so, Ljubljana has made significant strides toward sustainable mobility, including by modernising its public transport fleet and services, expanding pedestrian zones and improving cycling conditions. The city aims for a modal split of one-third walking and cycling, one-third public transport and one-third "smart use" of cars by 2020.

CIVITAS Phase: II – MOBILIS

Duration: 2005 – 2009

Measures: 3, 12, 15

Role: Learning city

CIVITAS Phase: Plus – ELAN

Duration: 2008 – 2012

Measures: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11,  
13, 14, 16, 17, 18, 19, 20, 21

Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### PUBLIC BICYCLES/BICYCLE SHARING

**1. Comprehensive cycling strategy.** One of the most innovative achievements of CIVITAS in Ljubljana was the development of a comprehensive cycling strategy. It defined quality conditions for the city's cycling network and addressed safety issues and accessibility, granting priority to cyclists. It included information about the city's cycling vision and aimed to link cycling paths, improve bike-parking facilities and intensify cycling promotion. The city also established a public bike-sharing system called Bicike (LJ) with 300 bicycles available at 31 terminals. The city hired a cycling coordinator and developed an interactive and regularly updated cycling map with information on bicycle infrastructure, Bicike (LJ) terminals, bicycle racks, services and potentially dangerous spots.

The cycling strategy was defined after an intense citizens' engagement process and innovative promotion campaigns. Afterwards, the strategy was included in the Transport Policy

until 2020, which was adopted by the city council in September 2012.

The bike-sharing system was a success, surpassing expectations. It was replicated in other Slovenian cities. Thanks to CIVITAS, the cycling rate in Ljubljana increased by 20 percent, based on the number of journeys. The input from citizens during the planning process showed that safety is the biggest influence on people's decision to get on their bike to get around the city.

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**2. Pure plant oil for vehicle propulsion.** Before Ljubljana's second CIVITAS project, pure plant oil (PPO) was not used locally for vehicle propulsion. The measure involved a pilot project for testing PPO in a laboratory setting and in real conditions in three vehicles: a car and two tractors. The use of 100 percent PPO was innovative not only at the local level, but also at the national level.

Through strengthened cooperation among biofuel producers, research institutions, students and other stakeholders, Ljubljana aimed to create a network around applicative research and measure implementation.

The use of PPO proved to be economically viable, the expected problems in maintenance did not occur, and pollutant emission levels were the same or even lower in comparison to diesel or 100 percent biodiesel (see measure 3). Ljubljana's lesson learned is that initiating dialogue with and persuading the authorities is more important than technical issues within the measure for the wider acceptance of PPO as fuel for vehicles.

### CLEANER FLEETS

**3. Hybrid and compressed natural gas buses.** The first experiment with compressed natural gas (CNG) buses in Ljubljana took place in 1994, but there was no possibility to build the necessary infrastructure and use it at that time. CIVITAS helped Ljubljana's public transport operator (LPP) to modernise its fleet and — after tests in different types of vehicles — replace its old, most-polluting vehicles with five hybrid buses and 20 CNG buses. The new buses featured state-of-the-art technology and were in compliance with the Euro V environmental standard.

A first CNG filling station was built in Ljubljana by the investors Energetika Ljubljana and Geoplin.

Thanks to the newer technology (Euro V compliant) and lower fuel consumption, the hybrid and CNG buses produced only 88 and 32 percent of the external costs of Euro III diesel buses. Although the hybrid buses exceeded the environmental and fuel consumption targets, they had only about two-thirds of the passenger capacity, so the initial investment cost would not be compensated during the buses' lifetime (up to 20 years). Therefore, the CNG buses with lower emissions and lower fuel price appeared to be a better choice. The measure's good

results motivated the public transport operator to add further CNG buses to its fleet after the CIVITAS project. The measure showed that the CNG bus technology has a potential to be replicated in other Slovenian cities.

**4. Implementation and large-scale deployment of bio-diesel and CNG fleets in Ljubljana.** Generally, there was little use of alternative fuels in transport in Slovenia before 2005. The only use of biofuels was a 5 percent blend of biodiesel added to mineral diesel (D2). Within the city's first CIVITAS project, a 100 percent biodiesel blend (B100) was tested in two public buses and then used in a further 18 buses. The large-scale production of B100 was optimised, 18 different sorts of rapeseed oil were tested and equipment for decentralised production of B100 at small farms was developed.

During the project, a discussion on biofuel use was initiated with the professional community, decision makers and the public.

The quality of the produced B100 was optimised, but it did not meet all quality standards defined by EU regulations (EN 14214). Although emissions of all pollutants except NO<sub>x</sub> were lower than in D2 buses, the public transport operator chose not to use B100 on another 80 buses. The costs for preparation and maintenance of the B100 buses were higher than expected (doubled frequency of servicing) and fuel consumption increased by 10 percent. Meanwhile there was no real difference in price between B100 and D2, and performance was lower at temperatures below -7°C. There were many lessons learned on how measures could be better implemented and a strong awareness was gained about the need to implement measures that are sustainable under diverse conditions.

**5. Sustainable Electromobility Plan.** At the start of Ljubljana's second CIVITAS project, the municipal administration believed that electric vehicles were ideal for city use, but also that a passive approach to the widespread introduction of electric vehicles would be risky. Therefore the city decided to elaborate and adopt a sustainable electromobility plan (SEP) that explains the advantages of electric mobility, highlights the links between electric vehicles and supporting infrastructure, and puts forward strategic starting points and proposals for the fast, safe and organised adoption of electric mobility. With this plan Ljubljana became the first city in the country and one of the first among the new EU member states with a municipal plan for electric mobility.

The draft plan was discussed in July 2012 at a workshop organised to collect public responses. In May 2013, the city council accepted the plan as part of the city's strategy for better quality of life.

The successfully implemented measures, based on the SEP, aimed to increase the number of electric vehicles on city streets and thereby reduce the negative impacts of transport on quality of life. Being the first of its kind in Slovenia, the Sustainable Electromobility Plan paved a path for the introduction of national standards. Training sessions for Slovenian municipalities have revealed great interest and possibilities for the exploitation, upscaling and transferability of Ljubljana's SEP.

## HYBRID, CLEAN AND ELECTRIC VEHICLES

**6. Green procurement for cleaner public fleets.** At the start of Ljubljana's second CIVITAS project, there were no hybrid vehicles in the public vehicle fleet. To create a clean and energy-efficient image for the city and to promote the use of hybrid vehicles, Ljubljana included reduced fuel consumption and energy efficiency as award criteria in public procurement. In 2009, Ljubljana renewed the entire city fleet: old cars were replaced by new vehicles, including six rental hybrid cars representing roughly 10 percent of the city's entire car fleet. The city purchased 50 bicycles for use by the city administration and city traffic wardens for work trips.

In the framework of the measure, employees of the city administration received eco-driving training.

Results were good in terms of fuel consumption and emissions of CO<sub>2</sub> and noise. The leasing costs of hybrids were high, but this did not outweigh the positive effect of lower environmental impacts. Interestingly, the eco-driving course proved that the biggest potential for lowering fuel consumption is related to driving habits.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**7. Demand-responsive services.** Before Ljubljana's second CIVITAS project, travellers with cognitive disorders could get transport help only if they belonged to special associations in the city. There was a lack of accessible transport for non-members and visitors to Ljubljana. To address this need, the city set up a demand-responsive public transport service for people with cognitive disorders. To start, an application was developed and distributed to identify public transport lines where special services were needed. The process helped inform bus drivers about the plans to serve these passengers with public transport. Additionally, the public transport operator (LPP) introduced a novel service (perhaps the first of its kind in the world) in which passengers with Down Syndrome and autism could use buses on their own.

LPP developed the system for passengers with Down Syndrome and autism in cooperation with an educational institution for youngsters with cognitive disorders called Janez Levec. Thanks to the involvement of relevant associations, the measure was implemented differently than planned and consisted of a service with two additional vehicles, operated by LPP.

Before the full implementation of the demand-responsive service, in January 2012, 17 customers were using the public transport service, while only three were registered in the system. After the full implementation and operation of the software tool in August 2012, all 17 users were registered. It has been noted that additional passengers not registered for the service have taken advantage of the system's features. The main lesson learned from the measure was about the importance of involving the target group from the earliest stage of planning.

## TICKETING AND TARIFFS

**8. E-ticketing and public transport portal.** Before Ljubljana's second CIVITAS project, differences in timetables, fares and services of different providers had made the public transport system difficult to understand. With the support of CIVITAS, Ljubljana introduced a system enabling passengers to plan journeys online and travel with a single ticket on all transport modes. An integrated city card "Urbana" was introduced as a payment tool and later as a ticket covering the entire city, and, in the last phase, the region. Based on electronic ticketing technology, passengers can purchase tickets via mobile phone among other channels. The city created a common website using Google Transit that offers travel information for the entire public transport network in the city and enables route planning in Ljubljana.

Ljubljana's public transport operator (LPP) and Slovenian Railways (SZ) jointly prepared timetable and station position data for the Google Transit portal.

Regular public transport users in Ljubljana's suburbs welcomed ticketing integration between two bus service providers. It attracted an average of 34,000 users per month, with the number climbing by 600 per month. Sales and topping up of Urbana contactless cards were below expectations, although the numbers went up 20 percent from 2,167,623 in 2010 to 2,602,411 in 2012. The Ministry of Transportation viewed this measure as a national pilot project. As the *Measure Directory* was going to press, the ministry was in the process of defining the Slovenian fare integration standardisation guidance system.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**9. Sustainable congestion charging.** In Ljubljana, congestion was worst during peak hours (7–9 a.m. and 3–5 p.m.), especially at the highway exits to main roads into the city centre and in the city centre itself. Ljubljana used knowledge and experience from other countries to explore the potential of road pricing as a last-ditch means to reduce traffic. After studying different options, the city proposed the introduction of a vignette for the urban area within the highway ring; it would complement the introduction of vignettes on the ring road. As a contingency, the city also considered a workplace tariff charged to employers offering free parking places for their employees within the same area.

A constructive dialogue on the potential congestion involved stakeholders at the local, regional and national levels, including citizens. The proposal developed in the CIVITAS measure was incorporated in the city's Transport Policy until 2020, adopted by the city council in September 2012.

A formal agreement and proposal was prepared at the end of the project. Planners predicted the charging scheme and other related measures would result in a 15 percent decrease in private car traffic. Although the scheme has not been implemented, the city considers it a realistic option considering people's reluctance to change travel habits and

the requirements of EU directives on particulates, air quality and noise.

**10. Sustainable freight logistics.** To promote sustainable freight logistics, the city of Ljubljana conducted research on goods flows in the CIVITAS demonstration area and developed relevant measures. Planners also developed a computer model to simulate efficient distribution of goods and test the benefits of consolidated deliveries. A national web portal was created ([www.dostave.si](http://www.dostave.si)) with an interactive map to support delivery companies in finding optimal routes in the city centre.

The content and features of the web portal were based on cooperation between city authorities, transport companies and local businesses. The city organised several events for measure promotion, including a three-day training course for efficient freight delivery and a national conference on sustainable freight delivery in Ljubljana.

Traffic modelling research showed that in the simulated area, emissions could be reduced by up to 20 percent.

Stakeholders appeared keen to take up consolidated deliveries (67.5–100 percent acceptance), but the response rate was low. The number of web portal visitors per month increased significantly after its launch — from 1,230 visits in March 2012 to over 4,000 visits in August 2012. This measure demonstrated that simulation models, if designed properly, can be useful tools for assessing the impact of planned projects or developments. The model results also provided an important foundation for future discussions regarding the actual implementation of the consolidation scheme in the city centre.

### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**11. Integrated high-quality mobility corridor.** Before Ljubljana's second CIVITAS project, the main arterial roads inside the motorway ring leading into Ljubljana's city centre were heavily congested. Therefore Ljubljana created a high-quality mobility corridor that connects the northern and southern parts of the city through the city centre and towards neighbouring municipalities. The features of this corridor included: 1) a new park-and-ride (P&R) facility with 1,220 parking places on the northern side of the corridor; 2) the preparation of the P&R system on the southern side; 3) extended bus lanes from Slovenska Road to both sides of the corridor crossing the city centre; and 4) closing the corridor's central section to all motorised traffic except for public transport.

At the end of the CIVITAS project, similar measures for other main corridors in Ljubljana were included in the city's Transport Policy until 2020, adopted by the city council in September 2012.

Even though the corridor was not entirely implemented during the project period, the process of implementation and the related political discussions helped Ljubljana to realise a shift in ideology towards increased support for sustainable modes of transport. This new thinking is reflected in the Transport Policy until 2020.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**12. Individualised mobility marketing.** As public acceptance of transport policy is of crucial importance, the city wanted to enhance public participation in the policy process. With the support of CIVITAS, the area of the CIVITAS corridor was analysed through public opinion surveys, and a process of individualised mobility marketing was set up based on citizen involvement in setting transport policy. A brochure called "Mobile Ljubljana" with comprehensive information on sustainable mobility was sent to households and distributed at mobility info-points established during the previous CIVITAS project (see measure 13).

At least 50 meetings were held over four years with local partners. Thanks to the individualised mobility marketing campaign more than 2,600 people were involved, with 600 included in a special deep communication strategy procedure.

Among the 600, 20 percent declared they would change their travel habits, and 50 percent declared they were reconsidering the future use of their current transport mode. The mobility brochure was distributed to 130,000 households. Implementation of measures with a high potential impact on mobility behaviour occurred only toward the end of the project, so their full impact could not be evaluated during CIVITAS ELAN.

**13. Set-up of information points and campaign on clean vehicles and alternative fuels.** Before getting involved in CIVITAS, Ljubljana was active in European Car-Free Day and European Mobility Week. However, it had only limited experiences with sustainable mobility campaigns. With the support of CIVITAS, the city set up three info-points on clean vehicles and alternative fuel, and developed a promotion campaign for sustainable urban mobility. Due to limited resources, the info-points were installed in existing tourist information offices, widely visited also by the local residents.

Trainings on clean vehicles, alternative fuels and sustainable mobility were organised for info-point personnel and city administration officials. Dissemination materials (a bulletin and newsletters) were widely distributed and three nationwide public events (a seminar, a conference and a study visit to a biodiesel production plant) were also organised.

The main lesson learned was that a much wider set of measures was needed to promote sustainable mobility in Ljubljana and that awareness raising should be a continuous activity of the city. This is why the CIVITAS ELAN project was implemented after CIVITAS MOBILIS.

### MOBILITY PLANNING

**14. Update of the sustainable urban transport plan.** With the support of CIVITAS, Ljubljana wanted to transform its transport strategy into a modern sustainable urban transport plan (SUTP) meeting current European standards. The city held several workshops to assess the status of mobility, develop a common vision, define objectives, set targets and define

measures and responsible actors. Timelines and a monitoring plan were set. The plan was finalised in June 2011. An SUTP manual was developed in 2012 and Ljubljana gave trainings to other Slovenian municipalities. The update of the city's existing transport plans made Ljubljana the first city in Slovenia and one of the first among the new EU member states to transform its transport strategy into an SUTP based on a comprehensive long-term strategy.

The development of the SUTP was based on EU guidelines and experience from other cities. Foreign experts were consulted to improve the process. Most importantly, the plan was developed in a participatory process involving stakeholders and citizens. In addition, an outreach campaign reached several thousand people through events, newsletters and other communication tools.

In the end, the city administration decided not to adopt the SUTP developed within CIVITAS, but to prepare a new document with broader content, including technical guidelines for planning and implementing road infrastructure. The document was defined as the new Transport Policy until 2020 and was adopted by the city council in September 2012. The document incorporated most of the contents of the SUTP. An important lesson learned was that despite conflicts with the old way of thinking about traffic planning, a gradual approach can yield good results and innovative approaches in urban mobility.

### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**15. Participatory planning and promotion of safe and increased bicycle use.** Active engagement and participation of civil society in mobility planning and implementation is crucial. Within its first CIVITAS project, Ljubljana had focused on the development of a public participation model to enhance responsibility for future mobility development. Improved cycling infrastructure was emphasised in the starting phase.

Public participation was further developed during the city's second CIVITAS project (see measure 12).

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**16. Safety and security for seniors and public transport passengers.** Before Ljubljana's second CIVITAS project, the city had already undertaken activities to improve the safety and security of different groups of bus users. The CIVITAS project introduced new approaches to this matter, such as the direct involvement of bus users in improving public transport services. To increase safety, the public transport company LPP installed a video surveillance system on 109 buses. This was meant to discourage vandalism and other offences and to provide evidence in criminal cases if needed.

Trainings for drivers were organised to sensitise them to the needs of elderly people, adults with young children and people with disabilities. The city ran interactive workshops during which

elderly people were invited to help identify measures that will improve their safety and security. LPP distributed a leaflet that presents in an entertaining fashion what one should and should not do when riding the bus. Another special thematic brochure "Safe on the bus" was created.

The average number of reported injuries increased during the project (in 2009 and 2010), perhaps due to a more open communication with the public transport operator. However, in 2011 the number of reported injuries dropped by 18 percent, exceeding the initial target. Complaints of public transport users increased by almost 50 percent, but commendations increased by 70 percent. Damage from vandalism on buses was reduced by 11 percent, which justified the investment costs of the surveillance cameras. A lesson learned was that cameras are not enough to reduce vandalism. A strong dissemination activity about the cameras is needed along with strict sanctions for vandalism.

#### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**17. Reduced speed zones.** Ljubljana managed to make road traffic safer through the introduction and enforcement of speed limits and reduction of motorised traffic in the city centre. The city decided to take this further with a combination of activities to increase the safety of all traffic users, and the most vulnerable traffic participants in particular. The municipality reduced the speed limit in most of the city centre from 50 to 30 km/h and enforced this new speed limit effectively. Ljubljana also introduced new pedestrian zones, new parking areas for residents in these zones, one-way streets and a higher-speed regime for main avenues.

The public was informed about the benefits of the measure and devices have been installed to help sanction violations. In addition, the city aimed to improve cooperation among enforcement agents and provide training for even more effective enforcement. Plans for pedestrian zones and reduced-speed zones at several other locations were included in the city's Transport Policy until 2020. These were to be implemented along other main corridors in Ljubljana.

The reduced speed limit not only helped to improve safety in the city centre but also reduced traffic through the city centre. By the end of 2013, reduced speed zones and one-way streets covered 2,129 hectares and the pedestrianised surface area had increased fivefold in five years. When asked what was the best city feature of the last five years, a majority of Ljubljana's inhabitants, commuters and visitors referred to its large pedestrian zone in the city centre. The pedestrian and reduced-speed zones are probably the most visible of CIVITAS measures. They have led to a revitalisation of the old city centre due to the opening of many new restaurants, cafes and shops. This transformation took place in a relatively short period. While there were some complaints at first about the loss of parking spaces, acceptance increased steadily.

**18. Safe routes to school.** Ljubljana was concerned about the safety of children on their way to school. The city took steps to eliminate deaths and severe injuries due to traffic accidents involving children on their way to and from school. The city

introduced a web portal of safe routes, with particular focus on the elementary schools. Schools were to examine and, if necessary, update their maps of safe routes on a yearly basis.

The city organised workshops for teachers who then educated and trained parents and elementary school pupils on road safety. Schools collaborated with institutions dealing with road safety, such as the City Council for Prevention and Education in Road Traffic, the city police, societies and associations of drivers and mechanics and a core group of volunteers.

Despite several promotional activities for the online map of safe routes, more effort was needed to engage volunteers. The city had planned to upgrade the portal and it kept its target of eliminating deaths and injuries for school trips.

### TRANSPORT TELEMATICS

#### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**19. Public transport priority at intersections.** One of Ljubljana's measures to make its bus system more attractive, convenient and energy efficient was the implementation of public transport priority at intersections. For this purpose, Ljubljana acquired a direct communication technology called Zigbee for 210 buses and 15 intersections. This enabled traffic light operators to extend or shorten traffic light cycles in order to let approaching buses through crossroads. The equipment was fully compatible with the Galileo satellite navigation system that was under development at the time. The technology also introduced encrypted communication to prevent abuse of the system.

Ljubljana drew on national and European research and proven approaches in the field of prioritisation of public transport. The measure became part of the city's Transport Policy until 2020.

Over 95 percent of tested traffic light-triggering operations were successful and the results showed a significant improvement in bus punctuality. The data on travel speed and travel times remained relatively constant, which can be attributed to the rather scattered locations of bus stops equipped with the priority technology.

#### REAL-TIME ROAD USER INFORMATION

**20. Real-time public transport information.** Ljubljana had been working continuously on enhancing the attractiveness of the public transport network. As part of these efforts, the city placed 58 displays with information on bus arrivals at 45 bus stations at different locations in the CIVITAS corridor. The displays showed the estimated arrival time of buses and other public transport-related messages. The signs were integrated with the existing public transport management system of the public transport operator LPP.

The displays became very popular among citizens, and the city of Ljubljana received several requests to install further displays.

The average accuracy of arrival and departure announcements in June/July 2012 was approximately 85 percent and

77 percent, respectively. The target of a 10 percent increase in acceptance level was not reached: although the public liked the displays, they expected a higher level of accuracy. Thus, Ljubljana would recommend that newly implemented technology should work properly or additional dissemination activities should be used to explain the circumstances surrounding the early phases of operation. This can prepare the public for possible problems connected with newly established systems.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**21. Integrated freight policy development.** The city of Ljubljana had established its first local freight network in 2006. It included representatives from the city administration, road hauliers, logistics companies, retailers and service providers, manufacturing companies, couriers, access restriction managers and research organisations. During CIVITAS, the city led the establishment of new freight networks in other CIVITAS ELAN cities. These local networks were managed through periodic working meetings, approximately biannually. At these local meetings, partners established stakeholders' needs, planned dissemination actions, and discussed operational issues and evaluation results.

In each city, active participation in and support for the freight network was formalised through a memorandum of understanding or a similar agreement among members.

As a result, urban freight was approached in a more cooperative manner that included all stakeholders. Promotion of freight delivery solutions was the key activity during the project and was continued afterwards. A recommendation that came out of this measure was that it is important to include representatives from the entire transport chain, from suppliers to customers.

Christian Resebo  
Malmö stad  
20580 Malmö  
christian.resebo@malmo.se  
Tel: +46 70 934 14 60  
www.malmo.se

Malmö is Sweden's third largest city with a population of around 290,000 at the time of the CIVITAS project. Dating from the Middle Ages, the city has developed as a thriving industrial and trade centre following a significant economic recession and high unemployment in the 1980s and 1990s.

CIVITAS Phase: II – SMILE  
Duration: 2005 – 2009  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Car sharing for individuals and businesses.** Prior to CIVITAS there was only one private car-sharing club and the city had no commercial car-sharing alternatives.

A total of five car-sharing sites, offering vehicles of varying sizes, were set up. Each targeted a specific range of users. The first site, called SunFleet, was for companies and the public; it opened in 2005 near the central railway station. By the summer of 2008 all five car-sharing sites were opened and about 15 cars were operating in the city.

The SunFleet experiment showed that it makes better economic and practical sense to allow all types of users to use all cars at all sites. Broadening access increased car availability for customers and enabled fixed costs to be recovered faster and prices to be more competitive. According to surveyed citizens, awareness of car sharing had risen from 28 percent in 2003 to almost 47 percent by 2008.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Adapting the university hospital's fleet.** The university hospital in Malmö (UMAS) had a fleet of 65 vehicles and on average one-third of the fleet is replaced each year. CIVITAS helped in the development of a strategy for leasing clean vehicles as part of a long-term goal for the region's entire hospital fleet to comprise clean vehicles.

The objective to attain a fleet with 50 percent clean vehicles by the end of the project became impossible because of reorganisations. Nevertheless, 21 new clean vehicles were

purchased in 2009, all powered by natural gas/biogas and bioethanol.

This resulted in a 20 percent reduction in emissions of CO<sub>2</sub>, a 12.8 percent reduction in NO<sub>x</sub> and a 2.5 percent reduction in particulates.

**3. Developing a clean municipal fleet.** Before CIVITAS, approximately 35 percent of municipally owned or leased vehicles could be considered clean. With the help of CIVITAS the use of clean vehicles was promoted by creating an almost totally clean municipal fleet.

As the 18,000 municipality employees have few alternatives but to use the clean cars in the municipal car pool, the positive experience of such vehicles could spread more rapidly than if the same number of vehicles were purchased by individuals. The measure led to the purchase of over 300 new clean vehicles, or 65 percent of the fleet during the project period.

Reductions in CO<sub>2</sub> emissions were between 92,834 and 241,776 kg/year, reductions in emissions of NO<sub>x</sub> were between 24 and 32 kg/year and reductions in emissions of particulates were approximately 1.5 kg/year. The measure was widely acknowledged according to a general public survey in 2008. Over 3,000 people took part and were asked to name measures implemented in the city related to transport and the environment. The biggest response was environmentally adapted or "clean" cars at 34 percent.

## CLEAN FUELS AND FUELLING INFRASTRUCTURE

**4. Biogas in the grid.** Prior to CIVITAS there were no facilities for biogas use in Malmo. CIVITAS helped to establish a plant for the upgrading of an annual 2 million Nm<sup>3</sup> of biogas to natural gas quality, to be used in vehicles.

The biogas upgrading plant at the Sjolunda sewage treatment plant was constructed and put into operation in summer 2008. Biofuel produced here was injected into the grid. Two compressed natural gas/biogas filling stations were put into operation. The gas supplier Eon established a local biogas injection to the grid through the purchase of raw biogas from Sjolunda sewage treatment plant and the establishment of an upgrade facility. This led to the introduction of 10 GWh of biogas to the local transport system. Eon also established a vehicle gas fuelling facility in Ystad, 60 km from Malmo, and a slow-filling gas facility where heavy goods vehicles can be fuelled overnight.

The CIVITAS measure led to a reduction of 430,920 kg of CO<sub>2</sub> emissions from vehicles in Malmo and the surrounding area during 2008.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**5. Extending environmental zones for heavy goods vehicles.** In many areas of Malmo, ambient air quality did not meet the environmental standards established by Sweden

or the EU. The creation of a new environmental zone was identified as a way of improving the situation through CIVITAS.

The existing environmental zone was extended to a larger area with stricter regulations for heavy vehicles and more effective compliance enforcement. Measure implementation required extensive cooperation between a variety of actors, including the municipality of Malmo, transport organisations and national government bodies.

As a result of this CIVITAS initiative, transport companies clearly accelerated the renewal of their vehicles, and the compliance rate rose by approximately 5 percent. In the case of NO<sub>x</sub>, there was a reduction of 33 tonnes per year (17 percent), and for particulates an estimated reduction of just over 1 tonne per year (30 percent). The measure corresponds to similar steps taken in Gothenburg, Lund and Stockholm, making compliance easier for hauliers who work throughout the country.

### PARKING MANAGEMENT/PRICING

**6. Subsidised parking for clean vehicles.** Before CIVITAS, less than 10 percent of new cars purchased were classified as clean vehicles. CIVITAS helped to increase this proportion by changing public perceptions.

Subsidised parking for clean vehicles was introduced in October 2007. The subsidy applied to vehicles that are no more than three years old and that comply with Malmo's definition of clean vehicles (i.e. running on ethanol, hybrid or pure electric vehicles). Drivers of clean vehicles could purchase a permit allowing them to park for one hour free of charge in parking spaces administered by the city.

Within seven months of implementation, 5.5 percent of the public were taking advantage of the subsidies (1,031 permits issued). A survey carried out in spring 2008 showed that only 3 percent of the respondents did not know what was meant by a "clean vehicle". Between October 2007 and April 2008, approximately 1,700 new clean cars were registered in Malmo.

### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**7. Integrating cycling with public transport.** More than 20 percent of all trips in Malmo were made by bicycle prior to measure implementation but the city did not have a consistent and coherent marketing strategy to promote bicycle usage. CIVITAS helped to focus on the connections between cycling and public transport in order to create a fully intermodal transport system.

A total of 26 radar bicycle detectors were installed at high-risk intersections, with the aim of giving cyclists priority at traffic lights. In the best case, the percentage of cyclists stopping at traffic lights fell from 64 percent to 47 percent. The concept for high-quality demonstration cycle lanes was developed. A 3D model of a state-of-the-art parking facility and handbook on cycling promotion were presented to the public at various locations.

A general survey in 2008 suggested an increase in bicycle usage from about 20 percent to about 22 percent and about 10 percent of respondents thought about changing, or actually changed, their travel habits.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**8. Eco-driving training for hospital employees.** CIVITAS helped to offer a course in eco-driving for all staff members of the hospital driving more than 5,000 km a year on work-related trips.

Negotiations took place with driving schools and information about the forthcoming eco-driving course was disseminated among hospital employees. Training sessions took place for more than 100 members of staff. The measure failed to train as many staff as originally intended due to budget constraints and difficulties in attracting participants.

However, this CIVITAS measure led to a decrease in fuel consumption by the hospital transport department by 4.7 percent (126 litres) in September–November 2008 compared to February–April 2008.

**9. Eco-driving training for lorry drivers.** The haulage company Malmo LBC is a major player in the Malmo transport market, operating 150 vehicles on a daily basis in the city of Malmo as well as on long-distance routes with 300 drivers. With the goal of lowering the environmental impacts of its business, Malmo LBC created a training programme for its drivers on how to drive in a more fuel efficient and environmentally friendly way.

The actual training reached 139 drivers. Each driver spent about two hours with an instructor for the practical training session, driving the same route once before instruction and once after instruction, following the principles of eco-driving. Afterwards, fuel consumption was compared between the two trips.

Malmo's lesson learned was that the benefit to the business in financial terms was more than twice the cost of implementing the measure.

**10. Eco-driving training for municipal employees.** Before CIVITAS, pilot studies had been carried out in a number of Swedish cities, including Malmo, to teach drivers a more efficient and safer way of driving. By offering the training to a greater number of municipal employees, CIVITAS hoped to reach a threshold at which interest in eco-driving would begin to spread throughout the entire staff of the municipality, and beyond to the general population.

The training comprised both theoretical and practical elements and equipment was used in six vehicles to gauge the effect of the training on fuel consumption. Only a small proportion of municipal employees (1,091) were trained in eco-driving, leading to a reduction in fuel consumption for the total fleet of between 0.27 and 0.13 percent, and a reduction in emissions by approximately 0.47 percent.

However, consumption per trained employee decreased by an average of 13 percent, indicating that the measure has good potential for achieving real environmental benefits.

**11. Internet tool for traffic planning.** Before CIVITAS, Malmo's existing journey planning website [www.trafikenu.se](http://www.trafikenu.se) provided only information related to trips undertaken by car or public transport, while the Skanetrafikens site focused on trips by bus and train ([www.skanetrafikens.se](http://www.skanetrafikens.se)).

CIVITAS supported the addition of information about the cycle lane network to these two web pages, highlighting the possibility to travel quickly and safely by bike. The cycling planning tools allowed users to make an informed choice between the various available options on the basis of cost, journey time, health benefits and environmental impact.

The tools were used on average 400 times per week following the launch in May 2008, although it was not easy to quantify how this affected travel behaviour. Only around 3 percent of the general public were aware of the measure due to the lack of accompanying marketing activities.

**12. Managing mobility needs in the private and business sectors.** Before CIVITAS, the city had rarely used soft measures as a way of influencing transport behaviour. CIVITAS supported the implementation of several awareness-raising campaigns targeting different groups.

Newsletters, advertisements, conferences, networking events and study visits were created. Work with local companies included breakfast meetings, company visits and seminars, cycling promotion activities, a large-scale marketing campaign and company travel surveys. Among its own employees, the municipality encouraged changes in commuting behaviour via a "commuting competition", including bicycle promotion.

Among surveyed citizens, 19 percent were aware of at least one campaign, and between 2 and 5 percent participated. More than 40 percent of the participants continued using a new, more sustainable travel mode after the trial period. Between 20 and 30 percent of the people who had newly moved to Malmo drove less than before moving to the city. Moreover there was a decrease in the proportion of children being driven to school from 75 percent to 65 percent, resulting in a saving of 5.2 tonnes of CO<sub>2</sub> during the project period.

**13. Marketing new bus routes.** Before CIVITAS, Malmo's bus system comprised 20 lines. CIVITAS helped to make the network easier to use with the aim of making journey times faster and reducing the amount of time that travellers spent waiting for buses.

The bus route network was simplified and made more user friendly by changing it from 20 lines to eight main lines and six support lines. The campaign and information materials were based around three key concepts: greener, easier and more frequent. The idea behind it was that passengers no longer need timetables but can expect a bus to arrive every five to six minutes in peak periods. Information materials were sent to all inhabitants in Malmo: 13 different editions were produced, adapted to the different areas of the city.

This resulted in an increase of 4 percent in public transport trips in 2006 to 6.5 percent in 2007, meaning that passenger trips rose from 25.5 million to 27.1 million. Following the promotion campaign, the level of awareness of the new bus routes was 91 percent among frequent travellers, while 70 percent of respondents considered that they had received sufficient information about route changes.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**14. Improving security and safety on buses with closed-circuit cameras.** Before CIVITAS, a public transport security strategy was clearly needed: some 38 percent of surveyed passengers said that they had experienced frightening or disturbing situations when travelling by bus and 6 percent mentioned safety concerns as a reason for avoiding bus travel. CIVITAS supported the installation of security cameras in all 170 buses in Malmo as part of a security strategy approved by the regional authority.

The positive effects were already apparent in 2006. According to a survey by Lund University, 60 percent of passengers stated that they felt safer on their journeys after the cameras had been installed, and 17 percent said that they travelled more as a result of the cameras. Among those travelling more, between 31 and 40 percent were over 65 years of age.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**15. Installing a bus priority system.** Prior to this CIVITAS measure, buses spent some 11 percent of their journey time waiting at traffic lights. CIVITAS helped introduce bus priority systems at 42 sets of traffic lights, improving the bus service by increasing frequency from 10 minutes to 7.5 minutes without having to introduce additional vehicles.

By 2004, all city buses and some regional buses had been equipped with GPS and computers that can communicate with the traffic light controls to request priority. The average bus speed during the day increased from 15.4 to 16.1 km/h towards the city centre, and from 15.9 to 16.5 km/h away from the city centre. The best results were recorded in the afternoon peak period, when average bus speeds rose nearly 10 percent, from 14.1 to 15.5 km/h. There was also an improvement in punctuality: from 23 to 25 percent towards the city centre, and from 25 to 29 percent away from the city centre.

**16. Introducing new traffic signals.** Before CIVITAS, the traffic signals in Malmo had fixed time settings for peak and off-peak hours. This measure focused on installing adaptive signal controls at 10 traffic lights in Malmo to give priority to public transport, cyclists and pedestrians.

The controls at these 10 intersections were connected and coordinated, ensuring a green wave during peak hours and allowing the system as a whole to work more efficiently.

After installation, traffic flow was evaluated on three routes. It was found that average travel times were in fact higher, average speeds slower and fuel consumption higher after measure implementation but it is likely that the system was not operating optimally during the test period.

**17. Mobile Internet bus information service.** CIVITAS helped the public transport operator Skanetrafiiken to develop a mobile Internet service based on an existing real-time information system, a customer database and an Internet-based travel planner.

The mobile service was complemented by digital timetables that can be downloaded to a mobile phone for use off-line. During the project period, four versions of the mobile service were developed and tested thoroughly, and mobile phone ticketing was introduced. Surveys conducted from October to November 2007 showed that 64 percent of passengers knew about the service, while 12 percent used it sometimes and 5 percent used it frequently.

The use of mobile Internet services increased the number of journeys: 8 percent said that they travelled more as a result of the service and 21 percent said mobile services meant better travel quality.

**18. Real-time passenger information with in-vehicle displays.** CIVITAS helped the regional public transport operator Skanetrafiiken to equip the entire bus fleet with real-time information displays, making it easier for passengers to plan their journeys and keeping them informed of possible delays and disruptions.

During 2007, 40 real-time information displays were installed at bus stops. Around 60 existing electronic displays were updated to show real-time information. Two larger display screens were installed in the main bus terminal in 2008, showing bus departure times.

The number of bus stops equipped with real-time information displays rose from 44 to 84 at the end of the project period, and the proportion of passengers who stated that they would be more willing to travel by public transport rose by 2 percent.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**19. Freight driver support.** As part of its efforts to lower the environmental impact of its business and with the help of CIVITAS, the haulage company Malmo LBC decided to install a system of vehicle computers in eight heavy goods lorries to follow up on its drivers' environmental performance.

The initial aim was to test the functionality of the concept of vehicle/driver support by installing computers in 150 heavy goods vehicles during the project period. However, none of the screened equipment could adequately record the data required by Malmo LBC.

The measure became a technology development project taking into account the needs and opinions of drivers when

developing the system (in relation to issues such as screen size and user friendliness), but no quantitative results were available by the end of the project period.

**20. Satellite-based traffic management.** Prior to CIVITAS, private courier company 215215 Transporter AB had no system for capturing real-time positioning data. CIVITAS supported the installation of GPS equipment in every vehicle in the fleet, along with handheld devices for more efficient communication between the dispatch centre and the vehicles.

The CIVITAS measure was a great success: average driven distances were lowered and coordination improved dramatically. The new equipment was also designed to create a report on the environmental benefits of freight coordination for each of the company's customers.

Evaluation based on four selected vehicles showed an increase in the total number of completed tasks per day for all four drivers of around 3 percent. This meant that fewer vehicles were needed and fewer kilometres covered for the same number of tasks, thus reducing pollution and fuel consumption.

**21. Sustainable logistics for the food industry.** Before CIVITAS, many small and medium-sized enterprises (SMEs) in the food sector found it difficult to provide competitive logistics solutions to access markets. In this CIVITAS pioneering project, Malmo aimed to introduce a cost-effective and environmentally friendly regional shared goods distribution scheme.

The supporting web tool was very complex and took time to develop. The scheme was officially launched with 21 producers and the first orders were placed. Measure implementation was nevertheless delayed, because it proved difficult to contact and recruit producers during their busy season, especially because of the low levels of e-mail use among them.

Malmo's lesson learned is that greater efforts should have been made with marketing. Among surveyed stakeholders, however, seven out of 10 believed that the idea of a virtual marketplace had some potential.

## FLEET MANAGEMENT INCLUDING CLEANER FLEETS

**22. Clean heavy goods vehicles in company fleets.** The dairy products supplier Skanemejerier wished to improve its environmental planning. CIVITAS supported the introduction of newer heavy goods vehicles running on natural gas, together with training in fuel-efficient driving skills and better maintenance instructions. The company logistics were adjusted, for example, by changing routes to reduce the number of kilometres driven with the same load.

The procurement of methane-powered heavy goods vehicles had a significant impact on the emissions from the Skanemejerier fleet (60 vehicles covering 12,960,000 km in one year). Emissions reductions were achieved of CO<sub>2</sub> by 436.8 tonnes (13.3 percent), of NO<sub>x</sub> by 1.6 tonnes (11.4 percent) and of particulates by 29 kg (13.8 percent).

Simonetta Vittoria  
Via Guarenti 2  
20052 Monza  
mobilita@comune.monza.it  
Tel: +39 03 92 83 28 39  
Fax: +39 03 92 83 28 47  
www.archimedes.monza.it

The city of Monza, located in northern Italy, had approximately 123,000 inhabitants at the time of the CIVITAS project. It is located in the Lombardy region 15 km north of Milan on the Lambro River. Monza is best known for its Grand Prix but it is also an important contributor to the Italian economy with 58,500 mostly small and medium-sized enterprises. Monza developed a sustainable urban transport plan in 2008.

CIVITAS Phase: Plus – ARCHIMEDES  
Duration: 2008 – 2012  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Car-sharing scheme improvements.** Before CIVITAS, 75,000 private cars were registered in Monza. This led to a high demand for parking, especially in the central areas of the city, while a national analysis showed that private cars are used on average for only 20 minutes per day. In order to reduce this problem, Monza introduced a car-sharing scheme in April 2007. At the end of the project there were three cars available for around 150 private subscriptions. During European Mobility Week 2010, 50 new subscriptions were offered for free to interested citizens.

A focus group of car-sharing users was carried out to improve the service and develop a better marketing strategy. According to the calculations made during the development of Monza's Sustainable Urban Transport Plan, a potential 3.5 percent of existing car trips could be diverted to car sharing.

The number of active members increased from 40 to 146 in four years and the number of car rentals from 414 to 582. Two lessons learned are that only a few users were willing to subscribe to the service without a municipal incentive and that it takes time to identify the right communication strategy.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Hybrid bus.** To reduce the environmental impact of the city's public transport fleet, the city conducted a study on how to procure and operate a hybrid bus in Monza. This research led to the procurement and deployment of a hybrid bus.

Thanks to press coverage and to the replacement of the first bus with a second-generation model, public awareness of the measure, the technical features of the bus and the improvement of the quality of service increased significantly.

The fuel economy of the hybrid bus was between 23 and 38 percent better compared with a traditional diesel-fuelled bus. Emissions from diesel use were significantly reduced as fuel consumption dropped, although particulate emissions increased due to the fact that no particulate filter was installed on the vehicle. Due to the merger of the municipal public transport company with the private company NET, the capacity of the municipality of Monza to influence choices about future procurements decreased. For this reason, initial expectations of replacing the entire public transport fleet with hybrid vehicles proved to be too optimistic.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

#### 3. Demand-responsive public transport connections.

To transport passengers from poorly served areas to areas connected to the main public transport services, the municipality of Monza and the local public transport operator NET implemented a demand-responsive transport service (DRTS) with smaller vehicles. Following some administrative difficulties and very high costs, a reduced DRTS was implemented covering only one particular district of the city and only in particular situations, like important events in the city.

A strong information campaign was launched through the city hall's main channels of communication: website, SMS, Facebook page, press releases. However, awareness of the measure among citizens remained low.

Despite the limited implementation, this experience showed that if people are offered an alternative to the car, especially in difficult traffic conditions and in off-peak hours, they are willing to test it. This result was considered a good starting point for the implementation of a traditional DRTS. The idea of implementing the DRTS in spite of the running contract which was managed by an entity other than the municipality was too optimistic and delayed the demonstration stage.

## DEMAND MANAGEMENT STRATEGIES

### PARKING MANAGEMENT/PRICING

**4. Parking guidance system.** In 2009, Monza became the capital of the Province of Monza and Brianza, with the consequence that traffic to the city's institutions (hospital, university) and local government offices (province, police) increased. In order to deal with the new traffic situation, the city recognised the importance of creating parking areas and supplying real-time parking information. Under CIVITAS, the city of Monza implemented a real-time parking guidance system that informs drivers about the occupancy rates of the most relevant parking lots in the city. The measure was innovative, as

before implementation the city of Monza had not been aware of the occupancy rate of its parking lots.

The implementation of the system was well known and accepted by citizens, who expressed interest in further improvements, like web services or smartphone applications to check parking availability.

The parking system provided the municipality with much more reliable data in order to better understand the distribution of cars in the different parking areas of the city. The city of Monza learned that the involvement of parking owners is important to gain approval for the system, since a balance has to be found when planning the number of guidance panels to be installed in order to not to disturb the competition between operators.

## WALKING AND CYCLING ENHANCEMENTS/SERVICES

**5. Cycling improvements.** Before CIVITAS, the share of cyclists in Monza was rather low. With the support of CIVITAS, a study was conducted to identify suitable measures to foster cycling mobility. As a result, Monza decided to implement a bike-sharing scheme and adopted a bicycle plan. Completed actions included building an 800 m extension of a cycling route, and installing ramps to create an important shortcut over the railway.

Various events with local stakeholders and cyclists' associations were organised to encourage the use of the bicycle. These included workshops on bike repair and maintenance. The city's Sustainable Urban Transport Plan stated that the modal share for cycling during the morning peak was 3.6 percent and that 18 percent of existing car trips internal to Monza municipality could be transferred to cycling.

As a result of this measure, the number of cyclists in the city almost doubled in two years (+96 percent). All proposed actions for cycling improvement have been welcomed by surveyed people, the most interesting being "Bike parking areas at railway station or bus stops" and "More bicycle paths" (90 percent approval). Based on the outcomes of the study conducted in this measure, the city of Monza secured additional funding from the Lombardy region to implement bike sharing after the end of the CIVITAS project.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**6. School travel plans.** Before CIVITAS, there was a Walk to School Week in Monza every year. To set up a more structural project to promote sustainable school trips, Monza implemented a walking bus scheme with 10 walking bus routes designed by students. A communication campaign in the city and in primary schools aimed to further expand the measure, supported by a leaflet that described "the good recipe to start a walking bus". An innovative aspect was that all children who joined the walking bus received a voucher of EUR 20 at the end of the school year as a contribution to families' expenses for school supplies.

A skilled group of experts led a series of workshops to involve pupils and parents in the stops and timetable of the walking bus routes. The city also involved key stakeholders such as the local police, teachers and school managers in order to coordinate the scheme with the school timetables and to discuss security aspects of the scheme.

More than 140 pupils, or 15 percent of children, were going to school using the walking bus, which was considered a good result. In some schools the walking buses were operational for 161 out of the 200 official school days. An average 8 percent reduction in car traffic in front of the four schools involved was estimated. One lesson learned was that every year it is necessary to recruit more parents to operate the walking buses. In some cases the entire demonstration relied on the availability of a few parents who did not know if they could sustain this commitment from one year to the next.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**7. Urban traffic control system.** Before CIVITAS, Monza was affected by a huge amount of traffic due to vehicles crossing the city to reach Milan. Prior to this measure, Monza had about 80 intersections equipped with traffic lights. In order to maximise the efficiency of the entire road network and coordinate intersections, an urban traffic control system was implemented. The service level provided by urban public transport was increased with an automatic vehicle location and monitoring system (see measure 8).

A “learning history workshop” engaged relevant stakeholders such as top political representatives (Monza’s mobility councillor and city manager), the city’s CIVITAS team, municipal traffic engineers and project automation traffic technicians. During the workshop, drivers and barriers were identified and discussed and future activities were defined according to the scheduled work plan.

Results of a cost-benefit analysis showed that after seven years the incurred costs were recovered and the next three years generated a positive return on the investments. Monza officials said that this measure can be successfully taken up by other Italian and European cities since traffic light management is often underestimated as a tool to apply traffic control strategies.

### INTELLIGENT TRANSPORT SYSTEM (ITS) – BASED ENHANCEMENT OF PUBLIC TRANSPORT

**8. Bus management system.** Before CIVITAS an initial implementation of an automatic vehicle location and monitoring system had already been accomplished. Following the results of a study, the city decided to substitute the previous bus management system in order to allow dialogue with urban traffic control (see measure 7). Data on vehicle positions and bus punctuality were now sent to the control centre approximately every minute. These data were immediately

published through a web service showing information on the stop or the transit of a bus at a relevant bus stop.

A good practice guide to bus management systems was finalised in April 2011.

The quality of data concerning the localisation and monitoring of the buses seemed to be suitable for use by other CIVITAS measures. The performance of the web service to access data was evaluated positively as well. This CIVITAS measure helped Monza to increase the service level of public transport in the city.

**9. Improved traveller information.** In 2006, the most important interchange node in Monza, Porta Castello, became operational. With the support of CIVITAS, a bus traveller information study was undertaken to define the kind of information that should be provided to passengers at key interchanges and key bus stops. As a result, improved (real-time) traveller information was provided to passengers at 10 key stops and at Porta Castello.

The need to set up a passenger information service for urban public transport was recognised by citizens.

An important investment was required to implement the measure in the whole city. More specifically, 10 electronic bus stops would cost EUR 217,800. An increase of 4 percent in public transport use would be plausible after the upscaling of the measure, but the city could not afford the necessary investment. Monza’s lesson learned was that, due to the necessary investment, it is crucial to include in the tender whether such a system has to be implemented in the city or not.

**10. Public transport priority system.** Monza already implemented a priority system for public transport buses in the 1990s, where buses were detected through infrared sensors installed at intersections in order to extend green light time. The system was tested but did not become fully operational. The experience gained showed that the priority system must be strongly interconnected with the urban traffic control system (see measure 7), limiting priority requests when private traffic levels are high. This CIVITAS measure aimed to update the bus priority system to consider the actual situation of the buses, monitored through the automatic vehicle location system developed during CIVITAS (see measure 8). This enabled the system to grant priority to buses running late.

The measure was successfully implemented, but did not reduce travel times. The main reason was the high level of congestion in a large part of the city. This was caused by a significant reduction in the throughput of the western external ring since 2008 and was expected to continue until April 2013, when a new 2 km urban tunnel would be completed. Monza expected that in April 2013 this measure would become fully effective and travel time would be reduced.

Lamia Rouleau Tiraoui  
2 cours du Champ de Mars  
Nantes Métropole  
lamia.rouleau-tiraoui@nantesmetropole.fr  
Tel: +33 24 099 52 22  
www.nantesmetropole.fr

Located close to the Atlantic coast, the Nantes conurbation with its 24 municipalities is the largest urban centre in western France. Since 2000, it has seen the second highest rate of population growth in France. The Nantes–Saint-Nazaire metropolitan zone combines strong economic assets with a quality of life based on a balance between the natural and urban environments.

CIVITAS Phase: I – VIVALDI  
Duration: 2002 – 2006  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### PUBLIC BICYCLES/BICYCLE SHARING

**1. Improving bicycle culture and services. Ville à Vélo and Bicloo.** Before CIVITAS, Nantes did not have high cycling levels. With the initiative's help, a long-term rental service, Ville à Vélo, was introduced in 2004 and a short-term service, Bicloo, followed in 2008.

New bicycle racks and secure bike-parking facilities were installed at several transport interchanges. The success of Ville à Vélo (12 percent more rentals in 2007 compared to 2006) led to the enlargement of the service.

The biking culture is still growing, with 23 percent more rentals in 2012 compared to 2011. The bike service now has 120 electric bicycles and 150 regular ones.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Developing a new clean public transport fleet.** Buses in Nantes could use a better image, especially in comparison with the city's modern tram network. CIVITAS helped to introduce new, clean buses to its fleet together with the needed infrastructure.

Despite some delays in the delivery and technical problems, 125 standard compressed natural gas (CNG) buses and 30 articulated CNG buses were put into operation. This resulted in 90 percent of all trips being made with clean vehicles (trams or CNG buses).

Energy costs dropped by 7 percent. Emissions of non-methane hydrocarbons fell by 50 percent; NO<sub>x</sub> by 43 percent; and

PM10 by 90 percent. A lesson learned was the need to provide sufficient time for the preparation of clean fleet procurements due to the complex technical requirements.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**3. Introducing a waterbus service.** Several rivers flow through the Nantes conurbation, making transport connections in some areas problematic. CIVITAS supported the creation of two new waterborne public transport services as proposed in the Urban Mobility Plan.

The Navibus on the River Erdre was handed over to a tourist boat operator after four years. With only one boat, a low frequency (one trip every 80 minutes) and a route following that of the tram, the Erdre navibus did not attract sufficient passengers and was mostly used by tourists (70,500 users in 2008).

With 365,000 users in 2008, the Loire Navibus can be considered a success. The service was reinforced with the purchase of a new boat in 2009, raising the frequency to 10-minute intervals during peak hours.

### INTERMODALITY

**4. Developing public transport interchanges.** Vannes Road had a very poor image: the multi-purpose four-lane highway served a big regional shopping centre and other services but lacked infrastructure for cyclists and pedestrians.

This CIVITAS measure aimed at improving the quality of urban spaces along this route, including the creation of a multimodal station as part of the Urban Mobility Plan.

The bus-tram-car multimodal interchange opened in 2004, with a covered park-and-ride facility with 302 parking spaces for cars and 10 for bicycles. Surveys indicated a continuous increase in the number of passengers using the extended tram line and the park-and-ride facility.

**5. New rail link and the Nantes BusWay.** The southeast part of Nantes has relatively poor public transport service and suffered from rising congestion. With the help of CIVITAS, public transport was used as a comprehensive tool to reshape the urban environment in favour of other alternative modes.

During the first part of the project a new rail link was created with two new intermediary stations, park-and-ride facilities and connections to the bicycle and bus networks. In the second stage, a clean and reliable bus with a high level of service, the BusWay, was introduced.

The new rail link proved very successful, with the number of passengers rising from 300 passengers per day in 2002 up to 1,100 passengers per day in 2007. The impact of the BusWay project is even more impressive: it had attracted 28,000 daily passengers by 2010, reducing car traffic by between 40 and 70 percent.

## DEMAND MANAGEMENT STRATEGIES

### PARKING MANAGEMENT/PRICING

**6. Introducing park-and-ride facilities and parking standards.** Nantes suffered from high volumes of traffic in the city centre and an acute problem of illegal parking.

Between 2003 and 2005, CIVITAS supported a sixfold increase in park-and-ride facilities near tram lines, boat shuttle stops, train stations and BusWay lanes (see measure 5). In addition, parking standards were introduced for new buildings.

As a result, the rate of occupancy of the park-and-ride facilities showed a rapid progression. Some of the facilities were even overcrowded in their first week of operation and required immediate extension.

**7. New mobility concept for Tertre University campus.** Most of the public space around the Tertre campus was used as a parking place for around 2,000 cars.

Within the CIVITAS project, 700 parking spaces were removed, while creating better links between the campus and public transport services. A large esplanade for pedestrians with new walkways to the tram stops, new bike racks and pedestrian crossing points was created to improve safety and promote cycling. A student car-pooling association was developed with 1,000 regular users online.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**8. Creating 246 company travel plans.** In 2002, 75 percent of the almost 600,000 work-related trips in Nantes were made by car, largely during peak hours. CIVITAS helped the city with a travel plan for its own employees.

Moreover, it provided support for companies in elaborating their mobility plans, including technical and financial help, a car-pooling service and a discount on public transport season tickets for employees.

By the end of 2010, a total of 246 company travel plans had been put into effect (compared to 16 in 2005), benefiting around 66,690 employees. The company travel plan of the Nantes local authority itself reduced car use by between 50 and 62 percent, representing an annual saving of 640,000 km and therefore a decrease in CO<sub>2</sub> emissions of 90 tonnes. Thanks to CIVITAS, a long-term process has been initiated. In August 2012, there were 277 travel plans active (52 percent more than in 2008) involving 77,439 employees (a 27 percent increase).

Paul Donnachie  
Norfolk County Council  
Environment, Transport and Development  
County Hall, Martineau Lane  
Norwich NR1 2SG  
paul.donnachie@norfolk.gov.uk  
Tel: +44 16 03 22 30 97  
Fax: +44 34 48 00 80 12  
www.norfolk.gov.uk

The city of Norwich, situated in the east of England, is the administrative centre of the county of Norfolk. It covers some 50 km<sup>2</sup> and had a population of around 120,000 during the CIVITAS project. The city is surrounded by an extensive rural catchment area and, proportionately, has the highest level of inward commuting in the UK after London.

CIVITAS Phase: II – SMILE  
Duration: 2005 – 2009  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Relaunching a car-pooling scheme.** CIVITAS helped to relaunch and rebrand an existing car-pooling web tool.

All 20 targeted workplaces set up a car-pooling scheme and information was disseminated to a further 20 businesses outside the city centre. The overall membership of the car-pooling scheme rose to 2,400 users across public and private organisations during the project period.

Since 76 percent of the commuting car poolers previously travelled in single-occupancy cars, it can be claimed that this measure removed approximately 1,646 single-occupancy cars from the network at peak time. This means a reduction of 993,690 commuter miles travelled or 304 tonnes of CO<sub>2</sub> saved during the project period.

### CAR SHARING

**2. Developing a city-centre car-sharing club.** Norwich faced an increase in private cars and parking places. CIVITAS therefore supported the development of a car club with a pool of vehicles running on clean fuels, available for occasional use by local people and businesses and operating from two centres.

There was good local press coverage during the initiative's launch, which helped to raise awareness of the system and boosted the number of enquiries and members. The car club expanded steadily over the first two years of operation, reaching nearly 200 people using 10 car club vehicles. More

than 74 percent of people joining the scheme either gave up a car or chose not to buy one.

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**3. Biodiesel trials.** Before CIVITAS, there was no experience in the UK regarding buses and other public service vehicles running on biodiesel.

CIVITAS helped in the realisation of a biodiesel laboratory to perform quality checks on biodiesel from different suppliers and to establish a new supply chain of high-quality sustainable biodiesel.

In cooperation with local fleet operators, biodiesel use was tested and the fuel economy and emissions from different biofuel blends were analysed. B20 fuel, a mix of 20 percent biodiesel and conventional diesel appeared to offer an optimum compromise between CO<sub>2</sub> savings, fuel economy and NO<sub>2</sub> emissions.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**4. Providing a high-quality bus/rail interchange.** Public consultations in Norwich had consistently demonstrated a public demand for better linkages between the railway station and the city centre. CIVITAS helped to accommodate these needs.

The railway station district was reorganised with better access arrangements for buses, high-quality waiting facilities and real-time passenger information.

Bus travel to the railway station rose by 24 percent during the project period. An on-street survey recorded that 98 percent of the respondents were satisfied with the quality of the new facilities and 68 percent of respondents said that they felt safer when using the new interchange.

### TICKETING AND TARIFFS

**5. Roadside ticket vending machines.** The majority of bus passengers in Norwich purchased their tickets from the driver on board, causing delays and traffic congestion. This CIVITAS measure involved the installation of 16 state-of-the-art touch-screen roadside ticket machines with communication links to remote monitoring and revenue management systems.

Awareness about the machines greatly exceeded their use: for example, while 52 percent of people interviewed at the hospital were aware of the machines, only 8 percent had actually used them. There was also a big variation in the use of the different machines, suggesting the importance of identifying the most appropriate location for this kind of machine.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Introducing a low-emission zone.** Due to high levels of NO<sub>2</sub> pollution in the centre of Norwich, an air quality management station had already been installed. CIVITAS supported the development of a low-emission zone (LEZ) in the area, covering one street on which traffic was limited to buses, taxis, delivery vehicles and emergency services.

Public involvement was guaranteed before the establishment of the LEZ and dissemination was both general (in the press) and targeted (to bus drivers).

The LEZ included an engine switch-off traffic regulation order, free eco-driving training sessions and the introduction of liquefied petroleum gas (LPG) within the taxi fleet. Thanks to the LEZ, compliance with European air pollution standards was met with broad public support.

**7. Introducing time-controlled access restrictions** (not successful). With the support of CIVITAS, this measure evaluated the implementation of variable access restrictions in two city-centre streets in close cooperation with local traders.

One was closed during peak pedestrian activities but got closed at all times to prevent safety problems. Another shopping street was only closed on Saturdays but it became clear that the pedestrianisation did not work despite the support of local traders: the scheme was withdrawn.

So neither scheme succeeded as a part-time access control measure. An important lesson learned was the need for clear reasons for closing a certain street at certain times and not others.

**8. Priority access for clean goods vehicles.** To encourage clean freight distribution to the city centre, a one-year experiment was developed within the CIVITAS framework: it allowed goods vehicles with a predetermined clean vehicle standard to use bus priority lanes.

The width of the existing bus lanes, however, appeared to be a barrier. It was therefore decided to allow only heavy goods vehicles associated with the Norwich Freight Consolidation Centre. This made the measure easier to enforce but limited users to about one per day.

Monitoring showed a peak-time journey saving of two to four minutes per trip for an overall average journey of 25 minutes. There was little benefit from using the bus lane at off-peak times.

### PARKING MANAGEMENT AND PRICING

**9. Discounted parking for smaller and more fuel-efficient vehicles.** Existing parking policies made no distinction between different types of vehicles except for drivers with impaired mobility.

CIVITAS helped to realise a new parking tariff scheme including extensive consultations with residents and businesses in the

controlled parking zones. The price of the annual permit differed according to the vehicle length and permits were free for any vehicle operating on alternative fuel.

Analysis of the relationship between car length, on-street parking capacity and emissions of CO<sub>2</sub> demonstrated that a 10 percent reduction in average vehicle length would increase practical parking capacity in streets by over 10 percent. And if all the freed space was used for parking by “new” vehicles there would be a net reduction in CO<sub>2</sub> emissions by almost 2 percent.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**10. Providing individual travel advice.** CIVITAS helped introduce TravelSmart personalised journey planning among students and staff at the university.

A personal travel advisor implemented a range of direct marketing methods to promote the measure among a total of 8,000 people, including targeting particular postcode areas, drop-in sessions and events. More than 70 percent of those who had contact with the personal travel service tried an alternative mode. Half the university community was travelling on foot or by bike by the end of the measure.

The cycling initiatives were very successful: 39 of the 48 people who participated in the “try-before-you-buy” scheme went on to buy a bike and started cycling two to three times each week. A significant increase in shared car journeys from 1 to 7 percent was recorded as well.

### MOBILITY PLANNING

**11. Linking individual transport information with healthcare appointments** (not implemented as planned). Health-related transport in Norwich was provided by the health sector, social services and the voluntary sector, all operating independently. With the help of CIVITAS, the city aimed at achieving an integrated and coordinated approach with personalised transport timetables and booking information linked to healthcare appointments, providing a better public transport service for patients and reducing the number of appointments not attended.

Many organisations, both public and private, had difficulties allocating resources to this experimental initiative and the measure was not implemented as planned. Nevertheless, a specific public transport campaign was launched and transport information leaflets were distributed at the hospital.

**12. Travel planning for schools and workplaces.** CIVITAS helped Norfolk to develop travel plans for schools and workplaces. The work was undertaken by travel plan officers and resulted in tailor-made plans and a range of initiatives including walking schemes, “bike and breakfast” schemes, presentations on car sharing and eco-driving, shuttle bus initiatives, car-pooling schemes and bike-loan clubs.

Eighty-eight schools approved their travel plans and achieved collectively a 10.3 percent reduction in single-occupancy car trips. All 20 targeted workplaces approved travel plans as well. The four largest employers were closely monitored and presented positive modal shift results between 4 percent and 18 percent. Single-occupancy car travel to and from workplaces fell by 10.75 percent.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**13. Providing real-time passenger information on displays and by SMS.** The provision of real-time passenger information, available on information displays and by SMS, was intended to achieve reductions in actual public transport journey times.

There were, however, significant problems with obtaining real-time next departure data from the existing BusNet tracking system. An alternative trial system at only one location was developed. In addition, service cancellations were announced by SMS message to a test group of 35 regular bus users.

The post-implementation surveys indicated that the display screens were found to be useful by more than 60 percent of the respondents and that 47 percent of them would consider using the bus for their next journey. The disruption messages were well accepted by the test group.

### REAL-TIME ROAD USER INFORMATION

**14. Traffic and travel information for freight operators.** As an incentive to adopt cleaner vehicle technology, CIVITAS proposed a customised information service for freight operators linked to their willingness to use more energy efficient vehicles in the urban area.

Work was undertaken with the two most interested operators to identify their traffic and travel information needs and develop a customised viewer that could be used by operators of heavy goods vehicles.

It concluded that traffic and travel information can help with the planning of delivery routes before and during deliveries. A sufficient level of detail about road conditions is required, however. Ideally, this is backed by other information such as the most appropriate routes for heavy goods vehicles and the locations of weight/width/height restrictions on the road network.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**15. Developing a strategic freight stakeholders club.** Norwich undertook several measures within CIVITAS focusing on freight operators and more efficient goods deliveries in the city.

This measure aimed at establishing a freight stakeholder group that could work together on a strategic freight initiative in the Norwich urban area. It attempted to involve key private sector haulage, logistics and freight distributors and the local authorities.

There was, however, only limited interest from operators and it was also difficult to encourage those who did express an interest to attend any regular working group meetings. Contribution to strategies and consultation work was therefore organised on an ad hoc basis.

**16. Establishing an urban transshipment centre.** Through a partnership between Norfolk County Council and a logistics company a transshipment centre warehouse was realised, enabling the optimisation of delivery flows towards the city.

Although the measure achieved limited success in terms of customer recruitment, there was a high level of satisfaction with the service among existing customers.

There was also some success in switching urban deliveries to smaller goods vehicles. Vehicles making deliveries from the transshipment centre were also allowed on the bus lanes, which resulted in an average peak journey time saving of 1.8 minutes.

**17. Goods deliveries to park-and-ride sites** (not implemented as planned). Norwich had six park-and-ride sites with high-quality and secure facilities and a reliable bus service. CIVITAS helped in the testing of a goods delivery service to existing park-and-ride facilities. The aim was to increase the use of collective transport by shoppers.

A new service linking the airport park-and-ride site with three city-centre collection points during the week was introduced as a test case. One independent retailer funded a van service to another P&R site and a Christmas-only service was launched as well.

The original intention for a shop-and-go service all year round turned out to be unfeasible for financial reasons. Moreover, the only demand for the service proved to be during the Christmas and New Year period.

Connie Juel Clausen  
Nørregade 36-38  
5100 Odense-C  
cjc@odense.dk  
Tel: +45 65 51 27 51  
Fax: +45 65 91 96 81  
www.odense.dk

Odense is an atmospheric city in the heart of Denmark on the island of Funen and was the third largest city at the time of the CIVITAS project. The city is a major hub for road, rail and bus transport. The city is one of Denmark's largest university towns and also hosts the largest single university hospital in Denmark with approximately 8,000 employees.

CIVITAS Phase: II – MOBILIS  
Duration: 2005 – 2009  
Role: Learning city

## COLLECTIVE PASSENGER TRANSPORT

### TICKETING AND TARIFFS

**1. E-ticketing and other improvements to public transport.** Challenged by falling passenger numbers and declining revenues for public transport, Odense realised some innovative services with the support of CIVITAS.

A bus priority system was installed that increased travel speeds by 3 percent in the evening and 1 percent during the day. Advanced information services were introduced including an SMS ticket selling service, a new website and real-time passenger information screens.

Promotion of all the new services was done by innovative marketing and media campaigns, resulting in a total of 5,001 SMS tickets sold per month during the first year. A 2006 survey showed that 87 percent of the users of the website appreciated its accessibility.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**2. Implementing environmental zones.** Before CIVITAS, several surveys had revealed that Odense needed a better pedestrian connection between the pedestrian street system and the railway station and that public support for low-speed traffic in residential areas was high. Within the CIVITAS project, environmental zones were established in the city centre and two selected housing areas. This was part of a city-wide policy for improving the environment and enhancing the quality of life of the citizens who live and work there. In the city centre, the measure was complemented with priority measures and interactive information points for pedestrians and cyclists.

There was a high level of citizens' involvement in the measure, in the planning process as well as during the implementation phase.

The results were impressive: the average speed dropped by 12 percent and 22 percent respectively in the two residential areas. The volume of traffic through the city centre fell by 35 percent. The proportion of residents who considered it safe to cross the road increased from 24 percent to 61 percent. The share of cycling increased by 62 percent.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**3. Creating alternative mobility options for owners of old cars.** The average age of cars in Denmark is higher than the European average. CIVITAS helped realise an innovative campaign to evaluate if and how owners of "old" cars might be persuaded to choose different mobility habits.

A group of 160 families joined the project and were offered alternative transport possibilities. A total of 6,602 "alternative" trips covering 145,275 km were registered in May and June 2006, while 6,628 trips covering 150,705 km were registered between September and October.

The campaign was therefore successful, but on a smaller scale than expected, as was the reduction in car use: changes in travel habits take possibly a longer time to achieve.

**4. Interactive traffic training for children.** Behavioural traffic training can reduce the number of accidents and improve mobility choices for and by children. In the framework of CIVITAS, a new Internet-based interactive tool "B-game" was developed with scenes filmed in Odense.

B-game was played 1,694 times during the project period and most pupils continued to play until they had succeeded in all 11 "missions".

Unfortunately, only 12 out of 53 schools played the game despite the general support from the Schools Department because they were already involved in a high number of other external programmes. The lesson was that schools need to be involved well before the development of training programmes to ensure high participation among pupils.

**5. Marketing personal transport choices.** CIVITAS supported the testing of the TravelSmart concept by personal transport choice marketing.

Trained students visited a total of 7,000 households (around 15 percent of the population) with information on sustainable modes of transport and incentives to change daily travel habits. Many of these people would then talk to friends, family and colleagues, spreading the message even further.

A sample of 310 households, with a total of 546 people, were asked about their travel habits before the visit and then three months after. The results showed that their car trips dropped by 9 percent, bus trips increased by 58 percent and train trips

increased by 54 percent during the project period. The related transport budget portal had a total of 1,546 visitors.

### MOBILITY PLANNING

#### **6. Mobility management service for the harbour.**

Odense harbour, formerly an industrial area, was turning over to more recreational and small-business uses. With the help of CIVITAS, an integrated mobility management plan was developed in which architecture and traffic planning were fully integrated.

A core working group including the Traffic Department, the City Planning Department, the Urban Planning Department, the public transport company and some external consultants started in 2007.

The key outputs were a toolbox for traffic planning, a cycle traffic model, and a plan for traffic and mobility. The cycle traffic model was very complicated to develop and required expertise from the city's technical university. The traffic and mobility plan was very ambitious and included all modes of transport and both soft and hard measures.

Judit Pongrazc  
Széchenyi tér 1  
H-7621 Pecs  
pongrazc.judit@ph.pecs.hu  
Tel: +36 72 53 38 12  
Fax: +36 72 23 63 68  
www.pecs.hu

With 157,000 inhabitants at the time of the CIVITAS project, Pecs is the fifth largest city in Hungary. Situated close to the Croatian border, Pecs has road and rail links with the Hungarian capital, Budapest, as well as with cities in Austria, Bosnia and Herzegovina and Croatia.

CIVITAS Phase: I – TRENDSETTER  
Duration: 2002 – 2005  
Role: Learning city

## DEMAND MANAGEMENT STRATEGIES

### PARKING MANAGEMENT/PRICING

**1. Establishing a zoned parking system in the city centre.** The objective of establishing a zone-model parking system was closely linked to the establishment of a car-free zone and limited access zone in measure 2.

CIVITAS helped to realise a new parking system including zone differentiation, more park-and-ride facilities outside the city centre and accompanying tools such as signs and vending machines.

After the implementation, there were fewer cars in the city centre, including roads and parking facilities. Emissions decreased by between 20 and 80 percent, depending on the type. The average parking time in the city centre was reduced by 20 to 30 percent. A reduction in air and noise pollution by 3 percent was measured in the city centre, which created better living and working conditions and a better environment for tourists. This better environment also helped in the preservation and protection of the city's UNESCO World Heritage sites.

### WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**2. Car-free zone, strolling zone and bicycle path network.** Prior to CIVITAS, the volume of traffic and the number of private cars visiting the UNESCO World Heritage sites and the city centre were steadily increasing. CIVITAS supported the introduction of a car-free zone and supplementary measures.

All stakeholders and affected citizens were invited to participate in the planning stages and the measures had full political support from all parties. The new World Heritage Zone became completely closed to private cars, with a speed limit of

30 km/h and access restrictions for heavy vehicles over 6 tonnes. A media campaign promoted the positive effects of the system among the public.

The measure fully met its objectives (see also measure 1) and the reduction targets for traffic and air/noise pollution were achieved. There was 80 percent less traffic in certain parts of the city centre, 95 percent fewer heavy goods vehicles and around 3 percent less noise pollution. Although the extension of the bicycle roads was postponed, living conditions significantly improved in the central areas of Pecs.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**3. Preparing a new traffic and transport strategy.** CIVITAS supported the city with the preparation of a local traffic and transport strategy to tackle the city's increasing volume of private cars and rising levels of pollution and congestion.

The strategy focused on two areas: access limitations in the city centre to offer better living conditions (see also measures 1 and 2) and the modernisation of the public transport system. The strategy explored public transport development from two perspectives: the feasibility of the introduction of fixed track public transport modes and the possibilities of a fuel change for the existing bus fleet.

Thanks to CIVITAS, the relocation of the local bus station from the densely populated centre to a suburban district was realised. A fixed-track public transport infrastructure and some road infrastructure needed for the opening of the expo centre and the Pecs-Pogany Regional Airport were developed as well.

Stefania Papa  
Piazza Morlacchi 23  
06123 Perugia  
s.papa@comune.perugia.it  
Tel: +39 07 55 77 38 09  
Fax: +39 07 55 77 39 34  
www.comune.perugia.it

Perugia is located in central Italy and had a population of 160,000 people at the time of the CIVITAS project. The historic town attracts a lot of tourists and traffic from throughout the region, which compromises the accessibility of the city centre. The city is a major educational centre that is popular with students from abroad. As the capital city of the Umbria region with almost a quarter of the population of the province, Perugia is also a major administrative, social and medical centre.

CIVITAS Phase: Plus – RENAISSANCE  
Duration: 2008 – 2012  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

#### **1. Car pooling: Encouraging higher vehicle occupancy.**

Although Perugia had restricted private car access to its city centre in the early 1980s, traffic problems worsened as car ownership grew. With the support of CIVITAS, the city developed a pilot car-pooling scheme for students and university staff. The measure included a study of a prototype gate that could check the number of persons inside the vehicle before granting access to a reserved parking area.

The city carried out an online survey to assess interest in car pooling within the university community and involved the staff and the mobility manager of the university in the implementation of the measure. The measure was carried out as part of the city's Urban Mobility Plan adopted in 2006.

The measure resulted in the creation of a new web portal which entered the test phase at the end of the CIVITAS project. CIVITAS provided Perugia with the opportunity to collaborate with stakeholders such as the university.

### CAR SHARING

**2. Car sharing in Perugia.** Before measure implementation, growing car ownership had aggravated traffic problems in Perugia's city centre. In order to complement the public transport system and discourage citizens from buying second cars, the city conducted a feasibility study for the introduction of a car-sharing system. The main innovative aspect was

connected to the "pay as you use" principle, giving users access to a variety of different vehicles.

A local survey was carried out to assess the demand for car sharing. The measure was carried out as part of the city's Urban Mobility Plan adopted in 2006.

As a result of the measure, the city council committed to a full-system implementation and launched a tender to find a provider to administrate the service. The CIVITAS project allowed the city of Perugia to introduce a new concept of transport to residents.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

#### **3. Clean fuel technology for the public transport fleet.**

Before CIVITAS, only 62 percent of the public bus fleet ran on clean fuel (methane). With the support of CIVITAS, 47 percent of the remaining diesel buses were retrofitted with an innovative dual-fuel solution.

Public transport users provided feedback in dedicated focus group sessions. The measure followed the public transport provider's policy to improve customer experience by introducing environmentally friendly features.

The measure significantly reduced emissions (up to 90 percent for CO<sub>2</sub>), noise (40 percent), and fuel and maintenance costs (21 percent). Thanks to its integrated approach to urban transport improvement, the CIVITAS project continues to play a strategic role, attracting increased interest among politicians in integrated solutions for sustainable mobility.

#### **4. Retrofitting the service car fleet of the municipality.**

At the start of the CIVITAS project, the municipal government had a fleet of 172 petrol-fuelled vehicles for daily trips across the city. To set a better example to citizens, the city retrofitted 33 of its most polluting vehicles to run on methane. The city took a creative approach to the promotion of clean vehicles by giving the remaining methane kits to 35 "winning" citizens using a list of criteria such as income and sustainable behaviour.

Dissemination activities helped get the CIVITAS message to the Perugia public as part of an overall policy to introduce more sustainable car use. The measure was part of the integrated package of CIVITAS measures, as the newly created mobility brand ESC (see measure 9) was used to promote the retrofitted vehicles.

While maintenance costs of the retrofitted vehicles remained unchanged, fuel costs dropped by 37.5 percent (2011 compared to 2008). CO<sub>2</sub> emissions dropped by 22 to 27 percent and hydrocarbons emissions by 34 percent at the lowest gear. Although the number of retrofitted municipal cars was quite small, it represented 100 percent of vehicles that could be retrofitted according to a detailed analysis.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

#### 5. Intermodal interchanges for public transport.

Along with the introduction of Perugia's Minimetro system, the intermodal integration of public transport needed reconsideration. The CIVITAS measure consisted of creating nodes to improve the connections through the introduction of footpaths, protected corridors, footbridges and advanced information systems.

The city promoted the benefits of the measure through various dissemination activities using its new mobility brand ESC (see measure 9). The multimodal integration of public transport was identified as a key priority for the next 10 years in Perugia's Urban Mobility Plan, with emphasis on creating a network of high-quality interchanges.

The creation of intermodal nodes resulted in increased customer satisfaction; more efficient public transport operations; and a 114 percent increase in bus boarding and alighting at these nodes. The efforts delivered in the CIVITAS project will help shape transport policy in the city for many years to come.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Reducing private vehicle access to the limited traffic zone.** In 2002, the city of Perugia installed automatic gates at the main access points to its limited traffic zone (LTZ), but a number of uncontrolled access points allowed drivers to get in. CIVITAS support was used to install 12 additional gates. A unique tracking system for different categories of users (lorries, buses, coaches, private cars) was developed to control the traffic and monitor the length of stay within the zone.

The city conducted an awareness campaign for citizens in collaboration with the local police. The measure was carried out as part of the city's Urban Mobility Plan adopted in 2006.

As the measure did not change the LTZ regulations, a decrease in entries, and hence traffic in the zone, was not expected from this measure. The integrated structure of the CIVITAS project has allowed the city to achieve more effective results than those that could have been attained through isolated measures.

#### 7. The set-up of a traffic monitoring control centre.

At the start of the CIVITAS project, Perugia was struggling to ensure a high level of mobility, as the transport system in the centre had to work around Etruscan, Roman and medieval walls mixed with peripheral post-war developments. The city set up a traffic monitoring control centre to increase the efficiency of both the municipal service fleet and the urban public transport fleet through automatic vehicle location, public transport priority, and real-time passenger information. The system used the latest innovations in information technology.

There were no citizens involved in this measure. The measure was carried out as part of the city's Urban Mobility Plan adopted in 2006.

Results of the analyses related to all indicators were very favourable on the implementation of the measure in both aspects (automatic vehicle monitoring systems and public transport priority; and municipal automatic vehicle location systems.) The indicators showed a good impact on urban traffic flows. Thanks to CIVITAS, the city of Perugia is now able to make short-term simulations of its transport system and reach better-informed planning decisions.

### PARKING MANAGEMENT/PRICING

**8. Implementation of the city parking strategy.** Before CIVITAS, free parking along the roads just outside the car-restricted city centre caused congestion and a shortage of parking spaces for local residents and businesses. With this CIVITAS measure, the city introduced paid parking and reserved parking spaces for the disabled and for lorries in a pilot area near the city centre. The measure was innovative because it created a buffer area, virtually extending the boundaries of the limited traffic zone (LTZ) in some respects.

Before implementation, the city assessed driver and public attitudes towards parking and the level of acceptance towards parking management measures. The measure included the design of a new parking action plan.

The number of free parking spaces was reduced by 40 percent. The number of residential and disabled reserved spaces increased fivefold. Illegal parking dropped by up to 33 percent during the morning peak. The impacts of the measure were striking and gave a boost to the city's mobility management policy. The CIVITAS measure facilitated the future introduction of parking management in other areas of the city that have good public transport and pedestrian connections to the centre.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**9. Raising awareness of the new mobility strategy.** At the start of the CIVITAS project, the city of Perugia had all of the necessary building bricks to introduce a fully sustainable transport system, but it needed to make its citizens aware of the new options that were available to move through the city. The city created a CIVITAS-branded awareness campaign, with a customised ESC logo ("Easy-Safe-Clean" mobility) for each CIVITAS measure. For the first time in the city, all public transport stakeholders worked together to raise awareness of sustainable mobility among citizens.

At the start of the measure, a task force with representatives of all local public transport operators and the city was created. The measure was designed to spread the vision of Perugia's recent Urban Mobility Plan, which introduced the concept of an intermodal public transport network with an integrated fare system.

As a result of this measure, awareness of the CIVITAS Initiative and Easy-Safe-Clean mobility increased among car drivers by 22 percent. Through the development of the ESC brand,

the communication strategy will continue after the end of the project as a permanent feature of transport policy in the city.

**10. Trip avoidance strategies.** As all of the main public bodies and offices of the municipality were located within the city centre, the low accessibility of the area was a nuisance for citizens who had to deal with administrative issues. In order to reduce the need to travel, the city made three of the most-used administrative procedures available through the Internet. The measure involved elaborating an innovative methodology for assessing and quantifying web service impact. It took into consideration results produced in the environmental and energy fields.

The city launched an extensive media campaign to make citizens aware of the new services. The measure was carried out as part of the city's Urban Mobility Plan adopted in 2006.

Almost 7,000 car trips were avoided thanks to the provision of the web services. CIVITAS helped the city of Perugia not only to cut unnecessary trips, but also to reduce the time needed to complete administrative tasks and to increase the efficiency of the municipal administration.

## MOBILITY PLANNING

**11. Sustainable commuting strategies.** Before CIVITAS, there was a growing trend among the 600 municipal employees to use their private cars to come to the offices located in the city centre. To reverse this trend, the municipality devised a home-to-work travel plan. At the time, workplace travel plans were an absolute novelty in the city.

The city surveyed its employees to identify their travel habits. With this measure, the city set an example to other employers in the city by implementing the vision of the city's recently adopted Urban Mobility Plan.

After implementation, 16 percent of employees said they changed their daily commuting mode from the car to walking (2 percent), car pooling (4 percent), bus (7 percent) and Minimetro (3 percent). This was counter to a city-wide decline in public transport use (-5 percent for bus and -11 percent for Minimetro). CIVITAS created a basis of support for sustainable commuting among the city employees and in the long run the city considered adding teleworking as an option, as well.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**12. Assessing options for more efficient road pavement markings.** Before CIVITAS, most municipalities only evaluated the work of external contractors in road marking maintenance in a qualitative manner. The city of Perugia, however, developed a tool to verify and judge the quality of road markings by means of a scientific and experimental approach. The measure included the design of an innovative rating system (CIS-Q) that considers all the evaluated parameters and expresses them in terms of a single number.

For this measure, the city cooperated with the University of Perugia.

The measure unveiled the poor quality of road markings, identified ways to reduce maintenance costs, and tightened the requirements and controls for public tender works. Thanks to CIVITAS, Perugia was able to take a leading role in road markings in Europe. The methodology was transferred to the CIVITAS partner city of Bath and disseminated to other cities in several international conferences.

**13. Improvements in the bus stop environment.** In the 20 years before CIVITAS, the city of Perugia had made many innovative investments to reduce car traffic and create an integrated public transport network. As the bus stop is the first contact point between the passenger and the bus service, the city used CIVITAS support to enhance the safety and comfort of 24 bus stops.

The customers and users of the public transport service were involved in focus groups where they related their perceptions, opinions and attitudes towards the changes at the bus stop. The measure aimed to make the public transport system a valuable part of citizens' everyday lives, corresponding to the vision expressed in the city's new Urban Mobility Plan.

Overall, users gave the refurbished bus stops a score of 4.5 out of 7. The integrated structure of the CIVITAS project has allowed the city to achieve more effective results than those that could have been attained through isolated measures.

## TRANSPORT TELEMATICS

### REAL-TIME ROAD USER INFORMATION

**14. Road safety and security traffic control/monitoring system.** With the support of CIVITAS, the city developed a traffic management system that monitors traffic, makes traffic forecasts and re-routes drivers to more reliable or safer routes through variable message signs. The measure involved the development of new software to make forecasts about traffic and safety conditions.

The installation of seven variable message signs and 13 sensors along the main roads led to a reduction in road accidents and a more efficient traffic flow.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**15. PIPE\$NET system for city logistics.** At the start of the CIVITAS project, the high number of freight vehicles necessitated by the numerous commercial activities in the city centre generated traffic problems and pollution, and made the historical city centre less attractive. The city used CIVITAS support to conduct a feasibility study for the introduction of Pipe\$Net, an innovative freight transport system constituted by a network of special pipes which allows for high-speed and low-energy freight transport. The measure demonstrated the potential application of this technology in a historical city like Perugia.

By communicating about the measure, the city aimed to interest public and private organisations in radically innovative freight transport systems.

The cost-benefit analysis showed that the system's emissions levels and energy consumption are very low when compared to road transport and predicted an increase in welfare. Thanks to the study, the city raised awareness among stakeholders about innovative logistics solutions in order to prepare a pilot line.

Milena Perpelea  
Bd. Republicii 2  
100066 Ploiesti  
al21@ploiesti.ro

Tel: +40 24 451 66 99 ext 366

Fax: +40 24 459 12 56

[www.ploiesti.ro](http://www.ploiesti.ro)

The city of Ploiesti is located in southern Romania. Between the two world wars the local economy was boosted by the opening of petroleum processing facilities. The city has become one of the most important economic centres in Romania, characterised by a concentration of large businesses. Between 1912 and 2002, the population rose from 56,460 to 232,452.

CIVITAS Phase: II – SUCCESS

Duration: 2005 – 2009

Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

#### **1. Converting buses to run on liquefied petroleum gas.**

At the time of measure implementation, old, high-maintenance and heavily polluting buses still made up the majority of Ploiesti's public transport fleet. With the support of CIVITAS, 25 buses were converted to run on liquefied petroleum gas (LPG). For Ploiesti, this was a pilot project.

The local public transport company was involved in the implementation of this measure. All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

Due to the higher levels of fuel consumption of LPG buses, there was only a slight decrease in fuel costs and maintenance costs remained high. However, the conversion was seen as a good short-term measure and the quality of public transport services rose as the buses were totally modernised before conversion. At the same time, the measures led to reduced pollution downtown. In Ploiesti, CIVITAS contributed to a positive image of public transport, as public reaction to the refurbishment was very positive.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

#### **2. Improved infrastructure for collective transport.**

Prior to measure implementation, Ploiesti had no special

infrastructure facilities in key transfer areas, no cycling parking at transport interchanges, poor information provision and poor access to public transport. This CIVITAS measure aimed to maintain and increase the usage of public transport services in competition with the private car by installing new shelters, signage, real-time information panels, bike parking facilities and accessibility features.

The local public transport company was involved in implementation. All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

The quality of public transport infrastructure was improved at 10 targeted interchanges.

## TICKETING AND TARIFFS

**3. Developing a new ticketing system** (not implemented). Before measure implementation, the existing ticketing system was obsolete and did not meet the requirements of public transport users. When ticket booths were closed, or at stops where there were no ticket sales at all, it was impossible for travellers to get tickets. With the support of CIVITAS, the first steps towards an integrated ticketing system were taken.

The measure required participation from external technical advisors, ticket machine/software suppliers and the local authorities. Awareness was raised among users and public transport staff. All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

Due to some unexpected legislative and technical barriers, the measure could not be implemented as initially planned. The measure resulted in a feasibility study, as a first stage, for a new ticketing system. Even if the system could not be implemented during the project, it is planned to introduce the system validated by the feasibility study.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT

**4. Developing a clear zone in the historical city centre.** The need for this measure arose from increasing congestion and pollution levels in the centre. The clear zone would impose access controls on motor vehicles, thereby protecting the area's historical heritage and improving safety for pedestrians and cyclists.

A survey among the public was developed before the implementation of the measure. All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

The creation of a clear zone of 1 km<sup>2</sup> led to reduced congestion, improved safety for pedestrians, a 20 percent improvement in public transport speeds and a 15 percent reduction in pollution in the central zone.

## WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**5. Creating new infrastructure for walking and cycling.** As a way of tackling high levels of pollution and increasing congestion, Ploiesti built 8 km of cycle paths and 12 km of pedestrian zones, improving accessibility, security, and connections between routes and modes. For the city, these would be the first real cycling and walking spaces.

Public consultations preceded implementation of the measure and the construction of the facilities was followed by a promotional campaign to encourage positive changes in attitudes and travel behaviour. All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

The measure led to improved accessibility to the city centre; a higher share of alternative transport modes within the modal split; and reduced pollution and traffic congestion.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**6. Planning for alternative transport modes.** Before CIVITAS, there were no plans for alternative transport in Ploiesti, congestion levels were high and traffic regulations lacking, forcing cyclists to use sidewalks to get to the centre of the city. In addition to building new infrastructure for walking and cycling (see measure 5), the city planned to improve the functionality and environmental compatibility of the traffic system components.

This measure was the design part of the project "Strategic Traffic Plan for Alternative Transport in Ploiesti Municipality".

The measure resulted in a study regarding alternative modes of transport and a strategic plan for walking and cycling. CIVITAS provided the framework for the city of Ploiesti to strategically improve safety and the quality of urban life, reduce pollution, promote a healthy urban lifestyle, improve the city's image and protect urban landscapes.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**7. Developing GPS monitoring for the public transport fleet.** At the time of measure implementation, the Ploiesti public transport company RATPP operated 62 trams, 193 buses and 10 trolleybuses. With the support of CIVITAS,

Global Positioning System (GPS) technology was developed for managing the public transport fleet and providing real-time passenger information (see measure 8). The GPS system offered the possibility to have traffic data in real time and adapt to traffic according to needs.

To avoid opposition from drivers and operator, it was stressed that the system served to provide real-time information for passengers, rather than for monitoring performance. All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

Improved fleet management produced savings in time and fuel and enhanced the quality of the public transport service.

**8. Implementing a real-time information system for public transport.** At the time of measure implementation, the Ploiesti public transport company RATPP transported an average of 300,000 passengers per day. The measure involved the installation of 28 light-emitting diode (LED) panels providing real-time passenger information at the busiest interchanges.

All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

The measure led to better financial results, increased patronage and improved traffic management within the city centre.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**9. Freight partnership, planning and routing.** Shops and minimarkets are located in the city centre, but several small companies are also quite near the heart of the city, causing pollution and congestion. With the support of CIVITAS, the city elaborated a strategic logistics plan, designed facilities dedicated to goods distribution, identified freight routes, and brought stakeholders together in a freight forum. The measure was innovative, as no policy regarding freight transport had been designed before the launch of CIVITAS.

Through the establishment of a freight forum, Ploiesti aimed to encourage a cooperative approach among stakeholders in order to optimise transport and delivery networks. All CIVITAS measures were designed on the basis of the Local Strategy for Sustainable Development created within the city's Local Agenda 21, the General Urban Plan of Ploiesti and the plan of transforming Ploiesti city into a nucleus of a metropolitan area.

As a result of signposting the new freight routes, access by heavy goods vehicles to the city centre was prohibited and heavy traffic was instead directed to the large commercial area on the outskirts of the city. Levels of congestion, pollution and noise inside the city were lowered.

Bruno Pereira  
Praça do General Humberto Delgado  
4049-001 Porto  
brunopereira@cm-porto.pt  
Tel: +35 12 22 09 04 00  
Fax: +35 12 22 09 71 00  
http://cm-porto.pt

Porto is located in a setting of rare natural beauty on the coast of the Atlantic Ocean. Portugal's second largest city stretches across 41.66 km<sup>2</sup> and was home to 263,000 inhabitants at the time of the CIVITAS project. Porto was granted UNESCO World Heritage status in 1996. Porto is known as the "city of bridges" for six outstanding structures that connect the banks of the Douro River. As one of Europe's oldest cities, it is steeped in tradition. About 60,000 students study in Porto, and the University of Porto is one of the largest and most prestigious academic institutions in the country. The city is also the hub of a highly industrialised region.

CIVITAS Phase: Plus – ELAN  
Duration: 2008 – 2012  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Light-weight bus shuttle.** Before CIVITAS, the city of Porto had not made significant efforts to make its public transport fleet cleaner. With the support of CIVITAS, Porto developed and tested a light-weight bus shuttle. It employed an innovative construction technology in order to reduce the weight and product costs of urban buses, reduce CO<sub>2</sub> emissions and promote a shift towards cleaner modes of transport.

A total of 14,000 passengers were carried by the light-weight bus, and CO<sub>2</sub> emissions were reduced by between 7 and 36 percent due to the weight reduction of 16 percent or 380 kg. The CIVITAS bus shuttle service attracted 27 percent new passengers. In Porto, CIVITAS demonstrated that if there is a good public transport service, citizens will use it.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**2. Flexible mobility agency.** Prior to the CIVITAS measure, Porto was confronted with traffic problems in the Asprela area. With the support of CIVITAS, the city of Porto set up a flexible mobility agency that offered a car-pooling platform and a demand-responsive transport service (DRT). The DRT was unprecedented in Porto and the car-pooling service was one of the first in the country.

Preliminary studies, based on citizens' opinions, helped to define the requirements and identified the routes and timetable for the DRT service. The Flexible Mobility Agency was part of the Mobility Shop launched within the CIVITAS project (see measure 3).

The CIVITAS measure contributed to a clarification and better understanding of the car-pooling and DRT concepts. The measure achieved high levels of reported satisfaction and a reduction in air pollution. The dissemination campaigns that promoted these two services were very important. Without them it would not have been possible to obtain these results and to get the public's attention.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**3. The Mobility Shop.** Before the CIVITAS project, the Asprela quarter in Porto suffered from heavy congestion. With the support of CIVITAS, Porto opened a Mobility Shop that provides citizens with information about all means of transport available in the city, and raises awareness of mobility issues. The Mobility Shop was the first service in the city to consolidate all public transport information.

The shop used a website to give information and advice on multimodal transport and logistics support for the car-pooling service.

The measure contributed to increased satisfaction with the public transport service, a better understanding of innovative mobility services and mobility information needs and an increased demand for public transport. The success of the Mobility Shop showed that this kind of service is important for citizens. Porto is confident that wider awareness of public transport options in the city will stimulate more intermodal travel.

### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**4. Participatory planning for a new intermodal interchange.** Before the CIVITAS project, Porto was confronted with high congestion in the Asprela area. The city launched a participatory planning process for an intermodal interchange point as the basis for a public tender for its construction. For the first time in Porto, residents were invited to participate in the process. Face-to-face interviews were set up where they could express their opinions about an intermodal interchange.

Since the beginning of the implementation, public and private transport operators, stakeholders and the local population were involved. Afterwards, in order to choose the best management model for the infrastructure, a business plan was drafted by an external consultancy company.

As a result of the measure, Porto gained expertise in the field of participatory planning and intermodal interchanges and took a huge step towards the implementation of the first multimodal

interchange point in the north of the city. By involving the most important public transport companies in the city, the final layout of the interchange reflected all their requests, and this promoted use of the hub.

**5. Integrated accessibility planning.** Despite a fairly good public transport service in the Asprela quarter, illegal parking and congestion were critical problems. Therefore, the city elaborated a participatory mobility plan for the area. The plan would consider all modes of transport and consider issues of land use, environment and operations.

The municipality conducted a door-to-door mobility survey in the Asprela quarter to find out residents' mobility concerns.

The measure contributed to the construction of a new cycle lane, better pedestrian mobility and accessibility, better public transport facilities, public transport priority at traffic lights, junctions redesigned for greater safety and a new traffic light intersection.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**6. Mobile mobility information.** Prior to the CIVITAS project, it was not easy for passengers to get comprehensive information on all the means of transportation available in Porto. This measure aimed to develop a support decision tool which helped people to plan and optimise their public transport trips, based on real-time information from different operators. The innovative aspect of the measure was the development of the new tool "Information for Mobility Support", which was used to feed liquid-crystal displays (LCD) in public spaces and the MOVE-ME application for mobile devices.

This project involved the private company OPT, responsible for technical research and development; two public transport companies, STCP and Metro do Porto; and 13 private transport companies.

Members of the general public returned good feedback and said they would like the service to continue. About 21 percent said they used their private cars less. The measure's two main products, the LCD displays and MOBILE-ME, were promoted for implementation in other cities in Portugal.

Mariella Parziale  
Via Vaccaro 127  
Potenza  
sat@comune.potenza.it  
Tel: +39 97 11 80 02 46  
Fax: +39 97 11 80 04 70  
www.comune.potenza.it

Situated in southern Italy, Potenza is the capital of the province of Potenza. The municipality covered an area of more than 170 km<sup>2</sup> and had a population of around 70,000 people during the CIVITAS project. Potenza is a very hilly town.

CIVITAS Phase: II – SMILE  
Duration: 2005 – 2009  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Developing a web-based car-pooling matchmaking tool.** Before CIVITAS, car pooling existed only in a spontaneous and disorganised way. CIVITAS supported the introduction of a car-pooling system with a web-based matchmaking tool.

A survey was carried out in 2006/2007 in order to obtain data about home-to-work trips in five companies in the city. Data analysis was followed by system design and the procurement of appropriate software in 2008. The database is linked to opportunity matching software and identifies ideal potential car-pooling partners. The tool targeted 631 employees working in the region. An awareness-raising campaign was carried out in 2008 among employees. As an incentive for car poolers, dedicated parking lots were also created.

From the project experience it was clear that at least one or two years are necessary to fully evaluate the effectiveness of car pooling. Moreover, structural policies concerning the management of mobility and public parking are needed to make car pooling part of people's normal travel patterns.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Introducing clean vehicles into the urban bus fleet.** Prior to CIVITAS, the public transport bus fleet of Potenza comprised 43 vehicles, which averaged 11 years in age. The fleet was far from compliant with European emission standards and all buses were powered by conventional fuel.

CIVITAS supported the partial replacement of the urban

fleet with four new buses running on compressed natural gas (CNG). This led to a decrease in annual fuel costs by EUR 30,357.

This positive CIVITAS experience raised awareness of the need for clean vehicles among many politicians and technicians. The Basilicata Region and the municipality of Potenza allocated additional funds to replace, step by step, their urban bus fleet. The municipality purchased five new CNG buses in 2011 and 12 in 2012.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**3. Creating a demand-responsive transport system** (not fully implemented). Before CIVITAS, the demand for a public transport service between the historical centre and the peri-urban zones was high. CIVITAS helped develop an innovative "dial-a-ride" public service, a so-called demand-responsive transport system (DTRS).

The integration of DTRS with other transport systems involved the careful planning of target interchanges, routes and stops. Transport personnel were trained and events were organised to promote the service among residents of areas with a low population density.

The DTRS measure could not be fully implemented during the project but the CIVITAS experience helped to re-engineer the existing public transport system and related services.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**4. Creating a mobility centre.** CIVITAS helped to realise the mobility centre, a service set up to integrate transport planning strategies and to coordinate mobility management measures.

The centre's main tasks included providing information to public and private companies on car pooling, demand-responsive transport solutions and road safety. It also raised public awareness of mobility issues. The mobility centre was and is the headquarters of mobility management and serves as the seat of a forum for cooperation and interaction between different regional planning organisations and economic stakeholders in the transport business. The centre develops technological solutions for traffic management and monitoring and coordinates passenger information systems.

Its analyses still provide a better understanding of the potential for a modal shift towards public transport and the potential benefits of actions in terms of economy, environment, transport and society.

# PRAGUE

## CZECH REPUBLIC

Jaroslav Mach  
Jungmannova 35/29  
111 21 Prague 1  
posta@praha.eu  
Tel: +42 02 36 00 42 86  
Fax: +42 02 36 00 70 44  
www.praha.eu

At the time of the CIVITAS project, the Czech capital Prague had a population of 1.187 million, and almost 3 million tourists visiting each year. The historical centre, with its unique panorama of Prague Castle, is a UNESCO conservation area. As the Czech centre of political and economic administration, industry, trade, education, research and tourism, serious efforts are required in terms of enhanced traffic management.

CIVITAS Phase: I – TRENDSETTER  
Duration: 2002 – 2005  
Role: Learning city

### COLLECTIVE PASSENGER TRANSPORT

#### ACCESSIBILITY

**1. Creating a new bus route.** Prior to measure implementation, the local street network made the Karlov area, home to several medical centres and the General Teaching Hospital, inaccessible by standard public transport buses. The CIVITAS measure aimed to satisfy basic transport demands with a regular bus line with small, low-floor “midi-buses”. The measure was innovative, as it closed a missing link in the bus network in an area where historical street design did not allow the deployment of standard buses.

The different options for the proposed routing were discussed with relevant municipal authorities and representatives of the General Teaching Hospital, while the actual implementation of the bus line was preceded by several local surveys and other discussions.

From the first days of operation, the line has been well used: up to 2,400 customers were transported daily and 98 percent of users indicated satisfaction with the quality of the service. The CIVITAS Initiative helped to remove the barriers to further expansion of the bus network, as the introduction of the line was a clear impetus for the introduction of other midi-bus lines.

### DEMAND MANAGEMENT STRATEGIES

#### ACCESS MANAGEMENT AND ROAD PRICING

**2. Extending the environmental zone.** In the 1960s, an access restriction zone was created in Prague’s city centre and gradually expanded to exclude heavy goods vehicles to an

area of 17 km<sup>2</sup>. Because of escalating motor traffic in Prague, the support of CIVITAS was used to limit access by heavy goods vehicles to other densely populated neighbourhoods.

Information leaflets were printed and articles were published in the local newspaper to raise awareness about the extension to the environmental zone. The measure was part of the strategy defined in the Principles of Transport Policy of the City of Prague.

The measure achieved a reduction in emissions, a reduction in energy consumption, a shift towards more fuel-efficient and cleaner vehicles and a more attractive city centre. The environmental zone proved to be an effective tool to improve the environment in urbanised areas and the standard needed for heavy goods vehicles to obtain a permit to enter was raised to Euro IV limits in January 2013.

### TRANSPORT TELEMATICS

#### INTELLIGENT TRANSPORT SYSTEM (ITS)–BASED ENHANCEMENT OF PUBLIC TRANSPORT

**3. Optimising the bus priority system.** Before CIVITAS, buses were given priority using road signs and, at some traffic lights, using passive detection systems. The CIVITAS measure brought a new bus priority system using active detection at several intersections. The new system brought a major change, as it makes it possible to identify individual buses and allocate priority based on the direction and timetable of each vehicle.

The measure was in line with the long-term public transport priority strategy applied by the regional transit authority ROPID, in cooperation with the city authorities and the police.

The measure achieved 100 percent adherence to bus schedules, an increase in operating speeds of up to 2.5 km/h, and a reduction in emissions and energy use. The CIVITAS measure proved the effectiveness of active detection of public transport vehicles and led to a gradual increase in the number of traffic lights equipped with a bus priority system (100 percent in early 2011) and in the number of retrofitted vehicles (70 percent of the fleet in early 2013).

# PRESTON UNITED KINGDOM

Christopher Hadfield  
County Hall  
Preston PR1 0LD  
christopher.hadfield@lancashire.gov.uk  
Tel: +44 17 72 53 04 85  
www.lancashire.gov.uk

The ancient town of Preston was granted city status in 2002, making it England's newest city. At the time of the CIVITAS project, the city had a population of 129,000. It is the administrative capital and largest commercial centre of Lancashire in northwest England. The city's strategic location makes it an important transport hub on the UK Trans-European Network between London and Scotland. With 32,000 students, the University of Central Lancashire in Preston was the sixth largest university in the UK and one of the fastest growing.

CIVITAS Phase: II – SUCCESS  
Duration: 2005 – 2009  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Promoting car pooling and car sharing.** Before CIVITAS, there were no, or very limited, car-pooling or car-sharing systems in place in Preston. This CIVITAS measure provided organisations in Lancashire with ride-matching software for use on their intranet sites in order to promote car pooling among their employees. The system was also put in place on the Internet to enable citizens to use car pooling for their daily commute or journey. Attempts to introduce a car-sharing scheme for the city of Preston failed.

This was part of a measure to reduce single-occupancy car use and to enable people to travel easily in the area.

With over 400 people from Preston and the neighbouring town of South Ribble registered, and each shared journey making an annual reduction of 1,000 kg of CO<sub>2</sub>, the measure provided a potential reduction in CO<sub>2</sub> of over 200,000 kg per annum. This proved the willingness of citizens to take part in this measure. It has subsequently been developed to cover a wider area and continues to receive funding for on-going promotion.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Testing cleaner buses.** As part of Preston's efforts to reduce air pollution and create a cleaner urban environment, the public transport operator Preston Bus carried out trials of

new clean engines that aimed to produce at least a 5 percent savings in emissions and fuel consumption.

This was part of a broader measure to ease congestion and improve air quality in the area.

Due to low availability, high costs, and grants being withdrawn on the national level, it was not possible to purchase hybrid buses. Instead, 10 diesel buses with "clean and purge" technology were tested. These yielded inconclusive results. Subsequent trials on three buses with 5 percent biodiesel showed little difference in performance and higher operating costs. CIVITAS allowed this trial to take place and although inconclusive at the time, it led to further developments of hybrid vehicles in the UK.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**3. Improving public transport infrastructure.** In an attempt to tackle increasing congestion and pollution, the city of Preston was already making efforts to market its public transport system. To boost passenger confidence, optimised and user-friendly infrastructure was created, including sheltered bus stops, a better maintenance regime with a hotline for reporting faults and damage, more bike parking, real-time information and better bus prioritisation.

Other bus operator stakeholders and organisations were involved in the development of the measure. It was part of a wider measure to improve the quality and impression of public transport in the area.

At the end of the implementation period, a rise in customer satisfaction could be measured, but there was not yet a rise in public transport passenger numbers.

**4. Introducing demand-responsive transport.** Inhabitants of outlying, rural areas that are not well served by public transport routes risk social exclusion unless services are developed that cater for their specific needs. The main objective of this measure was therefore to develop lower-frequency services to promote bus use as an alternative to the private car.

The measure was developed following consultation with potential users to enable the service to target and meet local demands.

Between 500 and 600 passengers were carried monthly and customer satisfaction was high.

### TICKETING AND TARIFFS

**5. Developing integrated transport ticketing.** Test versions of an interoperable smartcard were trialled in Preston generating useful results on performance and usability.

The roll-out strategy was refined with feedback that smartcard recharge should take place on board the bus.

Feedback from users was that instructions on how to use the smartcard were clear. Payment by smartcard was the preferred method amongst respondents across all bus routes that were surveyed. In Preston, CIVITAS served as an engine for potential behavioural change and it has helped generate political support that has continued.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Improving air quality by means of clear zones.** Before CIVITAS, significant areas of the city suffered from high levels of traffic with subsequent air quality issues. Preston undertook comprehensive air quality assessments in order to designate clear zones in sensitive locations (see measure 7). This gave a new focus for developing policies to tackle poor air quality in a targeted way.

Considerable public and stakeholder consultation took place throughout the development and implementation of the measure.

During the CIVITAS evaluation period, the trend in air quality was one of general improvement, with concentrations of all pollutants seen to be decreasing. CIVITAS served as an engine for behavioural change in planning activities and has helped generate political will and funding commitments for similar schemes in other parts of the authority.

**7. Planning for clear zones.** Before CIVITAS, significant areas of the city centre experienced vehicle — pedestrian conflict. The city created three clear zones, made major improvements to a dangerous junction, and introduced traffic calming measures and a 30 km/h speed limit in the city centre.

The city gained public support via a process of consultation, while discussions took place with property developers to encourage them to integrate clear zones and facilities for pedestrians and cyclists into their projects.

Reduced car traffic made the affected areas safer for cyclists and pedestrians, and initial statistics suggested a reduction in the number of traffic-related accidents in one of the clear zones. CIVITAS has helped generate political will and ensured future funding commitments for similar schemes in the authority, including the roll-out of 30 km/h limits in all residential areas and outside all schools in Lancashire.

### PARKING MANAGEMENT/PRICING

**8. Developing a parking strategy.** With the support of CIVITAS, Preston developed a consistent and equitable pricing structure for both on-street and off-street parking.

The city installed a working group of providers of on-street and off-street parking and park-and-ride services, while a survey was undertaken to ascertain users' opinions on current parking provision and pricing, and reactions to possible changes.

A second survey showed an increase in the use of car parks for

park-and-ride purposes, but concerns were raised that some parking charges could become too high.

### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**9. Implementing new infrastructure for cycling.** Prior to measure implementation, cycle use in Preston was declining and was low by European standards. The city decided to make cycling more attractive by extending and improving cycle routes, producing a new cycle map, installing new signage and cycle counters, and developing school travel plans.

Local communities were involved in audits of the area (see measure 16).

The cycle counters registered an increase in cycling of 8 percent, while the national traffic survey suggested an increase in cycle use in the Preston area of 13 percent. CIVITAS acted as a catalyst to turn the decline in cycling around and bring cycling levels in Preston closer to the European average.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**10. Branding the Overground public transport offer.** Before measure implementation, public transport passenger numbers were declining in Preston. The city marketed its high-frequency bus network by creating the Overground brand, which was promoted in a similar way to the London Underground.

The bus network was reviewed in cooperation with bus operators.

Although the CIVITAS project was being implemented during a period of upheaval in Preston's bus market, with commercial operators aggressively competing over the network, public awareness was raised about the network as a whole, rather than individual routes.

**11. Disseminating information.** The local authority in Preston developed a transport portal to highlight all sustainable transport opportunities in the area and strove to make better use of variable message signs for citywide network information and route choice advice.

Eight out of 10 people surveyed found the website easy to use and feedback from respondents encouraged the city to add more content.

**12. Public transport information and promotion.** The city aimed to make public transport more attractive and user friendly through more roadside information displays, real-time information on mobile phones, an interactive online network map, personalised travel planning, information on multimodal interchanges, a new network brand (see measure 10) and improved driver training.

The measure contributed to a city-wide decline in car use of

5 percent and an increase in the use of buses and non-motorised transport modes of 25 percent.

## MOBILITY PLANNING

**13. Business travel planning.** Business travel plans were implemented in Preston with a range of companies and linked closely to other CIVITAS measures, like the improvements to cycling infrastructure (see measure 9).

A network for the distribution to companies of information about walking, cycling and public transport was established and maintained.

Travelling by bus increased for medium to long distances; cycling increased in popularity over medium distances; and train travel was more popular over long distances.

**14. Large-scale personal travel planning.** In order to support infrastructure-related CIVITAS projects, Preston organised a wide-scale personalised travel planning campaign to encourage people to replace car journeys with sustainable trips.

The measure was part of Lancashire County's TravelSmart project to contact 50,000 households in Lancashire.

The results showed a 10 percent reduction in car trips in Preston and an increase in the number of people cycling, walking and using public transport.

**15. School travel planning.** The city offered assistance in developing a school travel plan to all local authority schools in the area, and rewarded schools that successfully developed a plan with access to grants for mobility-related measures. The development of a schools travel plan workshop model, attended by 23 schools, proved to be a valuable innovative measure.

The Preston Primary Care Trust helped to raise awareness of the initiative among local primary schools.

As a result of the measure, 62 percent of schools in Preston developed and approved a school travel plan, contributing to a reduction in car traffic and an increase in walking. Continuing from the work done through CIVITAS, Lancashire managed to ensure that 99.5 percent of schools developed a travel plan.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**16. Planning for alternative transport modes.** Research carried out in Preston suggested that cycling had the greatest potential of any mode to replace car journeys, but the city's traffic management system represented something of a barrier to bike use and Preston had a high accident rate for cyclists. The city decided to build a strategic plan for the development of alternative transport modes based on a pedestrian and cycling audit of the city centre and other important routes.

Local communities were involved in audits of the area and public consultation meetings were held on draft strategies for improving conditions for pedestrians in the city.

A strategic plan for the development of alternative transport modes was developed and adopted by the local authority.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**17. Improving data collection for transport management.** With the support of CIVITAS, Preston worked to improve its collection and use of traffic data to feed the relevant transport management systems. The measure was innovative, as it involved the design of new data management systems and visualisation tools.

**18. Integrating transport information systems.** At the start of the CIVITAS project, Preston had several different transport information systems, each dedicated to a different function and/or run by a different operator. The aims of the CIVITAS measure were to reinforce the integration of these systems and to strengthen the services that information systems can provide to users.

The measure was introduced as part of Preston's efforts to improve the reliability of the public transport system.

The reliability of public transport services was improved by the implementation of bus priority measures and the use of urban traffic management and control systems.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**19. Establishing a freight partnership.** Before CIVITAS, there was little interaction between Preston's local authorities and the freight industry and goods distribution often conflicted with pedestrians, cyclists and other traffic, particularly in the city centre. Freight measures in Preston included a strategic plan for city logistics inspired by the example of partner city La Rochelle, including improved routes for drivers and better signage, and closely linked to the Preston clear zone (see measure 7).

An active freight quality partnership involving private sector freight operators, retailers and the public sector was established to identify and steer the implementation of freight measures in the area. Preston's new freight strategy complemented the Local Transport Plan and was included as an annex in Lancashire County's Freight Strategy.

The measure resulted in a map with freight zones and preferred routes and the freight quality partnership began to forge strong links between freight users and policy implementers within local government. Experience within CIVITAS taught Preston that a global approach to urban freight and its integration into urban transport management is vital.

Chiara Di Majo  
Via di Vigna Murata 60  
00143 Rome  
chiara.dimajo@agenziamobilita.roma.it  
Tel: +39 06 46 95 68 53  
www.agenziamobilita.roma.it

As capital of Italy, the Rome metropolitan area covers 5,300 km<sup>2</sup> and was home to around 4 million inhabitants during the CIVITAS period. In 2007, Rome was the 11th most visited city in the world and its historic city centre is listed by UNESCO as a World Heritage Site.

CIVITAS Phase: I – MIRACLES  
Duration: 2002 – 2005  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Setting up a car-pooling scheme.** Before the CIVITAS project got under way, many cars circulating in downtown Rome during peak hours had just a single occupant. Car pooling existed in the city, but was not formally organised. CIVITAS introduced an opportunity to develop a systematic approach that would promote car pooling more effectively.

Based on a comprehensive survey and working with simulation models, the public transport company ATAC provided legal and technical expertise to design commuting plans and potential car-pooling schemes (see also measure 6). In the municipality's offices, a group of 480 employees were involved in the first trial and 160 car pools were formed. A second trial at the hospital Policlinico Umberto I had an even greater impact, with 600 employees signed up and 200 pools formed. Finally, a home-to-work plan was produced for the Ministry of Public Health and submitted to its mobility manager (100 employees, 23 pools created).

Agreements were made with local garages to provide facilities at special rates. A total of 1,180 car poolers were addressed during the trial period, and the vehicle occupancy rate was about 75 percent.

### CAR SHARING

**2. Implementing a car-sharing scheme.** Rome had one of the highest rates of car ownership in the world, with 76 cars for every 100 inhabitants. CIVITAS introduced a car-sharing fleet with vehicles available for rent for non-regular journeys.

A first car-sharing service trial with five dedicated parking areas, 11 cars and 200 subscribers turned into a service in 2011 with 106 cars, 61 parking lots and a total of 1,951 subscribers.

In order to speed up the registration process a website was designed where users could learn about the service and create accounts. All new car-sharing account holders were issued regional public transport cards in 2009 to promote multimodality.

Rome's lesson learned was that the CIVITAS project provided very good stimulus for this successful measure. It resulted in the complete integration of the car-sharing system with the local public transport system and with Rome's sustainable mobility strategy.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**3. Developing a clean public e-bus fleet.** Since 1996, a relatively large fleet of 42 electric buses had been operating on three lines in Rome. CIVITAS supported the purchase of new electric buses with higher transport capacity to serve a larger area and to provide a "clean" bus service dedicated to the newly implemented limited access zones.

The first new e-buses proved ideal for use on the city's narrow streets and were greatly welcomed by passengers as they were non-polluting, comfortable and silent. Drawbacks were their relatively small capacities, weak engines and limited range of around 45 km, or six hours of operation. With the aim to upgrade performance, 36 more medium-sized e-buses were introduced to run on two new lines, each with a capacity of 36 passengers.

The city learned that operational costs and fleet size, in comparison to the service offered, are obviously higher than in the case of conventional buses.

**4. Introducing clean trolleybuses.** Before CIVITAS, the bus fleet in Rome mainly comprised old, polluting buses, not yet compliant with European emissions standards. With the support of CIVITAS, a plan was drawn up to speed up the renewal of the traditional bus fleet.

Bi-modal trolleybuses (capable of running on either external power or on-board batteries) were introduced to replace conventional diesel buses on links entering the limited access zone.

At the end of 2003, out of the fleet of 2,796 buses a total of 1,239 were Euro III vehicles. The average age of the public transport company's buses was reduced to 6.9 years, compared to 12 years in 2000. The new trolleybuses represented the first application of the battery propulsion of a heavy-load vehicle.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**5. Implementing access restrictions.** The volume of traffic in the historic centre of Rome affected quality of life in the city. This CIVITAS measure was set up to create a limited traffic zone.

The zone aimed at reducing peak-hour traffic, cutting the number of highly polluting vehicles in the city centre and encouraging a shift towards more sustainable modes of transport. In 2001, a limited traffic zone with automatic access control was implemented in the centre of the city, covering an area of 4.8 km<sup>2</sup>. The scheme was enlarged in 2007, when five additional sensitive areas were identified. Restriction periods were introduced and a further 22 electronic access gates were installed. In total, 45 gates controlled access to an area of around 10 km<sup>2</sup>.

Rome had now the largest restricted access area in Europe after London. The access restriction policy had multiple positive results with a 10 percent decrease in traffic even outside the restricted period, a 20 percent decrease in traffic flows during the restriction period, a 15 percent decrease in traffic flow during the morning peak period, a greater use of public transport services in the area and a 10 percent increase in the use of two-wheeled transport.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**6. Supporting mobility managers.** In 2003, the municipality of Rome entrusted all activities related to sustainable mobility to ATAC, the public transport operator in Rome, which acts as a coordinator between the political level, private and public transport companies, and company management. CIVITAS promoted the appointment of mobility managers to support this role.

These mobility managers are responsible for raising awareness among citizens and stakeholders of traffic congestion and for encouraging company employees to rationalise their commuting choices. A total of 180 mobility managers drew up home-to-work travel plans for 5,000 people/day. They established car pools and car-sharing systems (see measures 1 and 2), set up company and area bus lines and organised several information days.

Employees of companies with a mobility manager were eligible for discounted public transport passes. Mobility managers also had access to the internal ATAC website, where they could submit best practice examples, participate in thematic forums, access databases, and download presentations and information.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**7. Safety and security at Termini Station.** Termini Station is Rome's main public transport interchange. Its traditional closed circuit television (CCTV) system was not appropriate for controlling all illegal or dangerous activities.

A new automatic video surveillance support system was therefore tested with the support of CIVITAS, allowing for the automatic detection of overcrowding and congestion in semi-

open areas of high human activity and capable of spotting intrusions, unusual loitering and abandoned objects.

Following the trial ATAC began a feasibility study of technical, operational and financial challenges for the implementation of a large-scale system.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

#### **8. Real-time multimodal information for smartphones.**

As a way of further promoting a modal shift among citizens and tourists towards public transport, CIVITAS and Rome's public transport operator ATAC explored ways to improve access to mobility information via new media and mobile devices.

By providing an online, wireless, multimodal, multilingual and user-friendly information system, ATAC facilitated personalised journey planning. In this way it could send users on the move recommendations on the most convenient, time-efficient public transport options. ATAC's mobile service provided information on bus arrival times, real-time news, traffic bulletins, journey planners, webcams, information on bike sharing, parking spaces and general advice.

As a result, the number of visitors to ATAC's website rose by 197 percent between 2002 and 2005. Following the introduction of the wireless system, 10,000 queries per month came in from mobile users. The success of the measure was clearly linked with the efforts made to design a platform capable of delivering information according to the graphic functionalities of each device, ensuring provision of the most user friendly information.

# ROTTERDAM

## THE NETHERLANDS

Richard van der Wulp  
PO Box 6575  
3002 AN Rotterdam  
r.vanderwulp@rotterdam.nl  
Tel: +31 10 489 56 29  
www.rotterdam.nl

Rotterdam is the second biggest city in the Netherlands, with more than 600,000 inhabitants at the time of the CIVITAS project. The city is the economic, social and cultural centre of the Rijnmond region and the industrial heart of the Netherlands. As the largest port in Europe, Rotterdam generates significant traffic and is in a continuous process of (re-)development, mainly concentrated in the city centre.

CIVITAS Phase: I – TELLUS  
Duration: 2002 – 2005  
Role: Leading city

### CLEAN FUELS AND VEHICLES

#### CLEANER FLEETS

**1. Cleaner vehicles for waste collection.** At the start of the CIVITAS project, the city of Rotterdam introduced a new system of underground waste containers, which required new waste collection vehicles. This was seen as a suitable opportunity for testing continuously regenerating technology (CRT) particulate filters on two vehicles. At the time, the technology to filter the emission of particulates was very new.

Because of the technical nature of the measure, there was no public consultation during the planning process. The measure was carried out in the context of the Policy Plan for Transport and Traffic in the Region of Rotterdam and the Rotterdam Environmental Action Programme.

Because of considerable technical problems, the measure was poorly accepted by the operators and could not be evaluated on its environmental impacts. The measure was extended to retrofit 20 sweeping machines with the recently developed catalytic particulate oxidizer (CPO) filter for smaller diesel engines, which worked very well and reduced emissions of particles (5 to 25 percent), CO (90 percent) and volatile organic compounds (60 percent). Rotterdam's lesson learned is that cooperation between the truck manufacturers, the filter suppliers and the waste collection company proved to be vital for a satisfactory outcome of the measure.

**2. Clean public and private transport fleets.** In 1999, Rotterdam's public fleet contained 15 electric vehicles. A large-scale increase was not possible, however, due to poor supply on the Dutch market and a general fear of technical shortcomings. With the support of CIVITAS, Rotterdam purchased several hybrid, electric and flexi-fuel vehicles.

It also retrofitted two waste collection trucks with electronic continuously regenerating technology (CRT) systems to compare their results with the active systems implemented in measure 2. The flexi-fuel vehicles were the first of their kind in the Netherlands.

Because of the technical nature of the measure, there was no public consultation during the planning process. The measure was carried out in the context of the Policy Plan for Transport and Traffic in the Region of Rotterdam and the Rotterdam Environmental Action Programme.

The new vehicles proved to be successful. The project was a starting point for Rotterdam to be the frontrunner on electric vehicles throughout several European projects.

**3. Equipping the public transport fleet with exhaust filters and selective catalytic reducers.** At the start of measure implementation, air quality levels in Rotterdam were only just compliant with national directives. Thanks to CIVITAS, seven buses were fitted with a complete NO<sub>x</sub> (DeNO<sub>x</sub>) filter system. Because all seven filters failed during initial tests, it was decided to reallocate the budget to the installation of selective catalytic reduction (SCR) filters on 73 buses.

Because of the technical nature of the measure, there was no public consultation during the planning process. The measure was carried out in the context of the Policy Plan for Transport and Traffic in the Region of Rotterdam and the Rotterdam Environmental Action Programme.

The overall efficiency of the buses increased by 60 to 85 percent and NO<sub>x</sub> emissions were reduced by 58 tonnes per year per bus. However, emissions of CO<sub>2</sub> increased. CIVITAS gave Rotterdam the opportunity to test state-of-the-art techniques.

#### HYBRID, CLEAN AND ELECTRIC VEHICLES

**4. Electric vehicles for goods distribution.** Before CIVITAS, a small-scale demonstration of clean, quiet and energy-efficient vehicles in three major delivery companies had to be abandoned for technical reasons. With the support of CIVITAS, the trial was continued with the two electric vehicles still in use by carrier DHL. The innovative aspect of the measure was that this type of electric vehicle, with ZEBRA battery technology, had not yet been widely tested in practice.

There was no public participation during the planning process. The measure was carried out in the context of the Policy Plan for Transport and Traffic in the Region of Rotterdam, the Rotterdam Environmental Action Programme and the Rotterdam Action Plan for Air Quality.

Due to severe technical problems with the batteries and the termination of the maintenance contract after the 36-month testing period, both vehicles were taken out of use. Nevertheless, perceptions regarding clean vehicles were positive in terms of reduced noise and emissions. Despite its failure, the experience gathered through this measure contributed to the development of the Clean Vehicles Introduction Plan of 2005.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**5. Expanding park-and-ride facilities.** Prior to measure implementation, 23 park-and-ride (P&R) facilities with 4,700 parking places were being used to full capacity and a 15-year strategy for P&R expansion was drawn up to cater for the general increase in mobility. The CIVITAS measure comprised the design of 1,600 new parking places and the improvement of existing poor-quality sites. A dedicated website, integrated into the Regional Traffic Information Centre site, was developed to promote P&R in Rotterdam.

The measure was implemented as part of the Regional Traffic and Transport Plan 2003–2020, which sets the target for the larger Rotterdam region at 23,000 P&R car spaces by 2020.

The only large site that was completed by the end of the CIVITAS project period had a very low occupancy rate of less than 10 percent. A possible explanation might be a low level of awareness due to the fact that completion took place just before the summer holidays. In the following years the knowledge of the CIVITAS cities helped to sharpen the strategy. Nowadays, the Rotterdam region has one of the highest numbers of P&R facilities of any region in Europe.

**6. Free parking for public transport passengers.** Prior to measure implementation, the Alexander Park-and-Ride (P&R) site, located near a metro and train station, was so oversubscribed by shoppers and local employees that the intended users — commuters taking public transport into the city — were often unable to find a parking space. The CIVITAS measure consisted of a two-year pilot parking management project in which people without a valid public transport ticket had to pay for parking.

Residents and organisations situated near the site were informed and consulted. The promotion and expansion of P&R sites in the Rotterdam region is an important item within the Regional Traffic and Transport Plan 2003–2020.

After implementation, occupancy rates dropped to 65 percent, while the number of users who actually boarded public transport to continue their journey increased from 64 to 95 percent. Although occupancy rates in nearby car parks did not change, there was no clear modal shift in favour of public transport, and continued monitoring was recommended.

**7. Integrating cycling and public transport.** Prior to measure implementation, a survey had indicated that the rate of bicycle ownership was lower in Rotterdam than in other cities in the Netherlands. With the support of CIVITAS, the city improved on-street cycle parking facilities and introduced secure parking facilities at transport interchanges to promote the integration of cycling with public transport use.

The measure was implemented as part of the action programmes Parking Bikes (Fietsparkeren) and Space for the Bicycle (Ruimte voor de fiets).

Unguarded parking facilities were extended and improved at 23 public transport stops and several metro stations, three large-scale guarded bicycle parks near major points of interest

were installed and 400 secure parking boxes were installed in various residential areas. Through several workshops, the CIVITAS Initiative gave Rotterdam the opportunity to exchange knowledge and experiences and discuss new ideas with other cities.

**8. Introducing automated people movers.** The ParkShuttle was introduced in Rotterdam in 1997 as an experimental automated people mover (APM). Featuring electric driverless vehicles, it ran on dedicated tracks connecting a metro station and park-and-ride facility to the Rivium business park. With the support of CIVITAS, the ParkShuttle was improved and up-scaled to overcome technical problems such as low speeds, long waiting times due to the single track, and insufficient capacity as a result of the expansion of Rivium. Thanks to CIVITAS, Rotterdam could act as a test case for this state-of-the-art technology.

Good cooperation existed with the municipality of Capelle aan de IJssel, the Development Corporation City of Rotterdam, the public transport company Connexion and goods suppliers.

The system proved to be more flexible and efficient than regular bus transport and it had an obvious financial benefit, as driver wages typically represent 50 to 60 percent of operational costs. Rotterdam learned that the essential element for the success of APMs is a guaranteed high frequency.

### SERVICE IMPROVEMENTS

**9. Water-borne public transport.** Prior to measure implementation, the only water-borne passenger transport was a fast ferry line. With the support of CIVITAS, a taxi service was introduced for individuals or groups of up to eight people. Although the city of Rotterdam is a major port city, there was no concept of water-borne passenger transport within the city at that time.

There is no record of public participation in this measure and it was not carried out in the context of a broader planning or policy framework.

In the first year of operation 280,000 passenger-kilometres were travelled by water taxi, mainly for recreational trips (85 percent). If the service had not been available, 40 percent of passengers would have travelled by car or normal taxi, but 13 percent would not have travelled at all. The city of Rotterdam learned that legal issues and the division of responsibilities between public and private partners must be clearly described and agreed in advance and that the construction of a landing stage is a complex project in itself.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**10. Giving priority to public transport.** Prior to implementation, rising volumes of traffic on the city's roads were slowing down trams and reducing the reliability of travel times. The concept of a high-quality tram line with segregated

tracks and priority at traffic lights, known as TramPlus, emerged as a way of promoting public transport. Three routes were partly implemented under the CIVITAS project. Rotterdam used state-of-the-art techniques and ideas for the TramPlus concept.

There was good cooperation between the city's departments and the public transport company RET, as well as extensive communication with organisations of local shopkeepers and affected residents. The measure was embedded in the Policy Plan for Traffic and Transport in the Region of Rotterdam.

TramPlus achieved a cost recovery of 50 percent from passenger revenues, as opposed to 30 to 40 percent for the other tram lines. However, the impact on public transport use and modal shift was difficult to assess. The ideas generated within the CIVITAS project gave an important boost to the development of the concept in Rotterdam.

**11. Introducing kilometre pricing.** Congestion was a major problem in the densely populated Rotterdam region, but for political reasons, congestion charging had not been implemented. As an alternative to the fixed-level taxation system in place at the time of measure implementation, it was decided to introduce a system of variable kilometre pricing on national roads leading towards the city centre. This would have been one of the first national pricing strategies to be launched at the time.

The overall strategy was the responsibility of the national Ministry of Traffic and Transport, and the city of Rotterdam was responsible for setting management and revenue strategies and for implementing kilometre pricing and monitoring its effects.

Because of serious delays on the national level, the focus of the measure was changed from implementation to preparation. A seminar on the topic was organised by the Regional Traffic and Transport Department for stakeholders in the Rotterdam region. A panel of politicians discussed the possible impact of the scheme in Rotterdam. Kilometre pricing was thus placed on the political agenda with policy decisions pending.

## PARKING MANAGEMENT/PRICING

**12. Demand-dependent strategies for paid parking.** In response to the extensive parking problems faced by the Nieuwe Westen district, demand-dependent parking tariffs per street were to be introduced to keep drivers from crossing the area border to find cheaper parking. The municipality set the rules for paid parking in the area within the framework of the national governments policy, in which paid parking is regarded as a local tax.

The measure involved the hiring and training of parking wardens. The measure was carried out in the context of the Policy Plan for Transport and Traffic in the Region of Rotterdam and the Rotterdam Action Plan for Air Quality.

In a first stage, parking ticket machines were installed and paid parking was introduced at the lowest tariff used in Rotterdam (24 minutes for EUR 0.50). Subsequently, demand for parking spaces was to be determined for each street, but

an unexpectedly large reduction in the number of parked cars rendered the street-dependent pricing policy obsolete. This surprising outcome demonstrated that paid parking is a positive instrument in reducing the volume of cars.

## WALKING AND CYCLING ENHANCEMENTS/SERVICES

**13. Creating dedicated bicycle lanes** (not fully implemented). At the start of the CIVITAS project, only 21 percent of short trips in Rotterdam were being made by bike and a survey in 2003 indicated that the lack of continuous high-quality bike paths was a major barrier to bicycle use. It was therefore decided to build four new routes into the city centre and to the central railway station. The paths would be separated from traffic with better lighting, better surface quality and right of way ensured for cyclists at junctions.

For the development of the strategy several parties were involved, including the national bicycle federation. Although cyclists welcomed the new routes, objections came from residents who feared the loss of car parking, did not want changes made to their streets or feared that bicycle traffic endangered their children. The measure was part of Rotterdam's Bicycle Action Plan.

Due to changing policies after the 2002 elections and political conflict, only one route was constructed and the implementation of the other three was cancelled. According to a survey conducted in 2003, bike traffic grew 6.5 percent at the expense of car and tram modal share. CIVITAS did serve as an engine for further investment in cycling, as the three other routes were constructed after the end of the CIVITAS period.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**14. Introducing green commuter plans.** Prior to measure implementation, commuter traffic was identified as one of the main contributors to the major congestion problems in the city. With the support of CIVITAS, the services of the mobility advice centre for the greater Rotterdam region were extended with an Internet and e-mail-based information centre for employees. The offer included an annual cycling competition, the distribution of free public transport weekly passes in rural areas with major road works, and the integration of a car-pooling database.

In order to familiarise employees with the site, a number of companies were selected for an intensive communication campaign. The development of this measure has not been specifically addressed in municipal or regional policy plans, but it fits in the city's strategy to encourage measures that reduce private car use.

After two years, about 45,000 employees had been reached. The cycling competition was particularly successful, although its impact on modal shift was not sufficiently clear to be measured. The knowledge exchange throughout the CIVITAS

project supported the development of the strategy and its implementation.

**15. New approaches to integrated planning: Ahoy Zuidplein.** For the events and shopping district Ahoy Zuidplein, an expansion of offices and sport/leisure functions was foreseen. With the support of CIVITAS, an integrated design study was conducted, focusing on accessibility, smart land use and combined use of parking facilities. The bus station was identified as the first project to be undertaken. The innovative aspect of this measure was the combination of smart land use and public-private cooperation in several areas where integrated planning was necessary.

The public was consulted throughout the project development. The development of public areas combining several functions has been addressed in several policy documents, in particular the Rotterdam Plan for Spatial Development.

Safety was shown to have improved following the renewal of the bus station. One positive outcome was that all stakeholders were involved in the long-term planning, which helped smooth out the complex processes. Rotterdam learned that if pressure from the private market is sufficiently strong, policy makers will usually create the preconditions for new developments.

**16. New approaches to integrated planning: Alexander Master Plan.** The Alexander railway station is located near bus and metro lines, a large shopping centre, a park-and-ride facility and several leisure facilities, including a newly built cinema at the time of measure implementation. The immediate objective of this measure was therefore to develop a master plan for the area, taking into account its mixed functions and growing economic activity. The innovative aspect of this measure was the combination of smart land use and public-private cooperation in several areas where integrated planning was necessary.

All local parties were involved in the concept, including local businesses, residents and transport companies. The development of public areas combining several functions has been addressed in several policy documents, in particular the Rotterdam Plan for Spatial Development.

Cooperation between government and private partners proved an important driver for the acceptance of the project, although acceptance among residents was high due to the obvious benefits for them (e.g. shopping facilities). It is not possible to relate actual impacts with the measure of integrated planning, but one benefit was that all stakeholders were involved in the long-term planning, which helped to smooth out these complex processes.

**17. New approaches to integrated planning: Kralingse Zoom.** A master plan for the strategic transport interchange Kralingse Zoom was finalised in 2001, but due to new insights into the office market and legislation on external safety, it needed revision. With the support of CIVITAS, a new plan was drawn up for expanding park-and-ride (P&R) facilities with 1,470 extra parking spaces and improving accessibility to the P&R site from the highway. The concept of a sheltered P&R site, including target lane, was unique in the Netherlands and played

a significant role as a pilot study for similar developments in the future.

The public was consulted throughout the project development. There was some resistance from residents who feared that the introduction of fees at the P&R facility could lead to increased parking pressure in residential areas. The development of public areas combining several functions has been addressed in several policy documents, in particular the Rotterdam Plan for Spatial Development and the regional policy plan for P&R.

Cooperation between government and private partners proved an important driver for the acceptance of the project. It is not possible to identify all the impacts of an integrated planning measure, but one benefit was that all stakeholders were involved in the long-term planning, which helped smooth out the complex processes.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**18. Integrating public and private initiatives.** Prior to measure implementation, congestion was a major problem in the densely populated Rotterdam region and it was felt that a shared view on mobility was needed to solve this problem. With the support of CIVITAS, an action called Fileplan ("jam plan") was introduced to improve accessibility to the region, with high-profile network meetings, workshops with users and road authorities, communication campaigns and websites, the facilitation of structural measures and the improvement of cooperation among relevant actors in the city.

Road users were consulted to generate an overview of bottlenecks and possible solutions. The measure was in line with the Regional Plan for Traffic and Transport in the Rotterdam Region, as one of its main objectives was to strengthen the city's position as a major European port.

Among the achievements of these measures were a Fileplan high-level breakfast meeting which attracted more than 200 participants; a reference manual on train and metro stations, including an assessment tool for the quality of such sites; and start-up meetings with relevant knowledge institutions. CIVITAS gave a much-needed boost to stakeholder engagement in Rotterdam and led to the launch of a new programme in 2005 to improve relations with the business sector and with knowledge institutes.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**19. Providing dynamic public transport information.** In the years before implementation, several new systems to supply real-time information to passengers had been introduced in the public transport sector. With the support of CIVITAS, the Rotterdam transport company RET introduced real-time arrival and departure information at over 100 tram, bus and metro stops and adapted 60 new trams to be detected

by the real-time information system. The combination of a real-time information system with the comfort and speed of the TramPlus concept (see measure 10) was probably an innovation in the European context.

There was intensive cooperation between the city's departments and RET, as well as intensive communication with organisations of local shopkeepers and affected residents. The measure was embedded in the Policy Plan for Traffic and Transport in the Region of Rotterdam.

A survey in 2002 indicated that acceptance among users was high: 47 percent agreed that information about waiting times is important, and 45 percent agreed that dynamic public transport information increases the use of public transport. The introduction of higher tariffs, however, led to a drop in passenger numbers. Thanks to CIVITAS, the city planned to equip all tram systems and most metro systems in Rotterdam with the real-time information system.

**20. Providing intermodal travel information.** In 1996, the city of Rotterdam launched the Regional Traffic Information Centre (RegioTIC) to provide information on traffic conditions in and around the city. With the support of CIVITAS, the RegioTIC website was converted to an integrated intermodal website with information on on-street parking options, car parks, park-and-ride facilities and car pooling, regional public transport options, road works, traffic jams, cycle path networks and cycle parking facilities. The measure was innovative because of the software which made it possible to convert information from various systems into forms suitable for the different information channels available to the general public.

Another innovative feature was the cooperation between the public transport organisations and RegioTIC. Information for road users was an important issue in national, regional and local policy.

As it was only completed in 2009, after the end of the CIVITAS project, the measure could not be evaluated. During the project period, other CIVITAS cities developed similar projects, and ideas were discussed for mutual learning purposes.

## REAL-TIME ROAD USER INFORMATION

**21. Integrating transport management systems.** Prior to the TELLUS project, road users leaving the city had little information to help them decide whether to take the ring road towards the left or the right. Five variable message signs (VMS, or DRIPS in Dutch) were installed at locations with high levels of goods traffic in order to display traffic conditions on the ring road. The measure created a unique situation in which information was constantly exchanged between two road authorities, the national highway authority and the municipality of Rotterdam.

A website was created to explain the benefits of the signs. Information for road users was an important issue in national, regional as well as local policy.

The VMS had an impact on route choice among road users. Surveys showed that 45 percent of drivers who were able to choose between routes were willing to change their itinerary,

but 25 percent did not trust the information displayed on the VMS due to bad experiences. The increased cooperation with the Department of Public Works was experienced as a very positive and lasting outcome of this demonstration measure.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**22. Creating a high-quality network for sustainable freight transport.** Prior to measure implementation, the city's intention to elaborate a plan on time access restrictions met with strong opposition from the freight sector and other stakeholders. With the support of CIVITAS and through extensive stakeholder consultation, a regional policy for sustainable freight traffic was designed, focusing on the creation of a high-quality regional road network to provide access to regional industrial areas and shopping centres. At the time, very few public institutions provided such a network, especially on the very local level.

Key stakeholders were consulted during the development of the plan, including the Chamber of Commerce of Rotterdam, transport organisations, the Port of Rotterdam and the province of Zuid-Holland. Also, the regional and neighbouring local authorities needed to be involved in the design and application of the measure. The measure was not implemented as part of a broader policy framework because distribution is not a major problem in the city.

The implementation of the last stage of the CIVITAS project made it impossible to obtain impact-related results. For Rotterdam, the main barrier to this measure, cooperation with stakeholders, developed into the main driver for the adapted measure and laid the groundwork for discussions on low-emission zones and clean vehicles.

**23. MultiCore tube logistics.** Goods transport by road is a major source of traffic congestion and air pollution. As an alternative, the city used CIVITAS support to create an underground distribution system of four pipes to transport and distribute chemicals and gas between Rotterdam's harbour area and city businesses. The technique used was unique in the world and the multiple cores in each pipeline were an innovation that made possible the transportation of several commodities at the same time and the sharing of infrastructure by several parties.

Contacts with some public bodies in the region led to a better acceptance of underground pipeline transport in general. The measure corresponded to the specific problems of the harbour area that are also addressed in the Policy Plan for Traffic and Transport in the Region of Rotterdam.

Many businesses showed an interest in the MultiCore system and the first contracts were signed during the project period. For the first customer, Exxon, the new system mainly substitutes water transport, with little impact on safety and energy consumption, but considerable time gains. The system gained publicity and the work of convincing companies of the advantages of the underground transport system continued beyond the project period.

# SKOPJE

## FORMER YUGOSLAV REPUBLIC OF MACEDONIA

**24. Truck parking management.** Prior to measure implementation, residents of areas close to the city's port suffered from high levels of noise due to heavy goods vehicles parking in residential streets. In order to address these issues, a harbour area had been designated as a long-term parking site for 40 trucks with 24-hour surveillance. With the support of CIVITAS, a further 20 spaces were added, as well as a traffic guidance system and communication and safety systems. The local police department was requested to tighten parking controls in the residential areas.

Use of the truck park was promoted and enforced by the companies that actually handle the cargo. The measure was in line with the Policy Plan for Traffic and Transport in the Region of Rotterdam, which aims to mitigate nuisance and congestion problems due to goods transport.

In 2004, well over 9,000 trucks made use of the truck park and the occupancy rate was between 50 and 60 percent. The decrease in parking movements in residential areas shifted the peak noise burden from populated to less-populated areas. Important lessons learned include the need for good communication with truck drivers about the benefits of the new parking facility, the need for clear signposting, and the importance of setting fees at a rate that does not deter drivers from using the truck park.

Lovren Markic  
Bul. Ilinden 82  
1000 Skopje  
lovrenm@skopje.gov.mk  
Tel: +38 92 329 72 45  
www.skopje.gov.mk

With over 500,000 inhabitants at the time of the CIVITAS project, the capital city Skopje is home to a quarter of the Macedonian population. Located in the north of the country on the Vardar River, the city rests about half way along the major north-south Balkan route between Belgrade and Athens. Its favourable position at a key junction for routes across Europe has greatly assisted in the city's development. It is the country's political, cultural, economic and academic centre with a range of industries including metal processing, chemicals, timber, textiles, leather and printing.

CIVITAS Phase: Plus – RENAISSANCE  
Duration: 2008 – 2012  
Role: Learning city

### CLEAN FUELS AND VEHICLES

#### CLEANER FLEETS

**1. Conversion of public buses from diesel to compressed natural gas.** At the start of the CIVITAS project, the public transport system in Skopje was outdated and rising traffic levels caused environmental problems. With the support of CIVITAS, public transport company JSP tested a technology to retrofit diesel buses into compressed natural gas (CNG) and diesel hybrids in order to improve air quality and the image of public transport. It was the first time that public transport diesel buses were converted to CNG in the former Yugoslav Republic of Macedonia. A policy for the homologation of these kinds of vehicles had to be adopted at the national level, which required the installation of additional safety valves.

Public transport staff were trained to maintain and operate the retrofitted buses. Transport companies with old bus fleets also expressed interest in the technology, and citizens came to the JSP premises for advice on converting their vehicles to CNG. Promoting the use of clean alternative fuels and energy efficiency became a part of the city's new Sustainable Urban Mobility Plan (see measure 2).

A total of 12 buses were retrofitted. This measure had a big influence on the city. The Macedonian fuel company opened a commercial CNG pump in Skopje after the installation of a CNG station at the JSP premises. Thanks to CIVITAS, the city's approach to public transport provision has shifted focus to clean and attractive bus services. This positively promotes the city.

## MOBILITY MANAGEMENT

### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**2. Plan for the development of a sustainable urban transport system in Skopje.** Prior to measure implementation, the number of annual public transport journeys in Skopje had dropped from 150 million in 1989 to 45 million in 2006. To reverse the trend towards private car use and ownership, the city decided to plan and implement well-defined, coordinated activities to promote sustainable transport. Up till then, no city in the former Yugoslav Republic of Macedonia had ever developed a plan for sustainable urban transport development.

The city circulated the draft plan among several target group representatives, organised workshops to collect feedback, and hosted a prestigious international seminar on policy integration. A CIVITAS-branded bus generated wide media attention and information requests from citizens.

The plan was adopted by the city council and the process established a new planning culture with open-minded creative thinking and thought-provoking dialogue. This CIVITAS measure allowed Skopje to act as an inspiration to other cities in the former Yugoslav Republic of Macedonia. The country's second largest city has already expressed interest in developing a sustainable urban mobility plan.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**3. Intelligent traffic management and control in the city centre.** At the start of the CIVITAS project, the existing traffic signal system was unable to meet the increasing traffic demand. In order to reduce congestion and pollution in the city centre, the city developed an automated traffic management (ATM) and control system. This technology can process traffic data in real time, adapt signal timings to actual traffic demand and give priority to public transport vehicles at intersections. It was the first intelligent traffic management system in the country.

Given the nature and the objectives of this measure, it was very important to include all relevant stakeholders. Political representatives of the city, members of the city council, various city departments (transport, urban planning, environmental protection, tourism promotion), professional associations (transport engineers, motor vehicle drivers, architects) and NGOs took part. This measure was strongly related to the other innovative actions for improving public transport in Skopje, as outlined in the city's new Sustainable Urban Mobility Plan (see measure 2).

At the end of the CIVITAS project, the city installed new traffic signals and signal controllers at 30 crossings in the city centre. It purchased the central software and the hardware needed

for the ATM system, and identified a building to house the Traffic Management Control Centre. The city expected the ATM system to shorten travel time along the busiest streets by 40 percent and increase the average speed of traffic by 9.5 km/h to 25 km/h. CIVITAS acted as a catalyst to secure additional funds of EUR 2.6 billion from the European Bank for Reconstruction and Development. This allowed for the upscaling of the Traffic Management Control Centre to cover 125 crossings instead of 30. The investment also included a closed-circuit television (CCTV) surveillance system, variable message signs, a parking guidance system and an integrated automated vehicle location system.

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

#### **4. Introducing an automatic vehicle location system and real-time passenger information at bus stops.**

At the start of the CIVITAS project, the public transport system in Skopje was outdated, with an ageing bus fleet, low reliability and poor passenger information. With the support of CIVITAS, real-time arrival times were displayed at 10 bus stops, using GPS devices in 30 buses and a monitoring centre and software. It was the country's first automatic vehicle location and real-time information system.

The city promoted the measure through several channels, with an emphasis on television and radio, national newspapers, and the city website. This measure was closely related to the other innovative actions for improving public transport in Skopje, as outlined in the city's new Sustainable Urban Mobility Plan (see measure 2).

Over 60 percent of people thought that real-time information would greatly help to increase public transport use and more than 90 percent of people surveyed said it should be extended to the entire public transport network in Skopje. The city and the local bus operator have already started procedures to do so. The CIVITAS measure gave rise to a public-private partnership that will increase the number of real-time information displays from 10 to 80. The number of GPS-equipped buses will increase from 30 to 400.

Eva Sunnerstedt  
Box 8136  
104 20 Stockholm  
eva.sunnerstedt@stockholm.se  
Tel: +46 85 082 89 13  
Fax: +46 76 122 89 13  
www.stockholm.se

At the time of the CIVITAS project, the Swedish capital Stockholm had a population of 860,000 inhabitants, and the metropolitan area was home to 22 percent of Sweden's population. Located on 14 islands on the southeast coast of Sweden, Stockholm is sometimes referred to as the Venice of the North. There is strong political support for reducing congestion and making the transport system more environmentally friendly.

CIVITAS Phase: I – TRENDSETTER  
Duration: 2002 – 2005  
Role: Leading city

## CLEAN FUELS AND VEHICLES

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**1. Improving biogas refuelling infrastructure.** Prior to measure implementation, lack of refuelling infrastructure for biogas-fuelled vehicles had been a major barrier to the promotion of this type of vehicle among individuals and companies in Stockholm. With the support of CIVITAS, four new facilities were planned with an innovative, flexible and mobile fuel supply system.

The Environment and Health Administration played an important role in the difficult negotiations between the gas company, AGA, and the producer of the biogas, Stockholm Water Company. Articles were published in local and national newspapers about the new filling stations and information was posted on the city's website. The measure was a part of the city's Clean Vehicle Strategy.

During the CIVITAS project period, three facilities were built, but the fourth was cancelled due to a conflict regarding its location near the city centre. This CIVITAS measure contributed to the development of the market for biogas in Stockholm: by 2010, there were 16 fuelling stations in the city and the demand surpassed supply.

### CLEANER FLEETS

**2. Accelerating the expansion of a clean municipal fleet.** After the entire municipal fleet was outsourced to a private leasing company in 2002, purchase decisions were decentralised and the share of clean cars in the municipal

fleet dropped. Within the CIVITAS project, Stockholm broke this negative trend by offering subsidies for clean vehicles. It brought together buyers of clean vehicles in a joint procurement procedure and arranged seminars and information activities to encourage city administrations to choose clean vehicles. An innovative aspect of the measure was the creation of a test fleet of clean cars to give potential buyers a longer try-out experience than a regular test drive could provide.

Discussions with local and national politicians resulted in free or discounted parking for clean cars and exemption from congestion charges. Discussions with car dealers also helped to introduce a greater range of clean car models. The measure was a part of the city's Clean Vehicle Strategy.

By the end of the CIVITAS project in 2005, some 43 percent of the municipal fleet (465 vehicles) were clean vehicles. This led to a reduction in total energy consumption by 25 percent; a reduction in fossil CO<sub>2</sub> emissions from 650 to 560 tonnes per year; a reduction in emissions of NO<sub>x</sub>, hydrocarbon and CO; and a reduction in fuel costs for biogas vehicles by 15 percent. Fuelling costs for the electric hybrid vehicles were 3 percent lower. Stockholm continued to promote clean vehicles after the end of the project period, and by 2010, clean vehicles made up over 85 percent of the city's fleet.

**3. Increasing clean vehicle use in private company fleets.** In Stockholm, efforts to promote cleaner vehicles initially focused on the municipal fleet in order to develop a market for cleaner fuels and for the associated infrastructure (see measure 2). Subsequently, the aim of this CIVITAS measure was to influence private companies with corporate fleets to choose clean vehicles through the distribution of an information package and website, a one-week trial of a clean vehicles scheme and a purchase subsidy (for companies in the Clean Vehicle Network, see measure 4).

In cooperation with the vehicle industry and fuel distributors, a large PR campaign was launched to inform the public. The measure was a part of the city's Clean Vehicle Strategy.

By the end of 2005, the number of clean vehicles in Stockholm had increased by 2,438; emissions of fossil CO<sub>2</sub> had decreased from 186 to 87 g per vehicle-kilometre; and awareness of the benefits of clean vehicles and fuels was raised. By 2010, the share of clean vehicles in the Stockholm region had risen to approximately 11.5 percent of the total vehicle fleet, and clean vehicles represented over 40 percent of new vehicle sales.

**4. Making clean vehicles less expensive.** At the start of the CIVITAS project, there was political support in Stockholm for making the transport system even more environmentally friendly by substituting conventional vehicles with clean vehicles. With the support of CIVITAS, the city encouraged vehicle manufacturers to produce clean vehicles, made clean vehicles available on the Swedish market, and established a Clean Vehicle Network of companies using and promoting clean vehicles. A system of subsidies was established to cover part of the additional costs of clean vehicles (see also measure 5). An innovative approach was the organisation of common procurement, which was rarely used, especially for vehicles.

Before implementation, a market survey of approximately 10,000 enterprises and public institutions throughout Sweden was conducted, followed by a nationwide publicity campaign with meetings at 36 different locations throughout Sweden to assess interest in a common procurement procedure. The measure was part of the city's Clean Vehicle Strategy.

As a result of the common procurement, more than 50 municipalities and some 30 companies were offered better or much better prices. Through the Clean Vehicle Network a total of 206 clean vehicles were introduced. Fossil-fuel CO<sub>2</sub> emissions fell by 430 tonnes per year. This measure was the start of a close cooperation between the city and front-running companies, which has continued in the form of roundtables and the Climate Pact.

**5. Promoting clean and efficient vehicles for public transport.** At the time of measure implementation, the local transport operator Stockholm Transport was operating around 1,700 buses through subcontracted entrepreneurs who owned the vehicles. Of these, 250 operated in the city centre and ran on ethanol. With the support of CIVITAS, 24 biogas buses were purchased and tested in the city centre.

To secure the supply of biogas, Stockholm Transport signed a long-term contract with the supplier, Stockholm Water Company.

By 2006, the measure had reduced emissions by 50 to 86 percent and noise levels by 50 percent. Hydrocarbon emissions, maintenance costs, and consumption of motor oil and fuel, however, increased significantly. As a result of continued efforts after the CIVITAS project, 130 biogas buses and 500 ethanol buses had been put into operation by Stockholm Transport by 2010.

**6. Waste collection using biogas vehicles.** At the time of the CIVITAS project, the city's Waste Management Administration operated two waste collection trucks that ran on biogas. These were greatly appreciated by both drivers and residents. Based on this positive experience, the city of Stockholm decided to replace a further eight diesel trucks with biogas vehicles. It gave financial support to the contractors who invested in the trucks.

Both drivers and residents were surveyed after the introduction of the vehicles. The measure was a part of the city's Clean Vehicle Strategy.

The biogas-fuelled waste collection trucks proved reliable, less noisy and smelly and achieved an annual savings of 65 tonnes of CO<sub>2</sub>, 0.33 tonnes of NO<sub>x</sub> and 0.014 tonnes of particulate matter. On the other hand, the biogas trucks were less powerful than the diesel ones and their range between fillings was shorter. By 2010, the waste-collection fleet was nearly all biogas fuelled.

## COLLECTIVE PASSENGER TRANSPORT

### TICKETING AND TARIFFS

**7. Introducing a smartcard system and integrated ticketing.** In 2000, a prototype smartcard was tested to replace the previous ticketing system, which dated from 1992. With the support of CIVITAS, the system was further developed and implemented, but it was only finalised in 2009, after the CIVITAS project period.

The requirements for the system were drafted based on operator Stockholm Transport's needs, the wishes of passengers, and the experience of other European transport operators.

By the end of 2010, a total of 2.9 million cards had been distributed, with 850,000 in use on a regular basis.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**8. Preparing a congestion charging scheme.** The measure was implemented in response to the severe congestion on the main access roads into Stockholm during peak hours. With the support of CIVITAS, a full-scale six-month trial of congestion charges was held, accompanied by significant investments in public transport and park-and-ride facilities. The trial used state-of-the-art technology previously used in Singapore and Melbourne.

The proposal for a permanent congestion charge was subsequently approved in a referendum.

The system was put into operation in August 2007 and in the first two years there was an 18 percent reduction in traffic in the congestion charge zone (96,000 vehicles per day). An increase was observed in the number of vehicles using alternative fuels, which had exemption from the congestion charge until July 2012. Use of the city's park-and-ride facilities increased, and more people started using public transport and cycling. Emissions of NO<sub>x</sub> were reduced by 110 tonnes and particulate matter by 37 tonnes.

### PARKING MANAGEMENT/PRICING

**9. Reducing parking fees to promote clean vehicles.** Prior to measure implementation, Stockholm had high parking fees during office hours, but owners of electric cars registered in Stockholm could get a free parking permit. The CIVITAS measure consisted of the introduction of free parking permits for more types of clean vehicles — electric, hybrid, biogas bi-fuel as well as bioethanol fuel-flexible vehicles. This was innovative as it was not required in national legislation.

The measure was a part of the city's Clean Vehicle Strategy.

Because of the rapid expansion of the clean vehicle market in Sweden, the free parking incentive was allowed to expire at the end of the trial period. The introduction of the incentive was

complicated by its unclear legal and economic implications. However, the implementation of the trial in Stockholm and other Swedish cities led to increasing national consensus on the definition of clean vehicles.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**10. Creating a website for optimal trip planning.** At the time of measure implementation, [www.trafiken.nu](http://www.trafiken.nu) was a well-used and appreciated website, covering the entire road network as well as public transport services and cycling. The CIVITAS project contributed to its development and improvement by adding services like real-time information and an intermodal trip planner, and by attracting new users.

Evaluation results are not available.

**11. Increasing the number of public transport passengers.** In 1998, public transport in Stockholm transported 640,000 passengers per day. This CIVITAS measure aimed to increase passenger numbers by another 100,000 per day through the provision of traffic disruption information, a travel guarantee (the transport operator promised to compensate the cost of a taxi trip in case of delays of 20 minutes or more), and incentives for contractors to achieve targets for punctuality, cleanliness, revenue and customer satisfaction.

Surveys were conducted twice a year to assess passenger satisfaction and a direct marketing campaign was conducted among 2,400 new residents and in large companies. The measure was a part of Stockholm's transport goal to increase passenger numbers by 15 percent.

Passenger numbers increased by 72,000, but fell short of the 100,000 target due to several external developments. Several aspects of the measure were permanently integrated into the services of Stockholm Transport, notably the travel guarantee, the incentives for contractors and the direct marketing campaign for new residents.

**12. Launching a clean vehicles web portal.** Prior to measure implementation, information about clean vehicles was available on different websites but there was no guarantee about its reliability. With the support of CIVITAS, a new website was launched in order to give owners of clean vehicles in Sweden essential information about running, maintaining and fuelling their cars.

The cities of Gothenburg and Malmo were involved in the development and marketing of the web portal. The measure was part of the city's Clean Vehicle Strategy.

By the end of the CIVITAS project in 2006, the website had more than 25,000 individual visitors per month. Some 69 percent of surveyed visitors in 2004 regarded the site as very reliable. After CIVITAS, the website was further developed and maintained by the three cities. It is now established as one of the most important websites in Sweden for owners of clean vehicles ([www.miljofordon.se](http://www.miljofordon.se)).

**13. Making cycling more attractive through better information and services.** At the time of measure implementation, cycling levels in Stockholm were lower than in other Nordic cities. Online bike-and-ride information was introduced as part of a new intermodal travel planner for the greater Stockholm area (see measure 10). Service stations for bicycles at bike-and-ride and public transport facilities were also installed.

Together with some infrastructure improvements, this measure has more than doubled the amount of bikers. Every day more than 150,000 people cycle in Stockholm.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**14. Implementing traffic monitoring and supervision.** With the support of CIVITAS, the MatriX real-time multimodal transport model was developed as a platform for a new traffic management system in Stockholm. With real-time information for operators, planners, decision makers and passengers, the system was an innovative means of increasing the precision of traffic planning and monitoring.

For this measure, the city of Stockholm cooperated with the Swedish Road Administration.

The objectives were partly fulfilled, but the measure was delayed due to financial cutbacks and the opening of a major tunnel system in southern Stockholm that affected traffic flow.

**15. Making road network data more accessible.** Prior to measure implementation, the city of Stockholm had large volumes of data stored in separate databases, with poor accessibility and limited possibilities for sharing and analysing data. The Swedish standard for digital road and railway networks was used in Stockholm to build an information platform that would facilitate data sharing and integration among separate existing or new systems handling road or traffic data.

For this measure, the city of Stockholm cooperated with the National Roads Administration.

Using these datasets together made it possible to provide information on travel routes and actual traffic conditions; the actual and planned status of snow management and road maintenance; parking spaces for disabled drivers or available parking spaces near a given location; speed limits and other information based on GPS positions. Thanks to the database developed within the CIVITAS project, it became possible to export data to external users such as the Swedish National Digital Database.

## INTELLIGENT TRANSPORT SYSTEM (ITS)–BASED ENHANCEMENT OF PUBLIC TRANSPORT

**16. Implementing more adaptive signal control in a bus priority system** (not implemented as planned). In this technology assessment measure a new, more adaptive traffic control system was tested in Stockholm to compare it with the system already in place. Instead of pre-defined fixed time plans for the entire coordinated system with only limited flexibility, the new system repeatedly runs a mathematical optimisation procedure to identify the optimal time to change the colour of the traffic lights.

The measure was a part of the city's Accessibility Strategy.

Stockholm did not proceed with installation of the system due to concerns that it was not adapted to Swedish needs, particularly with regard to pedestrians and cyclists. Instead, Stockholm worked to optimise traffic signals in the framework of the city's MATSIS project ("Reduced CO<sub>2</sub> emissions through adaptive traffic signalling in Stockholm"). The results were very good, with delay times substantially reduced. MATSIS became one of the most profitable environmental projects carried out by the city of Stockholm.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**17. Creating a logistics centre for downtown Stockholm.** The need for an efficient delivery system in the narrow streets in Stockholm's medieval old town was the main driving force behind this measure. By introducing a logistics centre for food deliveries, the transport mileage to restaurants was expected to decrease by 65 percent. This was — and still is — one of the few, totally privately driven co-transport services with a working business model.

The measure was conducted in cooperation with the delivery company Home2You.

As a result of several setbacks, the logistics centre only had two customers. Nevertheless, it reduced the number of delivery trips in the city centre by nine trips per day, and the number of vehicle-kilometres by six per day. The centre became an important symbol of a sustainable solution to an urgent problem, and contributed to the acceptance of more radical demands for traffic restrictions.

### FLEET MANAGEMENT INCLUDING CLEANER FLEETS

**18. Optimising freight deliveries at construction sites.** Access to the new housing district Hammarby Sjöstad was restricted for delivery vehicles due to the geography of the site and to existing buildings. The goal of this measure was therefore to establish a logistics centre to reduce the number of individual delivery trips into the area, estimated at 400 deliveries and 700 tonnes of construction material per day, through co-transport. This was an innovative way of reducing queuing time for deliveries while at the same time reducing emissions

and improving building quality as no material was left outdoors to be spoiled by weather.

The logistics centre reduced the number of small direct deliveries by 80 percent during peak periods and there has also been a considerable reduction in thefts, losses and damaged materials. The logistics centre continued to operate after the end of the CIVITAS project, as the building companies themselves asked for the service to continue.

Regina Luedert  
Gaisburgstrasse 4  
70182 Stuttgart  
regina.luedert@stuttgart.de  
Tel: +49 71 121 68 86 34  
Fax: +49 71 121 68 86 60  
www.stuttgart.de/mobil

The sixth largest city in Germany, Stuttgart is the capital of Baden-Württemberg and the centre of one of the country's most important economic areas. The Stuttgart region has strong automotive and mechanical engineering industries and is sometimes referred to as "the cradle of the automobile".

CIVITAS Phase: II – CARAVEL  
Duration: 2005 – 2009  
Role: Learning city

CIVITAS Phase: Plus II – 2MOVE2 (on-going at the time of publication of this directory)  
Duration: 2012 – 2016  
Role: Project coordinator

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Upgrading the car-pooling system with an events feature.** During CIVITAS CARAVEL, the daily 750,000 commuters in the Stuttgart region had an average car occupancy of 1.3.

CIVITAS helped extend the existing car-pool system with an events-oriented feature and a technical upgrade to enhance services and user friendliness.

The demand for the car-pooling system increased considerably: the number of hits on the car-pooling portal rose from around 200,000 to more than 800,000 during the project period. The events-oriented car-pooling service was successfully implemented, including home matches of the local premier league football club. More than 120 companies and about 40 municipalities in the Stuttgart region added a web link to the Stuttgart Pendlernetz portal.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**2. Policy options for access restrictions.** Prior to CIVITAS, Stuttgart struggled with the emission objectives of the European Clean Air Directive. In the framework of CIVITAS, access restrictions for heavy-duty vehicles were tested

including a year-round ban on heavy-duty vehicles and diesel vehicles that did not meet the Euro II standard.

An environmental zone was introduced. A roundtable on clean air and noise reduction guaranteed public involvement at an early stage. A survey of 409 Stuttgart citizens revealed that 95 percent knew about the problem of air pollution and some 79 percent supported a ban on heavy traffic.

On a 2 km section of test road, the number of heavy-duty vehicles fell by 11.5 percent, achieving emissions reductions of NO<sub>x</sub> and particulates (PM10) of between 5 and 30 percent.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**3. Sustainable mobility marketing.** Prior to CIVITAS, Stuttgart's Mobility Information Centre had an advisory role in general transport issues. CIVITAS supported the enlargement of its role towards sustainable mobility marketing initiatives, such as car-sharing schemes, a rental scheme for bicycle boxes and awareness campaigns (see also measure 1).

The number of responses to requests for mobility information rose to 70,000 per year. A third of the information concerned public transport, a third city tourism and a third environmentally friendly transport modes. The bicycle box hire scheme was successful, although maintenance costs turned out to be higher than expected due to legal issues and misuse. The car-sharing company was also very successful with 380 vehicles available at 176 locations. Hiking has become a fashionable weekend activity.

The most important lesson learned by the city is the fact that mobility management services have to be offered for a long period in order to be successful.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**4. Security action plan for suburban railway.** CIVITAS helped to realise the first integrated transport security concept for the suburban railway in Greater Stuttgart.

The continuous monitoring of quality factors, the installation of video cameras at each station and improvements to the communication technology devices were key. Innovative training workshops were organised for target passenger groups encouraging them to use public transport and to improve their sense of security. Drivers also received training to make them more aware of passengers' needs.

Passengers' perceptions of security on public transport improved, especially among young people, women and the elderly. This result was achieved through a good partnership between the local authorities and the public transport operator.

## TRANSPORT TELEMATICS

INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**5. Introducing IT-based event-oriented traffic management.** Stuttgart's road network suffered from traffic disruptions on about 90 days per year due to coinciding events in congress centres, concert venues and sports stadiums. CIVITAS helped realise the Security and Mobility Management Centre, which includes the Integrated Traffic Management Centre.

The centre represented a unique approach in Germany to enhance traffic flows and ensured cooperation between the city of Stuttgart, the police and the public transport operator.

The results were very positive: congestion has been reduced and parking facilities emptied more rapidly following an event. Emissions by congestion were thus lowered: a comparison of emissions values during peak periods revealed an hourly average reduction of approximately 38.1 percent of CO and NO<sub>x</sub> from traffic leaving the stadium after a football match.

Dan Dura  
1 Mai 5A boulevard  
Suceava  
dandura@primariasv.ro  
Tel: +40 23 021 26 96  
Fax: +40 23 052 05 93  
www.primariasv.ro

The city of Suceava is situated in the northeast of Romania, 450 km from Bucharest, and had a population of 118,500 at the time of the CIVITAS project. It is located in a mountainous region and the historical centre of Suceava is included among UNESCO's World Heritage sites.

CIVITAS Phase: II – SMILE  
Duration: 2005 – 2009  
Role: Learning city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Developing a clean bus fleet.** Before CIVITAS, Suceava public transport had a bad image and an outdated fleet. With the help of CIVITAS, the fleet was successfully modernised to conform with Euro III emissions standards.

The concept of eco-routes was introduced: these were defined as public transport lines where the level of noise and emissions are considerably reduced. The refurbished bus fleet was promoted via a wide range of publicity activities. This led to a rise in passenger numbers of 757 percent.

As a result of fleet renewal and the conversion to alternative fuels (see measure 2), emissions of pollutants fell considerably: CO<sub>2</sub> dropped by 11 percent/year, CO by 3 percent/year, NO<sub>x</sub> by 15 percent/year and particulates by 49 percent/year during the project period.

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**2. Promoting liquefied petroleum gas in the public and private sectors.** Before the project, biogas was not available on the market and only three out of the city's 11 filling stations sold liquefied petroleum gas (LPG). CIVITAS helped promote alternative fuels, LPG fuelling and clean vehicles via marketing campaigns and events. Both the public and private sectors were targeted.

Sales of LPG fuel rose by almost 40 percent in two years. More than 30 percent of the entire taxi fleet became LPG fuelled, resulting in a 7 percent reduction in CO emissions and a 10 percent reduction in CO<sub>2</sub> emissions.

An on-street survey showed that 82 percent of respondents were aware of cleaner vehicles and alternative fuels, providing a good starting point for future traffic management innovations.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**3. Introducing bus priority and other improvements.** To reverse the negative trends in Suceava's transport system, CIVITAS supported the upgrading of public transport services.

A range of improvements were implemented such as bus priority lanes, new traffic lights, "green ways", new ticketing systems and the development of park-and-ride facilities. The quality of public transport services improved considerably and in many ways: in terms of physical comfort, personal security, journey times, accessibility, drivers' attitudes and the provision of real-time information.

These results translated into a good level of acceptance for the implemented measures. In the course of the project, there was a 750 percent increase in the number of public transport passengers (see also measures 1 and 2).

### WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**4. Extending the low-emission zone.** A low-emission zone was introduced before CIVITAS and positively received. CIVITAS helped to extend the restricted-access area and the restricted periods.

The basis for the new zones was the "eco routes" for the city's new alternative-fuel buses. In order to avoid congestion on other routes, a bypass road and "green wave" traffic lights were installed.

There was a 6 percent increase in the number of citizens satisfied with the low-emission zones in the city. More than 30 percent considered that noise levels were more acceptable than before. Businesses' perception of the low-emission zone concept improved as well: there was a 20 percent decrease in the number of business owners dissatisfied with the existence of such zones.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**5. Providing information and raising awareness.** In order to tackle the problem of traffic congestion, one of the city's goals was to promote public transport as a viable alternative to cars for daily journeys in the city centre.

This CIVITAS measure focused on young people in order to help them understand their responsibility in the future development of the city. Information was provided to them in an attractive way, including through e-mail campaigns, workshops and roundtables in schools. This resulted in personalised travel plans for municipal employees and schoolchildren.

A total of 87.6 percent of people interviewed were aware of this measure and 79.1 percent welcomed it. There was a general improvement in people's perceptions of the quality of public transport services. The occupancy rate of public transport vehicles multiplied by 3.1 times from 2005 to 2008.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**6. Improving public transport information.** CIVITAS helped Suceava realise an accurate, high-quality real-time information system.

This system included the dissemination of information on websites from the City Hall and Mobility Centre and on electronic display boards. Several variable message signs (VMS) were installed, as well. Widespread acceptance of the implemented measures contributed to the creation of a new urban mobility culture.

During the project period, 22.6 percent of respondents used a VMS to obtain public transport information, 20.5 percent of respondents obtained information from leaflets, 18.1 percent visited the City Hall website for transport information, 17.8 percent obtained information from bus stops and 12.2 percent of respondents used the Mobility Centre as a source of information.

Jacek Piotrowski  
ul. Grota Roweckiego 29  
78 400 Szczecinek  
jacekpolna@wp.pl  
Tel: +48 604 17 10 92  
www.szczecinek.pl

At the time of the CIVITAS project, the historical town of Szczecinek in northern Poland had almost 40,000 inhabitants. Its stunning location between two lakes, Wielimie Lake and the smaller Trzesiecko Lake with a beautiful park spanning its shore, draws droves of tourists. The growing tourism sector is an important engine for the city's development.

CIVITAS Phase: Plus – RENAISSANCE  
Duration: 2008 – 2012  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### PUBLIC BICYCLES/BICYCLE SHARING

**1. Setting up a bicycle rental system and rickshaw services.** Before CIVITAS, the city of Szczecinek had already worked hard to build necessary infrastructure for cycling, but there was a need for attractive bicycle services, too. One of the first CIVITAS measures that the city implemented was a bike rental scheme and rickshaw taxi service. This was innovative because it was one of the first bicycle renting systems launched in the province. Also innovative was the integration of the bicycle renting system with public transport.

The city collected feedback from citizens and other stakeholders including city councillors, local authorities, the cycling association and the public transport management, especially regarding the location of renting points. The measure was integrated with other modes of transport, especially the newly developed water transport system (see measure 3). Bicycle rental points were placed close to the stops of the water tram and water taxi.

The 50 bicycles available from five rental stations were rented for 7,000 hours and on average there were about 500 rickshaw trips per year. CIVITAS made a significant contribution to enhancing quality of life for city residents, which was a very strong motivator for the mayor of Szczecinek to support the project.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Clean minibus fleet implementation.** Before measure implementation, the decline in public transport use and the increase in car use had worsened the environmental impact of road transport in the city. With the support of CIVITAS, the public transport operator tested three minibuses fuelled by liquefied petroleum gas (LPG) and installed a technical service point for all LPG users in the city. As an extra service, the operator built an eco-carwash for cars and trucks, the first of its kind in the city.

The clean minibus fleet and eco-wash were developed in consultation with environmental experts and technicians as well as local authorities and city councillors. These consultations were held during the preparation phase of the Szczecinek Transportation Strategy 2010–2020.

The measure achieved a reduction in CO emissions of 50 percent and increased the attractiveness of public transport, with 90 percent of surveyed passengers expressing satisfaction. The experience and knowledge gained during the CIVITAS project placed the city of Szczecinek and its stakeholders in a strong position to continue the work started within the project.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**3. Development of a waterborne public transport system.** In the year before the CIVITAS project began, the city launched a water tram service on the lake, and it was packed during weekends and holidays. With the support of CIVITAS, the service was made more accessible through integration with the rest of public transport (bus, bicycle and rickshaw – see measure 1). A second water taxi was added, increasing service flexibility. A waterborne transport system as a public means of transport rather than as a tourist attraction existed nowhere else in the region. There were several ferries in the region connecting riverbanks, but Szczecinek was the first to experiment with a water tram running as public transport on a lake.

Waterborne public transport was a subject of consultations with environmental experts and technicians as well as local authorities and city councillors. These consultations were held during the preparation phase of the Szczecinek Transportation Strategy 2010–2020.

Although water transport remained the transport mode least used by citizens, the number of users grew by 24 percent. These were mainly tourists, many of whom would probably have taken a car to go sightseeing if water transport had not been available. In Szczecinek, CIVITAS contributed to the revival of a transport mode that had been used by residents and tourists as early as the 19th century.

## DEMAND MANAGEMENT STRATEGIES

### WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**4. Closing missing links in the bicycle path network.** In a country where cycling levels are particularly low but gradually increasing, Szczecinek was a perfect place for promoting cycling thanks to its beautiful surroundings. Within the CIVITAS project, the city closed several missing links in its bicycle path network. Decision makers decided to create infrastructure that allows pupils to go to school by bikes. Going by bike gave them a measure of independence and responsibility.

For this measure, the city authorities consulted the county road traffic department, and the county conservation and environmental protection officers. The measure was part of Szczecinek's wider efforts to develop its cycling network, and the missing links were identified through a revision of the local spatial plan.

In combination with the other measures to promote bicycle use in Szczecinek, closing the missing links in the cycling network led to a modal share for cycling of approximately 19.6 percent (baseline value 18 percent) of urban traffic. In Szczecinek CIVITAS acted as a catalyst for behavioural change among residents and tourists.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**5. Campaigns promoting public transport use and cycling.** From the outset of the project, it was clear that there should be one integrated campaign promoting all CIVITAS tasks in Szczecinek, despite the separate communication budgets of each partner. Communications included a website in Polish, constant media attention, big events, a newsletter, television ads and many information products and gadgets.

Both the design and implementation of these activities were based on close cooperation with citizens. All activities in this measure were part of the local dissemination plan of the CIVITAS project in Szczecinek.

Awareness levels rose, but the self-reported willingness to change to sustainable modes had dropped slightly at the end of the project. In Szczecinek, CIVITAS served as an engine for behavioural change and helped generate political will to ensure future funding commitments.

### MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

**6. Sustainable transport development strategy.** Before measure implementation, Szczecinek did not possess a document which specifically defined a transport development strategy. With the support of CIVITAS, the city developed the Szczecinek Transport Strategy and the Noise Reduction Plan in order to create a vision of sustainable transport in the city. Up till then, transport issues had only been addressed in a

non-integrated way in the Development Strategy, Investment Strategy, Revitalisation Plan and other documents.

The city held a wide range of consultations with consultants, city council members, experts from the road management department, public transport operators, police, municipal police, taxi representatives and citizens.

The city council adopted the plan in September 2010 and started implementing it in 2011, resulting in a 10 percent decrease in noise in the city centre. The CIVITAS Initiative allowed Szczecinek to benefit from the experience of other CIVITAS cities.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**7. Development of dialogue displays at pedestrian crossings near schools.** Before measure implementation, there were no special tools to slow down car traffic and the number of accidents involving schoolchildren was increasing. As most car drivers ignored static warning signs, the city decided to install dialogue displays at pedestrian crossings used by students on their way to or from school. Using telematics technology for solving road and pedestrian safety was an innovative approach.

The demonstration was accompanied by dissemination activities in the context of a "safe-routes-to-school" campaign. All safety measures were developed in consultation with safety experts and technicians as well as local authorities and city councillors during the preparation phase of Szczecinek's Transportation Strategy 2010–2020.

There was a 66 percent decrease in the number of traffic accidents at pedestrian crossings near selected schools. In Szczecinek, CIVITAS served as an engine for behavioural change and helped generate political will to ensure future funding commitments.

**8. Increased safety of pedestrian and road traffic.** Due to the lack of a ring road, transit traffic ran through Szczecinek's city centre, where only three intersections were equipped with traffic lights. Within the CIVITAS project, Szczecinek installed additional signalling systems at one intersection and two pedestrian crossings, as well as illumination at four pedestrian crossings.

The dangerous points were identified through consultations with the road management department and police representatives. The safety measures were a subject of consultations with safety experts and technicians as well as local authorities and city councillors during the preparation phase of Szczecinek's Transportation Strategy 2010–2020.

The measure resulted in a 50 percent decrease in road accidents and a high perception of security. In Szczecinek, CIVITAS served as an engine for behavioural change and helped generate political will to ensure future funding commitments.

## 9. Traffic surveillance at selected main road intersections.

Before CIVITAS, the number of car accidents in Szczecinek was on the rise due to the increased level of car ownership, road deterioration and lack of respect for traffic rules. The city decided to promote safe driving by extending the traffic surveillance system at the busiest and most dangerous intersections.

Implementation took into account the recommendations from safety experts. The measure was part of a larger-scale traffic surveillance strategy.

The measures reduced the average time of police intervention from 16 minutes to five minutes at monitored locations and the level of perceived security rose by 14.5 percent. In Szczecinek, CIVITAS served as an engine for behavioural change and helped generate political will to ensure future funding commitments.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)–BASED ENHANCEMENT OF PUBLIC TRANSPORT

#### 10. Increasing the accessibility of bus stops and the attractiveness of public transport.

At the start of the CIVITAS project, buses were the main means of public transport in Szczecinek. However, there was an urgent need for modernisation and adjustment to contemporary needs. To promote high-quality collective passenger transport services, the operator installed a dynamic passenger information system (DPIS) and renovated old bus stop shelters.

Szczecinek's DPIS was the third system of its kind implemented in the province and it used state-of-the-art technology.

Consultations were held with a number of citizens and other stakeholders, including city councillors, local authorities and public transport management, in order to get direct feedback on the measure implementation, especially regarding the location of DPIS points. The measure was a part of Szczecinek's Transportation Strategy 2010–2020.

The implemented solution reached a very high level of acceptance as more than 90 percent of survey respondents thought that the displays are useful. In Szczecinek, CIVITAS served as an engine for behavioural change and helped generate political will to ensure future funding commitments.

Tiit Laiksoo  
Vabaduse väljak 10  
10146 Tallinn  
tiit.laiksoo@tallinnlv.ee  
Tel: +37 26 40 46 80  
Fax: +37 26 40 46 17  
www.tallinn.ee

Tallinn is the capital of Estonia with 430,000 inhabitants and an area of 159 km<sup>2</sup>. It is the country's largest city and a national centre of cultural, economic and higher education. As a medieval Hanseatic city, which is one of the oldest in the list of UNESCO World Heritage sites, Tallinn attracts many tourists.

CIVITAS Phase: II – SMILE  
Duration: 2005 – 2009  
Measures: 10, 12  
Role: Learning city

CIVITAS Phase: Plus – MIMOSA  
Duration: 2008 – 2012  
Measures: 1–9, 11, 13  
Role: Leading city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Alternative fuels.** Before CIVITAS, there were no biofuel-powered vehicles in Tallinn's public transport fleet. With the support of CIVITAS, Tallinn conducted two studies to investigate legislative, technical, socio-economic and environmental aspects of the introduction of alternative fuels and technologies.

The constructive partnership with all project partners, including Tallinn University of Technology and Stockholm Environmental Institute's Tallinn Centre, positively affected the outcome of the studies. The results were used to raise awareness among decision makers and stakeholders with several workshops.

Surveys indicated that stakeholders' awareness of alternative fuels increased by 67 percent after reading the studies. Tallinn learned that an in-depth study with a wide circle of experts is essential before introducing alternative fuels. Similar experiences of other cities and countries can be of great value in terms of transferable elements and knowledge.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

#### 2. Developing park-and-ride and school bus services.

Prior to CIVITAS, an ever-increasing rate of private car use significantly slowed down public transport. CIVITAS helped to analyse and promote park-and-ride (P&R) and school bus services. Studies looked into the use and problems of the current systems and analysed possibilities for improvement. Apart from traditional studying methods, an e-school system was used for getting feedback on the school bus service from parents of students.

The results were used for the promotion of the P&R and school bus systems in separate campaigns with advertisements, banners in public spaces, television interviews and Internet actions.

The average use of P&R car parks increased from 14.5 percent to 24 percent between the “before” and “after” counts in the project period; this meant a 62.5 percent increase in usage, although this cannot be attributed to the P&R promotion only. Compared to the business as usual scenario, the increase in school bus usage was 47 percent to 56 percent, which is an 18 percent increase during the CIVITAS period. This CIVITAS measure helped the city to obtain considerable knowledge about both services. It learned that dissemination and promotion are important, but services have to be improved as well — even after reaching the maximum number of users. Therefore there must be strong political will and resources for development.

### SERVICE IMPROVEMENTS

**3. Public transport communication system.** CIVITAS supported the installation of a modern communication system comprising a driver communication unit and an operator workstation based on the 3G mobile communication standard. The system was installed on 145 out of 350 buses and enabled better information-sharing possibilities, quicker communication and better traffic management.

Survey results showed that on average 90 percent of bus drivers and managers/operators believed the new communication system improved their working conditions and arrangements. In addition, 90 percent of both drivers and managers/operators believed the system had also improved traffic safety. An important lesson was that the whole fleet should be equipped with a similar and integrated information technology system to have a full impact.

### TICKETING AND TARIFFS

**4. New ticketing system.** CIVITAS helped to test and introduce a new ticket infrastructure that made public transport more convenient and permitted dynamic fare integration with other counties and cities. The measure was innovative because of the new technology and contactless ticketing system as well as the new conceptual approach: the system not only improved public transport service but also enabled the operator to gather

data on public transport use. This information could be used to optimise the public transport network.

The public testing of the system lasted five months after a broad dissemination campaign. The measure was part of the city's Sustainable Development Plan.

The public transport system's annual costs were cut by 64 percent, and awareness of the new ticketing system quadrupled. Acceptance of the system increased by 18 percent. An important lesson was that the implementation of a complicated and large-scale measure in a limited (four-year) project period has a high risk of failure. Strong political will and a smoothly functioning technology are crucial elements for success.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING.

**5. Eco-driving training for bus drivers.** Before CIVITAS, eco-driving was not common practice for public transport drivers in Tallinn. CIVITAS helped to develop a training programme on energy-efficient driving for bus drivers to decrease fuel consumption and increase road safety. Within the scope of this measure, 15 buses were equipped with training equipment and 274 of the 666 drivers were trained as well as 10 Tallinn Bus Company trainers. The innovative approach of the measure consisted of modern technology enabling detailed real-time feedback and results analysis. Another novelty was the organisation of driving lessons in real working conditions instead of at a remote training site. This meant that no time was wasted.

Fuel consumption among trained drivers was reduced by 4 percent and the number of accidents decreased by 22 percent. Depending on the type of emissions, the total Tallinn Bus Company annual amount was reduced by between 0.7 and 1.0 percent. A lesson learned for the city was that eco-driving training is highly cost-effective, both socio-economically and financially. Moreover, supportive management and competition between fellow drivers kept the drivers motivated in the training, which is essential for getting the best possible results.

#### 6. Mobility management: Making public transport more popular.

Before CIVITAS, the public transport system in Tallinn had been improved, and innovative steps were taken, but the mode remained very unpopular. CIVITAS helped to promote public transport through several events and campaigns for a wide variety of target groups, with children as a special focus. One of the most influential activities was the creation of a new identity for Tallinn's public transport service. The aim was to change the user experience and the transport company's image and communications. The new identity received the Design Management Europe Award in 2012.

Constructive partnership arrangements with other city departments and other institutions dealing with transport helped to successfully implement the new public transport identity.

The activities had a very high level of acceptance among citizens of Tallinn (78 percent). This contributed to a general decline in car use from 32 percent to 30.5 percent. The traditional Estonian view of cars as a status symbol was felt to be a cultural barrier for the city, but experiences and recommendations from Dublin and other CIVITAS cities helped to implement several ideas that generated high acceptance at a low cost.

## SAFETY AND SECURITY

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**7. Improving safety at pedestrian crossings and on bicycle tracks.** The city of Tallinn had witnessed an increased number of cyclists, pedestrians and roller-skaters. CIVITAS supported the development of new approaches to improve traffic safety on crossings. Preliminary studies were carried out to identify the city's unsafe crossings. Four non-traditional solutions were selected and implemented in suitable locations: a spot-lighted crossing sign above the crossing, LED-equipped blinking reflectors, speed sensors and traffic light dimmers.

Citizens were consulted about needed safety improvements. The selection of solutions was based on a series of meetings of traffic experts from the city council and Tallinn University of Technology.

Each solution was evaluated using city-specific indicators of traffic behaviour, pedestrian accident statistics and awareness of the general public about the situation with regard to using crossings. Speed sensors, for instance, led to a 6 percent reduction in cars exceeding the speed limit as they approached crossings. A traffic light dimmer led to a 40 percent improvement in drivers' attention in poor visibility conditions.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**8. Marking routes for smooth freight and city logistics.** Before CIVITAS, heavy freight transport to the old city harbour had an increasing impact on daily congestion. With the support of CIVITAS, an optimal freight route corridor from the old city harbour to the national road network was developed. This was in combination with a new guidance sign system and free downloadable freight routes for GPS navigation systems. The measure was innovative because of its conceptual approach of a freight corridor and the use of different technical solutions (signing and digital mapping).

The measure targeted specific user groups and involved them from the start of the project.

Among interviewed truck drivers, 31 percent considered the new guidance sign system useful. The Tallinn heavy goods vehicles web page attracted frequent visits, in Estonian language as well as in English. GPS navigation routes were

downloaded 317 times between March and September 2012. The city would recommend the same approach to other cities, as it was easily replicable and relatively inexpensive.

**9. Traffic monitoring.** Prior to CIVITAS, a lack of information made it impossible to effectively manage traffic flows in the city. CIVITAS helped to realise a system for the counting and real-time monitoring of vehicle traffic on the main street network of Tallinn. The system was installed at 10 intersections and one straight road section on the western border of Tallinn. The counting cameras automatically monitored traffic flows, speeds and classifications in real time and also created automatic traffic reports for traffic planners and consultants.

While the measure was initially intended for traffic experts only, secondary features were added to make the real-time traffic flow available for the public in the form of an overall Tallinn map and as a free-of-charge mobile application, called 'm Traffic.

Traffic experts gave a very high appraisal to the system, varying from 4.5 to 5 on a scale of 1 to 5. There was only a modest use of the public web page with around 2,000 page visits per month in the period July to September 2012. The city learned that even if the resources for implementing the monitoring system are not sufficient for creating a full-scale network covering the whole city, this network should be planned before implementing the first parts of the system.

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**10. Automatic stop calls and information signs in vehicles.** According to a passenger survey carried out in 2003, 69 percent of public transport passengers were satisfied with public transport, but only 36 percent of passengers were satisfied with information. With the support of CIVITAS, the city installed outward electronic displays of the route number and destination on public transport vehicles, as well as on-board, inward displays giving information on route number, route destination, the next stop name and current time. Buses, trams and trolleybuses were also equipped with automatic audio stop calls announcing the name of the current stop, the available connections and the name of the next stop.

Significant problems were encountered in the official public tendering process for the information systems, which caused much delay.

Satisfaction with public transport information rose from 35 to almost 60 percent. The system introduced under CIVITAS became the standard for any vehicles purchased from then on.

**11. Bus lane and red light cameras.** Before CIVITAS, cameras had not been used in the enforcement of traffic signal compliance, speed limits or bus-lane incursions. With the help of CIVITAS, the city installed enforcement cameras at several intersections to help police these matters. The use of new technologies and infrastructural solutions was innovative for the city and the country.

The city worked together with the Tallinn University of Technology and the police for the implementation process.

The cameras were still not fully functional at the time of publication of this measure directory. The required legislative changes made system preparation and equipment procurement very complicated and time-consuming. A proper evaluation was planned two years after full implementation of the system.

**12. Public transport priority system in Tallinn.** Between 1990 and 2000, the modal share of public transport in Tallinn had collapsed from 77 to 31 percent. That is why the city implemented a priority system for public transport involving 10 km of added public transport lanes, priority signals at 31 intersections, priority devices in 99 buses (six routes) and 59 trolleybuses (three routes) plus automatic passenger counting devices in six buses and six trolleybuses for evaluating the results. This large-scale demonstration was unique for the new member states in Eastern Europe.

Attempts were then made to raise public awareness in order to put pressure on politicians to support public transport priority, but this had limited success. Implementation of the priority system was linked to the road construction plan, as construction and reconstruction projects had to observe the requirements of the priority system. However, conflicting priorities of different municipal departments led to the cancellation of one public transport lane and a number of construction projects at one of the key junctions just a few months after the introduction of the priority system.

The creation of bus lanes led to an 11 km/h decrease in average car speeds during the evening peak in 2008 as compared to 2005. Average trolleybus speeds remained stable (2 km/h faster than the business as usual scenario). The steady decline in the modal share of public transport was halted in 2008. As a source of EU co-financing, CIVITAS was a crucial lever to persuade politicians to sign off on the scheme.

**13. Real-time information system.** Prior to CIVITAS, passenger information for Tallinn's public transport system was neither reliable nor up to date. This CIVITAS measure introduced a real-time public transport information service to improve public transport comfort (see measure 4). Electronic real-time public transport information displays were installed at the six most suitable bus stops. Additional functionalities to the website and mobile applications for smartphones were created to provide public transport schedule information.

Public awareness of the plans to improve public transport services in 2009 and 2012 increased by 37 percent. The most important recommendation for replication from the city was that the real-time information system should, if possible, be part of a complete system from one provider.

Aurore Asorey  
7 Esplanade Compans Caffarelli  
31 000 Toulouse  
aurore.asorey@tisseo.fr  
Tel: +33 56 777 80 17  
Fax: +33 56 777 80 02  
www.tisseo.fr

Situated midway between the Mediterranean and the Atlantic, Toulouse is the fourth largest city in France. With more than 900,000 inhabitants at the time of the CIVITAS project, the Toulouse metropolitan area is also among the biggest conurbations in southern Europe.

CIVITAS Phase: II – MOBILIS  
Duration: 2005 – 2009  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR POOLING

**1. Promoting car pooling and its integration with public transport.** Before CIVITAS, some car pools in Toulouse were coordinated by the non-profit group COVOITURAL. CIVITAS helped to enhance this activity and integrate it into a dedicated new mobility centre.

Between 2005 and 2007, the number of registered participants rose from 194 to 1,866, with 17 percent car pooling on a daily basis. During this period, it can be estimated that some 1.6 million car-kilometres were avoided, with a saving of 340,000 kg of CO<sub>2</sub> equivalents.

Capitalising on this CIVITAS experience, the public transport authority went a step further by improving the car-pooling website [www.covoiturage.tisseo.fr](http://www.covoiturage.tisseo.fr). This resulted in the gain of more than 2,300 registered users. Two mobility advisers for workplace mobility were hired to promote alternatives to individual car use in companies and administrations.

### CAR SHARING

**2. Linking car sharing to public transport services.** There was no car-sharing system in Toulouse before the CIVITAS project started. This measure analysed the potential for such a service together with barriers and possible implementation scenarios. The emphasis was on integration with public transport services.

The realisation of this feasibility and marketing study took more time than initially planned. The Mobilib' car-sharing service in Toulouse was finally launched in July 2007 and was very successful from the start. In 2012, more than 30 vehicles were available in 14 different stations. The public transport authority is a member and partner of Mobilib'.

## PUBLIC BICYCLES/BICYCLE SHARING

**3. Promoting cycling and its integration with public transport services.** The modal share of cycling was only around 4 percent at conurbation level and new infrastructure was urgently needed. CIVITAS helped set up a cycling working group to analyse barriers, needs and expectations of cycling.

The results were translated into a comprehensive cycling policy with two pillars: the extension of the cycle route network by 70 percent and the introduction of a bike-sharing system. The VélôToulouse scheme was launched with 2,400 bicycles.

The implementation of the VélôToulouse system created 42 new jobs and was very successful: some 11,460 subscribers registered and around 3,800 daily rentals were recorded. The number of people renting bikes tripled in one year. Bicycles have become more visible in the city, increasing safety conditions for cyclists. The creation of the cycling working group with all stakeholders was key to this success. A lesson learned is that projects involving the redesigning of city centre spaces offer good opportunities for new and innovative cycling investments.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**4. Introducing biogas and particulate filters for buses.** Before CIVITAS the public bus fleet did not use biodiesel or particulate filters. To support a 100 percent clean bus fleet (see measure 5) the use of biodiesel was investigated, including its possible production in the Toulouse area.

Based on the feasibility tests by the School of Agronomy, the public transport authority decided to use biogas as soon as national regulations on biogas would allow the injection of biogas into the natural gas network.

As a result of the installation of particulate filters on more than 100 buses, the amount of particulate matter emitted per 1,000 km was reduced by 90.9 percent. Bus fleet emissions of NO<sub>x</sub> fell by 31.9 percent, CO by 54.2 percent, hydrocarbon by 42.8 percent and particulate matter by 84.4 percent.

### CLEAN FUELS AND FUELLING INFRASTRUCTURE

**5. Operating clean buses and preparing for a sustainable fuel supply.** About 20 percent of the city's bus fleet ran on compressed natural gas (CNG) but there was just one CNG filling station. Supporting the 100 percent clean bus fleet objective, CIVITAS helped in the purchasing of 68 new CNG buses and in the building of a new gas filling station with a capacity for 200 buses.

Emissions of pollutants from the bus fleet as a whole decreased during the project: NO<sub>x</sub> by around 30 percent, methane by 50 percent, hydrocarbons by 40 percent; and particulates by 80 percent (see also measure 4).

The city also launched the "CNG at Home" solution by providing micro-compressors for households. However, the campaign fell short of its 1,000 home target because of a lack of interest and an unconvincing business model.

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**6. Improving the accessibility of public transport.** CIVITAS helped in assessing the overall accessibility of the public transport network and defining concrete objectives to ensure high-level accessibility.

The Accessibility Master Plan resulted in the Accessibility Charter for High-Quality Bus Corridors (HQBC), a training plan for customer reception points and a database for managing complaints and agreed actions.

By 2008, 50 percent of bus stops, 55 percent of buses and 100 percent of the metro system were accessible to disabled people. The Accessibility Charter became a reference document for all new public transport infrastructure.

### SERVICE IMPROVEMENTS

**7. Developing proximity services at major passenger transport hubs.** Metro stations in Toulouse offered very few services before CIVITAS. During the construction of the second metro line, special attention was given to the development of proximity services at intermodal nodes, with the Jean Jaures station as a demonstration pilot.

A specialist marketing agency was recruited to help the public transport authority Tisséo with the implementation of the services/shopping area and the development of an innovative marketing concept. The newly built services/shopping area was well received, although it became clear that some of the services/shops were not well adapted to the hub interchange situation.

The development of other services/shopping areas in other intermodal hubs followed and Tisséo has planned to adapt 11 other interchange hubs based on a good business model with a special focus on communication and accessibility.

**8. Improving the quality and structure of public transport services** (not fully implemented). CIVITAS took the reorganisation of the public transport network as an opportunity to improve the overall quality of the public transport services.

A thorough bottom-up approach was realised by different committees comprising the public transport authority, the public transport operator and passengers' associations. A new and fully functioning certification methodology was developed based on automatic measurements and sensors on several bus lines.

The decision to postpone the reorganisation of the public transport network and political conflicts hindered full measure implementation.

**9. Integrating a demand-responsive public transport service.** Five transport-on-demand lines were operating in the Toulouse conurbation, each with its own booking service. With the support of CIVITAS these services were integrated into the public transport offer to improve efficiency and connections.

At the end of the project period, 18 transport-on-demand (TAD) lines were in operation. There was a continuous rise in use and the appreciation among users was very high. An economic analysis highlighted that operating TAD lines was much cheaper than operating regular bus lines. It offers moreover a service in low-density areas where it would have been too expensive to implement a regular bus service.

This CIVITAS measure remains successful: the TAD use rate increased by around 20 percent in 2010. In 2012, 12 TAD lines and a shuttle were available and one line (TAD 106) has been given NF Environment certification by the French certification agency (AFNOR).

## TICKETING AND TARIFFS

**10. Integrated tariffs for public transport using the Pastel smartcard.** As part of the CIVITAS project, the public transport authority renewed its ticketing system, making it electronic and interoperable with other local transport networks through the Pastel contactless smartcard.

The general smartcard ticketing system and associated personalised travel card (380,000 in total) were distributed to annual ticket holders. Based on a survey, some specific public transport products were tested: non-personalised smartcards and annual Activeo cards for employees of companies with commuter mobility plans. The Activeo trial was very successful and contributed to a modal shift from the private car to public transport or combined journeys. Activeo subscribers were very satisfied with the card. Its success depended, however, on the location of the company, awareness raising at company level, and the level of co-financing by the employer.

Building on the success of the CIVITAS experience, Tisséo continues working towards improving traveller mobility. Pastel now works with the VélôToulouse bike-sharing and Mobilib car-sharing systems. In the near future, Pastel will integrate further services, including those related to tourism and education. The development of near-field communication solutions is also planned, enabling mobile payments through the combination of multimodal information.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**11. Developing high-quality bus corridors and safe city centre lanes.** The public transport authority and surrounding cities jointly committed to develop high-quality bus corridors to some residential areas. CIVITAS supported the concrete implementation.

The first two new corridors improved journey times and reliability during the day, with speeds from 10 to 15 km/h to an

average of 30 km/h and travel times no longer depending on traffic conditions. Car travel times remained constant compared to the situation without bus lanes.

The gradual implementation of more dedicated bus lanes led to a reduction in average bus travel times of around 10 percent, greater bus frequency, and a reduction in car journey times by 23 percent.

### PARKING MANAGEMENT/PRICING

**12. Defining and implementing a new parking management policy.** A wide range of free parking facilities led to conflicts of use between shopkeepers, residents, commuters and visitors.

Within the CIVITAS project, a local parking plan was introduced including the creation of a rate for residents. The scheme started in four local areas and was gradually expanded to cover the entire city centre.

The residents' pass scheme can be considered a success: average parking fell from 23 to five minutes, and 78 percent of the residents of the 19 areas involved were satisfied. Parking space occupancy rates dropped by 17 percent and the rate of illegal parking decreased by 2 percent. The proportion of free spaces (25 percent on average) could be interpreted as a possible opportunity to reorganise public spaces and install sustainable transport infrastructure (see also measure 14).

**13. Regulated parking zone for Blagnac.** Before CIVITAS, parking was free everywhere but difficult in the area of Blagnac. The introduction of a new tram line linking Blagnac to Toulouse was an opportunity to implement new parking measures.

CIVITAS helped to define different parking zones and to limit, inter alia, the number of private cars in the town centre. Parking was still free in the "Blue Zone" but was regulated and only for short stays.

The introduction of the Blue Zone resulted in better access to the centre as the turnover ratio increased by 2.7 percent. There was a better distribution of parking demand and a 7 percent decrease in the average occupancy rate.

### WALKING AND CYCLING ENHANCEMENTS/SERVICES

**14. Redesigning public spaces.** In anticipation of the opening of the city's second metro line, an agreement was signed by the city of Toulouse, the Greater Toulouse Authority (CAGT) and the public transport authority to base the make-over of the city centre on the encouragement of sustainable transport.

CIVITAS helped realise the modification of the traffic layout, with more provision for bicycles, the extension of pedestrian zones and the creation of delivery areas in the city centre. Furthermore, car access control was reinforced.

Thanks to this approach, between 2006 and 2008 car traffic was reduced by 12.5 percent during morning peak hours and by 17 percent during morning off-peak hours.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

#### **15. Raising awareness to change mobility behaviour.**

Through this CIVITAS measure, the different public transport actors developed an individualised marketing process and awareness-raising campaigns to promote the use of public transport.

The campaign was implemented in conjunction with the renewal of the ticketing system and the development of new public transport infrastructure (see also measures 6 to 10). A users panel of 1,000 people discussed tariffs, advertising strategies and passenger satisfaction levels. The panel's feedback gave operators insights into users' needs and they were taken into account in the development of new services.

A lesson learned was that deep involvement of the public transport operator's commercial and communication departments is needed to make such a campaign successful.

**16. Setting up a mobility agency and customised services.** Before CIVITAS, there was a lack of accurate and accessible information on public transport. A first local mobility agency was created by a local syndicate and offered five different services: car pooling, bicycle rental, public information, mobility advice and public transport ticket sales. CIVITAS helped to analyse the needs and set up a more formal agency.

An in-depth evaluation confirmed the need for the mobility agency: around 200 in-person visits per month and 800 visits per month to the website. Ticket sales were a useful but non-essential activity of the mobility agency, while bike rentals were very popular.

On the basis of this success the local public transport operator decided to establish new mobility agencies to cover the entire territory of the agglomeration of Toulouse.

### MOBILITY PLANNING

**17. Developing commuter and administration mobility plans.** Before CIVITAS, only 10 companies in the region had a commuter plan. CIVITAS helped four major companies to make commuter travel plans and another was created for the Blagnac district.

These plans included the development of dedicated public transport services, the improvement of accessibility for all modes and the development of complementary services for cyclists.

The main lesson learned was that mobility should be included as soon as possible in the planning process for new industrial or business areas. Thanks to the active participation of the public transport authority in the commuter plan development, more than 80 commuter plans were being implemented by the end of the project period.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**18. Developing an integrated multimodal traveller information system** (suspended). With the support of CIVITAS, Toulouse aimed at improving existing public transport information systems for the city's high-quality bus corridors and at intermodal stations.

The measure was unfortunately suspended due to the public transport operator's problems using the systems and to conflicts between the stakeholders involved. A quantitative survey was carried out at several metro stations which reaffirmed passengers' need for integrated information in order to make multimodal journeys.

**19. EGNOS/Galileo services for public transport control and information.** This CIVITAS measure evaluated the feasibility of using global navigation satellite systems (GNSS) to support public transport use.

The trial demonstrated the reliability of the technology, confirming that in future bus management systems innovative GNSS technologies can help reduce operational costs. The simulations also revealed that, with the use of multiple satellites, including GPS and Galileo, GNSS can provide global availability of positioning systems that enable new transport-related services (see also measure 20).

Optimal use of GNSS would require the modification of systems that allow buses to communicate with each other and the monitoring centre. The existing location report was not frequent enough with respect to the expected GNSS accuracy and this made it difficult to analyse the impact of accuracy improvement on the system. The measure benefited from the complementary skills and expertise of different stakeholders in the GNSS field and the transport sector. Policy leaders and decision makers showed a lot of interest, which encouraged and motivated all stakeholders.

**20. Implementing a bus priority scheme.** To improve the share of public transport in the modal split, CIVITAS helped implement two bus priority systems.

In the first trial, buses were equipped with a priority request system and evaluation focused on advantages and constraints of the system for both public transport and private car flows. Bus regularity and journey times improved and average bus waiting times at traffic lights were reduced by 52 percent (9 seconds).

The second trial focused on buses in the high-quality corridors. They were equipped with beams that activated electromagnetic loops to obtain priority at traffic lights. Many difficulties were encountered in defining a traffic light cycle algorithm that would alleviate traffic congestion. Based on the trials, the city of Toulouse decided to equip new junctions with a loop-based bus priority system, suitable for the new infrastructure.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**21. Developing clean urban logistics.** Improving freight delivery services was identified as a way of overcoming the city's increasing congestion problems. Several CIVITAS initiatives contributed to less freight congestion and were supported by all relevant stakeholders.

A consultation process between road haulage companies and city representatives worked towards a global approach to freight delivery. A new delivery regulation limited the tonnage for goods delivery lorries and the delivery time period during the day. A freight delivery quality charter established areas where freight delivery traffic was controlled. The new parking management regulation (see measure 12) freed up access to these delivery zones. The city of Toulouse also supported the creation of a micro-delivery platform called Chronopost that made use of clean vehicles.

All these CIVITAS measures led to a new charter on goods distribution signed in 2012. This charter established new delivery schedules based on engine type and imposed the use of a parking disc that limits stops to 20 minutes in delivery zones.

Dalibor Darilek  
Velká Hradební 8  
401 00 Usti nad Labem  
dalibor.darilek@mag-ul.cz  
Tel: +42 04 75 27 18 43  
Fax: +42 04 75 27 18 50  
www.usti-nad-labem.cz

The city of Usti nad Labem is an important industrial centre in northwestern Czech Republic. At the time of the CIVITAS project, the city had about 95,000 inhabitants in an administrative area of 94 km<sup>2</sup>. Usti nad Labem is located in a river basin surrounded by hills. Usti nad Labem is home to the Jan Evangelista Purkyně University, with eight faculties and a large student population. The city was formerly the base for a large range of heavy industries, which caused damage to the local environment. This was the major focus for improvements and care at the time of the CIVITAS project. The city made a sustainable urban transport plan during the lifespan of its CIVITAS project and integrated this into the overall city Master Plan.

CIVITAS Phase: Plus – ARCHIMEDES  
Duration: 2008 – 2012  
Role: Learning city

## COLLECTIVE PASSENGER TRANSPORT

### ACCESSIBILITY

**1. Public transport promotion.** Before CIVITAS, public transport use had fallen off from 2005 levels. To assess the needs of public transport users, a survey was conducted to map transport demand for all lines. To attract more passengers, the city conducted a promotion campaign in cooperation with a public transport operator.

Public events were organised to promote local public transport services to residents. During these events, people were able to compare services provided in the past and in the present. This measure was integrated into the Sustainable Urban Transport Plan that the city drafted during the CIVITAS project.

As a result, the majority of public transport connections were optimised, operating times were adjusted and intervals of individual connections were set to better correspond with each other. A survey of customer satisfaction revealed that the majority of respondents required improvements to existing services rather than newly established ones.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**2. City centre access control.** Before CIVITAS, Usti nad Labem was gradually becoming more and more congested with vehicles as travel demand grew. To counter this, a study was elaborated to propose possible options for regulating traffic in the city centre, including access restrictions.

The general public was not involved in the study, which was based on traffic measurements and traffic simulations. This measure was integrated into the Sustainable Urban Transport Plan that the city drafted during the CIVITAS project.

The study resulted in an overview of all the regulatory tools applicable in the city centre. Implementation of city centre access control could be achieved effectively only after completion of the highway D8, leading from Prague to Dresden and bypassing the city. At the time, this traffic crossed the city on the urban road network. Usti nad Labem's lesson learned was that the measure must be tightly linked to other measures, such as implementation of park-and-ride facilities, the development of public transport and cycling, and improvements in traffic management.

**3. Noise reduction.** Usti nad Labem sought to reduce the number of residential areas exposed to traffic noise levels above 65 decibels. With the support of CIVITAS, the city conducted studies to gain a better understanding of measures for noise reduction and to develop a noise map of the city. The ultimate aim was to propose measures to reduce noise from cars in the most affected areas by the year 2012.

There were no stakeholders involved in this measure. Problem areas were targeted as part of the Sustainable Urban Transport Plan drafted during the CIVITAS project.

Noise-reducing models were developed for seven scenarios, including ones involving the construction of specific bypasses, the implementation of 10 percent speed reductions and the exclusion of freight transport from certain parts of the city. The last solution predicted the most tangible results (see measure 10). The city learned that noise reduction would be expensive. It required radical measures and would have to be supported by other technical solutions (noise barriers, use of innovative noise-dampening materials, the building of tunnels etc.). It might also require demand management for individual transport.

**4. Short-term parking scheme.** Before CIVITAS, the city of Usti nad Labem was facing critical parking shortages, primarily in the city centre and in dense residential areas. The city carried out a feasibility study on short-term parking and designed a strategy for regulating short-term parking in the problem areas.

The city realised that even the best system will not work efficiently without good promotion and public involvement. It had already conducted an information campaign on the current system of paid parking in the city centre. This measure was integrated into the Sustainable Urban Transport Plan that the city drafted during the CIVITAS project.

The measure resulted in a proposal for solving parking shortages in Usti nad Labem with on- and off-street paid parking, remote parking, and measures to prevent the shifting of cars to neighbouring areas. However, before paid parking zones could be introduced, the city would need to invest in collective parking garages, high-quality public transport and increased public awareness. Although it would not be possible to cover the present and future parking demand entirely, CIVITAS helped Usti nad Labem to take the first step in the difficult task of addressing the parking deficit.

**5. Strategic traffic management.** Before CIVITAS, the sharing of traffic information between different traffic management subsystems was minimal. With the support of CIVITAS, the city of Usti nad Labem developed a proposed traffic management strategy. The proposal defined an integrated traffic management system that gathered, processed, stored and shared information among the relevant bodies in the city with centralised management.

Several parties were involved in this measure, including transport experts, the municipal and state police, the fire brigade, and the administrator of traffic light devices in the city. The general public was not involved. The proposal was integrated into the Sustainable Urban Transport Plan of Usti nad Labem, which the city drafted during the CIVITAS project.

The measure did not include the implementation of the new system. A lesson learned was that sharing information is time-consuming but necessary for successful traffic management.

### WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**6. Cycle transport improvements.** At the start of the CIVITAS project, Usti nad Labem had very little road space dedicated to cycling and a very low number of cyclists. Based on the results of the BYPAD audit of the city, Usti nad Labem decided to improve information about cycling and to weave the existing cycling infrastructure in the area into a coherent network.

For the purpose of measure evaluation, a mobility survey was conducted among city residents. This measure was integrated into the Sustainable Urban Transport Plan that the city drafted during the CIVITAS project.

As a result, a web portal was developed with information on cycle routes, cycling safety, an overview of network quality, suitability of infrastructure for different types of bikes, videos of cycling routes and information on technical equipment and services. The survey of the public showed interest among inhabitants in developing cycling as a means of transport.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**7. Mobility improvements.** Before CIVITAS, most of the access routes in the city centre were already barrier free, but

the more vulnerable pedestrians were not aware of these routes. CIVITAS helped realise a web portal highlighting the access routes to a much wider public.

The issues surrounding accessible routes in the city were discussed with associations of disabled people in the Usti region, and with local schools and other representatives of the public. This measure was integrated into the Sustainable Urban Transport Plan that the city drafted during the CIVITAS project.

The city was resolved to keep updating and improving the web portal after the end of the CIVITAS project. It also recognised the need to continue adjusting public space and public transport stops to fulfil the conditions of barrier-free routes, based on the findings of the CIVITAS project.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**8. Drive safely campaign.** With the growing rate of motorisation, the number of traffic accidents in the city was continuously growing. Through awareness-raising activities and preventive traffic education the city wanted to tackle this issue. A set of activities took place: workshops focusing on safe traffic behaviour for young or potential drivers and elderly people; educational leaflets, knowledge tests for children, a traffic court; and traffic games and puzzles.

Many public events were organised in the city centre to increase awareness about road safety issues. The acceptance and awareness levels of participants were assessed for measure evaluation. This measure was integrated into the Sustainable Urban Transport Plan that the city drafted during the CIVITAS project.

Because of a positive cost-benefit analysis, the city of Usti nad Labem planned to organise similar, follow-up events based on the experience and best practices of CIVITAS campaigns. The city learned that to reach a wide audience an original and effective public campaign is needed.

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

**9. Road safety measures.** Usti nad Labem had set itself a target to reduce the number and impact of traffic accidents in the city through road safety measures. With the support of CIVITAS, the city conducted a road safety audit. This led to the development of an action plan for road safety and traffic calming.

Usti nad Labem launched a traffic speed reduction campaign in order to increase awareness of the danger of exceeding the speed limit and other road safety issues in the city. The action plan was incorporated into the Sustainable Urban Transport Plan that the city drafted during the CIVITAS project.

As a result of the measure, 42 locations were identified for implementation of 30 km/h zones and traffic calming solutions for each locality were proposed. A new website dedicated

to road safety in Usti nad Labem was launched. It contained recommendations for safe behaviour for drivers, pedestrians and cyclists. In Usti nad Labem, CIVITAS revealed that the city was not fully utilising the potential of traffic calming.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**10. Efficient goods distribution.** At the start of the CIVITAS project, the city's industrial centre was constantly busy with freight transport, which contributed to ever-increasing noise levels. To counter this trend, the city conducted a study to identify measures to reduce freight-related noise. Different measures were considered, including traffic planning and management, construction projects and technical solutions. The most efficient solution for reducing the negative impacts of traffic and achieving efficient goods distribution called for building a city ring road to bypass the city centre.

The proposed solution was not accepted by the city authorities and was removed from the Sustainable Urban Transport Plan (SUTP) that the city drafted during the CIVITAS project.

A plan for the efficient distribution of goods in the city was designed, but at the end of the CIVITAS project it remained a theoretical solution. The reduction of noise emissions in the urban environment by reducing of traffic intensity did not appear to be very effective (see measure 3). It turned out that even a three decibel decrease in noise emissions would require a 50 percent reduction in transport intensity. This would require radical, high-cost measures. Instead, proposals were made for improvements in traffic management and for a mix of soft measures, and these were included in the SUTP.

# UTRECHT THE NETHERLANDS

Jan Bloemheuvel  
Ravellaan 96  
3503RK Utrecht  
j.bloemheuvel@utrecht.nl  
Tel: +31 30 286 02 11  
www.utrecht.nl

Utrecht is the fourth largest city in the Netherlands with a growing population of 300,000 at the time of the CIVITAS project. Given its central location and history dating from Roman times, it is a popular destination for tourists. The city attracts about 90,000 commuters a week, a figure projected to double in 20 years.

CIVITAS Phase: Plus – MIMOSA  
Duration: 2008 – 2012  
Role: Leading city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

**1. Car sharing.** Before CIVITAS, the city facilitated car-sharing initiatives with around 200 cars in and around the city centre, particularly in neighbourhoods with paid and reserved parking spaces. With the help of CIVITAS, these services were expanded to residential areas on the outskirts of the city, based on market and segmentation research with more than 1,000 participants.

The city worked together with marketing company Emotion and network agency Nudge and with all relevant businesses. One of the main barriers observed was a disagreement between one of the car-sharing providers and the other stakeholders involved regarding the special tariff proposed to users during the campaign.

Implementing the measure led to reduced private car mileage and increased use of car sharing. Between June and August 2012, the number of car-sharing members increased by 298. Of these, 13 percent (39 new members) signed up through the campaign website. The success was partly due to the combination of a consumer platform that promotes sustainable projects by bringing people together (bottom-up) and cooperation with a communication agency that designed the campaign's visual identity (top-down).

### PUBLIC BICYCLES/BICYCLE SHARING

**2. Public and rental bikes** (not fully implemented). At the start of the CIVITAS project, bicycle use in Utrecht was high: 52 percent of the residents normally made city centre trips by bike. As the city wanted to give priority to the bicycle as the main mode of transport within the city, this measure aimed

at implementing a bike rental system with a dense network of pick-up and return points for both commuters and visitors.

A preliminary survey showed that most of the relevant partner companies thought that bike sharing would not be profitable without an annual public subsidy to cover expected losses.

After local elections the measure was suspended due to lack of political support and the only mildly promising results of a second market survey. Nevertheless, the city continued working on its bicycle management strategy to stimulate demand and supply, including through a bike system for public transport commuters working downtown. Two recommendations based on this measure concern the need for a clear definition of the target group as well as the consideration of a national-level design rather than custom-made local systems in each city.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**3. Park-and-ride facilities.** Before CIVITAS, car traffic into the city centre of Utrecht had increased continuously. Park-and-ride (P&R) facilities were needed to keep the city accessible, improve air quality and offer citizens a clean and healthy living environment. CIVITAS supported the development of the P&R concept comprising a high-quality public transport service combined with an increased number of P&R facilities. A broad campaign targeted social-leisure visitors and commuters with a website, an app and promotional activities. The extension of the paid parking area in Utrecht and the closure of 1,000 parking places near the city centre made the P&R facilities more attractive.

A baseline survey helped to better target the promotional activities. Specialised contractors for the various parts of this kind of measure proved to have added value.

There was a significant increase in the number of P&R tickets sold at three of the four facilities. As there were multiple CIVITAS measures aimed at decreasing traffic it is difficult to gauge the precise impact of this measure. The increase in awareness and satisfaction was marginal, however. The city recommended a thorough analysis of transport and parking options, as well as of potential P&R users, before implementation. Beyond the framework of CIVITAS, the city of Utrecht recognised the relevance of P&R services and decided to implement two additional P&R facilities by 2016.

### SERVICE IMPROVEMENTS

**4. Improving bus service quality between the centre and the north.** The bus line between the central station and the north of Utrecht was the only public transport corridor in the city where buses did not have a separate, priority lane. This resulted in long travel times and unpredictable services. With the help of CIVITAS, traffic light prioritisation was installed and a series of medium- and long-term measures were suggested for implementation or continuation after the end of the CIVITAS project.

The traffic light priority system was part of the city's Action Plan for Air Quality.

The impact of the priority system was not measured due to the lack of efficient tools to collect data on travel times. Measuring the travel times would have been an expensive task considering the modest scale of this measure. Thus impact evaluation was postponed until more of the proposed measures had been implemented. The city's lesson learned is that the objective of this type of project should be clearly embedded in policy documents beforehand. Secondly, the involvement of residents at the earliest stages of the process is essential for the measure's success. Thirdly, sufficient time and efforts should be devoted to compile an inventory of the interaction with other (infrastructural) projects for the area concerned.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**5. More flexible access for cleaner freight traffic.** In 2007, Utrecht introduced a low-emission zone in the city centre: only freight vehicles with "cleaner" engines would be allowed to enter this zone. Supported by CIVITAS, Utrecht implemented four flexible access management measures to promote the use of more sustainable freight vehicles and more energy-efficient freight distribution. The "Cargohopper" included an electric mini-train delivering freight from a city distribution centre to the inner city; a flexible access implementation plan giving benefits to transport companies that use "super-clean" vehicles (i.e. cleaner than the Euro V/EEV/EEV+ norm); night-time access for clean and very quiet freight vehicles; and freight vehicle access to bus lanes.

The city cooperated with private transport businesses to develop these measures.

The measures resulted in a decrease of 4,080 freight vehicle trips during the project lifespan, which corresponds to the saving of 88,332 km driven by diesel van or light truck. This in turn resulted in a 73 percent reduction in CO<sub>2</sub> emissions, a 27 percent reduction in NO<sub>x</sub> emissions and a 50 percent reduction in PM10 emissions. The cost-benefit analysis of the Cargohopper showed an economic benefit of about EUR 65,000, which made it cost-neutral during its lifespan.

**6. Rewarding motorists for avoiding rush hour.** To limit the negative impacts of major roadworks on traffic flows, a unique public-private initiative was set up called Stichting Utrecht Bereikbaar (Utrecht Accessible Foundation). With the help of CIVITAS, the foundation launched a pilot measure that rewarded motorists who avoided morning rush hour.

This innovative measure used licence plate recognition to identify car owners who usually drive along selected roads during the morning rush hour. During the pilot period, they received EUR 4 per day that they avoided this trip during rush hour. It used a reversed road pricing policy whereby instead of charging the drivers at peak hours, it paid them not to travel.

The members of the foundation were the municipality of

Utrecht, the national highways authority (Rijkswaterstaat), the Utrecht regional authority, the province of Utrecht, the Mid-Netherlands Chamber of Commerce and the employers' association VNO-NCW Utrecht.

Of the 15,555 people who were selected and invited by letter to participate, 4,026 car owners decided to do so. By distributing between 767 and 923 rewards per working day it was concluded that the traffic level was reduced by between 500 and 700 cars during morning rush hour. Despite the difficulty in establishing a causal relation between the pilot project and the reduction in traffic, observations on the traffic flow in Utrecht were positive and the measure may be considered a success.

### PARKING MANAGEMENT/PRICING

**7. Innovation of the system of parking permits and rates.** The city centre had a shortage in parking spaces. This CIVITAS measure consisted of an advanced digitalised parking system that would increase the efficiency of parking management and enforcement. It promised to improve "payment behaviour", decrease the number of visitors to the parking reception desk and generate parking data. Under this measure, new hardware and software were developed and implemented.

Lessons learned included the need for the establishment of a productive and continuous dialogue with local politicians and stakeholders during the entire process from the earliest stage.

Payment behaviour changed. The percentage of short-term parked cars with a ticket increased by 10 percent between 2010 and 2012 compared to the business as usual situation, while the number of enforcement officers decreased from 63 in 2008 to 45 in 2012. These personnel were replaced by a scan car. Furthermore, in the first few months, almost 15 percent of paid parking by visitors was ticketed by mobile phone. The number of visitors to the parking reception desk decreased by more than 10,000 per year compared to the business as usual situation, and personnel costs at the Department of Parking decreased proportionally. One of the barriers encountered concerned privacy issues connected to the collected data.

**8. Promoting the use of clean vehicles through an innovative parking policy.** As part of the new parking policy (see measure 7) the city aimed to develop a tariff system that differentiates between vehicles according to environmental performance. This enabled the city to promote the purchase and use of less-polluting vehicles. The measure was innovative as it required new national and municipal legislation.

This action was part of the city's Action Plan for Air Quality.

Research was conducted on how to classify vehicles based on environmental characteristics and how to enforce the parking rules. A national pilot with experimental legislation was stopped in 2011 due to lack of political support. This led to the suspension of the local pilot, as well. Differentiated parking tariffs based on environmental performance were clearly a politically sensitive idea. A lesson learned is that a city needs

a strong, consistent political and legislative framework to implement such measures.

## WALKING AND CYCLING ENHANCEMENTS/ SERVICES

### 9. Parking facilities for bicycles in the city centre.

Biking was already a popular transport mode for short trips in Utrecht, but the insufficient number of cycle parking facilities was an obstacle to encouraging additional travellers to switch from car to bicycle. With the growth of the city in mind, the city decided to work out an integrated plan for bicycle parking for different target groups.

Potential bicycle users, meaning all citizens and commuters that travel to the city centre, were involved as the main stakeholders. Others included local and regional authorities, visitors, interest groups, environmental organisations, the tourism sector, neighbouring municipalities, shopkeepers and companies.

The measure did not expand guarded parking places in the city but prevented a decrease of 500 guarded parking places. The measure did add 438 new parking places in the public area, an increase of 9 percent compared to the business as usual scenario. During the CIVITAS period the percentage of Utrecht residents that usually go to the city centre by bike grew by 4 percentage points from 51 percent to 55 percent. CIVITAS helped to put the shortage of bike parking places within the public interest and the city decided to continue the bicycle parking action plan after the CIVITAS project period.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

#### 10. Planning road construction and communication.

Before CIVITAS, communication about accessibility and traffic disruption was done by five different municipal departments, as well as by institutions such as the province and the national road authorities. With the help of CIVITAS, the Utrecht Accessible Foundation (see measure 6) wished to make communication more consistent and standardised. Detailed synchronisation of the planning of roadwork activities was therefore necessary.

As part of this challenging and innovative measure, a brand was developed that was used in all communication about roadworks. Messages were conveyed through a single media channel by one spokesperson. The Manual for Communication on Roadworks and Events was developed. It was a practical tool guiding the planning and implementation of project communications.

The communication strategy was considered to be clear, as 65 percent of survey respondents knew when roadworks would commence in their neighbourhoods, 47 percent knew when they would start on highways and 22 percent knew about project details elsewhere in the city, even if they were not affected by the works. Furthermore, 91 percent said they would change their travel behaviour if they were aware of roadworks

and disruptions. Utrecht's experience revealed the need for a sustainable collaboration between stakeholders with enough budget, time and political support. The unique brand was a key factor of success.

### MOBILITY PLANNING

**11. Construction logistics plan.** At the start of the CIVITAS project, Utrecht was reconstructing the central railway station area, causing additional traffic with up to 250 trucks driving to and from the central railway station area every day. Aware of the complexity of logistical challenges faced by such large-scale construction work, the city of Utrecht wanted to prevent traffic congestion and negative environmental impacts due to the construction works. CIVITAS supported the elaboration of a construction logistics plan to distribute traffic throughout the day. The scheme was based on a central construction logistics centre (CLC) operating seven days a week around the clock and consolidating different materials and deliveries. An innovative aspect of the measure was the development of 4D planning software developed to visualise and analyse construction logistics and traffic circulation in a given area, as well as general accessibility of the city.

This measure involved an agreement between the municipality and private construction and transport firms on the location and implementation of the consolidation centre.

During the CIVITAS period, the CLC was not yet used: its success depended on the participation of different suppliers and the flow of (mainly smaller) construction materials, which was in turn dependent upon the progress of the construction work around the central station.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**12. School road safety label.** Before CIVITAS, road traffic education had been given low priority because school curricula were already chock-a-block with other important lessons. With the help of CIVITAS, the Utrecht Road Safety Label (URSL) was developed, offering schools the opportunity to set up and execute a structural traffic education plan at their own pace. It helped raise awareness of road safety through education and to improve road safety around schools.

A pilot study was conducted with eight schools in five school zones to test the concept and materials. It was a difficult task to get schools involved due to their many other activities. Getting parents engaged was also a challenge. But the measure was a huge success story in Utrecht. In October 2012, 38 primary schools received the label and another 32 schools were actively working to meet the criteria. Satisfaction about road safety around URSL schools increased and 54 of the 70 participating schools' environments were redeveloped with a school zone. The city would recommend: a proactive approach to the school by a partner with a firm understanding of school practices; a consistent package of information that shows why it is in their interest to participate; and participation free of charge.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**13. Clean route planning for freight transport.** The Action Plan for Air Quality described clean air, an accessible city and sustainable growth as key objectives. CIVITAS supported the definition of a method to guide, in real time, freight traffic along routes that are less congested based on air quality measurements (see also measure 14).

The feasibility study justified the assumption that real-time freight traffic rerouting contributes to reducing traffic pollution on the city level: NO<sub>2</sub> emissions from freight vehicles are 20 times higher than from cars and heavy road freight traffic and buses emit more than twice as much pollution in congested conditions than in normally flowing traffic. The results of the feasibility study were summarised in a report to provide a technical basis for the further testing stages of the measure.

**14. Improvement and integration of regional traffic management.** Before CIVITAS, traffic management and traffic information provisions were divided and managed along modal and organisational boundaries. CIVITAS supported the realisation of a joint traffic management centre, implying agreements on joint data collection and traffic management scenarios (see measure 13).

The measure consisted of reinforced cooperation between the different actors involved and their management tools. The city cooperated with regional partners such as the Rijkswaterstaat, the provincial authority of Utrecht and surrounding smaller cities.

The permanent regional traffic control centre has been fully operational since 2012. A political agreement was signed early autumn 2012 which assured smooth functioning in terms of maintenance and funding of the centre up to 2020. By 2013, the city already documented fewer traffic disruptions at the local level.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**15. City distribution by boat.** Before CIVITAS, heavy vehicles damaged the historic and cultural heritage of the city and caused a nuisance in the form of accidents, noise and air pollution. These were enough reasons for the city to take advantage of the centre's good accessibility by waterways. With the help of CIVITAS, the city introduced a new zero-emission electric vessel, the Beer Boat, to transport goods to clients, shops, bars and restaurants in the city centre.

Since 2010, the Beer Boat has operated six times per day on four days of the week, supplying more than 60 catering businesses. A multi-purpose vessel and an "eco-boat" were launched, as well. The zero-emission vessel gave immediate

emission benefits of 38 tonnes of saved CO<sub>2</sub>, 31 kg of saved NO<sub>x</sub> and 6 kg of saved PM10 emissions during the CIVITAS period. Overall, the Beer Boat measure yielded a net present value of well over EUR 420,000 at a 3.5 percent discount rate. Due to the many positive effects of the Beer Boat it is considered one of Utrecht's most popular CIVITAS measures, having garnered significant attention and recognition at the national and international levels.

**16. Distribution centres for fresh and perishable goods.** Catering goods are usually delivered multiple times per week to guarantee freshness. This increases freight traffic in the inner city. With the support of CIVITAS, the city explored the delivery of fresh products using urban distribution centres bundling fresh and perishable goods and using cleaner freight transport vehicles for the distribution. This was a pioneer measure in the Netherlands.

Based on the results of two roundtables with retailers, wholesalers, transport companies and the Chamber of Commerce and desk research, a business plan for the bundling of fresh and perishable goods was finalised at the end of 2010. Several meetings with stakeholders ensued to discuss a pilot project.

However, the changes that were required in the organisation of the catering providers turned out to be too complex. The success of such a measure depends on the ability of the stakeholders to change their behaviour, which requires a step-by-step process over a long timeframe. However, the outcomes of the field research pointed out the challenges of creating a bundled delivery service. Caterers are nevertheless aware of the pressing necessity to shift the current freight transport towards a more sustainable system.

**17. Merchandise pick-up points (MPuPs).** In 2009, the proportion of customers driving their cars into the city centre for big purchases decreased from 20 to 9 percent. But car-driving shoppers still represented 13 percent of sales by inner-city shops. The idea of this CIVITAS measure was to install merchandise pick-up points (MPuPs) at accessible locations such as park-and-ride facilities or railway stations. Based on a feasibility study, the city looked to combine the MPuPs with the existing "inner-city service", a bundling concept in which one transporter offers delivery of goods, the pick-up and sending of parcels, and waste returns. This would be done to and from a hub outside the city centre.

No shopkeepers, however, were willing to participate in such a pilot project.

The experience made it clear that the concept of the MPuP should be context oriented and attractive for the different stakeholders. The MPuPs should offer direct benefits for customers and shopkeepers to encourage them to change their mobility habits. A combination of services would increase the chance of success of the measure.

Gabriele Vergani  
Villa Ceresa  
Via Mancini 10 Mestre  
30174 Venice  
relazioni.internazionali@comune.venezia.it  
Tel: +39 41 545 94 71  
Fax: +39 41 545 94 90  
www.comune.venezia.it

Venice has two distinct parts with different mobility needs: the historical centre characterised by waterborne transport and the mainland with a high road traffic density. It had a population of 271,000 at the time of the CIVITAS project, and each day 47,000 workers and 16,000 students commuted in and out of the old city. The city's architectural heritage, set in the unique lagoon environment, attracts millions of tourists each year.

CIVITAS Phase: II – MOBILIS  
Duration: 2005 – 2009  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### CAR SHARING

#### 1. Expanding and diversifying the car-sharing scheme.

Before CIVITAS, parking facilities in Venice were scarce and expensive. CIVITAS helped develop the existing car-sharing scheme.

The scheme grew in size and diversified its fleet, adding vehicles running on alternative fuels, specially equipped cars for disabled people and a service dedicated to corporate clients. Existing customers were consulted on needs and preferences.

The system succeeded beyond expectations: within four years, it had around 4,600 users and 494 firms had signed up for a regular car-sharing service. A subscriber survey revealed that users mainly subscribed for economic reasons (44.3 percent of respondents) and because they were fed up with traffic (41.8 percent). Just 27.2 percent cited environmental reasons for joining the scheme.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

#### 2. Deploying cleaner-fuelled buses and boats.

Increasing the number of clean, energy-efficient buses and boats in Venice was considered a way to reduce emissions and to protect the city's unique cultural heritage. CIVITAS helped to introduce 35 compressed natural gas (CNG) buses and five

CNG minibuses to connect park-and-ride facilities with the city centre.

This measure significantly reduced emissions during the project period: 16.3 tonnes in the case of CO, 509 kg of hydrocarbons, 75 tonnes of NO<sub>x</sub> and 3.5 tonnes of particulate matter. The number of bus passengers increased 1.25 percent per year.

The complex national and international legal contexts were challenging barriers for the introduction of cleaner boats and the necessary marine filling station. The station opened, however, in 2007 and 10 boats were purchased, while a publicity campaign extolled the benefits of liquefied petroleum gas (LPG) engines.

#### 3. Introducing passenger-friendly waterbuses with low environmental impact.

Before CIVITAS, the city expressed its wish to offer better accessibility and more comfortable and safer travel conditions for boat passengers with reduced mobility. With the support of CIVITAS the city improved its boat fleet, making it quicker and more comfortable for passengers.

The new waterbuses were wider and enabled easier access and egress due to a smaller height difference between deck and docking platform. The vessels created a smaller wake, which meant a smaller environmental impact. There was also a considerable reduction in noise: at most points in the passenger area the reduction exceeded 10 decibels. Customer satisfaction was very positive.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

4. Introducing city centre access management. More than 62,000 coaches from various countries arrived yearly in Venice. CIVITAS helped to implement differentiated access tariffs to promote the use of coaches complying with the Euro IV standard.

Press releases, articles and a mail campaign stressed the economic and environmental advantages of less-polluting buses. Reduction rates could go up to 33 percent, depending on the bus category and the season.

The proportion of Euro IV coaches rose from less than 0.5 percent at the beginning of the project to 5.4 percent at the end. The city learned that the application of new tariffs for local hotel buses was an important bottleneck in the setting of tariffs.

### PARKING MANAGEMENT/PRICING

5. Parking management strategies. A high percentage of short-term parking and a lack of park-and-ride facilities contributed to huge parking problems in the city centre. CIVITAS helped set up a new parking management strategy.

The new strategy included more parking areas, variable message signs, differentiated fees and restriction enforcement. Blue lanes encouraged the use of remote parking facilities, all linked with the city centre by frequent public transport services.

Over the period 2004 to 2008, the use of park-and-ride facilities in mainland Venice increased by 309 percent. Increases were highest at facilities with the most convenient locations and best public transport access.

## WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**6. Promoting bicycle use and ensuring the safety of cyclists.** Prior to CIVITAS, more than half of the car journeys on the Venice mainland covered less than 4 km. CIVITAS supported the development of a cycle paths plan coordinated by the Bike Office and accompanied by several public-awareness campaigns.

The cycle lane network increased by 70 percent and more than 100 secure bike racks were installed. Many schools were involved in the “Bike Safely to School” project and teachers appreciated the free materials.

The percentage of residents cycling frequently increased from 35 percent in 2006 to 42 percent in 2008. Bicycle traffic increased 15 and 24 percent respectively on two main streets of the city.

## MOBILITY MANAGEMENT

### MOBILITY PLANNING

**7. Establishing a management decision support system for waterborne traffic.** The Venice city administration developed an innovative dynamic decision-making support system to control boat circulation in the city.

The needs of potential users and stakeholders were extensively analysed. A standardised methodology for traffic field data collection was produced, along with a data collection form and handbook for field data collectors. Based on online geographical information system interfaces and data integration tools, the system was designed to enable regular updates over a long period.

An important step was the establishment of institutional agreements and bureaucratic protocols necessary to integrate the traffic control system with administrative systems affecting traffic, including permitting for parking and special circulation.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEMS (ITS) FOR TRAFFIC MONITORING, MANAGEMENT AND ENFORCEMENT

**8. Access and traffic management in the Grand Canal through ARGOS.** Before CIVITAS, more control and monitoring was needed for boats entering the Grand Canal. CIVITAS supported the development of the Automatic Remote Grand Canal Observation System (ARGOS).

ARGOS was based on automatic vision technologies and the

processing of digital images collected by survey cells, each using special cameras. ARGOS considerably improved the implementation of new traffic management policies by city authorities. It also aided the municipal police in the enforcement and implementation of regulations, traffic schemes and restrictions on boats navigating in the limited access zone of the Grand Canal.

**9. Installing electronic controls for the Mestre restricted access zone.** Before CIVITAS, there was no automatic system for enforcing access restrictions for cars. With the help of CIVITAS, a data transmission network and 12 tele-cameras were installed to improve monitoring.

A broad awareness-raising campaign took place, explaining the new traffic restrictions and functionality of the tele-cameras. It also highlighted alternatives such as interchange car parks, car sharing and bike rentals.

The target of a 10 percent reduction in the number of cars entering the city was fully achieved in 2008.

## INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

**10. Introducing satellite control for waterborne public transport services.** CIVITAS helped integrate the municipal police control centre SALOMON with the public transport operations centre (ACTV) in order to optimise boat traffic in the Venice lagoon.

Before the purchase of hardware for the joint centre, the city of Venice and ACTV technicians met on several occasions to assess the necessary data transfer protocols. The installation of GPS-GPRS systems was needed in all new waterbuses, and older systems were also replaced.

Since the CIVITAS project, all waterbuses circulating in the Venice canals can be tracked by the joint municipal police control system. The system allows for the dynamic management of the public boat fleet and improves the management of both daily activities and traffic emergencies.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**11. Developing a web tool to manage loading bays.** A 2001 survey identified the main problems for cargo workers in the city: congested boat traffic, lack of docks with unloading equipment and lack of space.

CIVITAS supported the creation of a web-enabled information system that improves the management of temporary and permanent parking spaces along Venice's inner canals. A handbook was produced to standardise the methodology for data collection, the analysis of dock uses and the re-calibration of permitted dock uses.

Local authorities, transport associations, the developer of the geographical information technology and the city's water mobility officers cooperated constructively towards the implementation of the system.

# VITORIA-GASTEIZ

## SPAIN

José Ignacio Arriba Chavarri  
San Prudencio 30. 4  
1005 Vitoria-Gasteiz  
jiarriba@vitoria-gasteiz.org  
Tel: +34 94 516 12 84  
Fax: +34 91 516 18 46  
www.vitoria-gasteiz.org

Vitoria-Gasteiz is the capital of the autonomous community of the Basque Country and of the province of Alava in northern Spain. At the time of the CIVITAS project, Vitoria-Gasteiz had 235,000 inhabitants. The city is not only an important trading centre but also has a well-preserved medieval district that was declared a national monument in 1987. Vitoria-Gasteiz offers 42 m<sup>2</sup> of green space per person, and the green belt surrounding the city has received international praise. The city was appointed European Green Capital 2012.

CIVITAS Phase: Plus – MODERN  
Duration: 2008 – 2012  
Role: Leading city

### CAR-INDEPENDENT LIFESTYLES

#### PUBLIC BICYCLES/BICYCLE SHARING

**1. Fourth-generation public bike system** (not fully implemented). In Vitoria-Gasteiz, where most non-pedestrian journeys were made by car, traffic was the second biggest source of greenhouse gas emissions and an issue that arguably had the most adverse impact on urban living. This CIVITAS measure aimed to improve the existing public bike system of 17 stations by creating a fourth-generation system, fully integrated with the public transport network. It was to be expanded with additional stations. The measure was innovative, as stations would be accessible within a five-minute walk from any point in the city.

The measure began with a feasibility study for the implementation of the system and its integration with the existing ticketing and information systems for public transport. However, due to lack of funding, measure implementation was stopped after the completion of the system design and the preparation of the tender documents.

### CLEAN FUELS AND VEHICLES

#### HYBRID, CLEAN AND ELECTRIC VEHICLES

**2. Electric vehicle use and e-car-sharing scheme.** Prior to the CIVITAS project, the unprecedented growth of the city challenged Vitoria-Gasteiz to live up to its reputation for sustainable urban planning. The measure aimed to promote the uptake of electric vehicles by creating an Electromobility Centre

acting as an information point, electric car-sharing base and recharging centre for electric vehicles. The centre served as a showcase for electric vehicles and was a symbol of a modern city committed to change.

As a first step, the Basque Energy Agency and the city of Vitoria-Gasteiz signed a formal agreement to promote the use of electric vehicles in the city. The introduction of charging points for electric vehicles, including those of car-sharing fleets, was part of the city's Mobility and Public Space Plan.

As a result of this measure, three e-car-sharing stations were installed, together with 13 charging points and eight parking places equipped with public charging points. After its inauguration in July 2012 until the end of October 2013, the centre received 4,040 visitors asking for information. Thanks to the agreements secured within the CIVITAS project, the availability of the charging points and the e-car-sharing system was assured for at least 25 years.

### DEMAND MANAGEMENT STRATEGIES

#### ACCESS MANAGEMENT AND ROAD PRICING

**3. New public transport network.** As the superblocks concept was introduced in Vitoria-Gasteiz as a way to reclaim public space for pedestrians and cyclists (see measure 5) the city needed to completely revise its public transport network, which consisted of 18 bus lines. This measure created a new network of two tram lines and just nine bus lines with new itineraries and timetables, improved frequencies, more resources, 146 relocated bus stops, new bus lanes, traffic light priority for buses, and so on. The measure was highly innovative, as it changed the transport network for the entire city in just one night.

The city conducted strong dissemination and participatory initiatives, with volunteers giving information to 44,683 people in the streets and extensive training for transport staff. The measure was the main element of the city's Sustainable Mobility Plan, according to the new segmentation of the city based on the superblocks concept.

In five years, the modal share for private cars dropped to 23 percent, the level it was at in 1996. The number of public transport users increased by 60 percent in four years, bus frequency improved from 20 minutes to 11, commercial speed improved by 18 percent and fewer bus accidents occurred. Several measures implemented by different municipal departments contributed to this success. The CIVITAS framework offered the opportunity to perform them in a gradual, strategically coordinated way with citizens' participation and the financial support of the European Union. It allowed the city to learn from the best practices of other cities and companies.

**4. Superblocks concept for access restrictions.** Prior to measure implementation, the city suffered from heavy through traffic. The municipality used CIVITAS support to restrict access to the city centre for through traffic, while allowing entry to residents, freight hauliers and services. In order to allow the smooth passage of trams, the city's automatic bollards

system was replaced by a number plate recognition system that identified transiting vehicles and monitored the length of time they spent in the centre.

The design phase of the measure led to political confrontation with many stakeholders and took much longer than foreseen. The issues were particularly delicate because local elections were coming up. This measure contributed to the superblocks concept stipulated in the city's Sustainable Mobility Plan (see measure 5). Priority was given to local traffic over through traffic, and traffic was redistributed from local streets to main roads.

In the demonstration superblock (see measure 3), the level of through traffic was reduced by over 65 percent, mainly due to the superblocks model and the tramway implementation. Acceptance among citizens was not so high as the system is based on fines. In Vitoria-Gasteiz, CIVITAS demonstrated that general land-use policies and traffic regulations, together with a competitive public transport offer, can have a big impact on driving behaviour without having to implement physical restriction measures.

**5. Superblocks model.** Before CIVITAS, the traditionally strong pedestrian mobility culture in Vitoria-Gasteiz was threatened by the rise of the car and physical growth that was making pedestrian mobility less and less competitive. With the support of CIVITAS, the city planned the redesign of public space into 77 superblocks, reserving the space within each block for pedestrians and cyclists. It tested the implementation of one demonstration block and established 16 other blocks within the project period. The measure was highly innovative, as it radically banned public transport and most car traffic from the insides of superblocks and aimed to convert much of the inner space into pedestrian areas with playgrounds, benches, vegetation and wifi connection.

Regular meetings with technicians, politicians and citizens' associations ensured a strong consensus for the measures to be implemented. The superblock model was proposed in the city's Sustainable Mobility Plan and was closely linked to other CIVITAS measures (see measures 3, 4, 6, 7 and 10). A big campaign targeting citizens helped foster favourable attitudes toward a new culture of sustainable mobility.

Pedestrian area in the demonstration superblock increased from 45 percent to 74 percent. Noise measured inside the superblock dropped from 66.5 decibels before the action to 61 decibels afterwards due to the reduction of motor traffic. Air quality improved with a 42 percent reduction in CO<sub>2</sub> and NO<sub>x</sub>; and a 38 percent reduction in particulates. The measure affected the rest of the city in terms of reduction of motorised mobility and, to a lesser extent, an increase in cycling and pedestrian mobility. Citizens' satisfaction was very high. The CIVITAS project helped the municipality to secure additional funds for public works from the Spanish Fund for Local Investment.

**6. Traffic light regulation for a new public transport network.** Before CIVITAS, traffic light phases in Vitoria-Gasteiz were too long and not adapted to the changing traffic flows throughout the day. This limited the capacity of

the road network. The city redesigned the whole traffic light regulation scheme to create green waves for vehicles following the network of main roads surrounding the newly created superblocks (see measure 5) and giving priority to public transport. The measure was innovative as it comprised the development of new simulation software to model the new scheme.

The new network was defined by traffic planners, civil engineers and public transport technicians (TUVISA) in a collaborative process. The measure supported the reorganisation of motorised traffic proposed by the superblock model in the city's Sustainable Mobility Plan.

The measure resulted in a reduction in travel time for public transport in seven selected itineraries, a reduction in waiting time at crossings by 3 percent, a reduction in the number of stops at crossings of 17 percent and a reduction in unused green light time. In Vitoria-Gasteiz, CIVITAS served as an engine for behavioural change, helped to foster political commitment, and ensured future funding commitments.

## WALKING AND CYCLING ENHANCEMENTS/ SERVICES

**7. Pedestrian and bicycle lane network.** The city regarded the introduction of the superblocks model for the regulation of motorised traffic (see measure 5) as an opportunity to revive walking and cycling mobility. With the support of CIVITAS, the city produced a Cycling Mobility Master Plan and a Pedestrian Mobility Master Plan. Bicycle and pedestrian networks were designed to connect the main points of interest in the city along the lines of the superblock model. Parts of both plans were implemented during the CIVITAS project, including the creation of a first demonstration superblock.

There was permanent contact with citizens' associations regarding the creation of the demonstration superblock. The measure supported the reorganisation of motorised traffic proposed by the superblock model in the city's Sustainable Mobility Plan.

Modal split in the demonstrative superblock shifted from 86 percent cars, 11 percent pedestrians and 3 percent cyclists to 23, 66 and 11 percent respectively. Pedestrian accidents citywide decreased from 187 to 160 in one year, pedestrian surface increased from 45 percent to 74 percent of total area and 25 km of bicycle lanes were built. Through its participation in CIVITAS, the city was able to double its efforts to turn public spaces into pleasant environments for people to meet.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**8. Training on energy-efficient driving.** In Vitoria-Gasteiz, where most non-pedestrian journeys were made by car, traffic was the second largest source of greenhouse gas emissions. During the CIVITAS project, around 600 citizens learnt to drive their vehicles in a more energy efficient way. This improved the

efficiency of energy use in transport, reduced greenhouse gas emissions and avoided accidents. Training courses of this kind were not common in Spain.

The city expected these educated citizens to spread the newly learned driving techniques among their relatives and friends. The measure contributed to the greenhouse gas emissions reduction objective of the city, signed in the Covenant of Mayors (-20 percent).

Around 80 percent of participants expressed a good level of satisfaction with the training. The techniques allowed them to save about 8 percent of fuel compared to inefficient driving, which roughly means 210 tonnes of CO<sub>2</sub> reduced per driver per year.

## TRANSPORT TELEMATICS

### REAL-TIME ROAD USER INFORMATION

**9. Information and traffic management systems.** Before CIVITAS, the municipal traffic website did not give real-time information and information about different modes was not integrated. The city created a new information system to collect real-time traffic information and integrate it with other mobility information on the municipal website. The system was then tested for wireless use. The measure was innovative because it included a trial of a wireless communications system for retrieving real-time information from traffic cameras over 5 percent of the city's surface.

Stakeholders involved in the measure were the Traffic Service, Contents Service, Environment Department, Environmental Studies Centre and Technologies Department.

As a result of the real-time information, the traffic website attracted more visitors (19,839 visits in the first year after the end of CIVITAS). The wireless communications system was extended to cover 15 percent of the city. In Vitoria-Gasteiz, CIVITAS served as an engine for behavioural change, helped to generate political commitment and ensured future funding commitments.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**10. Urban freight logistics.** At the start of the CIVITAS project, freight distribution activities caused congestion and invaded public space reserved for pedestrians and cyclists in the city's new superblocks (see measure 5). The city carefully studied freight distribution strategies from other cities and identified the "proximity areas distribution" scheme as the only economically viable scheme compatible with the superblocks model. The city then drafted a plan for the implementation of proximity areas within the central superblock. These areas would be reserved for freight traffic so that pedestrian areas could remain vehicle free.

Shops and logistics companies were surveyed about the current problems and possible solutions for freight distribution

in the superblock. The new scheme was compatible with the superblock model proposed by the Sustainable Mobility Plan of Vitoria-Gasteiz.

The Central Superblock project was not carried out due to the difficulty in forging an agreement with stakeholders. Nevertheless, after the end of CIVITAS, time windows for loading and unloading in pedestrian areas were being respected and there were also new spaces for this task outside pedestrian areas at other times. The city had hopes of implementing the new scheme in the near future.

# WINCHESTER UNITED KINGDOM

Andy Wren  
The Castle  
SO23 8UJ Winchester  
andy.wren@hants.gov.uk  
Tel: +44 19 62 84 75 00  
Fax: +44 19 62 84 51 54  
www.visitwinchester.co.uk

The cathedral city of Winchester in southern Britain is the ancient capital of England. It had a population of around 32,000 at the time of the CIVITAS project. With its many historic buildings and ancient street pattern, this major tourist attraction has to cope with heavy traffic on a daily basis.

CIVITAS Phase: I – MIRACLES  
Duration: 2002 – 2006  
Role: Learning city

## CAR-INDEPENDENT LIFESTYLES

### PUBLIC BICYCLES/BICYCLE SHARING

#### 1. Creating new cycling opportunities with Bikeabout.

The Bikeabout scheme in Winchester offered registered users a bicycle as often as they like, at no additional charge, for up to 24 hours at a time from four locations in the city.

With the help of CIVITAS, existing cycling infrastructure and information services were improved to increase the potential benefits of the scheme.

Bicycle parking surveys showed the peak number of bicycles parked increased by 46 percent between 2002 and 2005. Some 83 percent of the users rated the scheme as generally good or very good. At peak times, almost all of the 50 bicycles were in use. Valuable experience was gained on raising citizens' awareness towards biking.

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**2. Clean vehicle accreditation scheme Motorvate.** To improve the air quality in the city, the Quality Bus Partnership between CIVITAS and the main local operator realised the take-up of cleaner fuels and technologies, the introduction of new cleaner vehicles and the renewing and/or retrofitting of existing vehicles.

Motorvate, the green fleet accreditation scheme, was able to advise the council on how to improve the fuel efficiency and emissions status of its fleet. In total, 13 buses and 42 cleaner vehicles were purchased. These were available free of charge to local businesses for four-week trials.

The collaboration between local businesses and Motorvate, however, was less successful than expected because of financial reasons.

## COLLECTIVE PASSENGER TRANSPORT

### SERVICE IMPROVEMENTS

**3. Improving local bus services.** Before CIVITAS, public transport services were not well accepted by passengers. In order to boost passenger satisfaction CIVITAS helped improve local bus services.

These improvements included bus priority signals, new buses, bus shelters, better bus frequencies and the extension of park-and-ride facilities. A total of 10,000 Winchester Public Transport Plus pocket travel maps were distributed.

The new services were rated as good or very good by 87 percent of the passengers. Punctuality improved, with the number of early or late bus journeys falling from 0.95 percent in 2002/2003 to 0.34 percent in 2004/2005. The new cross-city park-and-ride service was, however, abandoned at the end of the trial because it attracted too few passengers.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**4. Vehicle emissions testing.** In the framework of the Air Quality Action Plan and with the help of CIVITAS, the monitoring of vehicle emissions was set up.

The monitoring scheme was linked to an automatic number plate recognition system and a mobile variable message sign (VMS) to identify and inform individual polluters. A four-stage enforcement strategy was designed to encourage voluntary maintenance of high-polluting vehicles and to restrict their access to the city centre air quality management area. A database of vehicle information was built up and used to assess the likely impacts of the various enforcement strategies.

Results indicated that regular feedback to vehicle owners on their emissions would be welcomed: 80 percent agreed with the monitoring of vehicles to reduce pollution and 80 percent said they would have their vehicle's engine checked if a VMS indicated that the vehicle's emissions were "poor".

### PARKING MANAGEMENT/PRICING

**5. Introducing an integrated parking tariff scheme.** A parking review prior to CIVITAS concluded that the take-up of environmentally friendly vehicles in the city centre should get more support. A pricing strategy was drafted within the CIVITAS project.

This strategy included raising the price of, and reducing the space devoted to, long-term parking in the city centre and setting relatively low charges at park-and-ride facilities. Graduated price discounts on parking tariffs based on a

vehicle's CO<sub>2</sub> emissions were introduced. In addition, electric and hybrid vehicles were eligible for free parking.

During the project lifetime, ticket sales at the seven busiest city centre car parks decreased by 16 percent, while sales of tickets at park-and-ride sites increased by 43 percent. At the same time, revenues at city centre car parks increased by 11 percent due to general price increases, and by 6 percent at park-and-ride sites due to the rise in ticket sales. The level of awareness of the strategy among the target group was good, with 58 percent of the respondents agreeing with the approach and 31 percent stating that the discounts would encourage them to purchase a more environmentally friendly car in the future.

Because 68 percent of local businesses did not recycle, the installation of a recyclable waste collection service with a clean fleet was explored, but there were no suitable vehicles commercially available during the project lifetime.

## TRANSPORT TELEMATICS

### REAL-TIME ROAD USER INFORMATION

**6. Better multimodal traveller information using different technologies.** Before CIVITAS, a "Best Value" review conducted in 2000 concluded that public transport information required further improvements.

As a result, CIVITAS supported the installation of a variety of display systems to provide better multimodal information for travellers, especially public transport users, such as kiosks and bus departure information systems (BDIS). A website was created and variable message signs (VMS) and information display boards were installed. In addition, systems were implemented to improve network management and to provide traffic and travel information to all road users.

The four information kiosks recorded over 3,500 users per month. Surveys indicated that 94 percent of users rated the kiosks highly; 97 percent found the information they were looking for; 94 percent found them easy to use; and 89 percent agreed with the aim of improving sustainable transport. In terms of awareness, 49 percent of people surveyed were aware of the BDIS; 42 percent of the VMS; 23 percent of the kiosks; and 19 percent of the new website.

## URBAN FREIGHT LOGISTICS

### DISTRIBUTION SCHEMES

**7. Collectpoint: Encouraging fleet efficiency and home delivery.** CIVITAS worked with the local freight forum with the aim of reducing the impact of deliveries on both traffic congestion and local air quality.

Freight maps showing routes, destinations and restrictions were distributed to businesses and local service stations. They were appreciated by users. The Collectpoint scheme with five locations was set up as an alternative home delivery service primarily for Internet shoppers.

Trial period results were not very positive: Internet retailers would need to better incorporate the scheme into their own delivery systems to make it successful.

ODRAZ-Sustainable Community Development  
Lidija Pavić-Rogošić  
Ljudevita Posavskog 2  
10000 Zagreb  
lidija@odraz.hr  
Tel: +38 51 465 52 03  
Fax: +38 51 465 52 00  
www.civitaszagreb.hr/naslovna/

The 900-year-old city of Zagreb is the capital and largest city of Croatia and, during the CIVITAS project, had nearly 800,000 inhabitants in a geographic area of 641 km<sup>2</sup>. Zagreb's flourishing economy and rising standard of living have been accompanied by a steep rise in the number of private cars, especially on the city's outskirts. Public transport consists of buses, trams, a funicular and suburban trains. There are more than 200 km of bicycle routes, although a coherent network is still missing. The city centre boasts expansive pedestrian areas, parks and green space.

CIVITAS Phase: Plus – ELAN  
Duration: 2008 – 2012  
Role: Leading city

## CLEAN FUELS AND VEHICLES

### CLEANER FLEETS

**1. Clean buses for the public transport network.** Due to a large number of inefficient, polluting, noisy and uncomfortable vehicles and capacity problems, transportation by bus had been unattractive. With the support of CIVITAS, 100 new bio-diesel buses and 60 buses running on compressed natural gas (CNG) were introduced into the public transport fleet in order to reduce CO<sub>2</sub> emissions, reduce noise levels of buses and make public transport more attractive. The introduction of alternative fuels and clean buses in the public transport system was innovative for the city of Zagreb.

During the project, bus drivers were trained on safe driving and on how to operate the new buses. Two surveys about the quality of the service were carried out. The measure was not implemented as part of a broader policy framework.

The measure increased the share of alternative fuels in the public transport fleet by 6 percent and decreased the noise level of buses by 2 decibels. Furthermore, public transport became more attractive and the level of passenger satisfaction and public transport quality increased. Zagreb's lesson learned was that the full potential of alternative fuel technology can only be achieved if investments in rolling stock are followed by investments in infrastructure, such as filling stations.

**2. Clean public vehicle fleet.** Before CIVITAS implementation, the fleet of 98 waste collecting and 18 sweeping machines,

owned by public enterprise CISTOCA, ran on standard diesel fuel (Euro I to IV). Since most of the vehicles were due for replacement, CISTOCA planned to procure 52 new vehicles running on a 7 percent biodiesel blend (B7).

During European Mobility Week and the Autumn Zagreb Fair, the measure was promoted. Leaflets were distributed and training was given to drivers and maintenance personnel.

As a result, CO<sub>2</sub> emissions from waste disposal vehicles dropped by 5 percent, fuel consumption decreased by 6 percent and operational costs by 39 percent. CIVITAS was just the starting point for CISTOCA, as the company planned to gradually increase the percentage of biodiesel use from B7 to B10 and B20. Also, CISTOCA planned to consider the introduction of other alternative fuels like bioethanol.

**3. Energy recovery system for trams.** With the support of CIVITAS, 70 new trams were introduced in Zagreb. The new low-floor trams were easier to access, and thus more attractive, especially for elderly riders, people with disabilities and parents with children. The innovative aspect of this measure was the energy recovery system that allowed trams to recover electrical energy during braking and feed it back into the electrical network.

During the project, tram drivers were trained on how to operate new trams. The measure was not implemented as part of a broader policy framework.

A survey revealed an increase in the positive image of the Zagreb Municipal Transit System, a higher level of passenger satisfaction and a higher level of attractiveness and quality of public transport. The measure also contributed to a reduction in tram noise by more than 5 decibels. Zagreb learned that citizens were eager to get involved in measure implementation and that their interest should be exploited in future projects of a similar nature.

## COLLECTIVE PASSENGER TRANSPORT

### INTERMODALITY

**4. Intermodal high-quality mobility corridor.** Before the CIVITAS project, Savska Street was one of the most congested traffic arteries in Zagreb, with a large number of tram lines and personal vehicles. Zagreb aimed to define a high-quality mobility corridor leading from the historic city centre across the river. Public transport, bicycle lanes and pedestrians would have priority over private motorised traffic. For Zagreb, this represented an innovative approach to traffic planning.

Several studies were jointly prepared by the city of Zagreb, Croatian Railways Infrastructure, public transport operator ZET and the NGO Bicikl. While producing the studies, citizens and stakeholders were engaged from the earliest stages of the work. Citizens became more interested in the studies when they realised some of their suggestions would be accepted.

A hundred bicycle racks were installed at five locations, 1.8 km of bicycle lanes were marked, and 82 real-time

passenger information displays were introduced at tram stops. The simulation model showed that if the street parallel to the tram line on Savska Street would be included in the traffic network, the average operational time of the trams would decrease by 34 percent.

## TICKETING AND TARIFFS

**5. Promotion of an electronic public transport tariff system.** Before the CIVITAS project, a joint tariff system existed within the city of Zagreb, but many bus operators were not included. To make the ticketing system in Zagreb more efficient, the city introduced an electronic public transport ticketing system and defined an appropriate model for a joint public transport offer that is well accepted among users.

The three regional authorities signed an agreement to cooperate in the joint tariff system.

As a result of CIVITAS, the number of prepaid tickets sold increased by 20 percent between 2009 and 2011 and user satisfaction with the possibility to purchase “the right ticket for the right destination” increased from 21 percent in 2009 to 24 percent in 2011. Zagreb’s lesson learned is that harmonised objectives are crucial for the success of measures that involve many different stakeholders from the private and public sectors.

## DEMAND MANAGEMENT STRATEGIES

### ACCESS MANAGEMENT AND ROAD PRICING

**6. Freight delivery restrictions.** Before CIVITAS, freight delivery in Zagreb fell under different regulatory systems, and these were often not respected or had not been implemented properly. To counteract this, new freight regulations for the city centre were proposed by the Faculty of Transport and Traffic Sciences of the University of Zagreb. These included restricted delivery times, specific delivery zones and delivery corridors.

The proposal for new freight delivery measures was outlined in several workshops with relevant target groups. The aim was to collect their suggestions for improvements to the regulations.

After an analysis of all the collected data, a new delivery regulation was proposed and sent to the city authorities in May 2011. Unfortunately, the proposed scheme was not implemented. Zagreb’s lesson learned was that the cooperation of all stakeholders at all levels is key for success.

**7. Study of congestion charging and dialogue on pricing.** The large number of personal cars in Zagreb’s city centre was the result of the poor road network in the northern part of the city — it required vehicles to pass through the city centre in order to get from east to west. To assess whether congestion charging in Zagreb was a realistic possibility, the Faculty of Transport and Traffic Sciences of the University of Zagreb carried out a feasibility study. The proposed preliminary solution suggested the introduction of an eco-zone in the city of Zagreb.

Since it was important for the city to reach high levels of acceptance for this proposed solution, a series of roundtables, workshops, public presentations and other public events was launched with stakeholders. More than 300 citizens were involved, and 25 television and radio interviews were conducted with the measure leader.

The study led to an increased level of acceptance among stakeholders and citizens (an increase of 6 percent among citizens and 8 percent among businesses). Surveys showed that more than 60 percent of the population was in favour of congestion charging. The study served as an excellent starting point for introducing congestion charging in the future because it gave clear recommendations for implementation.

## MOBILITY MANAGEMENT

### MOBILITY MARKETING AND AWARENESS RAISING

**8. Improving cycling conditions.** Before CIVITAS, cycling had a limited share of around 1 percent and cycling issues in the city were never tackled in a consistent manner. With a strategic plan Zagreb aimed to improve cycling conditions in general. The measure enhanced conditions for cycling and strengthened the integration between cycling and public transport. Efforts were also made to identify gaps and black spots in the cycling network and remove them if possible.

Zagreb’s main strategic document — the Zagreb Plan — contained a section dealing with transport that strongly emphasised the importance of alternative means of transport, including cycling and walking. It called for increasing their modal shares.

As a result of this measure, 340 parking spaces at different points of interest in the city were created and blueprints for cycling lanes in the southern part of Savska Street were made. The Cycling Master Plan was developed, but it was not officially accepted by the city assembly. Even so, it serves as an excellent basis for the future development of cycling traffic in the city because it defines the vision and objectives and some general measures for improvement.

### MOBILITY PLANNING

**9. Mobility management for large institutions.** Before CIVITAS, Zagreb had never tried to set up a car-pooling scheme. However, Zagreb was keen to promote alternatives to the car such as car pooling, public transport, cycling and walking for daily commuters and students at large institutions. To facilitate the transition to more sustainable modes, eight dedicated travel plans were set up for these companies. A new car-pooling web portal, Car-for-all, was developed.

An online survey on travelling to and from work was conducted in 23 companies.

As a result, the number of car-pool arrangements increased from eight in 2009 to 36 in 2012 among employees and from 26 in 2009 to 74 in 2012 among students.

## MULTI-STAKEHOLDER CONSULTATION/PUBLIC PARTICIPATION

### 10. Comprehensive mobility dialogue and marketing.

Although Zagreb had experience with citizen engagement before CIVITAS, when it concerned mobility issues, the main decisions were taken by professionals and the public often reacted only after implementation. For this measure, interested representatives of the public were invited to join different activities — from presentations and roundtables to dialogues on mobility with citizens in their neighbourhoods. The aim was to reach appropriate decisions, reduce dissatisfaction and share responsibility for implemented measures. Exhibitions, lectures and workshops on urban development and the use of public spaces took place within the CIVITAS Info-point and later on within the city's communications platform ZGforum.

Citizens' answers, requirements and suggestions regarding public transport were regularly collected at the CIVITAS Info-point. About 150 citizens were involved in mobility dialogue in their neighbourhoods.

This measure played an important role in promoting sustainable mobility solutions in the CIVITAS corridor, but also in the city in general. The most important outcome of this measure was the improved provision of information to the general public. Almost 22,000 visits were made to the Info-point, 1,400 people participated in events, more than 95,000 visits were made to the CIVITAS Zagreb website, more than 1,300 people became Facebook fans and the Facebook page had more than 209,000 views. In addition, three short films were made along with approximately 200 media appearances.

## SAFETY AND SECURITY

### ENHANCING PASSENGER SECURITY

**11. Safety and security for seniors.** Though older people are a growing user group of urban transport, they had seldom been considered in urban transport policies in Zagreb. CIVITAS gave senior citizens the opportunity to express their views and recommendations, and public transport operators collected valuable information for improvements needed to remove barriers to older passengers. A brochure, the first of the kind, was produced to explain how to use public transport safely, but also how to use newly introduced electronic tickets. A very popular short film "Alojz and Vlatka" was produced, as well.

Difficulties and obstacles for the elderly were discussed with the target group during 17 meetings, mostly in elderly citizens' homes. Seniors filled in a questionnaire dealing with their public transport habits, safety, communications with operators, etc.

As a result, a dedicated training scheme for 160 tram and bus drivers was developed. The main result of these activities was a reduction in the total number of accidents in public transport by 38 percent.

**12. Security improvement in public transport.** Public transport vehicles were occasionally subject to vandalism by passengers. Therefore, Zagreb wanted to identify black spots

on the public transport network where safety and security could be improved, along with the image and patronage of public transport.

To this end, a survey was carried out. Citizens were asked to share their concerns and get involved in developing concrete solutions.

The total number of damaged vehicles was reduced by 40.5 percent; the total number of damaged trams was reduced by 81 percent; and the total number of damaged buses was reduced by 15 percent.

### SAFER ROADS, BIKE PATHS AND FOOTPATHS

### 13. Comprehensive safety and security strategies.

Before CIVITAS, safety and security were an on-going area of concern. To improve safety, Zagreb carried out safety audits with local transport operators to assess the current situation and identify improvements that could be made.

This was a common measure implemented in all CIVITAS ELAN cities and coordinated by Zagreb. CIVITAS ELAN was used as a platform for sharing experiences and ideas on how to improve the safety and security of public transport.

This common measure was designed and joint activities were implemented. The activities boosted public transport patronage, improved the image of public transport and increased the visibility of European inter-municipal cooperation.

## TRANSPORT TELEMATICS

### INTELLIGENT TRANSPORT SYSTEM (ITS)-BASED ENHANCEMENT OF PUBLIC TRANSPORT

### 14. Public transport priority and traveller information.

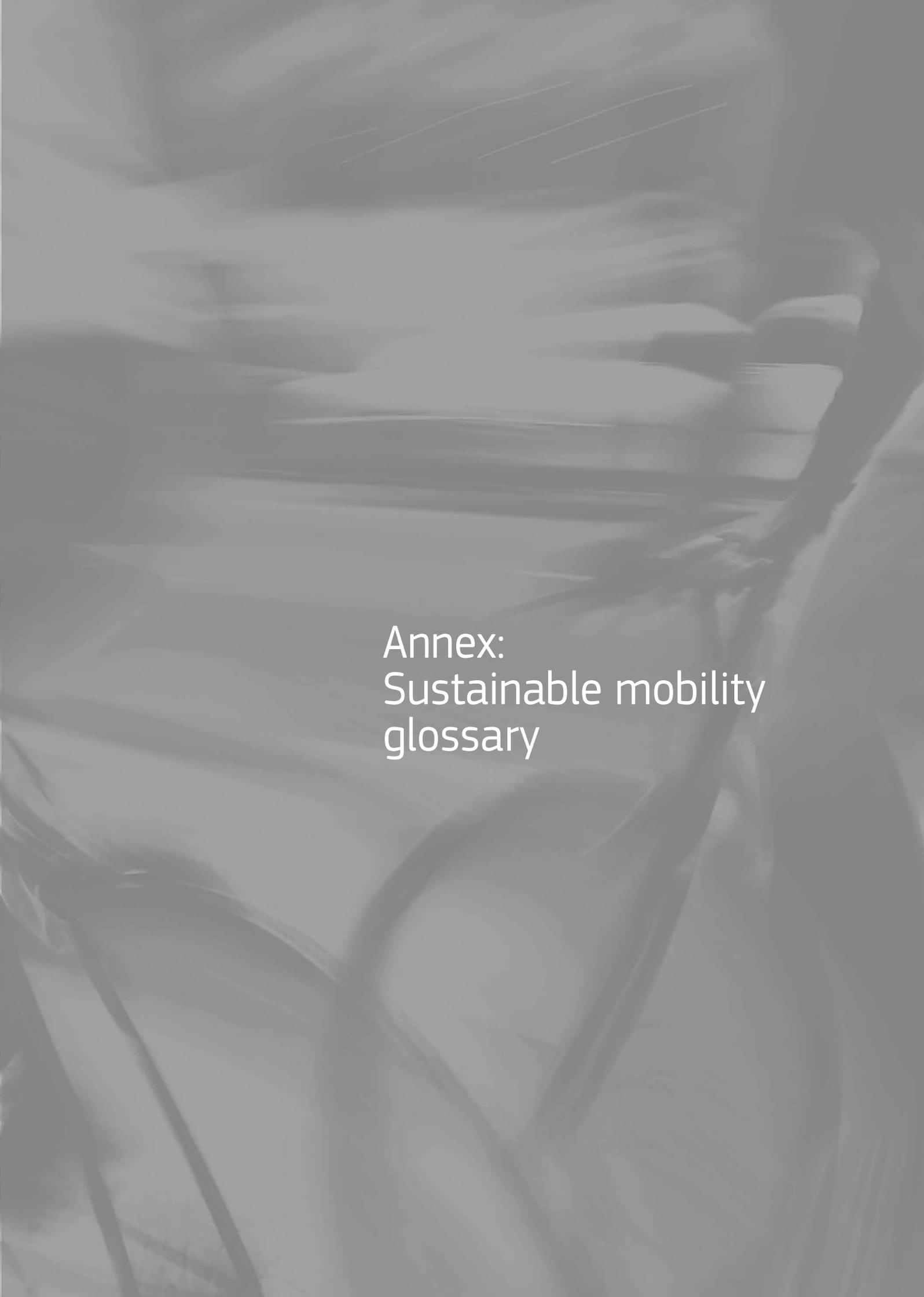
In order to make public transport in Zagreb more efficient, a real-time vehicle tracking system was introduced. Apart from this, a public transport priority system was demonstrated at three intersections and 40 light-emitting diode (LED) information display panels were installed in the CIVITAS corridor.

The Faculty of Transport and Traffic Sciences of the University of Zagreb designed an intelligent mobility system for Zagreb. It required further elaboration and public discussions, but represented a good starting point for the future implementation of intelligent transport services in Zagreb.

As a result, the share of users who are very satisfied with the availability of information at public transport stops increased from 6 to 11 percent from 2009 to 2011. The percentage of users who were very satisfied with the punctuality of public transport more than doubled to 15 percent by 2011. Average tram operation time decreased by 6.5 percent and cumulative intersection delay for trams along the entire length of Savska Street decreased by 18 percent.







Annex:  
Sustainable mobility  
glossary

# ANNEX: SUSTAINABLE MOBILITY GLOSSARY

Bracketed references indicate under which CIVITAS measure categories the terms can be found. The references are in the form of ["Category: Subcategory(ies)"]

**20 miles/hour zone:** See "30 km/h zone".

**30 km/h zone:** An intervention to limit traffic speeds in a defined urban area to 30 kilometres per hour. This is achieved through the posting of road signs, sometimes in combination with traffic-calming measures. The benefits are, on the one hand, an increased level of safety for residents; and, on the other hand, a higher number of cyclists and pedestrians in the respective zone. [Most typically utilised as part of "Demand management strategies: Walking and cycling enhancements/services" measures; and "Safety and security: Safer roads, bike paths and footpaths" measures]

**Access management:** A traffic intervention to limit access to a certain area at certain times and/or to certain types of vehicles. [Most typically utilised as part of "Demand management strategies: Access management and road pricing" measures; "Safety and security: Safer roads, bike paths and footpaths" measures; "Transport telematics: Intelligent transport systems (ITS) for traffic monitoring, management and enforcement" measures; and "Urban freight logistics: Distribution schemes" measures]

**Access control measure:** See "Access management".

**Accessibility:** Refers to the ease, convenience and comfort with which people can use transport vehicles and infrastructure. It may also be used in specific connection with people with limited mobility, including the elderly, parents pushing prams or the physically handicapped. [Most typically utilised as part of "Collective passenger transport: Accessibility" measures; "Safety and security: Enhancing passenger security" measures; and "Mobility management: Mobility marketing and awareness raising" measures]

**Advanced biofuels:** See "Second-generation biofuels".

**Advisory bicycle lane:** A marked lane on the carriageway that warns motorists of the possible presence of cyclists but that can still be driven on by motorists when not occupied by cyclists. Advisory lanes are typically distinguished from full-fledged bike lanes by being marked with dashed lines rather than solid lines (although in Belgium, dashed lines are used for full-fledged bike lanes), or in some cases just chevrons and bicycle icons. [Most typically utilised as part of "Demand management strategies: Walking and cycling enhancements/services" measures; and "Safety and security: Safer roads, bike paths and footpaths" measures]

**Automated people mover (APM):** A fully automated mass transit system, often rail based but also including driverless cars and buses. Originally used in relatively small areas, such as airports, today APMs are implemented in some instances for much larger, complex systems. [Most typically utilised as part of "Collective passenger transport: Service improvements + Accessibility" measures]

**Automatic number plate recognition (ANPR):** A mass surveillance method that uses optical character recognition on images to read vehicle registration plates. Frequently used in road rule enforcement, including access control measures. [Most typically utilised as part of "Transport telematics: Intelligent transport systems (ITS) for traffic monitoring, management and enforcement" measures]

**Automatic vehicle location (AVL):** A means of automatically determining the location of a vehicle, typically by GPS, and transmitting the information to a requester by SMS, GPRS or a satellite or terrestrial radio from the vehicle to a radio receiver. Used for various purposes by public transport companies. [Most typically utilised as part of "Transport telematics: Intelligent transport systems (ITS)-based enhancement of public transport" measures]

**Automatic vehicle monitoring (AVM):** Systems based on the real-time knowledge of each vehicle of a fleet. Fleet management includes location monitoring by GPS, load condition (passengers on board) and vehicle conditions (monitoring of engine and electrical parts). [Most typically utilised as part of "Transport telematics: Intelligent transport systems (ITS)-based enhancement of public transport" measures]

**Bicycle lane:** A road lane demarcated in many countries with solid lines (in Belgium, dashed lines are used) in which cyclists have the priority and which, as opposed to advisory cycle lanes, are off-limits to motorists. [Most typically utilised as part of “Demand management strategies: Walking and cycling enhancements/services measures + Access management and road pricing” measures; and “Safety and security: Safer roads, bike paths and footpaths” measures]

**Bicycle path:** A bicycle path is distinct from a cycle lane and cycle track by being entirely separate from the road proper. This separate alignment is especially appropriate along high-speed routes in the countryside, where the intermingling of bicycles and motor vehicles would create an unacceptable hazard. In many cases, such paths serve both pedestrians and cyclists; such paths are sometimes referred to as “shared-use paths”. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures]

**Bicycle track:** A category of cycling facility between a bicycle path and a bicycle lane. Cycle tracks can run at the level of the carriageway, at the level of the sidewalk, or at an intermediate grade. What distinguishes a bicycle track from a bicycle lane is that it is in some way physically separated from both the road and sidewalk. [Most typically utilised as part of “Demand management strategies: Walking and cycling enhancements/services + Access management and road pricing” measures; and “Safety and security: Safer roads, bike paths and footpaths” measures]

**Bicycle-bus lanes:** Bus priority lanes shared with cyclists. Avoids the situation created by exclusive bus priority lanes in which cyclists are not allowed in the curb lane and must, therefore, ride further out in the carriageway in between lanes of faster-moving motor vehicles. [Most typically utilised as part of “Demand management strategies: Walking and cycling enhancements/services + Access management and road pricing” measures; and “Safety and security: Safer roads, bike paths and footpaths” measures]

**Bicycle-sharing scheme:** A public transport system involving bicycles that can be rented for short periods for short journeys. Typical modern systems involve automated docking stations, accessed by smartcards. Users can pick up a bike from one station and leave it at another. Bike sharing is also known as a public bike scheme, bike hire or bike rental, although it is more flexible than traditional rental services. [Most typically utilised as part of “Car-independent lifestyles: Public bicycles/bicycle sharing” measures]

**Bike and ride (B&R):** Similar to a park and ride (P&R), this is a facility that promotes sustainable transport by providing cyclists with parking at a public transport stop. Often implemented to allow people to begin journeys by bicycle and switch to public transport so as to avoid congestion and high parking tariffs in the city centre. In combination with a bicycle-sharing scheme, these facilities also allow public transport users to continue journeys by bike after their public transport trip — this set-up is sometimes referred to as “ride and bike”. [Most typically utilised as part of “Collective passenger transport: Intermodality + Ticketing and tariffs” measures; “Demand management strategies: Walking and cycling enhancements/services” measures; “Mobility management: Mobility marketing and awareness raising + Mobility planning”; and “Car-independent lifestyles: Public bicycles/bicycle sharing” measures]

**Bike hire or bike rental:** See “Bicycle-sharing scheme”.

**Biodiesel:** A motor fuel typically made by lipids (e.g. vegetable oil or animal fat) that chemically react with an alcohol to produce fatty acid esters. Biodiesel (not to be confused with bio-ethanol) can be used in standard diesel engines and is thus distinct from the vegetable and waste oils used to fuel converted diesel engines. It has been shown to produce less pollution and GHG emissions than petroleum diesel. [Most typically utilised as part of “Clean fuels and vehicles: All subcategories” measures; “Mobility management: Mobility planning + Mobility marketing and awareness raising” measures]

**Bio-ethanol:** Motor fuel made by the fermentation of vegetable matter. Although bio-ethanol can theoretically be a carbon-neutral fuel source, critics say that much of the biofuel currently produced yields more GHG emissions than fossil fuels due to the energy, fertiliser and other inputs required during production. See also “Second-generation biofuels”. [Most typically utilised as part of “Demand management strategies: Parking management/pricing” measures; and “Clean fuels and vehicles: Cleaner fleets” measures]

**Biogas:** Combustible gas, normally a combination of methane, hydrogen and CO, produced by the biological breakdown of organic matter in the absence of oxygen. Can be produced from municipal waste and sewage and, as a motor fuel, produces lower GHG emissions and almost no particulates. Biogas may be mixed with CNG. [Most typically utilised as part of “Clean fuels and vehicles: Clean fuels and fuelling infrastructure + Cleaner fleets” measures; “Demand management strategies: Parking management/pricing” measures; and “Urban freight logistics: Both subcategories” measures]

**Bus priority lanes:** Traffic lanes, normally beside the kerb, reserved for buses and, in many cases, other priority traffic such as emergency vehicles, taxis and other multiple-passenger vehicles and bicyclists. See also “Bicycle-bus lanes”. [Most typically utilised as part of “Demand management strategies: Access management and road pricing” measures]

**Bus rapid transit (BRT):** Any of a variety of public transport systems using buses to provide faster, more efficient service than an ordinary bus line. Some systems employ grade-separated rights of way, but others operate under a variety of conditions, including mixed traffic. Average speeds compare favourably with rail-based tram or light rail systems while retaining the cost advantages and flexibility of buses. [Most typically utilised as part of “Demand management strategies: Access management and road pricing” measures; and “Collective passenger transport: Accessibility” measures]

**Car-free zone:** See “Pedestrian zone”.

**Car-free day:** A car-free day encourages motorists to give up their cars for a day and use sustainable alternatives to travel. Organised events are held in some cities and countries, notably on September 22, which is World Car-Free Day. [Most typically utilised as part of “Mobility management: Mobility marketing and awareness raising” measures]

**Car pooling:** Car pooling is the sharing of car journeys so that more than one person travels in a car. This can be arranged informally by car owners and passengers; or formally, for example through web-based platforms that match drivers with passengers based on compatible times and itineraries. Car pooling is sometimes referred to as ride sharing and sometimes, especially in the UK, as car sharing. However, in CIVITAS parlance, “car sharing” has a different, specific meaning. [Most typically utilised as part of “Car-independent lifestyles: Car pooling” measures]

**Car sharing:** A car-rental model in which people hire cars for short periods of time, typically by the hour. Often organised as a subscription-based service akin to bicycle sharing, it is attractive to those who make only occasional use of a vehicle, or to those who desire occasional access to a vehicle of a different type than they use day to day. In the UK, car-sharing services are commonly referred to as “car clubs” and the term “car sharing” is used for car pooling. [Most typically utilised as part of “Car-independent lifestyles: Car sharing” measures]

**Clear zones:** See “Environmental zones”

**Company travel plan:** A travel plan focusing on a place of business. Key components are car-pooling and car-sharing measures, the facilitation of cycling and public transport use and the promotion of other sustainable means of transport. It is an increasingly popular measure for companies, as it allows them to save money, reduce absenteeism and provide their employees with additional benefits. [Most typically utilised as part of “Mobility management: Mobility planning” measures]

**Compressed natural gas (CNG):** A fossil fuel substitute for petrol, diesel, or propane/liquid petroleum gas (LPG). Although its combustion does produce greenhouse gases, it is a more environmentally clean alternative to those fuels and it is much safer than other fuels in the event of a spill (natural gas is lighter than air, and disperses quickly when released). CNG may also be mixed with biogas, which does not increase the concentration of atmospheric carbon. [Most typically utilised as part of “Clean fuels and vehicles: Clean fuels and fuelling infrastructure” measures; “Demand management strategies: Access management and road pricing” measures; and “Urban freight logistics: Fleet management including cleaner fleets” measures]

**Congestion charging:** A type of road pricing with the specific aim of reducing traffic congestion on the routes or zones where the charge applies. [Most typically utilised as part of “Demand management strategies: Access management and road pricing” measures]

**Congestion charge zone:** See “Limited traffic zone (LTZ)”

**Contactless card:** A pocket-sized smartcard with embedded integrated circuits that can process and store data, and communicate with a terminal via radio waves. The convenience is that it can be detected with a quick wave past a reader. Examples of public transport use include Transport for London’s Oyster Card. [Most typically utilised as part of “Collective passenger transport: Ticketing and tariffs + Intermodality” measures]

**Cycle track:** See “Bicycle track”

**Demand management:** A strategy to reduce private vehicle traffic flow by manipulating the attractiveness of the route to drivers. This can be done with various tools, including road-use and parking pricing, traffic calming and prioritisation of other transport modes at the expense of cars. [Most typically utilised as part of “Demand management strategies: All subcategories” measures]

**Demand-responsive public transport:** A public bus service which can be requested on demand by users, often people with reduced mobility. Such services can be implemented in urban fringe or rural areas where passengers are too few and far between to justify a regularly scheduled bus route. Typically smaller buses or minivans are used and customers can arrange rides by phone. It is also called “on-demand public transport”. [Most typically utilised as part of “Collective passenger transport: Accessibility + Service improvements” measures]

**Dropped kerb:** A road infrastructure feature in which the pavement (or sidewalk) is tapered down to the road surface to allow vehicles, prams, wheelchairs or bicycles to cross smoothly. Commonly located at zebra crossings and driveways. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures]

**Electric vehicle:** Any vehicle that runs entirely on electricity. Although their effect on atmospheric carbon levels depends on the fuel used to produce the electricity and is compromised by the environmentally harmful production process, e-vehicles produce very little local air pollution and less noise than conventionally fuelled ones. [Most typically utilised as part of “Clean fuels and vehicles: Clean fuels and fuelling infrastructure” measures; “Demand management strategies: Access management and road pricing” measures; and “Urban freight logistics: Fleet management including cleaner fleets” measures]

**Environmental zone:** A demand management strategy in which the aim is to reduce pollution in a defined area, such as a historical city core. Restrictions or differentiated access fees might apply to vehicles of different sizes or conforming to certain European emissions standards. Environmental zones are also known as green zones, clear zones or low-emission zones. [Most typically utilised as part of “Demand management strategies: Access management and road pricing + Parking management/pricing” measures; and “Urban freight logistics: Fleet management including cleaner fleets” measures]

**E-ticket(ing):** An electronic ticket which can be ordered over the Internet and printed, saved as a PDF file, carried on a smartphone, delivered through a text message (SMS ticketing), or stored on a smartcard or electronic ID card. See also “Mobile ticketing”. [Most typically utilised as part of “Collective passenger transport: Ticketing and tariffs” measures]

**Euro ratings:** See “European emissions standards”.

**European emissions standards:** These define the acceptable limits for exhaust emissions of new vehicles sold within the EU. The standards are defined in a series of EU directives staging the progressive introduction of increasingly stringent standards. [Most typically utilised as part of “Clean fuels and vehicles: Hybrid, clean and electric vehicles Hybrid + Cleaner fleets” measures; “Demand management strategies: Access management and road pricing” measures; and “Urban freight logistics: Fleet management including cleaner fleets” measures]

**European Geostationary Navigation Overlay Service (EGNOS):** A highly accurate satellite-based navigational system, mostly used in aviation, but also trialled within CIVITAS for city bus services. [Most typically utilised as part of “Transport telematics: Intelligent transport systems (ITS)-based enhancement of public transport” measures]

**Freight consolidation centre:** A central freight collection and distribution centre that can help reduce environmental impacts of urban freight delivery by reducing the number of trips by heavy goods vehicles (HGVs). It receives deliveries from multiple suppliers, in many cases during off-business hours, and often uses clean vehicles or cargo bikes for the last urban mile. [Most typically utilised as part of “Urban freight logistics: Distribution schemes” measures]

**GALILEO:** A satellite navigation system under development by the EU, which is intended to be more accurate (with a margin of error under 1 metre) than the United States–operated Global Positioning System (GPS) and also reliable at greater altitudes. It is to be free of charge and more reliable to Europeans than GPS and other global systems that can be disabled during times of war. [Most typically utilised as part of “Transport telematics: Intelligent transport systems (ITS)–enhancement of public transport” measures]

**Global Positioning System (GPS):** A space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to at least four GPS satellites. It is maintained by the United States Government and is freely accessible by anyone with a GPS receiver, though some technical limitations are imposed and only removed for authorised users. [Most typically utilised as part of “Transport telematics: Intelligent transport systems (ITS)–enhancement of public transport” measures]

**Grade separation:** A method of aligning two or more axes of transport at different heights (grades) so they do not disrupt one another at junctions. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures]

**Green zone:** See “Environmental zone”.

**Heavy-goods vehicle (HGV):** In the EU, a truck weighing more than 3,500 kg. [Typically related to “Urban freight logistics: All subcategories” measures; and “Cleaner fuels and vehicles: Cleaner fleets” measures]

**High-occupancy vehicle (HOV) lane:** A lane restricted to vehicles occupied by multiple passengers. This is a demand management measure aimed at incentivising car pooling; and thus saving fuel, avoiding emissions and increasing the through-put of a roadway. [Most typically utilised as part of “Demand management strategies: Access management and road pricing” measures; and “Car-independent lifestyles: Car pooling” measures]

**High-quality mobility corridors:** In a CIVITAS context, these are high-capacity thoroughfares with highly developed infrastructure that prioritises sustainable modes of transport, including collective public transport, walking and cycling, as well as convenient connections that ease intermodal journeys. [Most typically utilised as part of “Demand management strategies: Access management and road pricing” measures]

**Hybrid electric vehicle (HEV):** See “Hybrid vehicle”. See also “Plug-in hybrid”.

**Hybrid vehicle:** A vehicle that uses two or more distinct power sources for locomotion, the most common being hybrid electric vehicles (HEVs), which combine an internal combustion engine and one or more electric motors. Compared to petrol-powered vehicles, hybrids have lower emissions of NO<sub>x</sub> as well as of CO<sub>2</sub>. See also “Plug-in hybrid”. [Most typically utilised as part of “Clean fuels and vehicles: Hybrid, clean and electric vehicles + Cleaner fleets” measures; “Demand management strategies: Access management and road pricing” measures; and “Urban freight logistics: Fleet management including cleaner fleets” measures]

**Individualised travel planning:** See “Personalised travel planning”.

**Integrated tariff system:** See “Integrated ticketing system”.

**Integrated ticketing system:** A system that allows travellers to make longer journeys involving multiple modes of transport — including modes with different operators — with a single ticket. Systems can encompass metropolitan areas, regions or even entire countries. [Most typically utilised as part of “Collective passenger transport: Ticketing and tariffs” measures]

**Intelligent speed adaptation (ISA):** Any system that constantly monitors vehicle speed and the local speed limit on a road and automatically reacts when the vehicle goes over the speed limit. The reaction may be an audio or visual warning or interference with the driving system to reduce the vehicle's speed. [Most typically utilised as part of "Safety and security: Safer roads, bike paths and footpaths" measures]

**Intelligent speed assistance:** See "Intelligent speed adaptation".

**Intelligent traffic light:** A traffic light that, with the aid of vehicle sensing and computing technologies, can automatically adjust its sequencing depending on traffic and thus achieve better traffic flow. By adjusting to exceptionally high and low traffic, and thus avoiding unnecessary hold-ups, it seeks to emulate the work of a traffic police officer. [Most typically utilised as part of "Safety and security: Safer roads, bike paths and footpaths" measures; and "Transport telematics: Intelligent transport systems (ITS)–enhancement of public transport" measures]

**Intelligent transport system (ITS):** Refers to information and communication technology, applied to transport infrastructure and vehicles, in order to improve such things as transport safety, transport productivity, travel reliability, informed travel choices, social equity, environmental performance and network operation resilience. See also "Transport telematics". [Most typically utilised as part of "Safety and security: Safer roads, bike paths and footpaths" measures; and "Transport telematics: Intelligent transport systems (ITS)–enhancement of public transport + Intelligent transport systems (ITS) for traffic monitoring, management and enforcement" measures]

**Intermodality:** Concerning two or more modes of transport that are used in one trip chain, for instance in a park-and-ride journey. [Most typically utilised as part of "Collective passenger transport: Ticketing and tariffs + Intermodality" measures]

**Kerb cut:** See "Dropped kerb".

**Kerb ramp:** See "Dropped kerb".

**Last urban mile:** Refers to the relatively costly and more difficult final, downtown leg of a journey beginning outside a city into the centre. In freight shipments, for example, this is the final transfer by van from a logistics centre, airport or rail stop to the end recipient. Although making up just a small part of the journey in terms of distance, the last urban mile accounts for a significant part of the cost. The concept can also apply to passenger travel, where special services such as urban bicycle sharing are deployed to offer a convenient final link through congested downtown traffic. [Typically related to "Urban freight logistics: Distribution schemes" measures; and "Demand management strategies: Access management and road pricing" measures]

**Limited traffic zone (LTZ):** A traffic intervention that seeks to limit traffic in a certain zone (e.g. a historical area) and in some cases only at certain times, to authorised vehicles. [Most typically utilised as part of "Demand management strategies: Access management and road pricing + Parking management/pricing" measures; and "Transport telematics: Intelligent transport systems (ITS) for traffic monitoring, management and enforcement" measures]

**Liquid petroleum gas (LPG):** Flammable gas produced by refining natural gas or crude oil, it consists mainly of butane or propane or a combination of both. It has less calorific value per volume than petrol, but burns with very little soot and with fewer carbon emissions per energy unit than petrol. [Most typically utilised as part of "Clean fuels and vehicles: Clean fuels and fuelling infrastructure" measures; "Demand management strategies: Access management and road pricing" measures; and "Urban freight logistics: Fleet management including cleaner fleets" measures]

**Low-emission zone (LEZ):** See "Environmental zone".

**Mobile ticketing:** This is the process whereby customers can order, pay for, obtain and validate tickets from any location and at any time using mobile phones or other mobile devices. This technology can economise ticketing tasks for transport operators and increase customer convenience. See also "E-ticketing". [Most typically utilised as part of "Collective passenger transport: Ticketing and tariffs" measures]

**Mobility centre:** A public office where citizens can obtain information and services related to urban transport. In CIVITAS, such centres have been opened with the express aim of promoting sustainable transport. [Most typically utilised as part of “Mobility management: Mobility marketing and awareness raising” measures]

**Mobility management:** Mobility management, according to the European Platform on Mobility Management (EPOMM), is the promotion of sustainable transport and management of private-car use by changing travellers’ attitudes and behaviour. Its methods are “soft” measures such as awareness raising and communication, the provision of services and coordinating activities involving stakeholders in urban transport. See also “Company travel plan”, “Mobility marketing”, “Mobility planning”, “School travel plan”, “Travel plan”, “Mobility centre”, “Individualised travel planning” or “Personalised travel plan”, and “Sustainable urban mobility plan”. [Most typically utilised as part of “Mobility management: All subcategories” measures]

**Mobility marketing:** An intervention within mobility management involving the advertising and promotion of sustainable transport modes. [Most typically utilised as part of “Mobility management: Mobility marketing and awareness raising” measures]

**Mobility planning:** Strategic transport planning that prioritises measures that produce greater efficiency, reduce trips, and provide more choices while respecting the need for sustainable development. It recognises that the capacity of a transport system should only be expanded after all efforts have been made to optimise existing facilities and road networks. See also “Mobility management”, “Sustainable urban mobility plan”, and “(Site-based) travel plan”. [Most typically utilised as part of “Mobility management: Mobility planning” measures]

**Multimodality:** Concerning the use of different modes of transport for different trips, circumstances and purposes. [Most typically utilised as part of “Collective passenger transport: Ticketing and tariffs + Intermodality” measures]

**NO<sub>x</sub>:** Referring to both nitrogen oxide and nitrogen dioxide, NO<sub>x</sub> is a category of pollutant emitted by petrol-powered vehicles. In warm, sunny weather, NO<sub>x</sub> reacts with other gases in the air to produce ozone, which, in high enough concentrations, can cause respiratory problems in humans. [Typically related to “Clean fuels and vehicles: All subcategories” measures; and “Urban freight logistics: Fleet management including cleaner fleets” measures]

**On-demand public transport:** See “Demand-responsive public transport”.

**Park and ride (P&R):** A facility that promotes sustainable transport by providing motorists with parking at a public transport stop. Often implemented to allow suburban motorists to begin journeys by car and switch to public transport so as to avoid congestion and high parking tariffs in the city centre. See also “Bike and ride (B&R)”. [Most typically utilised as part of “Collective passenger transport: Intermodality” measures; “Demand management strategies: Access management and road pricing + Parking management/pricing” measures; “Car-independent lifestyles” measures; and “Transport telematics: Real-time road user information” measures]

**Pedestrian zone:** Pedestrian zones (also known as auto-free zones and car-free zones) are areas of a city or town reserved for pedestrian-only use and in which some or all automobile traffic may be prohibited. Pedestrian zones may differ in their tolerance for or restrictions on human-powered vehicles such as bicycles, inline skates, skateboards and kick scooters. [Most typically utilised as part of “Demand management strategies: Access management and road pricing + Walking and cycling enhancements/services” measures; and “Safety and security: Safer roads, bike paths and footpaths” measures]

**People with reduced mobility (PRMs):** Those whose mobility is reduced due to any impairment — sensory, physical or intellectual. It may be due to age or other cause, and when using transport, such people need special attention and adaptations to their needs so that they have equal access to the same services made available to all passengers. [Typically related to “Collective passenger transport: Accessibility + Service improvements” measures; “Safety and security: Safer roads, bike paths and footpaths” measures; and “Mobility management: Mobility planning” measures]

**Personalised travel plan:** A travel plan at the individual level, it typically gets started with an interview about the client's travel routines. From this, a plan is put together based on alternative ways to make the same trips or accomplish the same tasks more sustainably (the plan may include cycle routes or bus lines, for example). Some CIVITAS cities have offered personalised travel planning services aimed at new residents. [Most typically utilised as part of "Mobility management: Mobility marketing and awareness raising" measures]

**Plug-in hybrid:** A hybrid vehicle which utilises rechargeable batteries, or another energy storage device, that can be recharged through an external electricity source, including a normal electric wall socket. Like a conventional hybrid electric vehicle (HEV), it has both an electric motor and an internal combustion engine. [Most typically utilised as part of "Clean fuels and vehicles: Hybrid, clean and electric vehicles" measures]

**Pram ramp:** A dropped kerb to help parents pushing prams, wheelchair users and others. [Most typically utilised as part of "Safety and security: Safer roads, bike paths and footpaths" measures]

**Public bicycle scheme:** See "Bicycle-sharing scheme".

**Real-time road user information:** Information available to travellers as soon as it is collected. Examples include variable message signs at public transport stops that inform passengers of the current location and estimated time of arrival of the next vehicle, or a sign that lets motorists know the availability of parking spots in a parking facility before they enter the facility. Another example is a sign on a public thoroughfare that alerts motorists to congestion levels on "downstream" routes. [Most typically utilised as part of "Transport telematics: Real-time road user information" measures; and "Collective passenger transport: All subcategories" measures]

**Ride sharing:** See "Car pooling".

**Road pricing:** An economic concept regarding the various charges applied for the use of roads. The main aims of such charges depend on the type. For instance, fuel taxes, licence fees, parking tariffs and tolls seek mainly to generate revenue, while congestion charging seeks to disincentivise driving and reduce congestion. [Most typically utilised as part of "Demand management strategies: Access management and road pricing" measures]

**Road user charging:** See "Road pricing".

**Second-generation biofuels:** Biofuels produced from sustainable feedstock, which is defined, among other ways, by the availability of the feedstock, the impact on greenhouse gas emissions and impact on biodiversity and land use. [Most typically utilised as part of "Clean fuels and vehicles: All subcategories" measures; "Collective passenger transport: Service improvements" measures; and "Demand management strategies: Access management and road pricing" measures]

**School travel plan:** A travel plan focusing on a school site.

**Share taxi:** A category of demand-responsive public transport service between public buses and taxis. Share taxis are medium-capacity vehicles, such as minivans, and may run along fixed or flexible routes and at irregular intervals and without fixed stops. They pick up passengers where needed and drop them off at their desired location. Popular in the developing world but less so in Europe. [Most typically utilised as part of "Collective passenger transport: Accessibility + Service improvements" measures]

**Shared-lane marking:** See "Advisory bicycle lane".

**Shared-use path:** For cyclists and pedestrians. See also "Bike path".

**Site-based travel plan:** See "Travel plan".

**Sleeping policeman:** See "Speed bump".

**Smartcard:** A pocket-sized plastic payment card containing integrated circuits to ensure strong authentication security. Smartcards are increasingly popular for use on public transport, as they can work in integrated ticketing schemes and can double as a debit card for other types of purchases. They are a popular medium for carrying e-tickets. See also "Contactless cards". [Most typically utilised as part of "Collective passenger transport: Ticketing and tariffs + Intermodality" measures]

**SMS ticketing:** See “E-ticketing”.

**Speed breaker:** See “Speed bump”.

**Speed bump:** A traffic-calming measure in the form of a bump in the roadway, typically between 7 and 10 cm high and 30 cm in depth, designed to slow down passing vehicles. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures; and “Demand management: Walking and cycling enhancements/services” measures]

**Speed cushion:** A traffic-calming measure that is similar to a speed hump but narrow enough so that vehicles with wide wheel bases can pass over it without having to slow down. Because of this characteristic, emergency service operators often prefer speed cushions to speed humps. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures; and “Demand management: Walking and cycling enhancements/services” measures]

**Speed hump:** Like a speed bump but of greater depth, typically about 1 metre. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures; and “Demand management: Walking and cycling enhancements/services” measures]

**Speed ramp:** See “Speed bump”.

**Speed table:** A speed bump with an extended flat top that runs several metres from the entry to exit ramps. They are so designed to reduce the impact on vehicles with long wheel bases, such as buses. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures; and “Demand management: Walking and cycling enhancements/services” measures]

**Sustainable mobility:** Mobility that meets the needs of society to move freely, gain access, communicate, trade and establish relationships without sacrificing other essential human or ecological requirements today or in the future. It is the principle underlying all CIVITAS measures. [Used in virtually all categories and subcategories]

**Sustainable urban mobility plan (SUMP):** A strategic document that sets out a package of interrelated measures to satisfy the mobility needs of people and businesses over the coming years. A SUMP involves a multi-stakeholder, integrated planning approach and addresses all modes of transport in cities and their surrounding areas. [Most typically utilised as part of “Mobility management: Mobility planning + Multi-stakeholder consultation/public participation” measures]

**Tempo-30 zone:** See “30 km/h zone”.

**Tourist taxi:** See “Share taxi”.

**Traffic calming:** Any of various measures intended to slow or reduce motor vehicle traffic on a street in order to improve living conditions for residents as well as to improve safety for pedestrians and cyclists. As these measures improve the quality of the streetscape, they can contribute to an increase in active travel modes and a decline in car use. [Most typically utilised as part of “Safety and security: Safer roads, bike paths and footpaths” measures; and “Demand management: Walking and cycling enhancements/services” measures]

**Transit-oriented development:** A mixed-use residential or commercial area designed to maximise access to public transport. This sort of development often incorporates features to encourage public transport ridership. [Most typically utilised as part of “Mobility management: Mobility planning + Multi-stakeholder consultation/public participation” measures; and “Collective passenger transport: Intermodality” measures]

**Transport telematics:** Information technologies used for enhancing transport systems. See also “Intelligent transport system (ITS)”. [Most typically utilised as part of “Transport telematics: All subcategories” measures]

**Travel plan:** A plan or guide for maintaining access to a business, school or other facility while reducing the number of motorised trips to and from the site. Travel plans typically involve a package of measures, with examples being staff or student car pooling; the installation of cycle parks; the promotion and/or enhancement of public transport links; or incentive schemes to stimulate the use of alternative means of transport. See also “Company travel plan”, “School travel plan” and “Personalised travel plan”. [Most typically utilised as part of “Mobility management: Mobility planning” measures]

**Trolleybus:** A bus operating on electric power delivered through a trolley pole that connects to overhead wires. [Typically related to “Collective passenger transport: Hybrid, clean and electric vehicles” measures]

**Zero-emission zone (ZEZ):** A low-emission zone where only zero-emission vehicles (ZEVs) are allowed. In such areas, all internal combustion engine vehicles are banned; this includes hybrid vehicles. Only all-electric vehicles are allowed in a ZEZ, along with walking and cycling and fully electric public transport vehicles like trams and trolleybuses. [Most typically utilised as part of “Clean fuels and vehicles: Clean fuels and fuelling infrastructure” measures; and “Demand management strategies: Access management and road pricing” measures]

**Zone 30:** See “30 km/h zone”.



---

## About VANGUARD

Launched in September 2008, CIVITAS VANGUARD was a 74-month grant-based project of the European Commission's Directorate-General for Mobility and Transport (DG-MOVE), funded as part of the CIVITAS Initiative. It was a support action for the coordination and dissemination of CIVITAS Plus, the third phase of the CIVITAS Initiative, and as such served the CIVITAS Plus collaborative projects and the CIVITAS Initiative itself.

Funded under the Seventh Framework Programme for Research and Technological Development, VANGUARD focused on the dissemination of research activities, results and experiences from cities and projects participating in CIVITAS.

One of the objectives of VANGUARD was to support the CIVITAS Plus collaborative projects through the provision of a number of services. These services were mainly related to:

- coordination, support and facilitation;
- dissemination and promotion; and
- CIVITAS community support.

---

### Publication

This directory is intended for all those with an interest in CIVITAS. This publication is also available from the Knowledge base on the CIVITAS website: [www.civitas.eu](http://www.civitas.eu).

---

### Publisher

The CIVITAS Initiative

---

### Authors

Elke Bossaert, Els Van den broeck, Marjan Frederix and Sarah Martens (Mobiel 21 – CIVITAS VANGUARD)

Greg Spencer and Jerome Simpson (REC – CIVITAS VANGUARD)

With contributions from the partners of the CIVITAS VANGUARD consortium and the CIVITAS demonstration cities

**Special thanks to** The CIVITAS editorial board

---

### Editor

REC

---

### Copy editor

Rachel Hideg (Regional Environmental Center)

---

### Acknowledgement

This publication is produced under the auspices of CIVITAS VANGUARD (Advancing Sustainable Urban Transport in an Enlarged Europe through CIVITAS), a support action for coordination and dissemination funded through the EC's Seventh Framework Programme for Research and Technological Development.

---

### Legal Notice

The views expressed in this publication are the sole responsibility of the authors named and do not necessarily reflect the views of the European Commission or the support action VANGUARD.

---

### Copyright

All articles and images in this publication can be replicated and built upon. However, they must be attributed to the CIVITAS Initiative.

June 2014

Online

ISBN 978-963-9638-64-8





