



CiViTAS

Cleaner and better transport in cities



CIVITAS GUIDE

FOR THE URBAN TRANSPORT PROFESSIONAL

RESULTS AND LESSONS OF LONG TERM EVALUATION
OF THE CIVITAS INITIATIVE

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Executive Summary

CIVITAS – CLEANER AND BETTER TRANSPORT IN CITIES

Urban transport professionals face major challenges in the decade to come. They are expected to facilitate the transition from a primarily car-based mobility to a mobility of at least the same quality level, but based on walking, cycling and collective passenger transport. They should offer more, better and more sustainable mobility and transport services to users. They should find solutions to mitigate the negative impacts of transport on citizens' health and well-being, environment and climate.

Finally, urban mobility professionals need to balance the desire for short-term improvements with the ambition to develop a strategic and sustainable planning perspective for their cities. In many cases, these tremendous challenges need to be approached under severe financial constraints due to the present economic crisis and strained public budgets.

With the CIVITAS Initiative, the European Commission aims to generate a decisive breakthrough towards sustainable urban mobility by supporting cities that adapt ambitious and innovative transport strategies. More specifically, CIVITAS is helping cities be (or become) key actors in the innovation process by providing them with support for testing integrated packages of new urban transport technologies and services prior to their broad deployment.

Since 2002, CIVITAS has supported 59 cities across Europe in the implementation of more than 730 innovative urban mobility measures. Through the CIVITAS Initiative, the European Commission seeks:

- To promote and implement sustainable, clean and (energy) efficient urban transport experiments
- To demonstrate integrated packages of technology and policy actions in the field of energy and transport in eight categories of measures
- To build up critical mass and markets for innovation by transferring good practices to other European cities

THIS HANDBOOK: LESSONS FROM THE CIVITAS INITIATIVE

During the ten years of the CIVITAS Initiative, more than 730 technical and policy-based urban transport measures have been developed and implemented. In several evaluations of their impacts and processes, valuable lessons for implementation in other cities were derived.

This handbook adds a more long term focus to those evaluations. It shows to what extent CIVITAS functions as a catalyst for the intended paradigm shift

towards new urban sustainable mobility. For mobility professionals working for city authorities, CIVITAS has much to offer in that respect: numerous examples of successful measures that, embedded in urban mobility policies, give substance to the transition towards cleaner and better urban transport. This handbook provides access to those examples.

TRANSFER OF KNOWLEDGE: THE ADDED VALUE OF CIVITAS

CIVITAS is all about developing good practice examples for sustainable urban mobility solutions, with the ultimate goal to transfer knowledge and experience generated to other cities in order to achieve similar results there. This includes the transfer of knowledge on policies and practices as well as on administrative arrangements, institutions, and ideas.

The CIVITAS Initiative with its numerous projects has demonstrated that good personal contacts and interactions facilitate knowledge transfer. A further lesson learned is that effective transfer requires appropriate transfer conditions. In other words, if the setting is right, a potential transfer of ideas and results can take place and a deeper understanding and learning experience can be achieved.

CHALLENGES: NEW INTEGRATED SUSTAINABLE TRANSPORT POLICIES START AT THE URBAN LEVEL

Transport is fundamental for a growing economy and an interconnected society. At the same time, the negative impacts of transport seriously affect citizens' quality of life. Based on this awareness, the European Commission, national governments and city authorities have set a number of targets to reduce or mitigate the negative impacts on health, climate, safety, security and accessibility. A tremendous effort is required to meet these targets. In addition to top-down actions supporting new sustainable urban transport systems, it is important to foster bottom-up developments ini-

tiated by the cities. The CIVITAS Initiative specifically supports cities experimenting with new sustainable transport policies.

Almost 80 percent of the European population lives in urban areas. The city level is therefore crucial for the change towards sustainable mobility. Based on the experience gained from the 730+ urban mobility measures implemented, CIVITAS is able to provide solutions to the most pressing urban challenges a transport professional faces.

IN THIS HANDBOOK, THE FOLLOWING FIVE CHALLENGES ARE ADDRESSED

1. HOW TO CREATE A HEALTHY ENVIRONMENT FOR CITIZENS

Urban transport can have a profound negative effect on health including premature death from air pollution, obesity resulting from lack of activity and traffic noise that causes sleep problems. Freight consolidation, clean vehicles, carpooling, car-sharing, and stimulation of slow modes contribute to citizens' health.

2. HOW TO CREATE AN ECONOMICALLY VIABLE AND ACCESSIBLE CITY

Congestion and traffic standstills, especially during peak hours, are among the most visible problems in European cities. Inaccessibility of urban areas comes at a cost: an estimated one percent of the GDP annually. The most obvious approach – and that used through much of the second half of the twentieth century – is to counter congestion by increasing road capacity. However, additional road space has been demonstrated to induce travel demand and in turn generate more traffic. It is also difficult and costly to expand road capacity within urban areas. Instead, several integrated packages of local transport and traffic management projects have been tested within CIVITAS. These packages turned out to be very cost effective. Most notable are: carpooling, congestion charging, traffic management, mobility management and better public transport.

3. HOW TO ENSURE A SAFE AND SECURE URBAN ENVIRONMENT AND MOBILITY

Road accidents are responsible for about 34,500 deaths and 1.6 million injuries annually (more than 60 percent within built-up area). Most policy measures within the CIVITAS Initiative have a positive effect on traffic safety. Or to be more specific, the CIVITAS measures not only improve air quality but also lead to fewer people being

killed and injured. This effect is easily forgotten when sustainable transport policies are presented. The most effective measures in this respect are better access to public transport for disabled passengers, freight consolidation, stimulation of slow modes, carpooling and car-sharing.

4. HOW TO INVOLVE CITIZENS AND OTHER URBAN MOBILITY STAKEHOLDERS

The CIVITAS Initiative proved the importance of stakeholder engagement. Many of the policies it experimented with were aimed at this goal. The main challenge these activities tried to address is how to obtain legitimisation and wide support for innovative urban transport improvements. Policies are more successful with the appropriate level of involvement from stakeholders, be it neighbouring public authorities, companies, lobby groups, representative organisations or individual citizens. In general, the aim within CIVITAS was to increase the involvement of stakeholders and citizens. Each policy or individual mobility measure requires its own level of engagement and its own method of involvement.

5. HOW TO ACHIEVE POLICY GOALS WHILE ENSURING THAT MOBILITY NEEDS OF SOCIETY AND ITS CITIZENS ARE MET

Many CIVITAS cities put considerable effort into the strategic policy planning process. Based on these experiences, both the Action Plan on Urban Mobility as well as the Transport White Paper stimulate the wide take-up of Sustainable Urban Mobility Plans. A number of case studies show the experiences of the CIVITAS cities.

WITHIN CIVITAS EIGHT SOLUTIONS GROUPS OF POLICY MEASURES ARE DISTINGUISHED

CIVITAS cities have been highly successful “urban laboratories” where new technologies and policy concepts were tested, where the value of innovative systems and services for citizens was demonstrated and where new forms of cooperation between stakeholders have come to life. Many new technologies and policies were tested. The challenge for an urban transport professional is to pick the combination that will be most successful within his/her city.

1. STIMULATING THE USE OF CLEAN FUELS AND VEHICLES

Both the vehicle and the fuel market are global, which means that inertia against a radical shift is extreme. Major obstacles to the introduction of alternative fuels and propulsion systems are: technical immaturity, price and lack of (common standards for) infrastructure. Public authorities can help overcome these obstacles and support market development by being early adopters of a substantial scale who are more forgiving regarding the immaturity of some of the technology and price.

Cities can initiate market change by using their own procurement power to “green” their own municipal vehicle fleets and by urging contractors and suppliers to do the same. Within CIVITAS, there were 62 local initiatives introducing clean vehicles and fuel actions. Evaluation shows that:

- Buses and waste collecting vehicles are suitable sub-markets to start with as cities often have direct influence over these and they often fuel up at a single geographical spot, reducing the need for vast infrastructure development. These vehicles are also responsible for a high proportion of local emissions thus changing to cleaner technology will improve air quality with relatively small efforts.
- Only a few cities have tried to influence the car market. Favourable national legislation and national incentives together with several active cities and local incentives seem to be success factors in developing a market for cleaner cars.

2. NEW METHODS OF URBAN FREIGHT DELIVERY

Freight transport accounts for a large share of urban traffic (on average 6 percent in the Netherlands and between 9 and 15 percent in France) but causes a much larger share of air pollution and other environmental damage. The management of freight traffic should be part of an overall transport master plan to be included in urban transport policy. Good examples are freight consolidation schemes. Instead of delivering goods to individual retailers, various wholesalers deliver their goods to an out-of-town logistics centre from which goods are loaded into a single (sometimes “green”) truck and delivered to the retailers. It reduces truck movements as well as individual deliveries for retailers.

3. DEMAND MANAGEMENT STRATEGIES

Liveability in cities is greatly influenced by the presence of private cars, both moving and parked. Regulation of private car use can be accomplished by access regulation for cars. Instruments for selective access are:

- Regulations based on characteristics of vehicles or vehicle users. For instance, it is very common that only residents are allowed to park for free in a given area. Visitors must pay to park their car. Another promising example is a Low Emission Zone where only vehicles which meet certain defined emission standards are allowed in.
- Pricing, either for access or for parking. Priced parking is the most common regulatory measure in European cities. The extent to which priced parking can influence mobility decisions depends on the city’s control over parking space within the city. A newer form of pricing is priced access, with only London and Stockholm as current examples. The impact of this new form of pricing is quite impressive: large decreases in numbers of cars – up to 30 percent – are very effective in creating a cleaner environment.

4. MOBILITY MANAGEMENT

CIVITAS cities try to influence travel behaviour through mobility management, which includes marketing, communication, education and information campaigns. Almost all CIVITAS cities have opened mobility agencies or developed an integrated website for the promotion of their mobility services. In all cases, the goal was to strengthen the integration of the different mobility services, e.g. with communication tools (interactive trip calculators; personalised mobility advice and dedicated campaigns). Mobility agencies have four principal components:

- Personalised mobility advice
- Multimodal information and promotion of sustainable mobility
- Integrated tickets and related services (public transport in combination with car pooling, car-sharing, cycle rental)
- Mobility plans for target groups: companies, commuters, schools, and more strategically-oriented sustainable urban mobility plans

5. COLLECTIVE PASSENGER TRANSPORT

Public transport improvements are at the core of CIVITAS. Changes to the modal share of public transport in European cities occur relatively slowly unless specific factors such as an economic crisis or the opening of a new metro line play a role. Consequently, the stimulation of public transport in CIVITAS cities focussed primarily on the greening of transport and on improving the quality of services (rather than directly influencing the modal share) by implementing measures on:

- Non-traditional public transport systems
- Security & safety improvements
- Improvements in access for people with reduced mobility, and
- Integration with walking, cycling and other modes (park & ride)

CIVITAS demonstrated that experiments with non-traditional public transport systems such as the installation of separated bus lanes are particularly successful. They both significantly raise the profile of public transport among citizens and optimise coverage and 'flow of the network. Also the introduction of different types of on-demand transport services proved to be successful as they allow for maintaining a reliable service in suburban areas and offer better access to transport for people with reduced mobility.

Public transport in many CIVITAS cities also largely benefitted from complementary measures in the areas of clean and energy-efficient vehicle fleets as well as various service enhancing telematics solutions.

6. TRANSPORT TELEMATICS

Starting from individual junction traffic lights, every larger European city nowadays has a centralised traffic management system in order to manage traffic flows and optimise the use of the available road network. Increasingly, these systems are now also used to steer travellers' mode choices by providing information and priority to public transport and to influence modes of travelling (e.g. multimodal journeys and carpooling). A wide range of applications and improvements has been experimented with in CIVITAS. Except for the set-up of new integrated traffic control centres and systems, for which the cost can amount to several millions, the cost of these measures is mostly below EUR 100,000 with significant environmental and socio-economic benefits.

7. LESS CAR DEPENDENT MOBILITY OPTIONS

Cars are an important mode of transport for many people. They are usually seen as offering flexibility and for some are even a symbol of freedom. Private cars are, however, also a transport mode which is costly for individuals and damaging to the quality of the urban environment as they consume valuable urban space and threaten the health and safety of individuals.

In promoting more sustainable use of the car and offering options to reduce car dependency, CIVITAS focuses on the following less car-dependent mobility options:

(1) Breaking with current patterns for car ownership and use:

- Car-sharing is a promising tool to regain street space and to provide more options for individual mobility. The “pay-as-you-drive” principle supports rational use of all transport modes, resulting in a modal shift from the car towards sustainable modes (including rail for long-distance travel). Car-sharing plays an important role in creating a new mobility culture. The potential is immense but far from fully exploited – either on the European scale or at the national or local levels. At the end of 2009, almost 400,000 Europeans were car-sharing customers.
- Carpooling means that two or more people, whose starting points and destinations are similar and who travel at similar times, agree to travel together in one car. Each city can stimulate carpooling through information campaigns conveying the benefits, namely shared costs and reduced congestion. Cities can support carpoolers by offering matching services.
- P+R travel, nothing new, but still with great potential. A trip is partly carried out by car and partly by public transport. Requires adequate parking facilities near public transport hubs.

(2) Encouraging cycling as an alternative to private car use (for some journeys).

Almost half of all car journeys are shorter than five kilometres and, because of the time needed for the motor to warm up, fuel consumption and emissions are very high for these trips. Cycling is often the most suitable mode for short distances (two to five kilometres). Thus promoting cycling as a replacement for short car trips is an excellent means to reduce fossil fuel consumption and enhance climate protection in urban areas. Measures undertaken in CIVITAS showed that there are no miracle solutions to achieve a higher modal share for the bicycle. Weather and topography can play a role, as can high fuel prices.

8. SUSTAINABLE URBAN MOBILITY PLANS

A Sustainable Urban Mobility Plan (SUMP) is a strategic plan that builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles to satisfy mobility needs and achieve a better quality of life.

SUMP is a people-focussed planning approach which is widely promoted by the European Commission. Interest in the SUMP approach has been spurred by the Transport White Paper (2011) proposal to “examine the possibility of a mandatory approach for cities of a certain size, according to national standards based on EU guidelines” and “link regional development and cohesion funds to cities and regions that have submitted a current, and independently validated Urban Mobility Performance and Sustainability Audit certificate”.

CIVITAS demonstrates that the long-term benefits of an SUMP comprise a better quality of life, environmental and health benefits, improved mobility and accessibility and an improved image of a city. Being frontrunners in the field of sustainable urban mobility, some CIVITAS cities show that it is wise to comply with SUMP planning practices and develop an SUMP in which their local projects and ambitious (tangible) targets are integrated.



1. How to use this Guide

CIVITAS is the European initiative for cleaner and better transport in cities. Since 2002, it is offering cities an opportunity to jointly implement innovative measures addressing various kinds of urban transport- and mobility-related issues. Cities all over Europe have participated in numerous projects and a large pool of knowledge and experiences exists and is shared with other cities and their stakeholders throughout Europe and beyond.

This Guide offers an overview of the knowledge and experience gained in CIVITAS from a long-term evaluation perspective.

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THIS GUIDE OFFERS DIFFERENT ENTRY POINTS

MOBILITY CHALLENGES

Chapter 2

Page 12

First, the reader has the option to get information about specific urban mobility challenges and the related policies. Chapter 2 therefore discusses six important urban challenges. In form of integrated packages of CIVITAS measures, each challenge offers suggestions to questions an urban transport professional commonly faces:

- How to create a healthy environment for citizens?
- How to create an economically viable and accessible city?
- How to ensure a safe and secure urban environment and mobility?
- How to involve citizens and other stakeholders?
- How to achieve policy goals while ensuring that mobility needs of society and its citizens are met?

SPECIFIC URBAN TRANSPORT THEME

Chapter 3

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Next, some readers may want to read about a specific urban transport theme. Chapter 3 reflects the thematic group structure used by CIVITAS and offers practical solutions from cities that have implemented measures in the respective areas of clean fuels and vehicles, urban freight, demand management strategies, mobility management, collective passenger transport, transport telematics, car-independent mobility options and, as a rather new and encompassing theme, Sustainable Urban Mobility Plans (in short SUMP).

INGREDIENTS OF SUCCESS

Chapter 4

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Third, the Guide responds to the awareness that the process of planning and implementing an innovative urban transport measure or a package of measures is a challenging task. In many cases internal (institutional, organisational), but also external factors (local political or global changes) can significantly affect the success of a measure. Based on the results of the CIVITAS process evaluation, chapter 4 provides details on the ingredients of success such as quality, relevance, inclusive management, integrated approach, finance, and public & political support.

TRANSFERABILITY

Chapter 5

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One main intention of CIVITAS is to transfer specific measures, packages of measures, concepts and ideas to other cities throughout Europe so that they can relate their own work to these good practices in order to achieve similar results in sustainability. To those readers who are interested in learning more about transferability, chapter 5 offers information concerning the transferability concept in a more scientific way and illustrates practical transfer cases within CIVITAS.

LESSONS LEARNED

Chapter 6

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Last, for the users of this guide who would like to read more about important urban mobility challenges – health, congestion, safety & security, participation, and planning (see also chapter 2) – the final chapter 6 offers lessons learned. This chapter is based on the wealth of knowledge and experience people involved in the planning and implementation of (packages of) measures possess.



2. Urban challenges and their policies

The Transport White Paper 2011¹ (p.8) recognises that transport is an important urban concern: “Cities suffer most from congestion, poor air quality and noise exposure”, and road accidents occur most in cities.

Moreover, urban transport contributes significantly to the supra-local problems of oil dependence and greenhouse gas emissions.

The Action Plan on Urban Mobility states that “Urban areas face today the challenge of making transport sustainable in environmental (CO₂, air pollution, noise) and competitiveness (congestion) terms while at the same time addressing social concerns. These range from the need to respond to health problems and demographic trends, fostering economic and social cohesion to taking into account the needs of persons with reduced mobility, families and children.”

1 European Commission, 2011: WHITE PAPER. Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. COM(2011) 144 final.

The Transport White Paper clearly recognises that much of the transport challenge is an urban one:

“The gradual phasing out of ‘conventionally-fuelled’ vehicles from the urban environment is a major contribution to significant reduction of oil dependence, greenhouse gas emissions and local air and noise pollution.”

“Urban mobility policy must strive to increase the shares for collective transport and walking and cycling.”

Almost 80 percent of the population in Europe are living in urban areas which are and will remain to be the driving forces of national economies. Transport volumes and despite improvements in energy efficiency also transport emissions are predicted to drastically increase in the future. Urban transport professionals have an enormous responsibility in responding adequately to the challenges mentioned in the Action Plan on Urban Mobility. Their work has a great potential to shape urban areas and to positively influence the quality of life in urban areas.

The so-called ‘last mile deliveries’ of freight into the cities must be organised more efficiently and less carbon-intensive. Urban transport planning is currently undergoing a transition – if not a paradigm shift – from the traditional approaches focusing on planning for cars and motorised transport to innovative approaches focusing on people and their quality of life. The CIVITAS Initiative supports cities which are willing to innovate and experiment with new sustainable transport policies. With the vast majority of the European population living in urban areas, this means that actual changes and implementation of new policies start at the level of a city.

As listed in the Action Plan and White Paper, negative impacts of transport indeed cause the local problems of health (air and noise pollution), economy (competition for space and congestion), and safety. On the national and European level, transport is related to the problems of oil dependence and climate change through greenhouse gas emissions.

This chapter is presenting solutions – as offered through the CIVITAS Initiative – to some of the most crucial challenges for the urban level: How to create a healthy and climate-responsible urban environment (chapter 2.1); how to create an economically viable and accessible city (chapter 2.2), how to ensure a safe and secure urban environment and mobility (chapter 2.3), and how to achieve this complex and difficult transition to a different mobility pattern, involving citizens and other stakeholders in decision-making (chapter 2.4), ensuring to provide attractive mobility choices and accommodating the mobility needs from a strategic or long-term perspective (chapter 2.5).

The fight against climate change

- The fight against climate change is one of the biggest challenges for societies worldwide. In order to temper climate change to a level below 2°C, the European Commission aims to reduce CO₂ emissions by the year 2050 by 80 to 95 percent compared to the emission levels of the year 1990². Several economic sectors are on the right path of emission reduction, whereas the transport sector, including urban transport, is still increasing its CO₂ emissions.³
- The transport sector accounts for 13 percent of greenhouse gas (GHG) emissions and 23 percent of energy related CO₂ emissions globally. It has been predicted that, by the year 2050, there will be a 120 percent growth in global transport emissions compared to levels from the year 2000.⁴
- European climate reduction goals imply a reduction of transport-related greenhouse gas emissions by 20 percent until the year 2030 compared to the year 2008. In practical terms, this would allow for a level of one ton CO₂ emissions per capita per year. The true relevance of this figure only becomes obvious if it is compared to the current CO₂ emissions of ten tons per capita per year.
- The climate change challenge is immense, and climate change is still to some extent a difficult to grasp phenomenon which slowly (but increasingly drastically) reveals its effect on societies. However, efforts to reduce emissions relevant for climate change are closely related to the emission of pollutants and the creation of noise which cause adverse health effects. These adverse effects on people's health and personal well-being are more obvious. This is a chance for planners to provide "emotional" (personal health-related) arguments for the promotion of sustainable measures.

2 European Commission, 2011: WHITE PAPER. Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. COM(2011) 144 final.

3 European Environment Agency dataservice; www.dataservice.eea.europa.eu.

4 EU Catch project, www.carbonaware.eu



2.1 Health

How to create a healthy environment for citizens

Sustainable urban transport can have direct effects on the local environment and health of our citizens. The Action Plan on Urban Mobility (2009) states that “sustainable urban transport can play a role in creating healthy environments and contribute to reducing non-communicable diseases such as respiratory diseases, cardiovascular diseases and injury prevention”.

Transport plays a role in our health in several ways:

- Air quality and cardiovascular health
- Transport-related noise pollution and health
- (Lack of) physical activity

AIR QUALITY, POLLUTANT EMISSIONS AND CARDIOVASCULAR HEALTH

Transport is one of the main sources of air pollution, for which evidence on direct effects on mortality as well as on respiratory and cardiovascular diseases is firmly established.⁵ Emissions from road traffic account for a significant share of this burden.

The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing and aggravation of existing respiratory and cardiac conditions. These effects can result in increased medication use, increased doctor or emergency room visits, more hospital admissions⁶ and premature death. Studies suggest that annually more than 300,000 Europeans die prematurely from air pollution.⁷ →

⁵ European Commission: Environmental fact sheet: moving towards clean air for Europe, 2000.

⁶ Research conducted by Friedman et al. (2001; The Journal of the American Medical Association; <http://jama.jamanetwork.com/article.aspx?articleid=193572>) gives evidence of the relationship between congestion and childhood asthma. Efforts to reduce downtown traffic congestion in Atlanta during the Olympic Games resulted in decreased traffic density, especially during the critical morning period. This was associated with a prolonged reduction in ozone pollution and significantly lower rates of childhood asthma events. These data provide support for efforts to reduce air pollution and improve health via reductions in motor vehicle traffic.

⁷ According to the European Commission’s “environmental fact sheet: moving towards clean air for Europe” (2006), 370,000 premature deaths were caused by diseases related to air pollution by particulate matter and ground-level ozone in the year 2000. With the European Air Quality Strategy in place, this number was expected to decrease to fewer than 300,000 premature deaths annually by the year 2020.



2.1 HEALTH

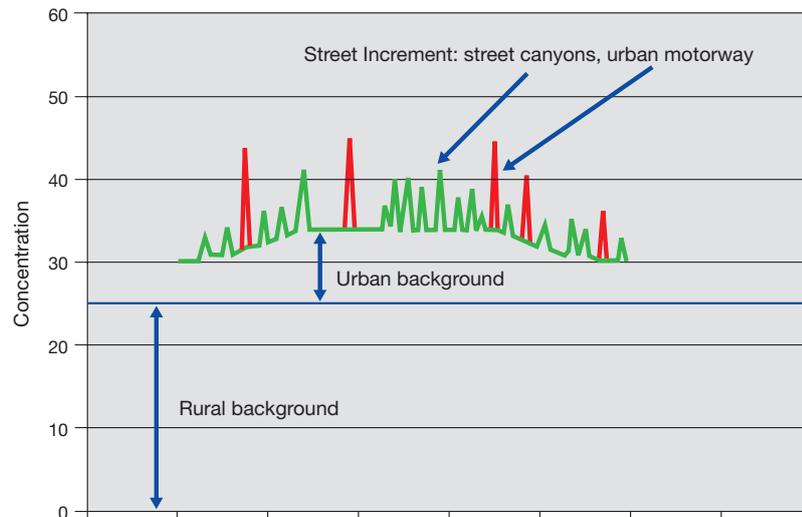
The concentration of urban traffic pollution differs widely between different spots in the city, time of the day and year, as indicated in the following table.⁸

Code	City	O ₃	NO ₂	CO	SO ₂	PM ₁₀	PM _{2,5}	C ₆ H ₆
		1 hour average	1 hour average	running 8 hour average	running 24 hour average			
		µg/m ³	µg/m ³	mg/m ³	µg/m ³	µg/m ³	µg/m ³	µg/m ³
Brussels Capital Region								
41B003	Brussel (Kunst-Wet)		187	1.1	14			
41B005	Brussel (Belliard)		77	0.5	10			
41B006	Brussel (EU Parlement)	10	NA	0.7				4.0
41B011	Sint-Agatha-Berchem	7	NA			117	87	
41MEU1	Neder-Over-Heembeek		95		10	126	94	
41N043	Haren	3	146	1.1	11	131	102	
41R001	Sint-Jans-Molenbeek	3	NA	1.1	14	126	106	
41R002	Elsene		111	0.7	14			
41R012	Ukkel	12	74		17	100	87	
41W0L1	Sint-Lambrechts-Woluwe	5	85	0.8	6	105		2.8
Flemish Region								
40MN01	Menen					103		
40OB01	Oostrozebeke		99		8	129		
40RL01	Roeselare (Brugsesteenweg)					115		
44M705	Roeselare (Haven)	1				171		
44N002	Zeebrugge				5			
44N012	Moerkerke	2	36			122		
44N029	Houtem	2	52		4	133	81	
44N052	Zwevegem	2	68		11	146		
40ZL01	Zelzate							3.3
42R821	Beveren Waas		99		9			

Table 1: Air quality levels in Brussels Capital Region and parts of the surrounding Flemish Region

⁸ CITEAIR II, INTERREG IVC, CAQI Common Air Quality Index, May 2010.

Figure 1:
Concept of primary
pollutant emissions



TRANSPORT-RELATED NOISE POLLUTION AND HEALTH

Road traffic is the main source of exposure to noise. According to European noise mapping, about 65 percent of the European population (325 million) is exposed to levels over 55 Lden⁹ (from road, rail, aircraft and industry), and nearly 20 percent to night-time levels that may harm their health (55 Ln_{night}). Noise disturbs sleep and heavily impacts on people's quality of life. Research shows that noise can kill¹⁰. Epidemiological research gives evidence that exposure to residential road traffic noise was associated with a higher risk of cardiovascular diseases¹¹ and hypertension¹². Children chronically exposed to loud noise show impairments in attention, memory, problem-solving ability and the acquisition of reading skills. Moreover, noise annoys people. About two thirds of European citizens are substantially annoyed by noise caused by road and railway traffic.¹³

LACK OF PHYSICAL ACTIVITY

The choices many people make to carry out most of their journeys by car – or infrastructure that doesn't allow them a choice – have a direct impact on their health. While there is a general trend in Europe over the past decades towards more mental work and less physical labour, this is not the only contributor to an increase in obesity (overweight) levels. The trend towards obesity parallels the increase in car use. Increased access to cars, combined with deterioration in the physical conditions for active mobility, is associated with more sedentary and inactive lifestyles. This is also related to the likelihood of becoming obese.¹⁴ People who get the recommended daily amount of physical activity lower their risk of becoming overweight.

9 Lden (Level day-evening-night) is an expression for the noise level. This is a long-term averaged sound level, determined over all the correspondent periods of a year. Since 2004, the use of Lden is obligatory in all European countries (the Environmental Noise Directive).

10 <http://www.silence-ip.org/site/#549>

11 Sorensen et al (2011; European Heart Journal; <http://eurheartj.oxfordjournals.org/content/early/2011/01/08/eurheartj.ehq466.abstract>). Sorensen et al (2012; PLOS one; <http://www.plosone.org/article/info:doi/10.1371/journal.pone.0039283>).

12 Bodin et al. (2009; Environmental Health; <http://www.ehjjournal.net/content/8/1/38/>).

13 Silence 2008; Annoyance of residents living in urban areas. http://www.silence-ip.org/site/fileadmin/SP_A/A-D6.pdf.

14 Wen LMO, Millett N, Rissel C. Driving to work and overweight and obesity: findings from the 2003 New South Wales Health Survey, Australia. *International Journal of Obesity*, 2006, 30:782–786.

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American Journal of Preventive Medicine, 2004, 27:87–96.

Bell AC, Ge K, Popkin BM. The road to obesity or the path to prevention: motorized transportation and obesity in China. *Obesity Research*, 2002, 10:277–283.

The health effects caused by a lack of physical activity can lead to obesity. Three million schoolchildren in the EU are now classed as obese – a figure that is increasing annually by 85,000. Research shows that these young people are likely to develop chronic diseases before or during early adulthood.¹⁵

Transport measures may contribute to the health of urban citizens. For instance, the promotion of non-motorised transport, i.e. walking and cycling, would obviously contribute to the fight against obesity.

FACTS AND FIGURES¹⁶

- On the level of the EU-27, people travelled over 6,527 billion kilometres with engine powered modes in 2008, which corresponds to around 1,257,936 kilo tons of CO₂. According to the best estimations, approximately 90 billion zero-emission kilometres are cycled annually in the EU¹⁷. That is as much as people travel by tram and metro.
- Almost half of all car trips are shorter than five kilometres and as it takes time before the motor is warmed up, fuel consumption and emissions are higher during these trips. In 2005, such car trips alone generated over 14,000 kilo tons of CO₂ in Germany and it is expected that such travel will still produce 11,000 of kilo tons by 2020. The distance below five kilometres is generally regarded as the ideal distance for cycling; five kilometres take up to twenty minutes.
- In the European Union, many trips are short and most of them are made by car. This contributes to over 30 percent of adults being insufficiently active during a typical week, and to a prevalence of obesity that increased by 10–40 percent between the late 1980s and the late 1990s.

- Some 40 million people in the 115 largest cities in the European Union are exposed to air exceeding WHO air quality guideline values for at least one pollutant.
- Living near busy roads is associated with an increased risk of childhood leukaemia, according to French researchers.^{18/19} The studies found that children living within 500 metres of major roads were more likely to develop leukaemia than those who lived far from such roads. It is possible that high levels of traffic pollution from the roads are responsible for the higher rates of the illness.

Health costs

- In England, the total cost of inactivity was estimated in 2002 to be EUR 3–12 billion, including cost for health care, days of absence from work and loss of income due to premature death. This excludes the contribution of physical inactivity to overweight and obesity, the overall cost of which might run to EUR 9.6–10.8 billion per year. In Switzerland, the direct treatment costs of physical inactivity are estimated at EUR 1.1–1.5 billion per year.
- In Austria, the modal share of cycling is (2009) five percent, with an average length of trips of two kilometres. It is estimated that this level of cycling saves 412 lives every year through regular physical activity. The corresponding average savings for Austria from this reduced mortality are estimated to amount to EUR 405 million per year. Achieving a 10 percent cycling share would double the savings.
- On the basis of the studies above, physical inactivity can be estimated to cost a country about EUR 150–300 per citizen per year.

15 Nutrition & obesity prevention, Factsheet, Directorate-General Health & Consumer Protection, September 2006.

16 World Health Organization – Regional Office for Europe: Topics “Physical Activity” <http://www.euro.who.int/en/what-we-do/health-topics/disease-prevention/physical-activity> and “health and transport” <http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/Transport-and-health/facts-and-figures/air-pollution-and-climate-change2>.

17 Figures of the European Cycle federation.

18 Steffen C. et al. (2004): Acute childhood leukemia and environmental exposure to potential sources of benzene and other hydrocarbons; a case-control study. *Occup Environ Med.* 2004 Sep;61(9):773-8. PubMed PMID: 15317919; PubMed Central PMCID: PMC1763669.

19 Brosselin P. et al. (2009): Acute childhood leukaemia and residence next to petrol stations and automotive repair garages: the ESCALE study (SFCE). *Occup Environ Med.* 2009 Sep;66(9):598-606. Epub 2009 Feb 12. PubMed PMID: 19213757.



2.2 Congestion

How to create an economically viable and accessible city?

Traffic congestion

Traffic congestion, especially during peak hours, is one of the most visible problems that almost every European city has to deal with. Congestion occurs when the traffic volume at certain points in the mobility network requires more capacity than is available. Congestion occurs in areas of high population density, and is basically a matter of too many people wanting to be in the same place at the same time. It is therefore more likely to occur in dense urban areas where space is scarce. Congestion may occur on a daily basis, in peak hours when traffic demand is temporarily higher than infrastructure can facilitate, but it can also be incidental (road works, accidents).

Daily congestion

Daily congestion is a problem of uneven distribution of traffic volumes in time and space. In night hours, infrastructure is normally at overcapacity while peak hours show undercapacity. It is the (local, national) government's task to plan infrastructure effectively and efficiently. Infrastructure is effective when it fully facilitates mobility; it performs efficiently when its capacity is utilised up to the maximum. The denser an urban area, the more efficient the performance of the road network. Of course, the downside of this efficiency is that every now and then traffic will come to a standstill. Avoiding congestion at all times can be very costly, so brief periods of undercapacity may be acceptable.

However, not all congestion can be regarded as unavoidable. Approaches to do something about congestion can be found in the different causes of traffic jams:

- (Operational) Roadworks can cause incidental situations of congestion; good planning and co-ordination may reduce the problem.
- (Operational) Accidents can also cause incidental congestion; well co-ordinated emergency services may reduce the associated congestion problem.
- (Operational and tactical) An urban road network can be regarded as a complex system, comparable with a clockwork system. Without co-ordination of the different elements in the system, temporary imbalances in demand may occur, especially when capacity is used up to a high degree. ITS services such as traffic information provision and other forms of traffic demand management may deliver this necessary system co-ordination and reduce the congestion problem.
- (Tactical) Infrastructure supply does not meet traffic demand. This may be caused by rapid economic growth or population growth at a pace that infrastructure development cannot cope with. This situation is quite common, for infrastructure development normally takes much time (planning, decision making, building). Slow planning procedures are certainly not favourable in avoiding traffic congestion. Moreover, lack of sufficient infrastructure may also be caused by limited public financial means.
- (Tactical/strategic) Mobility choices of individuals may cause an unfavourable modal split and cause congestion. Lack of adequate public transport and infrastructure for slow modes (cycling, walking) makes people car-dependent, for lack of adequate alternatives. Obviously, reduction of car use will have an influence on congestion.

As there may be approaches available to solve or avoid congestion, something can be done against its negative effects. The serious effects of congestion are:

- Increased air pollution, due to temporary concentration of the emitted emissions, and associated health issues (see chapter 2.1)
- Fuel waste (inefficient energy consumption)²⁰ and extra greenhouse gas emissions
- Delays and time waste²¹ which result in economic losses comparing to around one percent of GDP, annually²²
- Stress for road users
- Design and implementation of demand management strategies based upon the concept of ‘controlled access’ (access restrictions)
- Implementation of parking management schemes within city centres and at the outskirts (park & ride schemes)
- Promotion of planning concepts focussing on mixed-use concepts fostering a combination of different use patterns such as shopping, working and housing which helps to avoid traffic and dependence on the car from the beginning

The cost of congestion (waste of time and fuel only) in Europe amounts to approximately EUR 115 billion every year, or about one percent of the GDP.²³ Added to this is the cost of pollution.

Policies that aim to avoid congestion and to ensure accessibility of vital economic urban activity zones must address the imbalances in time and space, in modes, and in urban planning. This may lead to higher efficiency and effectiveness of the available road space and transport systems. Measures include:

- Provision of additional **new high-quality public transport systems** offering alternative mobility options to individual car traffic
- Promotion and **improvement of existing public transport systems**
- Promotion of **alternative modes** such as Car-sharing, carpooling, cycling and walking as well as the related infrastructure (car-sharing stations, cycle paths, bus lanes, interchanges)
- Fostering **changes in the individual mobility** behaviour seeking to avoid unsustainable traffic in the first place or shifting this kind of traffic to more sustainable modes

The approach often used in the past, that is to counter congestion by measures on the supply side, for example by increasing infrastructure capacity – has proven not to be a permanent solution. Besides high investment costs, experiences have shown that interactions between supply and demand occur, and that additional road space may induce travel demand and thus in turn generate more traffic.

Following the attempt to use the road space more efficiently and in a more sustainable way, in CIVITAS, several measures have been implemented and analysed as integrated policy packages. In chapter 3 selected examples are highlighted; it will be shown in particular that implementation of an integrated package of restrictions on the one hand and increased opportunities on the other will multiply the impacts of individual projects.

20 Americans waste 1.9 billion gallons (7.2 billion litres) of gasoline annually in traffic on congested roads. Treasury Department, 2012: A new Economic Analysis of Infrastructure Investment. <http://www.treasury.gov/resource-center/economic-policy/Documents/20120323InfrastructureReport.pdf>

21 Although the economic crisis caused a drop in time loss in traffic, still drivers in Belgium wasted 55 hours in traffic in 2011 and drivers in The Netherlands, UK, Spain, France, Italy and Germany all at least 29 hours, as reported by INRIX, 2012. See <http://www.inrix.com/pressrelease.asp?ID=159>.

22 Appendix 5 of the Impact Assessment accompanying the White Paper “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system”, SEC(2011) 358.

23 Potočník J. (2008). Making the European transport industry “greener, safer and smarter” to boost our industrial competitiveness. Transport Research Arena Opening Ceremony, Ljubljana, 21 April 2008.



2.3 Safety and security

How to ensure a safe and secure urban environment and mobility

The concepts of safety and security both come up often in the field of transport, but their meanings are different and safety and security concerns arise in different contexts. Issues of safety often come into play when individuals are in control of a vehicle and the threat is of an accident and physical injury, whereas security usually refers to efforts to prevent an intrusion or attack (that may or may not include physical harm).

Both safety and security are closely related to mobility. The term **safety** in the mobility discipline merely relates to traffic safety: to accidents, or rather the prevention of accidents. Safety is usually measured in hard figures, in numbers of injured or fatalities. Obviously, infrastructure decisions and mode choices have an influence on traffic safety. Further, driving behaviour and road user behaviour play a role in traffic safety. Examples of safety measures could include lowering speed limits around schools, any other traffic calming measure, or creating separate cycling facilities to prevent collisions between bicycles and cars.

The term **(perceived) security** is mainly related to infrastructure: to places and public transport vehicles. It relates to the quality of these places, whether people feel secure being in these environments. More than to mobility, there is a direct link to the threat of crime, or even terrorism. However, many decisions taken in the mobility discipline have a direct influence on this feeling of security. For instance, good lighting at public transport stops in the evening is crucial for security – or the presence of attendants on public transport vehicles.

HOW TO ENSURE A SAFE URBAN ENVIRONMENT AND SAFE MOBILITY?

This question increasingly receives attention also by the CIVITAS Initiative since road safety is a major societal issue constituting large-scale problems: in 2009 alone, more than 35,000 people died on the roads of the European Union, and no fewer than 1.5 million people were injured. According to the 2009 WHO report, road traffic injuries are the leading cause of death in children and young adults aged 5 to 29 years in the whole of

Europe (incl. the former Soviet Union). In addition to the individual pain, road traffic injuries cause a substantial economic loss to society: up to 3 percent of the gross domestic product of any given country. Pedestrians, cyclists and users of motorised two-wheelers as the most vulnerable street users constitute 39 percent of all deaths in road crashes. They are also more likely to be more seriously injured.

Road safety is a highly complex issue and interlinked with areas such as economy, energy and politics. For example mortality rates for road traffic injuries differ widely between European countries, with rates being twice as high in low- and middle-income countries compared with high-income countries. Also mortality rates are up to four times lower in the Nordic countries than in other parts of Europe. Over the past few years trends have been falling in many high-income countries but not in low- and middle income countries.

Taking these developments into account, transport policies that integrate road safety with environmental and health concerns are an important part of a solution to this situation. However, only one third of the European countries (WHO region) are currently implementing national policies on both public transport and safe walking and cycling. Even fewer countries have introduced measures to better manage private car use.

HOW TO ENSURE A SECURE URBAN ENVIRONMENT AND SECURE PUBLIC TRANSPORT?

Urban transport systems move millions of passengers daily. They are by nature open environments as they are designed to move high volumes of passengers. Securing these transport systems is complicated due to their need to be easy to use and efficient in expediting the flow of commuters. Moreover, the different urban transport modes such as buses, trains, light rail and metros are increasingly integrated and linked up with other transport modes such as long-distance rail or aviation and with other activities such as shopping and sporting events. These various activities may be owned, operated and protected by a variety of public, private

and hybrid entities. This complexity inevitably raises additional security challenges, in terms of allocating responsibility for prevention and response to threats or incidents and coordinating the use of resources.

The CIVITAS Initiative has been responding to this situation and most measure packages within the CIVITAS programme have had a positive effect on traffic safety and security. Or to be more specific: the CIVITAS measures do not only improve air quality, but also lead to fewer people killed and injured, and safer urban mobility.



2.4 Participation

How to involve citizens and other stakeholders

The CIVITAS Initiative is promoting the implementation of innovative and sustainable mobility measures in European cities. In doing so, it aims to ultimately improve the living conditions and the quality of life of the people who live or work in these cities or who even just visit them.

Innovative measures and ideas oftentimes question established processes or habits and try to introduce something new and yet unknown. Immediate and wide-based support for this can rarely be assumed. In any measure implementation, individuals and often also organisations are somehow involved or affected. The views of these individuals and organisations – commonly referred to as stakeholders – can be and are quite often contrary.

CIVITAS has proven that whenever stakeholders, including citizens, were involved in the development and decision-making processes, fewer problems arose and the measures could be implemented more rapidly. And even if a measure may not have been implemented as originally foreseen, it was repeatedly demonstrated that an important benefit of a good involvement process was that the different stakeholder groups overcame their animosities towards each other and started to build trust between them.

It has furthermore been observed that citizens and other stakeholders are not necessarily opposed even to restrictive measures. Quite the contrary can be true. If they become part of the solution by adopting a pioneering role, then they can become the true drivers for a particular measure.

“Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody.”

Jane Jacobs, American-Canadian Writer and Activist, 1916–2006

WHO ARE THE “STAKEHOLDERS”?

A stakeholder is any individual, group or organisation affected by, or able to affect, a proposed project and its implementation.²⁴ This includes the general public, businesses, public authorities, decision-makers, local institutions, experts, special interest groups and many others. See the table below for a comprehensive list of potential stakeholders.

The CIVITAS Initiative proved the importance of stakeholder and citizen involvement. Many of its implemented measures had specific participatory elements to obtain legitimisation as well as wide and public support for innovative urban transport improvements. CIVITAS has also shown that each policy or individual mobility measure requires its own level of stakeholder involvement.

Government/ Authorities	Businesses/Operators	Communities/ Local Neighbourhoods	Others
European Union	National business associations	National environmental NGOs	Research institutions
Ministry of Transport	Major employers	Motorist associations	Universities
Other national ministries	Private financiers	Trade unions	Training institutions
Regional government	International/national businesses	Media	Experts from other cities
Local authorities	Regional/local businesses	Local authority forums	Foundations
Neighbouring cities	Local business associations	Local community organisations	-
Local transport authority	Small businesses	Local interest groups	-
Traffic police	Retailers	Cycle/walking groups	-
Other local transport bodies	Utility services (e. g. electricity, telecommunications)	Public transport user groups	-
Other local authority bodies	Engineers/contractors	Transport users	-
Politicians	Transport operators/providers	Citizens	-
Other decision makers	Transport consultants	Visitors	-
Partnership bodies	Car-sharing companies	Citizens in neighbouring cities	-
Project managers	Bicycle rental operators	Disabled people	-
Professional staff	Other mobility providers	Landowners	-
Emergency services	-	Transport staff	-
Health & safety executives	-	Parents/children	-
-	-	Older people	-

Table 2: Typical stakeholder groups, broken down into four categories (GUIDEMAPS 2004)

24 GUIDEMAPS, 2004. Successful transport decision-making. A project management and stakeholder engagement handbook. Volume I: Concepts and Tools.

FORMS OF STAKEHOLDER INVOLVEMENT

Stakeholders can take part in the decision-making process during a particular stage or during all stages of the planning and implementation process or even the evaluation of a measure. The actual involvement of stakeholders in a given process can vary from merely providing information via consultation to actual citizen control, i.e. co-decision-making. Not surprisingly, the list of involvement tools and techniques is also a long one. Depending on the envisaged level of stakeholder involvement, but also depending on the type of meas-

ure and the types of stakeholders, various tools and techniques could be considered. The Internet, newsletters, brochures, fact sheets, etc. are typical means of information provision. Tools and techniques for the gathering of information from stakeholders include questionnaires (surveys) and personal interviews as well as interactive engagement tools such as stakeholder conferences, information markets, thematic workshops, focus group meetings – all of which can be combined with site visits or study tours.

IDENTIFICATION OF THE “RIGHT” STAKEHOLDERS

Out of the long list of potential stakeholder groups, a specific list should be established for each local project. A few basic rules should be considered.

Stakeholders with political responsibilities will be involved to different extents:

1. Depending on their political position, they may just require to be provided with information. This information will allow them to assure their “passive” participation (for example, a favourable vote within the city council).
2. Politicians can also be “actively” involved. This is relevant when the respective politicians are responsible for the specific topic (e.g. road safety) related to the local project (e.g. new cycle infrastructure). In those cases, it is recommended to provide opportunities for comments and suggestions.
3. Politicians’ involvement is relevant when the active support of the politician is required to guarantee the creation of basic conditions. For example in case of a restrictive parking policy, this politician plays a crucial role when other stakeholders must be convinced, such as shop owners and citizens.

Other public administrations are often stakeholders. In most cases, part of the local measure touches their fields of competence and the project manager is often legally obliged to consult them. Their respective competences can also help to increase the impact of the local measure. For example, in the case of new urban public infrastructure the involvement of the regional authorities responsible for the inter-urban buses can help to increase the use of the respective infrastructure.

Private companies or private citizens may be directly affected by the locally implemented measure. Associations represent citizens and companies for which the project will change conditions, for better or worse. Associations may also be lobbying for a specific related cause. For example in case of a new cycle policy, the bicycle associations are involved in general. Their involvement must be carefully managed, as their interests are often touching only part of the local project objectives.

A final group of stakeholders are the local citizens. Their involvement is discussed in the following paragraph.

CITIZENS' ENGAGEMENT

Approaches to public involvement differ in individual cities or countries according to the principles, standards and the level of participatory democracy established. The most important factor in determining the intensity of public involvement is in general the nature of the individual urban mobility improvement and the relevance of informing and public involvement for its success and effectiveness.

As regards the intensity of communication and impact on decision-making, several levels of participation can be distinguished:

1. Informing/educating/raising awareness – lowest level of participation, one-way, top down
2. Consulting/gathering information/discussing – one step up from informing, citizens are consulted, their views are taken into account, but not necessarily considered and acted upon
3. Deciding together/engaging – those affected by an issue are invited to learn about the issue, discuss and become part of the final decision-making process (clear boundaries are set on the level of influence to avoid unrealistic expectations)
4. Acting together/partnership – shared decision-making process and shared responsibility for implementing decisions and perhaps even evaluating the outcome

For very technical measures, such as traffic management support systems, a lower level of informing is considered sufficient. However for wider transport policy related initiatives, like the development of a new parking strategy, a higher level of involvement is required, especially from the local citizens. The development of a Sustainable Urban Mobility Plan (SUMP) needs the engagement of all relevant stakeholders and citizens to ensure transparency and increase legitimisation and acceptance of decisions and the SUMP itself.

Local projects in which restrictive actions are taken might better involve a more formal hearing of opinions, while the decisions are made on a socio-economic cost-benefit analysis of the different options. This is for example the case in measures that introduce “paid parking”. The evaluation in respect to public participation and awareness confirms that a high level of user consultation is in general a prerequisite for proper success.

ADVANTAGES

CIVITAS has proven that it is hard, but necessary to properly involve stakeholders. In general terms, the involvement of stakeholders in the measure planning and implementation process offers the opportunity to more clearly identify problems. It has been observed within CIVITAS that stakeholders turned scepticism (or even mistrust) about decision-makers and other stakehold-

ers into trust. Hence, stakeholder participation can be viewed as a means to develop a common ground for actions and for a durable cooperation between the city administration and other stakeholders. In this sense, the legitimacy of the planning (and implementation) process is ensured.

LIMITATIONS AND CHALLENGES

The involvement of a range of stakeholders in the decision-making process may prove counterproductive under certain circumstances, for example in cases where decisions have already been made and are no longer negotiable. In such cases, providing sufficient information may be more appropriate.

Depending on the specific city or measure contexts, organising stakeholder events may be a big challenge. For example, it may not be advisable to bring together stakeholders with very opposing opinions if there is a danger of creating a battleground rather than a discussion platform. A careful analysis of the stakeholders and their respective opinions may help to avoid such friction.

The selection of the “right” stakeholders is another challenge, i.e. to involve those citizens who actually have a concrete “stake” in the specific issue. The stakeholder identification process is crucial in this regard. Here, it is a challenge to involve those stakeholders that are perhaps less articulate (perhaps being somewhat shy, but also in cases of language deficits) or less involved in community affairs in order to offer all stakeholders the possibility to adequately voice their opinions. However, on the basis of a thorough stakeholder analysis and accurate preparation and planning of the involvement process, these challenges can be overcome.



2.5 Strategic Planning

How to achieve policy goals while ensuring that mobility needs of society and its citizens are met

“Mobility is vital for the internal market and for the quality of life of citizens as they enjoy their freedom to travel. Transport enables economic growth and job creation: it must be sustainable in the light of the new challenges we face.”²⁵

Health, quality of life and prosperity are all related to mobility, not just in terms of the negative effects described in the paragraphs 2.1 to 2.4. Mobility is also prerequisite for the economy and for the basic freedom of citizens. Also for cities, mobility is important to be an attractive place for people to live, work or visit. Other adjectives for a desired city come to mind, such as liveable, competitive, sustainable, accessible, (child-) friendly. They all describe positive features, people and businesses are looking for in such a city.

It requires thoughtful planning to improve a city in the desired way and the key question is how to strategically, i.e. with a long-term perspective of years and decades to come, plan for the mobility needs of cities and their citizens and other stakeholders.

The urban policy context is complex with mobility being closely related to other important challenges, such as climate change, availability of scarce resources & the dependency on resource “suppliers”, urban growth, migration (to cities), environmental quality, economic growth, the financial instabilities (financial crisis), public space development and social inclusion. Not only the European Commission, but also national policies and, indeed, many European cities have formulated their own policies regarding mobility and sustainability.

In general, we see policy objectives such as the following:

- A sharp reduction in CO₂ emissions to zero in transport, to be reached between 2040 and 2050
- A sharp reduction in air pollutant emissions
- Moving close to zero fatalities in road transport in, depending on the present situation, 20 to 40 years
- Drastically reducing congestion in traffic
- Enhancing urban quality of life in general

In general, there is broad consensus among national and urban governments to follow the following universal approaches to reach those goals (although there is of course political disagreement on details):

- Technology:
 - A more sustainable vehicle fleet: in about 20 years time the use of ‘conventionally-fuelled’ cars in cities must at least be reduced to 50 %, in about 40 years to zero. CO₂ emissions must be brought to zero in about the same period.
 - Optimising the performance of multimodal logistic chains, also by making greater use of more energy-efficient modes.
 - New technologies for traffic management will be key to lower emissions, and to better performance of road networks and thus reduce congestion (and

²⁵ European Commission, 2011: WHITE PAPER. Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. COM(2011) 144 final, p.3.

associated emissions). Information systems and market-based incentives (including application of user pays and polluter pays principles) may be applied.

- Investing in infrastructure for slower modes, in collective transport, in integrated mobility concepts. There is the chance to reduce the dependence on the car by integrated mobility concepts. The innovative principles of ‘use it – don’t own it’ show alternatives to private car-ownership. With fewer cars we can reduce the infrastructural costs and can make our cities more efficient and resilient.
- Behaviour: increased flexibility in working hours, modal shift towards more sustainable transport modes (public transport, bicycle, integrated concepts), less car-dependent lifestyles.
- Urban planning, facilitating infrastructure investments, technological innovation and behavioural measures. It seems clear that traditional urban planning approaches are no longer sufficient to address today’s policy challenges. The CIVITAS Initia-

tive is promoting an integrated planning approach which is also advocated by the European Union in the Action Plan on Urban Mobility and the Transport White Paper: Sustainable Urban Mobility Plans – SUMP.

To summarise, the great challenge is to get this all done: the transition from the present (unsustainable) car-based urban mobility to the future, sustainable, CO₂ neutral, more efficient and safer mobility, while ensuring mobility needs of society and its citizens.

“We cannot solve our problems with the same thinking we used when we created them.”

Albert Einstein (1879–1955)

SUMP Policy Background

In the Action Plan on Urban Mobility published in 2009, the European Commission proposed to accelerate the take-up of Sustainable Urban Mobility Plans in Europe by providing guidance material, promoting best practice exchange, identifying benchmarks, and supporting educational activities for urban mobility professionals. EU transport ministers are supporting the development of Sustainable Urban Mobility Plans. The conclusions on the Action Plan on Urban Mobility of 24 June 2010 state that the Council of the European Union “supports the development of Sustainable Urban Mobility Plans for cities and metropolitan areas [...] and encourages the development of incentives, such as expert assistance and information exchange, for the creation of such plans”.

In March 2011, the European Commission released its Transport White Paper “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system” (COM(2011)0144 final). The Transport White Paper proposes to examine the possibility of making Urban Mobility Plans a mandatory approach for cities of a certain size, according to national standards based on EU Guidelines. It also suggests to explore linking regional development and cohesion funds to cities and regions that have submitted a current, independently validated Urban Mobility Performance and Sustainability Audit certificate. Finally, the Transport White Paper proposes to examine the possibility of a European support framework for a progressive implementation of Urban Mobility Plans in European cities.

For more information on the SUMP Guidelines mentioned in the Transport White Paper, refer to chapter 3.8 on Sustainable Urban Mobility Plans.

The main differences between traditional transport planning and sustainable urban mobility planning are illustrated in the table below.

Traditional Transport Planning	Sustainable Urban Mobility Planning
Focus on traffic	Focus on people
Primary objective: Traffic flow capacity and speed	Primary objectives: Accessibility and quality of life
Political mandates and planning by experts	Important stakeholders are actively involved
Domain of transport engineers	Interdisciplinary planning
Infrastructure as the main topic	Combination of infrastructure, market mechanisms, information, and promotion
Investment-guided planning	Cost efficient achievement of goals
Focus on large and costly projects	Gradual efficiency increase and optimisation
Limited impact assessment	Intensive evaluation of impacts and shaping of a learning process
“If you plan cities for cars and traffic, you get cars and traffic.”	“If you plan for people and places, you get people and places.” <small>Fred Kent, Project for Public Spaces</small>

Table 3: Differences between traditional transport planning and sustainable urban mobility planning

A Sustainable Urban Mobility Plan is a strategic plan that builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles to satisfy the mobility needs of people today and tomorrow for a better quality of life in cities and their surroundings.

A Sustainable Urban Mobility Plan (SUMP) is following a participatory approach. It is focussing on people rather than cars or traffic. It means planning for people. And it means planning with people, as the involvement of stakeholders, including citizens, in planning, decision-making and evaluation processes is generally encouraged.

Another SUMP characteristic is its integrated approach. Integration can have various aspects, such as the geographic integration of a city with its surrounding areas or the institutional integration of different sectors (transport, health, urban development, land use planning, etc.), institutions or administrative levels. The integrated approach of SUMP also implies an interdisciplinary planning culture which is strikingly different from the engineer-driven traditional transport approach.

Infrastructure – often expressed in building new roads – has been the main focus of traditional transport planning. The SUMP concept obviously also includes infrastructural measures, but intentionally questions them (“do we really need to build this?”). SUMP aims to achieve a good combination of infrastructure, market mechanisms, information, and promotion.

Traditional transport planning is often guided by large investments into large projects while SUMP focuses on less costly (soft) measures, cost efficiency and gradual efficiency improvements.

SUMP is emphasising the importance of evaluation and the achievement of tangible targets. It thereby stands in contrast to traditional transport planning where the assessment of impacts usually plays a minor role.

SUMP is a planning concept able to achieve benefits for cities in many respects, including an improved image of a city, a better quality of life for its citizens, improved mobility and accessibility, environmental and health benefits, the potential to reach and involve people, citizen and stakeholder supported decisions, an effective fulfilment of legal obligations, increased competitiveness and better access to funding, an opportunity to create a new strategic vision for a city, and improved institutional cooperation. The benefits are discussed in more detail in chapter 3.8.

Good examples of SUMP in Europe have been identified.²⁶ They include Gent in Belgium (see case study below), Lille in France, Freiburg in Germany, Bologna and Reggio Emilia in Italy, Groningen in the Netherlands, Trondheim in Norway as well as Nottingham and York in the UK.

Some countries such as the United Kingdom (Local Transport Plans in England and Wales) and France (Plans de Déplacements Urbains) which have an established transport policy framework combined with national guidance on urban mobility planning are considered forerunners in sustainable urban mobility planning. In other countries, SUMP is a new or non-existing idea – most notably in the New Member States of Central and Eastern Europe. The European Commission is promoting SUMP through awareness raising events and technical training seminars all across Europe (www.mobilityplans.eu). In addition, the CIVITAS Initiative has established a complementary thematic network group on integrated planning which is promoting the SUMP concept.

26 Rupprecht Consult and Edinburgh Napier University, 2011: The State-of-the-Art of Sustainable Urban Mobility Plans in Europe.



3. CIVITAS Solution

Within the ten years of its existence, the CIVITAS Initiative supported the implementation of more than 730 innovative urban mobility measures in 59 European cities.

These 730 individual measures can be allocated to the solution groups (CIVITAS thematic groups) “clean fuels and vehicles”, “urban freight”, “demand management strategies”, “mobility management”, “collective passenger transport”, “transport telematics”, “less car-dependent mobility options”, and “Sustainable Urban Mobility Plans”. As depicted in the table on the next page, the CIVITAS long-term evaluation revealed to what extent these solutions are connected to the urban mobility challenges (described in chapter 2).

The unique strength of the CIVITAS Initiative goes well beyond this simplified illustration of the connection between urban mobility challenges and solutions. CIVITAS supports cities in the implementation of integrated packages of measures, i.e. the implementation of measures in a city which are complementary to each other. For example, the introduction of clean vehicles and fuels is well supported by (1) access restrictions for polluting vehicles and (2) the promotion of alternative transport modes such as public transport, cycling and walking.

This chapter offers a variety of examples of measures and integrated packages of measures which were successfully implemented in CIVITAS cities across Europe.



Challenges	How to create a healthy environment for citizens?	How to create an economically viable and accessible city?	How to ensure a safe and secure urban environment and mobility?	How to involve citizens and other stakeholders?	How to achieve policy goals while ensuring that mobility needs of society and its citizens are met?	How to achieve European climate reduction goals?
	health challenge	congestion challenge	safety & security challenge	participation challenge	strategic planning challenge	global climate change challenge
Clean fuels and vehicles	very strong connection	weak / indirect connection	weak / indirect connection	weak / indirect connection	moderate connection	strong connection
Urban freight	very strong connection	strong connection	strong connection	strong connection	strong connection	moderate connection
Demand management strategies	very strong connection	very strong connection	moderate connection	very strong connection	strong connection	strong connection
Mobility management	moderate connection	very strong connection	weak / indirect connection	very strong connection	strong connection	strong connection
Collective passenger transport	moderate connection	strong connection	very strong connection	strong connection	strong connection	moderate connection
Transport telematics	weak / indirect connection	very strong connection	strong connection	weak / indirect connection	weak / indirect connection	moderate connection
Less car-dependent mobility options	strong connection	strong connection	very strong connection	very strong connection	strong connection	strong connection
Sustainable Urban Mobility Plans	very strong connection	very strong connection	very strong connection	very strong connection	very strong connection	moderate connection

very strong connection
 strong connection
 moderate connection
 weak / indirect connection

Table 4: Connections between the solution groups and the urban mobility challenges



3.1 Clean fuels and vehicles

WHAT IS THE SOLUTION?

Cleaner fuels and vehicles decrease local air pollution and greenhouse gas (GHG) emissions, both of which help to improve the quality of life for citizens. CIVITAS cities seek to explore innovations in these fields and share best practice. Many cities try to stimulate the spread of clean and energy-efficient public and private vehicles for passenger and freight transport. At present there are several options to replace fossil run vehicles and/or fuels with alternative energy sources, such as:

- Usage of biofuels (biodiesel, vegetable oil, biogas, bioethanol)
- Usage of alternative fossil fuels (natural gas like CNG, LNG and propane LPG)
- Introduction of electric propulsion (full electric vehicles, hybrid electric vehicles, fuel cell technology (hydrogen), trolley buses)

BIOFUELS

Biofuels can – if properly grown and processed – reduce GHG emissions substantially, and biofuels like ethanol and biogas also significantly reduce local emissions. There is, however, a worry that a strong demand for biofuels and a rapid development of the biofuel market could result in unsustainable production methods being used. To this end, the EU has launched sustainability criteria and introduced a minimum standard for CO₂ reductions – presently 35 percent compared to fossil fuels, a figure that will be increased to 50 percent in 2017 and later even 60 percent.

There is still a concern that biofuel production will compete with other land use and that the final result of this will either be competition with food, deforestation or use of carbon-rich land which will increase GHG emissions. Research is still very uncertain of the magnitude – and even the direction of such an effect. While higher prices for agricultural land may provide incentives for deforestation, biofuel production also generates by-products such as feed and electricity which reduce GHG emissions. The net effect of this is uncertain and varies between production methods and fuels. Different interest groups use this ambiguity to push their special interests.

There is currently an ongoing debate on whether to introduce a so-called indirect land use penalty on all biofuels. EU policy is, however, not consistent – as at the same time they propose to make it compulsory to set aside a minimum of seven percent of all agricultural land in the EU where no production is allowed – due to the current over-production of agricultural commodities. At the local level, this debate gives a troubling image of biofuels to the general public.

The so-called second generation of biofuels is mainly produced from food waste, agricultural waste or forest products. Biogas, pine oil (hydrogenated vegetable oil) and waste ethanol are examples of such fuels which are, however, still only available in rather small quantities. There is big hope for the gasification of biomass and possibly algae oil, but these fuels are still far from being commercially available.

The use of biofuels could stimulate the creation of a biomass industry helping to create stronger agricultural markets, develop new markets overall and subsequently generate new jobs. This is of particular interest to European cities and regions with a local potential to produce biofuels. In particular for tropical and subtropical countries biofuel production can provide a new cash-crop which is more profitable than the traditional tobacco and cotton industry. This may lead to a reduction of oil dependency, trigger investment money for developing the economy and in most cases also produce electricity as a by-product.

Within CIVITAS, most biofuels have been tested in both light duty and heavy duty applications, with good results.

ALTERNATIVE FOSSIL FUELS

(natural gas like CNG, LNG and propane LPG)

There are also a few alternative fossil fuels on the market, namely natural gas (CNG) or liquefied petroleum gas (LPG). Though reducing local emissions and to some extent also GHG emissions, these alternative fuels are not considered to be a long-term solution as they are fossil and also finite.

The use of CNG buses could also lead to a strategic diversification of a sustainable fuel supply. If there is local production of biogas as in Lille (France) and Stockholm (Sweden), or if the biogas can be injected into the general gas network, this renewable fuel can replace fossil CNG. Lille and Stockholm have continued using and promoting biogas beyond their involvement as CIVITAS demonstration cities between 2002 and 2006.

ELECTRIC PROPULSION

(full electric vehicles, hybrid electric vehicles, fuel cell technology (hydrogen), trolley buses)

In an electric vehicle (EV), a battery or other energy storage device is used to store the electricity that powers the motor. EV batteries must be replenished by plugging in the vehicle to a power source. Some electric vehicles have on-board chargers; others plug into a charger located outside the vehicle. Furthermore, there

are currently four models of plug-in hybrid vehicles (PHEV) available on the European market. All types, however, use electricity that comes from the power grid. Although electricity production may contribute to air pollution (if e.g. made from coal), EV's are legally considered zero-emission vehicles because their motors do not produce local exhaust or emissions.

Hybrid cars use two distinct power sources to power or propel the vehicle. When the term hybrid vehicle is used, it most often refers to a hybrid electric vehicle (HEV). Hybrid electric vehicles are powered by an internal combustion engine as well as by an electric motor. The engines can run in parallel or separately. The electric engine runs alone when reversing or accelerating in stop-and-go traffic situations. The energy is taken from a battery, which is charged by the electric engine every time the vehicle brakes. Thus, the electric engine acts as a generator. At a high and consistent speed, only the combustion engine runs. When starting, both engines run and thus a better acceleration can be achieved. Every time the vehicle stops, the combustion engine turns off. Once the brake is released, the electric engine turns on the combustion engine again.

The main savings are made through using a smaller combustion engine than otherwise would be needed, keeping this engine close to its optimum efficiency window and using the battery and the electric engine to handle extra torque needed or store surplus energy from the combustion energy together with storing the energy generated in braking. The result is an efficiency improvement of up to 30 percent – which means better mileage and reduced emissions. The hybrid system also runs in heavy vehicles such as buses, but at the moment only Volvo sells hybrid buses on a large scale, having sold about 650 buses to date.

Fuel cell technology is still in an early stage of development. Major research and development efforts are aimed at making hydrogen vehicles practical for widespread use. This primarily includes the storage of hydrogen. It requires a large and heavy storage tank. An additional constraint is that hydrogen is highly inflammable.

Trolley buses are an energy efficient and local zero-emission transport mode. They are 100 percent environmentally friendly when using energy from re-

renewable sources. The initial start-up investment in infrastructure is costly, but due to lower energy cost and the particularly long life cycle of trolley buses, they can be operated economically. Trolley buses are more flexible nowadays because of new energy storage technologies and they can carry on even when the “booms” (poles on the roof of a trolley bus) are not connected to the electricity network. Finally, trolleybuses can reach similar passenger capacity, compared to trams, at much lower construction costs (up to 80 percent less).

Several CIVITAS cities have experimented with the latest biofuel technologies, alternative fossil fuels, and the latest generation of electric vehicles and uncovered the advantages and constraints of using clean vehicles and alternative fuels in the local urban context.

A typical measure for municipalities is to start with vehicles which they own and/or can influence directly, such as public transport buses or waste collection trucks. In most CIVITAS cities, experiments aimed at greening public transport buses and other publicly owned vehicles.

Both the vehicle market and the fuel market are global which means that there is strong resistance to radical shift. However, by focussing on vehicles which they own and/or can influence directly and spreading the example both via their transport procurement and by influencing other large transport buyers, municipalities can, initiate such a change.²⁷ Within CIVITAS there were in total 62 local initiatives introducing clean vehicles and or fuel actions. Evaluation data is quite scattered, but it can be seen that:

- Buses and waste collecting vehicles are suitable sub-markets to start with as cities often have direct influence over these and they often fuel up at a single geographical spot – reducing the need for vast infrastructure development. These vehicles are also responsible for a high proportion of local emissions and changing to cleaner technology will improve air quality with rather small efforts.
- Only a few cities have tried to influence the car market. Favourable national legislation and national incentives together with several active cities and local incentives seem to be success factors in starting a market development of clean cars.

CIVITAS cities where clean fuel/clean vehicle solutions have been implemented

Aalborg, Barcelona, Bath, Berlin, Bologna, Bremen, Brescia, Brighton & Hove, Bristol, Brno, Bucharest, Burgos, Coimbra, Cork, Craiova, Debrecen, Donostia-San Sebastián, Funchal, Gdansk, Genova, Gent, Gorna Oryahovitsa, Gothenburg, Graz, Iasi, Kaunas, Krakow, La Rochelle, Lille, Ljubljana, Malmö, Monza, Nantes, Norwich, Perugia, Ploiesti, Porto, Potenza, Preston, Rome, Rotterdam, Skopje, Stockholm, Suceava, Szczecinek, Tallinn, Toulouse, Venice, Vitoria-Gasteiz, Winchester, Zagreb

27 See e.g. Osterlin, C., Biogasplanning in Stockholm – A Systems Approach. To be published in 2012.

CASE STUDY

Clean fuels and vehicles in Stockholm, Sweden

Stockholm – the capital of Sweden – has a population of 870,000. It is located on 14 islands on Sweden's southeast coast. The public transport buses and private fossil-fuelled vehicle fleet is being replaced with clean vehicles that run on biogas and ethanol. Stockholm has the largest number of clean vehicles per city in Europe: As of 2012, Stockholm is fully serviced by clean buses – 800 bioethanol and 270 biogas buses are running on a daily schedule. In addition, there are over 160,000 clean vehicles operating in Stockholm, including 1,400 clean taxis and approximately 100 clean police vehicles – the majority of them running on biogas and bioethanol – and over 60 biogas-fuelled waste collection vehicles. Stockholm has a comprehensive infrastructure for alternative fuels, in accordance with the size of the growing clean vehicle fleet. Local biogas production facilities supply a portion of the alternative fuels.

The expansion of the clean fuel fleet is fostered along three axes:

1. Dedicated promotion of clean fuels
2. Increase in the number of clean vehicles in the public fleets
3. Improving the filling and maintenance infrastructure for clean vehicles

The use of biogas took off starting in 2004 when the public transport company introduced its first 21 biogas buses. As a response to the increased demand, biogas was purchased from the nearby cities of Linköping and Västerås. The number of filling stations increased from four in 2004 to eleven in 2007. The gas is transported by lorries to the gas stations, as there is no grid. Within the Biogasmax project another 105 vehicles were tested.

Four new production plants have started operation (Himmerfjärdsverket, Käppala, Loudden and Scandinavian Biogas), and several new public biogas fuelling stations have opened.



A local grid connecting the main biogas production plants with bus depots and filling stations was completed in 2011. Stockholm taxis adopted a clean vehicle policy where biomethane is the favoured fuel. In 2009 they ordered 350 gas fuelled cars.

By 2006, the local measures had already proved that the introduction of biogas led to reduced emissions of fossil carbon dioxide by 86 percent and emissions of nitrogen oxides, small particulates and carbon monoxide by 50 percent, although hydrocarbon emissions were 20 times higher.

Maintenance costs for gas-fuelled vehicles are in general higher than for diesel vehicles. In order to give an indication: maintenance costs rose from EUR 0.033 per km to EUR 0.045 per km for the biogas petrol engines. Motor oil consumption was twice as high for biogas vehicles compared to diesel vehicles, and fuel consumption was 60 percent higher, yet prices are in general set much lower for gas. Noise levels fell by 50 percent. More than 90 percent of drivers would recommend driving biogas heavy vehicles to others.

As a result of continuing efforts beyond the CIVITAS TRENDSETTER project which ran from 2002 to 2006, 130 biogas buses and 500 ethanol buses had been put into operation by Stockholm Transport by 2010.

CASE STUDY

Clean fuels and vehicles in Bremen, Germany

A CNG promotion campaign was implemented in Bremen in 2002. Prior to the launch of the campaign, Bremen had two CNG fuelling stations. As an incentive to switch to CNG and to make up for the lack of fuelling stations, the energy provider swb and the energy agency Bremer Energie-Konsens offered an incentive of EUR 1,000 per new CNG private car, and EUR 2,500 per company car. Commercial users received a higher incentive because they usually have higher inner-city mileage and tend to use conventional diesel cars, meaning their emission reductions would be greater.

A public relations campaign with special events increased awareness of CNG. All partners along the clean vehicle supply chain – car manufacturers, car dealers, energy providers, energy agencies, motor clubs and local politicians – were part of a network supporting the policy. The campaign target was to introduce 250 new CNG vehicles within the project period (2002–2006).

By the end of the project period about 70 percent of approved applicants had purchased a CNG car

(a total of 160). Some buyers had to wait to purchase their vehicle as several manufacturers were not able to deliver on time. Others decided to buy a different type of car.

Monitoring of the promotional work showed that after 2.5 years, more than 25 percent of Bremen citizens knew about the campaign as well as the environmental and economic advantages of CNG. Although they were advertised much earlier, the planned purchase of four CNG freight vehicles had to be postponed because they were not available. 7-ton CNG trucks could not be delivered by the motor industry until February 2010. Also in 2010, there were four CNG fuelling stations and about 600 CNG cars in Bremen.

The fleet of CNG vehicles in Bremen achieved a 23 percent reduction in CO₂ emissions (compared to petrol), a 77 percent reduction in NO_x emissions (compared to diesel) and a 99 percent reduction in PM₁₀ emissions (compared to diesel).



BARRIERS

The use of “clean” vehicles and alternative fuels is often one of the main themes for developing a more sustainable urban mobility system. A higher share of clean vehicles has helped to achieve the EU’s Kyoto objective of a greenhouse gas (GHG) emission reduction of 8 percent by 2012. Today’s driving forces are the European 20-20-20 climate and energy targets²⁸ and the 2011 Transport White Paper, together with ambitious cities like Copenhagen and Stockholm, that are spurring each other to set dates for being fossil free.

Public authorities can lead by example and help develop markets by cleaning their own fleets. In general the first are (public transport) buses and garbage trucks. A second group of vehicles are taxis (e.g. Stockholm and Amsterdam). The challenge is to persuade other fleet owners and private vehicle owners to follow these good examples. This can be done by information campaigns and bringing together companies who are willing to do something extra for society.

Major challenges are:

- High purchase costs. New technologies tend to be more expensive. Operating costs can be lower, but purchasing costs are in general higher than for conventional technologies. Special financial arrangements can overcome these barriers;
- Fuel (or charging) infrastructure. Alternative fuels or electric vehicles require a different energy distribution structure. Public authorities can, and sometimes must, play an important role in creating a basic level of service;
- Lack of a market for second hand vehicles. Determining the residual value of cleaner vehicles can be difficult. Since they do not exist yet, there is no market to determine the market price. Public authorities can help by guaranteeing a certain residual value for used vehicles.

²⁸ The 20-20-20 targets aim for I) a reduction in EU greenhouse gas emissions of at least 20 percent below 1990 levels, II) 20 percent of EU energy consumption to come from renewable resources, and III) a 20 percent reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency, by the year 2020.



3.2 Urban freight

WHAT IS THE SOLUTION?

Urban freight and its associated transport and logistics operations – often referred to as ‘city logistics’ – are concerned with delivering and collecting goods in town and city centres; as such, they are tackling traffic flows/congestion, the competitiveness of shops and the quality of life for the citizens, and last but not least the image of the city. Often many of the related processes and activities, or parts of them, are undertaken outside urban areas but they still have impacts on urban operations.

Therefore, city logistics cannot be viewed and studied in isolation but rather in the context of the entirety of supply chains that typically cross the geographical boundaries of urban areas and in relation to the economic and societal environment of a city.

The growing significance of city logistics is associated with increased population and sustained economic growth in urban areas. Goods transport in cities represents from 10 to 18 percent of road traffic. For some aspects, the importance of freight transport is even much higher. In fact, the transportation of goods accounts for 40 percent of air pollution and noise emissions. And the share of freight transport in congestion cost is also higher than 20 percent. The importance of urban freight transport can also be shown by the cost distribution within the freight transport chain: The share of pick-up and delivery operations, which often take place in urban areas, on the total door-to-door cost is about 40 percent in combined transport.

Less (or more efficient) and cleaner city logistics are therefore beneficial for the environment and the (urban) economy – in case where they are generating tangible results for the private sector involved. Improved deliv-

ery solutions able to maintain the vitality of city centres and their shops are also requested where the given infrastructure is incapable of handling increased freight volumes (historical city centres), where (re)construction sites are hindering truck and van movements or where large shopping centres or harbour areas are concentrating huge amounts of incoming and outgoing goods.

In accordance with European transport policies, city logistics can be improved by three different types of interventions:

1. **Stimulating the usage of more environmentally sustainable transport vehicles.** Key areas for consideration relate to the most appropriate size of vehicles and the type of fuel they require. There is a problematic trade-off between the size and capacity of the vehicles and the number of vehicles that will be required to fulfil logistical needs. The type of fuel is important not only for fuel consumption and hence emissions of pollutants and greenhouse gases, but also urban noise levels are affected by the handling systems used as well as by the operation of the engine.
2. **Implementing (new) distribution systems (the actual city logistics).** Perhaps the greatest potential for environmental improvement in city logistics relates to the improved consolidation of the many small loads prior to delivery into the urban centre. These new city logistics systems can lead to less freight transport movements within the (inner) city (i.e. less traffic congestion), and when special environmentally friendly vehicles are used for the delivery of goods the impact can be even higher.

3. Using information and communication technologies as supporting or facilitating tools. The logistics industry has already embraced a wide range of technologies and applications and reaped major efficiency gains as a result. This is almost certainly an area with great ‘win-win’ potential, i.e. where efficiency gains go hand in hand with environmental benefit through reduced travel distances, fewer vehicle movements, better matching of vehicles to work and improved levels of load consolidation.

The complexity of city logistics requires close and trustful co-operation between trade, commerce and industry, freight companies and local authorities. Good examples are freight consolidation schemes, where wholesalers and retailers have changed their delivery patterns. Instead of delivering goods to individual retailers, various wholesalers deliver their goods to an out-of-town logistic centre, from where goods are loaded into a single truck and delivered to the retailers. It saves a lot of truck movements, but also delivery movements for the retailers. It requires the organisation of all stakeholders (including citizens’ representatives), and initial funding from a third party (e.g. the local authority).

CIVITAS cities where urban freight solutions have been implemented

Most attention is given to more environmental vehicles, for instance by implementing Low Emission Zones (e.g. Berlin, Bremen, Gothenburg, Malmö, Rotterdam), and different measures with new ways to organise the urban freight transport flows (e.g. Bristol, La Rochelle, Usti nad Labem, Bologna, Bath, Krakow, Graz, Berlin, Utrecht), sometimes in combination with ITS (e.g. Norwich, Preston, Malmö).

BENEFITS

- Freight transport accounts for a large share of urban traffic (for example in the Netherlands²⁹ on average 6 percent and in France³⁰ between 9 and 15 percent), but causes a much larger share of air pollution and other environmental damage. The objective of interventions to overcome current issues of freight transport in an urban context is a more efficient distribution of goods, thereby reducing the freight vehicle kilometres (reducing emissions), and thus increasing – at the same time – air quality, traffic safety, accessibility and general attractiveness of city centres.
- If implemented properly (see challenges below), (new) city logistics will be beneficiary for shopkeepers and local businesses in the areas concerned, the freight delivery services/carriers, the population and the public sector.
- Citizens and the public will gain most from better and cleaner city logistics: Fewer (heavy) transport vehicles lead to less congestion, fewer accidents, less noise, healthier air quality and better accessibility of shopping areas.

29 Goudappel Coffeng, Traffic Intensities for air quality and noise calculations (in Dutch VI Lucht & Geluid), June 2007 (see also: <http://www.infomil.nl/onderwerpen/klimaat-lucht/luchtkwaliteit/rekenen-meten/vi-lucht-geluid/>).

30 Bestufs II, Quantification of Urban Freight Transport Effects I, October 2006 (see also <http://www.bestufs.net>).

- Bremen set up an environmental scheme which privileges clean delivery vehicles with extended access hours.
- Rotterdam supported and organised a range of sustainable urban freight actions, e.g. bundling of goods and night distribution. Night distribution aims at reduction of vehicles during peak hours. The logistic firms use certified silent freight vehicles. The project reduces general negative effects, e.g. congestion, unsafe traffic or emissions and increases the efficiency of the businesses.
- Malmö replaced diesel lorries with vehicles running on natural gas, trained truck drivers in eco-driving techniques and monitored tightly the delivery vehicle maintenance programs. Thanks to this broad approach of a more sustainable urban freight delivery, emissions in Malmö could considerably be reduced by 13 percent.
- Businesses benefit in a twofold regard. Using freight consolidation and distribution centres, logistic firms accomplish their delivery tasks more efficiently, i.e. they save costs due to reduced trip mileage, better loading rates, shorter trips, increased driver productivity and potentially less need for personnel, all leading to reduced service prices or extension of service offer.
- The Bristol freight consolidation scheme was set up to minimise the impact of freight deliveries to the city's core retail area (Broadmead). At the start in 2004, the trial involved 20 retailers and was later on extended to 53 retailers now. Goods deliverers for these shops deliver their goods to a centre outside the area, and from there goods are delivered on a regular basis to the individual shops, by one truck operated by one company. The scheme has resulted in reduction of vehicle movements and kilometres travelled and in reduced vehicle emissions. Vehicles are utilised better now.
- Wholesalers and retailers profit likewise from consolidation and distribution centres. The number of individual deliveries between wholesalers and retailers can be reduced due to higher load rates of delivery vehicles. Consequently, the costs per good delivered decrease. As a by-product, the access to inner city shops is alleviated for the citizens, i.e. the attractiveness of a single shop increases, and in cases where the majority of shops subscribes to such a new delivery approach, the whole city centre and the image of the city gain sustainably.
- The old inner city of Gothenburg has limited space for loading and unloading, resulting in trucks driving around to find appropriate spaces. The new distribution scheme involved minimum load rate demands (65 percent load factor) and other criteria (emissions) for entering a restricted zone, plus the implementation of unloading areas for companies that meet these criteria. For companies and drivers, there were clear benefits, and these acted as positive incentives to improve the load factor. In other words: access is given to those trucks that meet the load factor criteria, and access is much better than before.
- A different approach has been chosen in goods distribution in Genoa based on a scheme of mobility credits for shopkeepers and delivery services. They all have only a limited number of credits to enter the restricted zone of the historical centre. To avoid further payments for purchasing more credits for accessing the city centre, they have to organise the deliveries efficiently among themselves while pooling their deliveries.
- In the case of Malmö, the regional food industry took advantage of a web-based marketplace which interconnected many small food producers with a few purchasers.

BARRIERS

Experience shows that it is important to create a long-term coordination with the different stakeholders, especially shop owners and local freight deliverers. Important changes, such as the founding of an integrated urban freight distribution centre are more difficult to implement, if there is not already a history of cooperation and trust. Good and trustful cooperation with the private sector will be helpful, too, to get through slow bureaucratic procedures. It might be advisable to start building such relationships with the design of simpler measures, for example, an environmental freight delivery charter to agree on concerted and harmonised activities for clean goods delivery in the city. It is also possible to start a distribution centre with just some (e.g. two) partners. If the service proves efficient and successful, other potential participants may also show interest in the concept.

City logistic measures can normally be implemented within the given legal framework conditions by using different legal premises, such as ordinary traffic regulations on parking and loading/unloading as well as specific transport regulations such as weight limits on specific routes. However, in the case of fundamental changes like the use of environmental zones within a city, new traffic regulation orders may be needed which should be based on the limit values on air quality set by the European directives (Directive 1999/30/EC).

Private companies are likely to subscribe to a new goods distribution policy and scheme if (short-term) economic benefits are expected or if they are personally convinced of the right approach and the business efficiency of the measures. To make the delivery of freight more sustainable, it is important that the scheme

is well accepted by stakeholders. One should bear in mind in this context that many retailers are embedded in larger (wholesaler) distribution chains which cannot be opened easily. However, many benefits have (long-term and indirect) societal and environmental effects rather than monetary ones. In these situations, regulations have to be set which are sufficiently constraining and which have to be enforced strictly to be respected.

Often, mobility management focuses only on passenger related issues. The management of freight traffic should therefore be part of an overall transport master plan, to be included in urban transport policy, for which a strong political commitment is required. The commitment may include initial funding for the establishment and starting phase of a consolidation and distribution centre or of a zone with restricted access rules. It has to be noted that the operation of consolidation centres represents an additional handling of the goods. The subsequent costs and time efforts may overcompensate the advantages of bundled delivery.

Any development, discussion and implementation of more sustainable city logistics schemes as well as the undertaking to deal with the challenges mentioned above require a sound and transparent communication and involvement strategy in order to obtain a positive atmosphere in the public and with the stakeholders.

CASE STUDY

City logistics in La Rochelle, France



La Rochelle set up a logistics platform and a systematic approach to urban goods transportation. The objective was to optimise goods distribution in the city's historical centre with an environmentally friendly approach. The platform engages in two types of activities: delivery of parcels and auxiliary services with electric vehicles.

This involved the identification of locations for restricted access to distribution vehicles and the set-up of specific urban delivery zones. Retailers go to these zones to collect their packages in a system of optimised goods distribution. Specific electric vehicles are used for distribution.

The operational tasks of the platform were delegated (tendered out) to a private company. The main activities of the public-private cooperation were the following:

- Consult with carriers, to convince them that a different system of not delivering goods to the final destination could be beneficial
- Find appropriate electric/hybrid utility vans for the required loads
- Implement a supervision system to localise vehicles and communicate
- Set up specific pre-retail activities to be carried out in the hub to make the whole chain more efficient (such as sorting products, labelling, tuning)
- Promote the platform to shopkeepers
- Set up fleet sharing for customers
- Enforce freight traffic regulations

As a result, the efficiency of goods distribution in the city increased significantly, leading to a reduction in truck and van traffic. Emissions were thus reduced, also due to the non-emission electric vehicles used.



3.3 Demand management strategies

WHAT IS THE SOLUTION?

Liveability in cities is greatly influenced by the presence of private cars, rolling and standing still. Reduction of the number of private cars in an area can possibly improve living conditions (air, noise, safety), but also minimise congestion. This can be accomplished by modal shift (from cars to another mode), or by reducing travel demand.

In CIVITAS, demand management strategies are defined as “Managing travel demand through access restrictions and via financial incentives and disincentives”³¹. Demand management strategies have the objective to influence people’s individual choices to travel. Traffic can so be reduced through a variety of economic incentives, regulatory measures and modern communication technologies. CIVITAS cities experiment with a range of demand management measures to learn about the merit of different initiatives and share lessons learned. These include access restrictions, road pricing, parking policies and marketing campaigns.

Within the strategy of demand management, different tactical approaches can be distinguished:

- Restricted access. Regulation based on characteristics of vehicles or vehicle users, by enforcing selective access to certain sensitive areas of the city.

For instance, it is very common that only residents are allowed to park for free in an area, and a permit system is applied to identify residents. Visitors have to pay for parking their car. Another example is a Low Emission Zone (LEZ) where only vehicles, which meet certain defined emission standards, are allowed. As the examples show, regulation may refer to driving through, or to parking in a certain area.

- Pricing strategies can work as powerful incentives to get people to try cleaner ways of transport and make the private car a less appealing choice. Options are to use pricing either for getting in or for parking:
 - Priced parking is the most common regulatory measure in European cities. Some of CIVITAS cities are testing special parking tariffs for low-emission vehicles. The extent to which priced parking can influence mobility decisions depends on the city’s control over parking space within the city.
 - Priced access is not common, with only few examples (London, Stockholm) where for a complete area (congestion) pricing is introduced. More “simple” systems are financial rewards for avoiding peak times and a “mobility credits” scheme that attaches a financial value to saving or exceeding emissions.

³¹ This is a narrow definition, as compared to the definition that is mainly used in the US, for example by the Federal Highway Administration: “Transportation demand management, traffic demand management or travel demand management (all TDM) is the application of strategies and policies to reduce travel demand (specifically that of single-occupancy private vehicles), or to redistribute this demand in space or in time”. This definition includes themes that are treated separately in CIVITAS, such as mobility management, collective passenger transport and less car-intensive mobility options. See, Nelson, Donna C., Editor (2000). Intelligent Transportation Primer. Institute of Transportation Engineers, Washington, D.C. pp. 10-1. ISBN 0-935403-45-0.

CIVITAS cities where demand management strategy solutions have been implemented

Aalborg, Barcelona, Bath, Berlin, Bologna, Bremen, Brescia, Brighton & Hove, Bristol, Bucharest, Burgos, Cork, Craiova, Debrecen, Donostia-San Sebastián, Gdynia, Genova, Gent, Gorna Oryahovitsa, Gothenburg, Graz, Iasi, Kaunas, Krakow, La Rochelle, Lille, Ljubljana, Malmö, Monza, Nantes, Norwich, Odense, Pécs, Perugia, Ploiesti, Prague, Preston, Rome, Rotterdam, Stockholm, Stuttgart, Suceava, Szczecinek, Toulouse, Usti nad Labem, Utrecht, Venice, Vitoria-Gasteiz, Winchester, Zagreb

BENEFITS

Demand management strategies can have several benefits, namely:

- Improvement of liveability in terms of air quality, noise, traffic safety. Demand management strategies lead to lower car traffic volumes and therefore have a direct positive effect on the environment.
- Preservation of cultural heritage and urban attractiveness and thus commercial opportunities. Lower car traffic volumes create more space for slow modes (walking and bicycling) and especially for older city centres they increase the (touristic) attractiveness. For some cities, this economic reason is the main driver for implementing demand management strategies.
- Reduced car traffic means reduced congestion for cars and public transport.
- Revenues from parking permits, rates and access charges allow for public investment in soft modes and public transport.

CASE STUDY

Enforcement of access restrictions in Krakow, Poland

An electronic system of vehicle identification is used to control access to a restricted area. The area, called the B-zone, is a restricted traffic zone, with access only for inhabitants, disabled persons and goods deliverers (in time windows). Testing of the

electronic system started in 2007. The effectiveness of recognition is 80–90 percent. Revenues from fines have covered the cost of the system. The system is going to be extended in the near future.

CASE STUDY

Limited Traffic Zone (LTZ) in Rome, Italy

In October 2001, Rome started running the LTZ system in the central area of the old town with 22 electronic gates restricting the access to traffic from 6.30 a.m. to 6.00 p.m.; some vehicle categories are exempted (taxis, buses, residents, disabled etc.). The project was supported and sponsored by the Ministries for Environment and for Public Works. During the CIVITAS MIRACLES project, the area controlled by the LTZ cameras was extended from 5 km² to 10.5 km². The number of electronic gates was increased from 22 to 50, and the actual LTZ areas from one to five. The time band banning traffic now also includes the evening/night hours (9.00 p.m. to 3.00 a.m.), and all the electronic gates

have been equipped with Visual Message Sign Panels to improve communication on the traffic limitations. The main result is a traffic decrease by 18–20 percent. In addition, the technology used (cameras with ANPR – Automatic Number Plate Recognition) has further been used for delivering new services. The cameras have been implemented to safeguard the reserved bus lanes from improper use by private vehicles and the same kind of cameras have also been used by the Urban Travel Times system that calculates and predicts travel times on 100 kilometres of roads in Rome. Still today, in Rome a process is on-going to install new poles with cameras in an area now guarded by the local police.

CASE STUDY

Environmental zone in Gothenburg, Sweden

The environmental zone was established in 1996 and extended in 2007. Only Euro IV trucks are allowed in. Statistics (2008) show that over 96 percent

of the trucks in the area comply with the restriction rules. The extended zone reduced NO_x emissions by 40 tons annually, and particles by 1 ton per year.

CASE STUDY

Restricting vehicle access along the Ramblas in Barcelona, Spain

A section of the Ramblas has been set under control using an electronic system to ensure the enforcement of restricted access during the pedestrian peak hours (from 11.00 a.m. to 8.00 p.m.), when only authorised vehicles are allowed in. During these hours, the pedestrian is the dominant 'mode'; it can exceed 7,000 persons per hour. The Ramblas experienced a high number of accidents

with pedestrians. Now, cameras record cars, using automatic number plate recognition to identify the vehicles passing. Any car not white listed or speeding over 30 km/h is fined. Habitual offenders are blacklisted and subsequently prosecuted. The system has proved to reduce traffic by 40 percent during the controlled hours. This gives a considerable improvement in pedestrian well-being and safety.

CASE STUDY

Lower parking tariff for low emission cars in Graz, Austria

Owners of low emission cars can get tokens and park at lower rates. This raises awareness about emissions and motivates people to buy low emission cars. Other objectives were to reduce emission and noise levels in the city centre. The general parking rate of EUR 1.00 per hour was raised to

EUR 1.20, but reduced to EUR 0.80 for low emission cars. Owners of these cars register and get a token that is recognised by the parking ticket machines. The thresholds were: 140 g/km CO₂ emission for petrol and gas cars, and 130 g/km + particle filter for diesel cars.

Example of measure	Goal	Restriction for	Exceptions	Technique and enforcement	Cost and revenues	Results
Rome LTZ	Reduce traffic in old centre	Private cars	Nights (9.00 p.m. – 3.00 a.m.); taxis, buses, residents, disabled, fee payers	Electronic gates and automatic number plate recognition	Revenues from fees and fines are used to fund new investment in public transport	18–20% reduction in traffic; greater use of public transport; 10% increase in 2-wheel transport
Gothenburg environmental zone	Clean air within zone	Trucks and buses	Euro IV vehicles	Traffic signs; regular checks by the traffic police	(no information)	NO _x emissions reduced by 40 tons per year, particles by 1 ton
Krakov enforcement of access restrictions	Reduced private car traffic in zone	Private cars, trucks	Inhabitants, disabled persons and goods deliverers	Electronic system, vehicle identification	Revenues from fines have covered the cost of the system.	Technology is 80–89% effective; volume of traffic has been reduced
Barcelona restricting vehicle access along La Rambla	Less car traffic during pedestrian peak hours (11.00 a.m. – 8.00 p.m.); reduce accidents	Private cars, mopeds, motorcycles and trucks	Only authorised vehicles	Electronic gates and automatic number plate recognition; fines and prosecution for offenders	(no information)	Traffic is reduced by 40% during controlled hours; overall by 10–15%; higher levels of traffic before 11.00 a.m.
Graz lower parking tariff for low emission cars	Stimulate buying low emission cars, cleaner air	All vehicles below Euro IV standard and with high CO ₂ emission pay higher parking fee	None	Specific sticker on the car and token to be used in parking machines	(no information)	Inner city car traffic reduced, public transport increased; lower emission
Stockholm congestion charge	Reduce severe congestion, emission of CO ₂ , air pollution and noise, cut fuel consumption and make the city centre more attractive	Cars, trucks and buses	Through traffic. Emergency, military, clean vehicles, motorcycles and taxis	Electronic system did not function well and was taken out of service. Now, vehicles are monitored by cameras at various check-points.	Revenues from fees go to road investments in the region. No negative impact on inner-city economy	20% reduction of car traffic; positive impacts on road safety, increased use of park & ride, increased share of public transport and cycling

Table 5: Technical characteristics of case studies

CASE STUDY

Integrated package of measures: Clean vehicles and congestion charge in Stockholm, Sweden

The City of Stockholm has an urban area of around 187 km² and a population of 870,000. The city has a very well-functioning, handicapped-adapted and safe public transport system producing around 4.3 million person kilometres annually. Stockholm was experiencing air quality problems in inner city areas (high concentrations of NO_x, particulate matter and high noise levels).

Stockholm managed to establish a pilot infrastructure for alternative fuels, dimensioned for the present fleet. A large part of the municipal vehicle fleet was replaced, including public transport with clean vehicles driven by electricity, biogas and ethanol. Biogas production facilities deliver locally produced fuel.

Stockholm is also known for its city wide congestion charging scheme. Wide areas of the city centre are pedestrian zones, access to the centre is restricted for heavy vehicles and parking is expensive.

The Stockholm congestion charging scheme combined with its clean vehicle and fuel strategy was facilitated through work within CIVITAS

TRENDSETTER (2002 – 2006). Clean vehicles are exempted from paying the congestion charge; together with emergency vehicles, taxis and motorcycles, they comprise about 18 percent of all vehicles.

Following the scheme implementation, decreases in traffic by 22 percent and queuing times by 30–50 percent during rush hours as well as an increase of ~3 percent in public transport travel were observed. These improvements were maintained in the following years (see figure 2 below). The clean vehicle share increased to about 8 percent. There is political support for making the transport system even more environmentally friendly by (1) substituting conventional vehicles with clean ones, (2) making logistic services more effective and (3) making public transport more effective and attractive with ICT. Following a trial period from January to July 2006, Stockholm's citizens recognised the benefits of the congestion charge and, in a referendum in September 2006, 52 percent voted for a continuation.

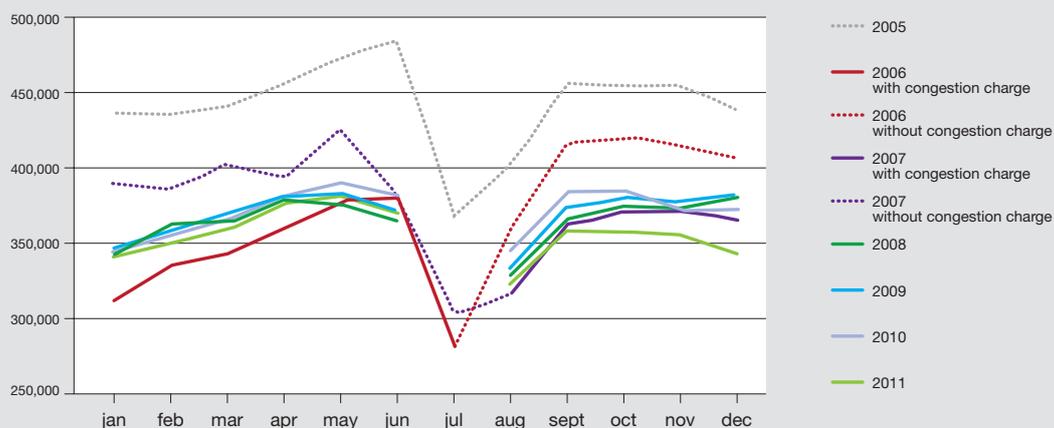


Figure 2: Car passengers under congestion charge, average 2005 to 2011

CASE STUDY

Integrated package of measures: Parking management and new public transport infrastructure in Toulouse, France

Greater Toulouse has just over 700,000 inhabitants. Tisséo-SMTC is the authority responsible for public transport in Toulouse and 83 communities of the Toulouse agglomeration, all situated in the so-called “public transport area” (Périmètre des Transports Urbains, PTU). Linked to the CIVITAS MOBILIS project, the local authorities restructured the public transport network completely, integrating a second metro line (Line B, 18 km and 20 stations), which was opened in 2007.

This large intervention proved to be the ideal moment to radically change the mobility behaviour of a large part of the residents in the city centre, and also of commuters and visitors. The metro line introduction was accompanied by the opening of high quality bus corridors and P&R facilities at the outskirts to enlarge the catchment area of the metro. In the city centre, a pedestrian area was created and a new parking payment scheme was introduced. Before the introduction of this local parking policy, Toulouse city centre offered a wide range of free parking facilities with over 12,000 parking places. This led to high congestion within the city

centre and reported conflicts of use between shopkeepers, residents, commuters and visitors to the city centre. To improve this situation and to reduce car traffic in and towards the city centre, Toulouse City Council decided to introduce a parking payment scheme. Residents pay a smaller fee than commuters and visitors, which was finally widely accepted by the residents in view of an improved parking situation.

The main result of the integrated package of paid parking and new public transport infrastructure was that about 200,000 persons travel daily with the new line B. While maintaining over 11,000 on-street parking sites, yet of which 60 percent (most in the centre) became paid parking, occupancy rates fell from 92 to 75 percent, but sectors outside the zone now suffer occupancy rates as high as 125 percent (reflecting a high level of illegal parking, double parking, etc.). Residents in those sectors are now claiming for themselves the introduction of a parking payment scheme in their neighbourhoods. Short-stay rose from 40 to 60 percent in the paid parking zone.

BARRIERS

Demand management introduces scarcity: by introducing price signals users are confronted with higher costs and/or by regulation users can no longer use a certain road or parking space every moment of the day. This will affect the demand for the good or service and for its substitutes. Increasing costs in private road transport may for instance induce people to use public transport instead. However, to implement demand management, some challenges have to be overcome.

1. Technological challenges

New (pricing) systems ideally involve charges that vary continuously over time, place, route chosen, driving style, type of vehicle and its technical state, driving style, etc. It is clear that the resulting pricing or regulation scheme may be too complex to be understood by car drivers and may require more sophisticated monitoring technologies than currently available. For instance, for realistic road pricing schemes, one would expect differentiation over user classes to be possible only for a crude distinction into passenger cars, vans and trucks; over time up to the level of a few steps during the peak and one level outside it, at a maximum; and tolls to be charged on a few key-roads (e.g. main highways) in the network, only. Different studies show that all kinds of technologies are available; however, it may take some additional time to test the reliability even of a relatively simple system that 'only' determines the time and location of the vehicle.

In some sense, technological barriers as sketched above can of course be interpreted as 'financial barriers': the required technologies may exist, but may as yet be too expensive to offer attractive possibilities.

2. Acceptability issues

It is broadly believed that probably the greatest barrier to implementation of demand management strategies is public, and – linked to this – political acceptability. In brief, public attitude surveys have identified a wide range of concerns about proposals to implement demand management strategies instead of the current system. Drivers find it for instance difficult to accept that they should pay for congestion. Furthermore, the public often thinks that these strategies are not needed, unfair and not effective. Local businesses may also be opposed to

the implementation of demand management schemes, mainly motivated by a fear of losing patronage. Alternatively, acceptability concerns may create a situation in which for instance a constraint on the maximum level of charges is pre-specified.

Finally, there is a clear correspondence between public and political acceptability in a democracy – where the chances of being re-elected depend on the extent to which voters appreciate the implemented policies. Politicians' perceptions of the public acceptability of demand management strategies – in particular for their specific voter population – may of course affect the position they take in these issues.

3. Institutional barriers

Various types of institutional barriers can be distinguished. One category of institutional barriers arises when the organisation of government bodies is such that there is no single regulator that can set all transport (related) prices and regulations. An example is where a local or regional government can either not affect some transport charges that are set by a higher level government (e.g. fuel taxes), or has to accept lower and/or upper limits on charges allowed, set by a higher level government. Another example is when the government in one jurisdiction cannot affect the policies of a neighbouring jurisdiction, while trans-boundary traffic and/or externalities are relatively important. The two governments may then end up in some form of policy competition.

Comparable problems may arise when public transport is operated by a private party which is relatively free in choosing prices and service levels, but does so in a socially non-optimal way, or when private toll roads exist in an otherwise publicly controlled road network.

One may finally distinguish legal barriers as a specific type of institutional barriers. It may not always be possible to implement the "best" demand management strategy. For instance, suppose that the law implies that the level of taxes should be predictable to the tax payer. A flexible pricing system based on the actual traffic situation is then not possible, and differentiating parking schemes based on the environmental burden of a vehicle can be hindered by all kinds of vehicle regulations.



3.4 Mobility management

WHAT IS THE SOLUTION?

CIVITAS cities try to influence travel behaviour through mobility management, which includes marketing, communication, education and information campaigns. The aim of mobility management is to change attitudes and travel behaviour with the ultimate goal to create a new mobility culture. Initiatives include for instance mobility management (or travel) plans for companies³² to get employees to travel to work using sustainable modes of transport, and awareness-raising campaigns and educational programmes at schools.

Almost all CIVITAS cities opened new mobility agencies, or developed an integrated website for the promotion of their mobility services. Where a sustainable mobility plan can be considered as the integrating tool at the level of planning, the mobility agency fosters the integration at the service level. In all cases the drive was to strengthen the integration of the different mobility services. Truly new mobility agencies were created, or existing agencies were reinforced with a new set of communication tools for the mobility agents (i.e. interactive trip calculators, personalised mobility advice and dedicated campaigns). Several cities improved the integration of their mobility services by using an entirely new internet interface.

Whereas mobility agencies and mobility agents are the channels through which promotion of an alternative mobility can take place, (personalised) mobility advice, marketing, integrated ticketing, public transport

promotion and information are the means to foster an integrated use of this package of so-called alternative mobility options (i.e. public transport, car-sharing, car-pooling, cycling, walking) in certain cases in combination with private car use (co-modality).

Several types of mobility agencies exist: from a simple commercial desk where the main task is ticket sales to (at the other end of the spectrum) the so-called “eco-mobility agencies” or “agencies of time management”.

A mobility agency is a service where different users are encouraged to rationalise their mobility practice and modal choice in accordance with a set of socio-economic criteria (health, budget, time management, etc.) and environmental criteria (impacts on air quality, noise, energy and space consumption, etc.). For example, on short distances and major urban transport itineraries, the mobility agent will preferably direct the client towards alternatives to the car which are less costly and less polluting, such as walking, cycling, and public transport.

At the local level, a mobility agency and its services can be organised by a single local authority, an inter-communal grouping, an association or a private company. The organisational configuration largely depends on the institutional context, nature of the main promoters, and their competences, obligations, as well as their ambitions.

³² CIVITAS defines a company travel plan as a contract between the company and its employees, which aims at fostering the use of alternative modes rather than private cars for commuting and professional trips.

It is possible to define the service of a mobility agency around four principal components:

- The provision of personalised mobility advice
- A wider provision of multimodal information and promotion of sustainable mobility
- The offer of integrated tickets and tariffs and related services (public transport in combination with carpooling, car-sharing, cycle rental)
- Assistance in the development of various kinds of mobility plans from targeted commuter plans, school travel plans to more strategically oriented urban mobility plans

The provision of personalised mobility can take place at a physical office, by telephone or through home-visits. A wider promotion of multimodal information and

promotion of sustainable mobility often takes place through a simple travel information provision (timetable information and real time). Within the CIVITAS Initiative, several innovative dedicated campaigns were tested.

Besides information provision, mobility agencies can be used to organise and make available an integrated offer of public transport in combination with carpooling, car-sharing and cycle rental.

Finally, the mobility agencies and their agents are involved in the development and elaboration of a wide set of dedicated travel plans for individual companies, schools, public administrations or geographical areas. In relation to the development of Sustainable Urban Mobility Plans, the mobility agency can be a tool to organise citizen and stakeholder involvement.

CIVITAS cities where transport mobility management solutions have been implemented

Aalborg, Berlin, Bologna, Bremen, Brescia, Brighton & Hove, Bristol, Brno, Burgos, Coimbra, Cork, Donostia-San Sebastián, Funchal, Gdansk, Genova, Gent, Gorna Oryahovitsa, Gothenburg, Graz, Iasi, Krakow, La Rochelle, Lille, Ljubljana, Malmö, Monza, Nantes, Norwich, Odense, Pécs, Perugia, Porto, Potenza, Preston, Rome, Rotterdam, Skopje, Stockholm, Stuttgart, Suceava, Szczecinek, Tallinn, Toulouse, Usti nad Labem, Utrecht, Venice, Vitoria-Gasteiz, Zagreb

BENEFITS

The main benefit of mobility management for individuals is that (economically attractive) alternatives are offered to travellers/commuters to shift from the private car to more sustainable transport modes. Benefits to society include reduced congestion, cleaner air, and potentially increased levels of health as a result of that modal shift.

Another major benefit is that mobility management actually motivates stakeholders to take action themselves. For example, employers have a stake in improv-

ing the accessibility to their company for customers by reducing or even avoiding congestion which is bad for business. In co-operation with mobility agents, these employers can take their own measures, e.g. to change their employees' mode choice.

Mobility management measures can also contribute to the overall attractiveness and quality of life in a city as they are ultimately contributing to reduced congestion and fewer accidents (due to fewer cars) and improved road safety.

BARRIERS

The direct results of mobility agencies are difficult to measure, as their primary role is the support and promotion of the use of alternative modes.

So far, it is not clear how long mobility agencies are supposed to be in place. Cities may not be willing or able to fund them in the long run. The mobility agen-

cies generate certain revenues (for instance for public transport or for employers), but these seem not to be sufficient to be economically self-sustaining. However, if cities save on infrastructure development by maintaining effective mobility agencies, they may well be worth permanent funding.

CASE STUDY

Mobility agency in Burgos, Spain

Burgos is situated in North-central Spain in the region of Castile and Leon and has a population of around 170,000 inhabitants. Burgos had a number of local measures that fostered sustainable mobility and formed the basis of the work of a newly formed mobility agency. This included activities such as:

- The development of mobility information specifically focused on visitors and tourists
- Setting up of a car-pooling and city bike scheme managed by the mobility agency
- The organisation of several marketing campaigns that promote a change of mobility behaviour
- The creation of a mobility forum

The establishment of the mobility agency is contributing to achieving the modal split objectives set for the urban centre of Burgos.

The modal share is 40 percent for walking, 30 percent for the private vehicle and 30 percent of the travels made by public transport, cycling, carpooling and/or private collective passenger transport (2009 figures). The main objective in terms of mobility is to regain a good level of walking and to augment the number of public transport users. The use of public transport increased by 8 percent during the last years and consequently decreased the number of travels made by private cars.

The mobility agency was developed within Burgos' CIVITAS involvements as well as the activities in the framework of the SUMOBIS project (INTERREG SUDOE, project coordination by Tisséo-SMTC from Toulouse) in which the fellow CIVITAS cities of Toulouse and Burgos have been collaborating to create mobility agencies and innovative mobility services.

CASE STUDY

Ecopoints in Genoa, Italy

Genoa, the capital of the region of Liguria in North-west Italy, has a population of 630,000. In central Genoa, the biggest mobility challenge is the number of private cars on the roads. A mix of measures was required, including access restrictions and new forms of mobility for both people and goods to start to change this unsustainable modal split.

Within the CIVITAS Initiative, Genoa's public transport operator, AMT, introduced the "Ecopoints" loyalty scheme. Integrated in its new fare policy and mobility marketing plan, the basic idea is that citizens using public transport and other sustainable mobility options such as car-sharing (managed by Genova Car-Sharing S.p.A.) instead of the private car receive rewards.

The target of the Ecopoint Programme was households with at least one annual public transport ticket (or 12 consecutive monthly tickets) and one member who is a very frequent public transport

user plus a membership with Genova Car-Sharing and/or an IKEA Family Card holder (the IKEA fidelity card).

More than 5,000 public transport passengers participated in the Ecopoints programme. By the end of 2007, the number of loyal public transport customers (i.e. those holding an annual public transport pass) had increased by approximately 36 percent. The Ecopoints programme, an exclusive AMT "club card" dedicated to annual ticket holders, offers advantages such as online payment of annual tickets as well as discounts in shops and theatres and other mobility services offered by AMT's commercial sponsors and partners. Public Transport ridership for the period 2005–2008 increased by over 6 percent or almost 10 million passenger trips. This increase in patronage can be directly attributed to the series of marketing initiatives of which the Ecopoints programme was a part.

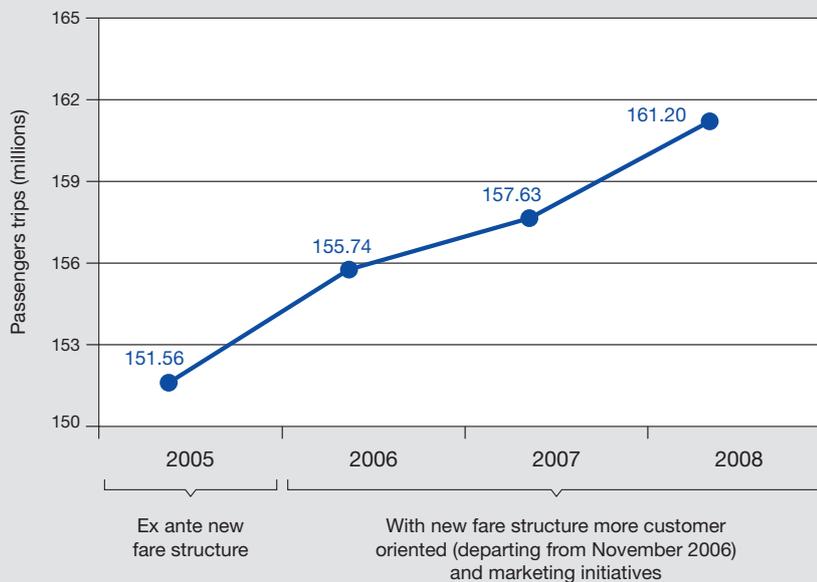


Figure 3: ATM passenger trips per year

FACTS

Mobility Credit Schemes

The notion that there must be limits to consumption of a common resource (urban road space) is conveyed by the allocation of mobility credits. Whereas “normal” road pricing charges from the beginning of consumption, with mobility credits, payment starts after a certain level of consumption, limiting abuse rather than penalising use.³³

The four basic pillars of a mobility credit scheme are³⁴:

- 1. Set the target:** This requires defining a suitable “sustainable environmental footprint” (SEF). This can include all the externalities associated with transport, from greenhouse gases to noxious emissions, congestion, street occupancy and noise.
- 2. Distribute credit budgets:** Convert the SEF into a total amount of credits which is distributed to all travellers and transport operators in the local area using various schemes.
- 3. Set the rules:** The rules will imply a consumption of credits based on actual behaviour of travellers including the modes of transport, the characteristics of vehicles, levels of emissions of CO₂ and other pollutants during actual conditions of use. The consumption of credits will depend heavily on the mobility choices of the traveller.
- 4. Exchange:** Allow travellers with a negative balance of credits to buy extra credits from other travellers with a positive balance.

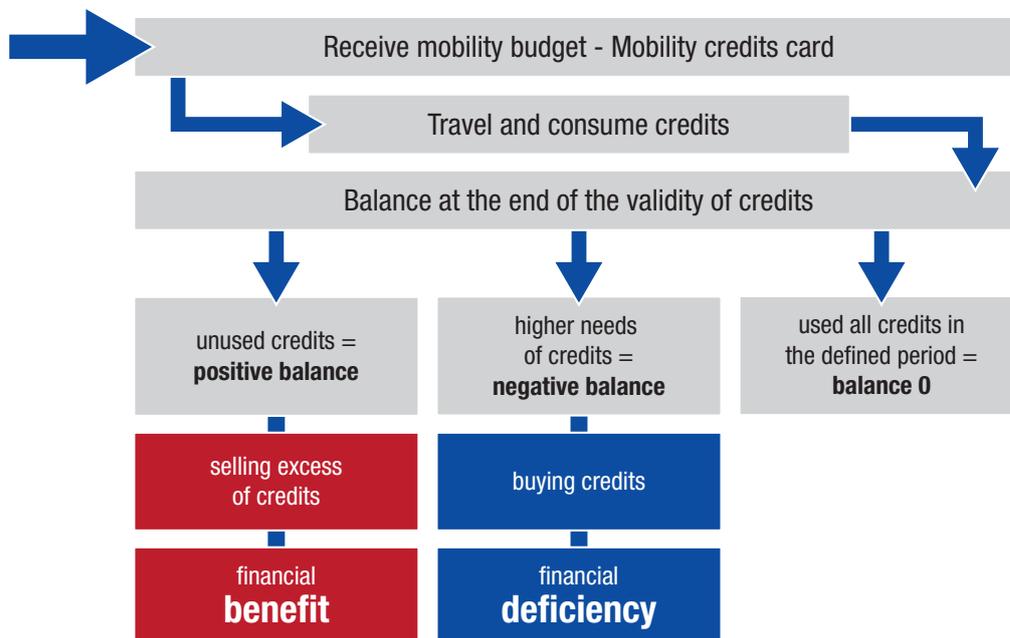


Figure 4: Overview of a mobility credit scheme from the user perspective

Source: EU DEMOCRITOS project: <http://www.democritos.ipacv.ro/docs/flyer%20DEMOCRITOS-v3.pdf>

33 The concept and the theoretical approach to a Mobility Credit Scheme, José Manuel Viegas, Instituto Superior Técnico, Technical University of Lisbon; and TIS.pt, consultores em Transportes, Inovação e Sistemas, s.a. Lisbon, Portugal.

34 <http://www.itsinternational.com/categories/charging-tolling/features/urban-mobility-and-demand-management-the-mobility-credits-model/>.

CASE STUDY

Company travel plan promotion in Nantes, France

Within the CIVITAS VIVALDI project, Nantes Métropole, the service agency for roughly 600,000 inhabitants of the City of Nantes and 23 surrounding suburban towns, has initiated a campaign to promote company travel plans among local companies and their employees.

In the Nantes metropolitan region, almost 600,000 work-related trips are undertaken every day, 75 percent of them (2002 study) by car. For Nantes, company travel plans are a means to contribute to the objective of the conurbation mobility plan to decrease the car modal share and to reach a 50/50 balance between the use of cars versus alternative transport modes.

Various benefits are associated with company travel plans. In the promotional campaign, the arguments used to convince stakeholders of the travel plan advantages include

- for companies: improved accessibility for clients and visitors due to traffic reductions, the need for fewer parking spaces and cost savings as cars are more expensive than alternative modes of transport
- for employees: cost savings on commuting trips, contribution to better health and less stress, and a viable solution for employees without a car
- for the local authority: a general increase in the economic attractiveness of the city and the quality of life, less congestion and a reduced the number of car accidents as less traffic leads to improved road safety

In partnership with the public transport operator, the environmental agency, the chamber of commerce and several company clubs, Nantes Métropole provides technical and financial support to companies to develop and implement company travel plans. It grants employees a 15 percent discount on public transport under the condition that the company also contributes 15 percent – offering employees a 30 percent discount on their season ticket. Another condition for a company to join into a Nantes Métropole supported company travel plan is the provision of access (via an access code) to the car sharing website of Nantes Métropole.

A company travel plan as promoted by Nantes Métropole follows a four-step implementation:

1. Diagnosis of employees' mobility needs and habits and the company's accessibility
2. Awareness raising among stakeholders and elaboration of concrete measures such as secure bicycles sheds and inexpensive seasonal public transport tickets
3. Contract between the company, Nantes Métropole and the public transport operator
4. Assessment of the contracts after latest three years

The company travel plan promotion in the Nantes metropolitan region was a success and has resulted in a continuous increase in the number of participating companies and employees.

Nantes Métropole has also set an example by implementing a travel plan for its own employees (2,300). This company travel plan helped to reduce commuting trips by car from 62 to 50 percent (2008 vs. 2005), thus leading to an annual saving of 640,000 kilometres of car trips and a decrease in CO₂ emissions of 90 tons. A new study on the impact of travel plans (car use, saved CO₂ emissions) will be launched by the end of year 2012.

Date	Active Company Travel Plans	Number of represented employees
December 2005	16	16,000
October 2008	182	61,000
August 2012	277	77,439

CASE STUDY

Integrated package of measures: Implementing new mobility patterns in Stuttgart, Germany

Stuttgart's geographical location in a valley basin, along with its mild climate, low winds and surrounding industries constitute a challenging situation as regards air quality. Continuous air monitoring indicates high levels of traffic-related emissions (especially particulates and nitrogen oxides), with European limit values being exceeded on some of Stuttgart's busiest roads. In addition, a high number of regional commuters (some 260,000 people into and out of the city) plus numerous large-scale public events in Stuttgart (around 90 throughout the year) result in additional challenges as regards congestion and road use. In response to this situation, for the city of Stuttgart the CIVITAS Initiative proved to be a valuable trigger to initiate and implement a number of integrated sustainable mobility measures. Within the CIVITAS CARAVEL project, Stuttgart developed a package of measures on:

- Mobility management
- Promotion of carpooling
- Access restrictions
- Mobility marketing

Most importantly within CIVITAS CARAVEL, Stuttgart set up an integrated traffic management centre. In parallel, the mobility information centre was reorganised to improve the coordination between traffic control, traffic information and mobility management. The specific goals of these local activities were:

- To improve traffic conditions during events and in case of traffic accidents
- To integrate the existing diversity of traffic information into the Integrated Traffic Management Centre (ITMC)
- To promote intermodal travel to major events
- To prevent congestion during major events
- To reduce travel times by providing optimum information and guidance to road users

Due to these measures, traffic and mobility during the Football World Cup 2006 was smooth and traffic jams were prevented. The mobility centre now responds to up to 70,000 information requests annually. This includes about one third of public transport information, one third of city tourism and one third of information on environmentally friendly transport modes.

The implementation of the traffic management centre was accompanied by awareness-raising activities. A marketing concept was developed, including flyers, banners, videos and a website, in order to promote sustainable transport modes. These activities helped to change the behaviour of road users in favour of new forms of vehicle use and environmentally friendly transport modes. Due to the integrated traffic management, only half the time is needed to bring the traffic situation back to normal. A comparison of emission values during peak periods revealed an hourly average reduction of approximately 38 percent of carbon monoxide and nitrogen oxides from traffic leaving the stadium after a match.

Addressing the 205,000 cars which enter Stuttgart each day and the approximately 58,000 commuters driving from Stuttgart to the surrounding region, the carpooling system Pendlernetz Stuttgart was set up. The system offers all commuters a chance to find an appropriate car pool, enabling them to travel to work in a more relaxed and environmentally friendly way. The Pendlernetz Stuttgart, which is able to organise door-to-door car pools, is likewise operated by Stuttgart Mobility Centre. →

→ Integrated package of measures: Implementing new mobility patterns in Stuttgart, Germany

Innovative features of the system include communication on potential car pools via mobile phone text messages to users; geographically referenced route mapping; and automatic transfer to the public transport information system to help people find alternative options in the event that no suitable car pool match is found.

As a result, demand for the carpooling system increased: the number of hits on the carpooling portal rose from around 200,000 in 2005 to more than 800,000 in 2008. Awareness was raised among members of the public as well as among private companies and public institutions in Stuttgart and the region.

To tackle the air quality challenges, various measures were designed, implemented and assessed in an effort to reduce air pollution and fulfil the requirements of the European Clean Air Directive. This included the Clean Air Programme and Action Plan, as well as operative measures such as action restrictions. The access restrictions included:

- A year-round ban on heavy-duty vehicles passing through Stuttgart (January 2006)
- A year-round traffic ban on diesel vehicles that do not meet any EURO standard, with the exception of those retrofitted with soot particle filters (2007)

- A year-round ban on diesel vehicles that do not meet at least the EURO 2 emissions standard, with the exception of those retrofitted with soot particle filters (2008)
- The installation of two pedestrian crossings on a highly polluted city road to reduce traffic speed and prevent congestion (2006)

The measures were supported by a wide range of public relations activities, including a round-table on clean air and noise reduction in 2005; a public awareness campaign in 2006 highlighting the topic of particulate emissions and promoting environmentally friendly transport modes such as cycling, public transport and carpooling; and a survey among the general public in 2007 on the measures contained in the Clean Air Programme. As a result of all above interventions, in a 2-km section of monitored test road the amount of heavy-duty vehicles fell by 11.5 percent, achieving emission reductions of 8 percent.



3.5 Collective passenger transport

WHAT IS THE SOLUTION?

There is a close connection between the modal share of public transport and the density of a town; in general the modal share of public transport increases with the density of a town. There is, however, also an inverse relationship between public transport share and income levels; the higher the income, the lower the share of public transport. When comparing across countries, cultural influences must be taken into account. Northern European cities in the Netherlands and Denmark, for example, have a high rate of bicycle use, which results in lower public transport use. In cities like San Sebastian with high levels of walking, public transport rates are also lower. A common characteristic of the modal share of public transport in the European Union is that changes occur relatively slowly. Annual rates of change of more than one percent in use of different modes of public transport without specific influence factors (the opening of a new metro line or an economic crisis) are rare.

Most CIVITAS cities have an extensive network of public transport lines relative to the size of city in terms of area and population. Depending on the size of the network and strategic choices made, this includes bus, tram and metro. Most measures executed in the CIVITAS cities involved a range of public transport solutions such as new infrastructure, clean public transport vehicles, innovative and flexible services, improved accessibility, integrated tariffs, contactless and/or paperless ticketing.

The stimulation of public transport use focussed less on a direct increase in modal share, and more on the greening of public transport and improved quality of services by means of:

- Introducing clean and energy-efficient vehicle fleets (see chapter 3.1)
- Introducing additional services (on-board technology, real-time information, new forms of ticketing) (see chapter 3.6)
- Experimenting with non-conventional public transport systems
- Improving security & safety
- Improving accessibility for people with reduced mobility
- Integrating walking, cycling and other modes (park & ride)

The two most tested public transport innovations were the introduction of different types of on-demand services and the development of faster bus service, for example by introducing separated public transport lanes.

Especially in suburban areas, there are generally very few transport alternatives available: there is relatively inexpensive traditional local public transport with its rigid timetables and routes or the more expensive, and often polluting, private car. For many citizens, particularly the elderly, the lack of in-between options is very limiting. Even if running an **on-demand service** has a higher per-customer cost in suburban areas than urban ones, increasing accessibility legislation and public transport obligations may render it cheaper than running an empty regular bus in the respective areas. Several forms of on-demand services exist: services that pick passengers up at bus stops with semi-fixed time tables such as in Preston, those that pick them up in front of their house and bring them to important public transport hubs as in Toulouse, or directly to the final destination. In Genoa, reservations can be made by phone or via the Internet one day before up to 20 minutes before departure.

Several forms of **separated bus lanes** were tested in CIVITAS, for example in the centre and the agglomeration area of Nantes or on radial lines such as the high-quality bus network in Toulouse. Often these corridors bring several public transport lines together and in certain cases even different modes, as in Gothenburg and Stockholm (tram and bus). These lanes are often meant to increase the visibility of public transport to the citizens, to optimise the coverage of the wider public transport network (e.g. feeding a tram or metro network) and to contribute to solutions for specific points of congestion and environmental problems.

Encouraging people to use public transport (more) involves improving the quality of services through increased **reinforcement of rules and safety and security for passengers**. This subject has a scope ranging from prevention of terrorism to reduction of simple acts of vandalism. Issues of safety and security can arise

both inside and outside the vehicle. Outside issues can be in the bus lanes or at stops or in the direct environment. These can be solved through the installation of improved street lighting, cameras and organisational arrangements. In Lille, for example, a rapid intervention programme was established in the event of problems: It is managed via GPS location equipment and improved cooperation and communication between the public transport operators, the police and justice officials. Safety and security issues inside the vehicle are dealt with, among other things, through driver training, as was carried out in Debrecen.

Following the EU Equal Treatment Directive³⁵ and its adoption in national legislation, public transport has had to assure **non-discriminatory access** to their services **for all citizens**. In CIVITAS, this resulted in experimentation with numerous measures from the development of strategic accessibility plans to the introduction of level bus stops as in Burgos. Special attention was paid to the development of accessible public transport ticketing (e.g. in Toulouse) and public transport information services (e.g. Brighton and Hove). Several on-demand services are also adapted to the transportation of disabled travellers.

In line with the Urban Mobility Green Paper, many of the CIVITAS cities rethought the optimisation of the use of all modes of transport and of organising “co-modality” between the different modes of collective passenger transport (train, tram, metro, bus, taxi) and the different modes of individual transport (car, motorcycle, cycle, walking).³⁶ Most of them relate to **park & ride facilities**. In the CIVITAS City of Cork this resulted, for example, in the first permanent park & ride facility in Ireland. Besides the introduction of physical infrastructure (e.g. cycle infrastructure at the main stations in Venice), intermodality also involved the **integration of time schedules, information and ticketing**.

³⁵ EC, Equal Treatment Directive, 2000/78/EC of 27 November 2000, Brussels.

³⁶ EC, Green Paper “Towards a new culture for urban mobility”, COM (2007) 551 final of 25 September 2007, Brussels.

CIVITAS cities where collective passenger transport solutions have been implemented

In the following CIVITAS cities collective passenger transport solutions have been implemented. The experiments related to clean vehicles and new technological services are dealt with in chapter 3.1 Clean Vehicles and Fuels and chapter 3.6 Telematics respectively.

Experimenting with non-conventional public transport systems:

Brno, Bristol, Genoa (on-demand transport agency), Kaunas, Krakow (dedicated bus lanes and demand-responsive transport), La Rochelle, Nantes, Prague, Rotterdam (people mover), Toulouse (on-demand services)

Improved security & safety:

Debrecen (bus driver training), Rome, Lille (safety and security plans), Malmö, Stuttgart

Accessibility of people with reduced mobility:

Burgos, Brighton and Hove, Kaunas, Toulouse

Integration with walking, cycling and other modes (park & ride):

La Rochelle, Malmö, Toulouse (train, metro, bus, bike sharing, car-sharing), Barcelona, Nantes, Toulouse, Cork and Rotterdam (park & ride), Bremen (tram and train)

CASE STUDY

Structuring of the public transport network in Nantes, France

The Nantes metropolitan area comprises the city of Nantes along with 23 suburban towns with shared areas of responsibility, among them public transport. Nantes has a long-established and well-integrated sustainable transport policy with a focus on public transport and cycling. The PT operator and the urban authority of Nantes cooperate on the structuring of public transport. Constructed during their CIVITAS project VIVALDI, line 4 entered into service on November 6, 2006. Completing the 3-line tram network, the bus line was the result of a bet: offer the same level of service with a bus system as with a tram. Indeed, the BusWay applied all the elements that characterise the tram: dedicated lane, dedicated rolling stock, well-designed

and equipped stations, priority at all intersections, high frequency. Moreover it serves four park & ride facilities within extended hours. The line is seven kilometres long and has 15 stations.

The EUR 50 million infrastructure costs and EUR 9.2 million cost for 20 natural gas buses brought the total to EUR 8 million per kilometre, about three times less than what a tramway would have cost. Punctuality went up to 95 percent with an average service speed of 21 to 23 kilometres per hour. Frequency during peak hours was increased in 2010. Ridership increased from 17,000 users per day at inauguration to 21,000 after four months and 30,000 in 2012.

BENEFITS

The collective passenger transport measures tested in CIVITAS aim to optimise use of each public transport mode and improve their perceived quality. The modernisation of the infrastructure, service and image of public transport can avert a decline in modal share in competition with the private car on certain corridors. The measures aimed at the improvement of features such as comfort, image, hospitality, reliability, frequency and information. In terms of infrastructure, most of the measures focussed on the improvement of physical access, ease of interchange and ticketing. Not to be neglected, efforts were made to increase the safety and security of infrastructure, vehicles and services.

On-demand transport, the most tested new public transport service, allows for maintaining reliable service and frequency in suburban areas where maintaining a regular bus service is too costly. This service proved to guarantee accessibility to public transport services in general, particularly for elderly and disabled travellers.

The introduction of separated bus lanes represented the physical part of new forms of non-traditional public transport services, especially aimed at the improvement of the reliability of service, yet also through its features improving the physical access and image of the collective passenger transport. Cities like Nantes and Stockholm (offering services around the entire network) provided faster public transport service through the introduction of separated bus lanes which resulted in a modal share change on the respective corridors of five percent in Stockholm and over 30 percent in Nantes in favour of public transport. Most of the gains are in the longer term related to regularity. Whereas the EU standards on service quality in public transport require at least 80 percent regularity, within most studies in the various CIVITAS demonstration cities, it proved possible to achieve levels of 95 percent regularity with the introduction of separated public transport lanes at strategic points and corridors.³⁷

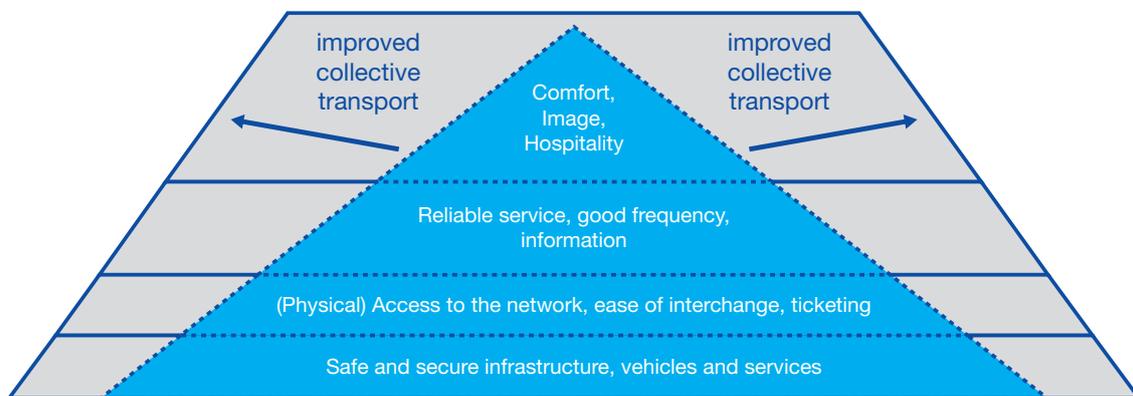


Figure 5: Overview of benefits of CIVITAS experiments

³⁷ See also www.bhls.eu/ Cost action TU0603.

All CIVITAS sites that worked on increasing accessibility for elderly and disabled travellers continue to do so. The EU directive and various Member States' laws oblige all authorities and operators to guarantee full access to all citizens. On the more frequented corridors and services, this is resulting in the continuing introduction of accessible vehicles and infrastructure. In the areas with lower levels of demand, this is done through the introduction of replacement (often on-demand) public transport services.

The improvements in safety and security in public transport services aim first at reducing the (generally already relatively low) levels of accidents and incidents. Nevertheless, when presented well to citizens, they also help to improve the image of public transport as a secure and safe form of transportation.

The success, measured in terms of increased usage due to an improved integration of modes depends in the long term not only on the level of integration itself, but also on the development of the individual modes. For example, if cycling is not a very popular mode locally, integration with public transport will only be beneficial in a limited way. The success of park & ride depends not only on the efficiency of the transfer and time gains, but also on the presence of supporting access restriction in the area(s) of destination. The introduction of a park & ride scheme in Toulouse together with an increase of access to the city centre through a new metro line and the introduction of paid parking in its central area contributed to the large success of the park & ride. A significant enlargement of the suburban park & ride scheme is planned to guarantee continued services.



3.6 Transport telematics

WHAT IS THE SOLUTION?

There is a wide range of services and applications where information and communication technologies – telematics – can be found in and around public transport and urban mobility, more or less visible to the passenger.

The most visible and tangible telematics application is the electronic ticket – e-ticketing systems based on smart cards or mobile (phone) devices. Instead of a printed paper ticket, the entitlement to travel is stored on a microchip of a smart card or on a dedicated application (usually called an “app”) or text message of a mobile phone. In all cases, the electronic tickets can be validated by a reader. E-Ticketing systems are operated by back office computer systems monitoring variable tariff schemes, black lists (of stolen or invalid smart cards) and assessing travel behaviours and patterns with the aim to improve the overall service quality.

Less tangible but nevertheless successful in motivating citizens to shift to public transport are integrated ticket services or applications. This is the integration of different transport operators (where customers make one single payment despite the service being provided by different operators), the integration between different transport modes (public transport, bike sharing, car-sharing, parking where a combined ticket enables the customer to use different mobility services) or the

integration with other types of services (access to other public services). Similar to e-ticketing systems, integrated tickets are operated by central computer systems (thus they can easily be combined) checking the validity and providing discounts.

Traffic management and control systems and applications are transport telematics systems that aim to optimise traffic flow, to reduce congestion and to enhance traffic safety. They can be subdivided into priority systems for public transport and traffic monitoring/control centres. Buses and trams get priority at crossroads with traffic lights in order to increase the average vehicle speed and/or to improve the regularity of the services; telematics systems are installed in the vehicle and in the road infrastructure. Control centres analyse diverse real-time traffic information (parking spaces, congestion, accidents, the regularity of public transport, the pollution situation) collected by various means (radio, electromagnetic loops, CCTV, GPS trackers, sensors, etc.) and react according to predefined plans in order to optimise the traffic flow to and from major events (concerts, football games), to provide more buses or to send replacement buses (in case of accidents or road work).

Selected and specific real-time traffic information (schedules, maps, arrival/departure times and chang-

es, destinations, next stops, possible connections) can be provided and displayed to the passengers via the Internet, at public transport stops and stations and on buses, trams or trains. Sophisticated tools even allow for personalised trip planning. This travel and passenger information can be combined with entertainment

and commercial information, so-called infotainment, providing news or advertisement verbally and graphically.

Last but not least, registered and analysed real-time traffic and travel information can be used for simulating and planning future traffic solutions.

CIVITAS cities where transport telematics solutions have been implemented

E-Ticketing: Alborg, Bologna, Bremen, Brescia, Bucharest, Coimbra, Kaunas, Lille, Ljubljana, Preston, Rotterdam, Stockholm, Toulouse

Traffic management and control systems: Bath, Bologna, Coimbra, Funchal, Genoa, Krakow, La Rochelle, Malmö, Monza, Norwich, Ploiesti, Preston, Rotterdam, Stuttgart, Tallinn, Toulouse, Venice

Passenger information: Alborg, Bath, Bremen, Funchal, Kaunas, Krakow, La Rochelle, Malmö, Norwich, Ploiesti, Preston, Rotterdam, Tallinn, Toulouse

Simulating and planning: Genoa, Krakow

BENEFITS

Telematics applications and services optimise the traffic and travel conditions in cities and facilitate the use of public transport means; they can be considered enabling and supporting technologies from which all stakeholders benefit.

E-Ticketing: Generally speaking, smart ticketing can offer various advantages. To **passengers** it can bring increased speed, convenience, “cashlessness”, the flexibility of stored value products and security against theft and loss, access to services beyond transport and the reliability and convenience of using one pass all day long across multiple operators. For the **public sector**, it can offer greatly improved data for transport planning

purposes and can help join up service delivery in other areas. Furthermore it can be combined with access control or additional services such as self-service bicycles, or it can be customised for special user groups such as school children, etc. For **operators**, there are quantifiable benefits in speeding up boarding times, reducing fraud and removing cash from the system. Further benefits can be derived from better data, allowing improved use of existing resources (offering variable pricing for demand management, pay-by-use, i.e. after trip payment), a better understanding of customer behaviour as well as the development of new commercial opportunities (hotlists and blocks in case of theft).

Toulouse started its innovative ticketing solutions with a magnetic stripe ticket in 1992 and is using a smart-card solution called “Pastel” with more than 380,000 cards distributed since 2007. Thanks to its success, new offers have been developed, e.g. the combination of the Pastel card for public transport with the bicycle card “VélôToulouse” or multiservice cards for schools and universities planning to use near field communication (NFC) technology. Smart ticketing is seen as reliable, convenient, fast and easy to use and as giving users more liberty to travel.

Integrated ticketing: The key benefit of an integrated ticket is perceived by the **passenger**. It simplifies the travel arrangement for both regular commuters (change of time and route in case of incidents, use of any available transport mode regardless of the operator) and occasional travellers (one overall ticket for travel from A to B with no need to check different tariff schemes). The simplification of travel arrangements increases passenger satisfaction which may be illustrated by a modal shift towards public transport. Increased use of public transport gives **public realm** a boost as the quality of life has improved. Combined tickets also encourage citizens’ sense of belonging to a city or region or to contributing to the environmental benefit of a city (e.g. low-cost environmental travel cards). Where a modal shift can be achieved, operators directly realise greater revenues. Starting with only one corridor, the integrated ticket between the Polish State Railway and the city of Krakow quickly achieved a 10 percent market share which encouraged the partners to extend the offer to four other corridors.

Traffic management and control systems aim to optimise traffic flow and reduce congestion and pollution. Thus, all stakeholders of urban mobility benefit from traffic management. Thanks to a real-time observation of strategic locations on the Grand Canal in Venice traffic rule infractions were reduced leading to less pollution and noise. The same can be said for Krakow, where number-plate recognition cameras helped to identify and automatically fine illegal accesses to and transits through the city centre. The number of illegal trips fell considerably, the traffic volume of the city centre was reduced, and the investment for the overall

system was quickly recovered by the fines generated.

Passengers experience less congestion, in public transport vehicles which has a positive impact on actual travel times. For the **public realm**, parking routing systems both reduce congestion and pollution generated by the fruitless search for parking and increase the occupancy rate of public garages. Both individuals and the public realm profit from a more efficient use of the road infrastructure as traffic can be re-routed following disturbances in the overall traffic system. **Operators** gain more passengers when service quality and reliability are improved through telematics; the traffic situation can be monitored, vehicles can be located and thus, operators can react faster and more appropriately in case of incidents. The traffic data and experience accumulated enable operators to further improve and adapt the service to the users’ needs and behaviour. This also applies to logistic operators dealing with the distribution of goods. A unique approach has been chosen in Stuttgart where the city traffic management, the police traffic department, the fire department, the ambulance service and the public transport operator have been physically combined under one roof; all traffic related information converges in this centre. The different entities are able to react much faster and more efficiently in case of incidents or large events; for example, thanks to dynamic lane signalling, the time needed to empty the stadium car parks was halved. The crucial test of the system was the Football World Cup in 2006. Since then, the concept has proved its value on multiple occasions.

Passenger information: Real-time and reliable traffic and travel information is key for shifting the modal split towards more sustainable public transport. It builds confidence. Real-time passenger information with widely distributed displays sustainably improved the image, acceptance and attractiveness of the public transport services in Norwich. When there is reliable and accessible information, **passengers** can plan their door-to-door trips better, reduce frustrating waiting times, and thus, shorten travel times, making public transport a real alternative to private car use. Information based on a tracking system for buses in La Rochelle that had been installed for internal purposes was made available to the public showing the waiting

times via displays or informing about the arrival time of the next buses via text message or e-mail: 90 percent of users considered this a worthwhile enhancement of the bus service. The **public realm** benefits from any additional passenger in public transport as it reduces the pressure on road space and the need for additional costly road works. The environment also profits from less congestion. On top of an existing real-time information system, Malmö provided a mobile Internet service including a travel planner which increased the number of public transport trips remarkably; the users also considered this additional feature a travel service of higher quality. The **operator's** image improves when it takes more seriously the passengers' wishes for better and reliable traffic and travel information; audio and graphical information facilitates the use of public transport, in particular for (current) occasional users who may become regular users in the future. As the display can also be used for other purposes, operators

can provide additional information about its services or traffic or sell "advertisement" slots.

Simulating and planning: While analysing the data collected through the diverse telematics applications, both local authorities and operators can easily simulate different traffic situations (incidents) and improve the planning and implementation of new or alternative infrastructure and services.

The police in Krakow and Genoa were equipped with handheld computers for collecting relevant data related to accidents. In Genoa, an exhaustive multi-source data warehouse was established where all information about accidents, injuries and road and traffic characteristics are gathered, compiled and analysed in order to better understand the real causes of road accidents and to develop preventive actions. In both cases, road safety improved.

BARRIERS

The challenge for services and applications focusing on passengers is to develop and implement user-friendly, understandable, and reliable systems which do not create a barrier to public transport but rather facilitate the shift towards public transport. This applies particularly to ticketing and the use of telematics-supported user interfaces – be it a stand-alone terminal for finding out timetables, the Internet, smart phone-base trip planners or displays with unambiguous information. New services and their advantages for passengers need to be the focus of appropriate and widespread marketing and awareness campaigns.

Operators and public authorities face organisational and financial issues when deploying transport telematics. They have to collaborate closely in dedicated working groups to define tasks and responsibilities during development and operation and to decide on technical equipment and services to come up with solutions that fit passenger requirements. In order to succeed, mutual trust needs to be established.

While integrated tickets (covering several operators) are quite common in western European countries, it is a big challenge in most of the New Member States. Two main challenges are finding agreement among the different operators on the division of income generated by e-tickets and integrated tickets and making different existing technical equipment compatible. The agreement process may be compromised if the main operator does not see a need for joint ticketing and tariff schemes or is not convinced that increased ridership will result.

A general barrier to transport telematics is the lack of interoperability between existing and upcoming systems which are installed as stand-alone solutions for a given region or city; the key to further development is agreement and application of national and European standards.

CASE STUDY

RATB travel card in Bucharest, Romania

The main idea for the e-ticketing solution in Bucharest was the integration of different public transport operators in order to provide flexible fares responding to citizens' needs and to deliver a more convenient transport service to the public. One (contactless smart) ticket allows for travelling in networks of different operators. The system started with the two main operators for underground, tram, bus and trolleybuses, but it is open to integrate more operators. There are two types of

cards: the ACTIV one for regular users (commuters) which also provides the function of an electronic purse, and the MULITPLU for occasional travellers (10 trips, one-day pass). A data warehouse collects all ticket validation information, manages the lost/stolen cards (black lists) and integrates other data from the fleet management system and on-board surveillance. Two million ACTIV cards and one million MULITPLU cards are in use per year.

CASE STUDY

Real-time travel information – the "muoversiaroma" application in Rome, Italy

One of the main tasks of the Mobility Agency of Rome is to supply updated and reliable real-time travel information to citizens. The idea of combining the information available on public and private mobility and providing this to citizens in a user friendly way was initially investigated during the CIVITAS MIRACLES project (2002–2006). In 2008 the "Atac mobile" application (renamed "muoversiaroma" in 2012) was launched. It was the first attempt at providing a set of open data using a common platform. The service is available in two versions: XHTML, accessible from all mobile phones with a web browser and the URL www.muoversiaroma.it.

The following information is available:

- Bus waiting times (information on arrival times by bus line at each bus stop)
- News – real time news on traffic, status of road works, demonstrations
- Access restrictions in place
- Traffic bulletin – allows to check a list showing the traffic conditions by zone
- Urban travel times – on 130 kilometres of main roads of the capital
- Journey planner
- Video cameras – four cameras display various traffic situations
- Bike sharing – users can check the availability of bikes
- Parking – users can check the availability of parking spaces in four city parking locations
- Ticket offices location

FACTS

Smart, intermodal, interoperable, and interregional

Smart electronic tickets (either as a card or via mobile phone) that are emerging everywhere in Europe (and in the rest of the world) are basically debit cards: the customer pre-loads an amount of money for which he/she can travel a certain number of trips or a certain distance. Further, for these smart cards, we distinguish the following characteristics:

- **Intermodal:** the first precondition for smart tickets in public transport. The ticket works in buses, trams and underground trains within the city. The challenge is primarily technical: to have ticket-reading machines in operation in all modes. Benefits of such a system are for the traveller (easy transfers, secured access), and also for the operator (no cash handling, more efficient passenger flow, customer information). Single fare systems exist (example Toulouse) as do multi-fare ones (Oyster Card London, Navigo Paris). There are many examples of intermodal systems.
- **Interoperable tickets** can be used among different providers of public transport. The challenge is also technical, but even more legal and organisational. All operators need to comply with a certain standard and a clearing house for financial re-distribution must be set up. Some of the interoperable smart tickets can be used not only in different public transport modes, but also for other services. In Toulouse, the mobility card Pastel can now be used for car parking at P+R facilities. In other cases, such as the MULTIPLU card in Bucharest, and the Kaunas tourist card, the mobility ticket can also be used as an electronic purse for small (non-transport) payments. This can come in very handy for public transport users, adding to the attraction of the public transport system.
- **Interregional systems** function not only in a single metropolitan area, but also beyond and in other cities. Only in the Netherlands³⁸ is a national smart card system (OV-chipkaart) now in operation, functioning for all public transport modes (bus, tram,

metro and short and long distance railways). This system was developed as a national system, not as a merger of different local systems. With the OV-chipkaart, passengers can travel from one city to another by an intercity train, and continue on a local tram or bus. The OV-chipkaart can also be used for other services, such as bicycle rent.

Local intermodal systems are widespread across Europe and a wide range of technologies are applied for these systems³⁹. Some of them are also interoperable. The development and introduction of an interoperable system is a complex task. Often, different operators have to comply with a single system and simply trust that they will get their due revenues in a timely fashion. It requires investment and reduces independence. In cities where all public transport is in the hands of a single organisation (e.g. RATB in Bucharest), an intermodal system may suffice, and the introduction of such a system may be relatively easy, as compared with a situation where different companies operate bus and railway lines (e.g. in London). Different from simply handling transport fares, interoperability requires the handling of money transfers, which requires a bank license. For that reason, there are fewer examples of truly interoperable systems in Europe.

Another complicating factor is a multi-fare system. The easiest system has one fare for a single trip (e.g. Toulouse), regardless of the length of the trip. The payment can be handled simply by checking in, requiring a single action from the passenger and a simple check from the operator whether the balance on the card is sufficient for one single trip. When the length of the trip matters for the fare, a method is needed to determine trip length and the amount to deduct from the card. Further, the balance on the card must be sufficient for the longest trip possible, assuming that the passenger may stay on the vehicle until the last stop. This was a constraining complexity for the chipkaart-system, where the a single fare in the city is below EUR 1 and a long distance train trip can amount to EUR 50.

38 In Israel, a similar national system is under development, RavKav. In Asia, notably in Taiwan, South Korea and China regional systems are operated for large regions.

39 UITP, the International Association of Public Transport, and the European Commission are now looking for interoperable standards for electronic ticketing throughout Europe. See: The next step in creating Electronic Ticketing Interoperability for Europe; Memorandum of understanding. ITSO, VDV KA, Calypos Networks, AFIMB, UITP, February 2012. <http://www.uitp.org/files/homepage/pdf/IFM%20Alliance%20MoU%20signed%2015%20Feb%202011.pdf>.

CASE STUDY

Integrated package of measures: Transport telematics and road safety in Krakow, Poland

Within the CIVITAS CARAVEL project (2005–2009) the city of Krakow implemented a package of measures, all geared towards making the roads of the Polish city safer for pedestrians, public transport users and car drivers. During the CIVITAS measure Monitoring Centre for Road Safety and Accident Prevention, members of the police were equipped with mobile computers to collect all relevant information in a standardised data format directly at the site of an accident. This information was automatically forwarded to a new resource and information management centre where the impact of the accident on the public transport system was also analysed. This measure helped to improve the entire information process, led to a better understanding of the causes of road accidents, and thereby contributed to improved road safety and much better management of the public transport system.

Complementary to the use of modern technologies and based on the information gained, the Krakow city administration developed an integrated public transport security action plan. In a first step in the city's efforts to promote the use of public transportation, a security audit was carried out. The audits took place in conjunction with the

introduction of clean high-mobility corridors and the improvement of public transport infrastructure in the city centre, taking into particular consideration the needs of passengers with reduced mobility. The audits focused primarily on tram stops where passengers have to alight into the road. An additional passenger survey highlighted important factors that compromised safety:

- The difference in level between the pavement and the bus or tram is a particular problem for older passengers and those with reduced mobility
- Cars often drive too fast close to public transport stops
- There are too many cars close to public transport stops, making it difficult for passengers to get on and off the vehicles safely
- Visibility at bus and tram stops is often poor

As a result of the audits and the surveys, an important junction and a public transport stop in the city centre were reconstructed and safe bus and tram stops were installed serving as a model for other locations in the city. The new combined bus and tram stops also feature real-time information conveyed in written form.



3.7 Less car-dependent mobility options

Urban mobility accounts for 40 percent of all road transport CO₂ emissions and up to 70 percent of other pollutants from transport. The increasing number of cars causes problems in terms of congestion (increased pollution and energy consumption) and space consumption for parking (problems of urban environment and quality of life). The issues of car ownership and usage are crucial to the environmental impact of individual transport patterns and to the quality of the urban realm in general through space consumption of cars.

Alternative forms of transport can reduce the environmental footprint of these individual transport patterns and improve the urban environment. Car-sharing has the unique potential of regaining street space and offering more flexible individual mobility. Carpooling reduces the number of car trips and thus emissions and energy consumption. Cycling is considered the most suitable mode for distances from 2 to 5 kilometres, and in Member States like the Netherlands, Denmark and parts of Germany and in Flanders even up to 8 kilometres.

The main options to decrease car dependency are:

(1) Breaking with current patterns for car ownership and use:

- Car-sharing
- Carpooling
- P+R travel

(2) Slow modes:

- Cycling (and walking)

CAR-SHARING

Car-sharing⁴⁰ gives access to a car without the need for ownership. Car-sharing is an innovative solution to the increasing problem of parking in urban neighbourhoods. Car-sharing is a useful and practical way of sharing vehicles for both business and private drivers. The idea of car-sharing is that a group of registered members share the opportunity to use a car when they need one. The “pay-as-you-drive” principle supports the rational choice of transport modes with the result of a modal shift from the car towards sustainable modes (including rail for long-distance travel). Car-sharing has demonstrated the ability to replace private cars and to optimise fleet management of corporate customers. The interaction with public transport plays an important role in a win-win situation to achieve more sustainable mobility patterns and a reduction in the number of cars in our cities.

Car-sharing plays an important role in creating a new mobility culture. The potential is immense and still far from fully exploited – either on the European scale or on the national or local level. At the end of 2009 almost 400,000 Europeans were car-sharing customers (see table on the next page). However, large differences exist between countries. In Switzerland, Germany and the Netherlands car-sharing is already an established service, whereas for instance in Ireland, Portugal and Spain, car-sharing is just getting started.

⁴⁰ In the U.K., the term car club is used.

Country	Car-sharing customers	Car-sharing vehicles
Austria	11,000	169
Belgium	6,932	248
Denmark	Approx. 5,000	225
Finland	2,232	38
France	13,000 (estimate)	700 (estimate)
Germany	137,000	3,900
Great Britain	64,679	1,459
Ireland	63	9
Italy	15,850	498
The Netherlands	27,000 (estimate)	1,832
Portugal	100	12
Spain	2,504	127
Sweden	14,889	more than 492
Switzerland	84,500	2,200
Total	384,749	11,909

Table 6: Car-sharing customers and vehicles in Europe (2009)⁴¹

In European cities, car-sharing differ primarily in the level of commercialisation. The commercialisation level can be distinguished in the following forms:

- **Fully commercial.** Car-sharing is organised and financed by one or more commercial businesses. The authorities are not directly involved (e.g. Aalborg).
- **Fully collective.** The car-sharing is organised and financed fully by the local authority. No commercial partners are involved.
- **Public-private partnership.** A combination of the local authorities and a commercial provider is involved in implementing car-sharing. The public-private partnership is the most common construction in European cities (e.g. Bremen and Bristol).
- **Private citizen initiative.** Car-sharing is organised by a group of citizens, with some financing in the form of subsidies and operational assistance (e.g. reservation of parking places) (e.g. Toulouse and the UK car clubs).

Theoretically, car-sharing schemes are economically self-sustainable and can be operated without much interference from the authorities on a break-even basis after three to four years and full repayment of initial investment costs from year six on. The precise figures depend on the success in terms of usage and organisational structure.⁴²

The number of participants and cars involved in car-sharing differs significantly among European cities. Both Bremen, with roughly 180 cars and 7,000 users (May 2012), and Bristol (45 cars and 1,286 users) have fairly large car-sharing schemes. In contrast, the scheme in Aalborg had 11 cars and now (July 2012) operates with only eight and a customer base of 149 users. The highest density of car-sharing can be found in Switzerland. At the end of 2008, the Swiss car-sharing company Mobility had 84,500 customers who had access to 2,200 vehicles all across Switzerland. Car-sharing services are available in 430 cities and communities. The majority of Swiss towns offering car-sharing are of a size at which, in other European countries, virtually no car-sharing services can be found.

41 Source: "The State of European Car-Sharing, Final Report D 2.4 Work Package 2", June 2010, EU project momo Car-Sharing.

42 Internal car-sharing study of the public transport authority of Toulouse.

CARPPOOLING

Carpooling is when two or more people who live near each other, have destinations near to one another and travel at similar times, agree to travel together in one car. This is also called ride-matching or ride-sharing. Each city can stimulate this form of behaviour through information campaigns conveying the benefits of travelling together: shared costs and reduced congestion. Car-pooling reduces the number of car trips and thus emissions and energy consumption. For example, within an industrial area in Burgos (Spain) a carpooling platform was offered for 450 employees. About 325 of them now use the service and the average car occupancy rate rose within three years from 1.15 to 1.53 per vehicle. With fewer cars on the road, and fewer vehicles parked, traffic congestion and parking problems can be reduced. Accessibility within the area is enhanced and more urban space is available for public use.

Cities can support carpoolers by offering matching services either online or via a call centre. Such a service can be offered to the wider public or to smaller groups (firms, schools). Commuters generally form the main target group. Companies are encouraged to support carpooling among their employees in order to save on (costly) parking spaces. The potential for carpooling is limited by the fact that it can be challenging to coordinate different people's trips. Approximately 30 percent of car users have the freedom to choose carpooling as an alternative.

In almost every country within Europe, small-sized initiatives can be found for stimulating carpooling and/or ride matching. The technology needed to facilitate carpooling is minimal, whereas the promoting and organisational assistance provided largely defines its success. At the informal level, carpooling can be facilitated through personal contact. Even if it only provides the basis, it is usual to make use of a database and some form of software accessed via the Internet and/or telephone.

CYCLING

Almost half of all car journeys are shorter than five kilometres and, as it takes time before the motor is warmed up, fuel consumption and emissions are higher for these trips. In 2005 such car trips generated over 14,000 kilo tons of CO₂ in Germany alone and it is expected that such travel will still produce 11,000 of kilo tons by 2020⁴³. Cycling is considered the most suitable mode for short distance travel. The development of electric bicycles can help overcome the often-cited limitations of hills and high temperatures. The measures in CIVITAS showed that there are no miracle solutions to achieve a higher modal share for the bicycle. Every city must set its own targets for cycling.

In general a distinction can be made between three types of situations⁴⁴:

- Cities with a modal share for cycling between 20 and 40 percent (Denmark, the Netherlands and certain parts of Belgium and Germany)
- Cities with a modal share for cycling between 5 and 20 percent (most in Austria, Switzerland, Germany, Belgium, the Scandinavian countries and larger cities in the Eastern Member States, UK, Spain, and Portugal)
- Cities with a very low modal share or virtually no cycling at all

In all cases only an integrated approach over time delivers real results:

- Integration in terms of organisational aspects from policy to new services and simple promotion activities
- Integration of infrastructure, from bicycle racks to new cycle lanes

Health and safety are arguments that become more and more important in the support and realisation of bicycle initiatives.

43 Thiemann-Linden, German Institute of Urban affairs A-4/2010.

44 Source: Fietsberaad, Bicycle policies of the EU principals continuous and integral, December 2009.

CIVITAS cities where car-independent mobility solutions have been implemented

Car-sharing: Rome, Aalborg, Bremen, Venice, Genova, Toulouse, Norwich, La Rochelle, Preston, Vitoria-Gasteiz, Monza, Brighton & Hove, Gent, Utrecht, Brescia, Bologna, Donostia-San Sebastián

Carpooling: Rome, Graz, Burgos, Krakow, Norwich, Stuttgart, Debrecen, Toulouse, Potenza, Perugia, Craiova, Donostia-San Sebastián

Cycling: Graz (Bike and Ride), Rotterdam (dedicated bicycle lanes, integrated cycling and public transport), Winchester, Stockholm, Bristol (cycle resource centre), Bremen (cycle friendly neighbourhoods), Venice (promoting cycle use and cycle safety), Malmö, Toulouse, La Rochelle (integration of cycling and public transport), Burgos (city bike system), Szczecinek, Monza, Aalborg (school cycle plans, cycle motorway), Utrecht (cycling and road safety label), Brighton & Hove, Donostia-San Sebastián, Vitoria Gasteiz, Gent (route planner, cycle house), Iasi, Brescia, Gdansk, Ljubljana

BENEFITS

In relation to the overall modal share, car-sharing has yet to achieve a strong impact, however the marketing of car-sharing can have a strong indirect impact on citizens' reflection on their own mobility patterns. Likewise carpooling has not achieved a major impact on the overall urban modal share although it can have significant impacts at the level of the companies involved. Both car-sharing and carpooling have excellent potential for the near future if Europe can manage to shift the car ownership paradigm that still dominates our present European society. Cycling, too, has potential to change the urban modal split significantly and changes are observable in many EU cities. Indeed, it is the combination of these (and other) measures that will make a difference in the urban landscape of Europe. More detailed benefits are described in the following subchapters.

CAR-SHARING

The introduction of car-sharing in cities causes effects in the fields of economy, energy, environment, transport and society:

- Each shared car replaces 6–10 personal vehicles, which eases congestion and space consumption.

The approximately 7,500 car-sharers in Bremen have already replaced more than 1,500 private or company cars. For 2020, it is envisaged that 20,000 car-sharing users will have replaced about 6,000 cars. The CIVITAS measure in Bremen shows also that car-sharing supports local shopping and the use of public transport.

- The intermodal aspects are important; car-sharers make a conscious decision about their modal choice. A combination of public transport, rail, taxi, car rental and of course walking and cycling is quite normal.
- Car-sharers drive less and cycle and use public transport more. In Bristol research has shown that car club members reduce their annual car mileage by 50 percent when they join a car club.
- Car-sharers use the environmentally friendly vehicles of the car-sharing service.
- Less space consumption because of fewer parked cars. More space is available for other societal activities and construction costs for housing can be reduced when fewer parking spaces are needed.

Some other precise figures on potential gains are presented in the following table⁴⁵.

45 Source: momo fact sheet: The environmental impacts of Car-Sharing use: www.momo-cs.eu.

C-S provider or area	Number of C-S customers who have given up (at least) one car	Number C-S customers who did not carry out planned car purchase	Each C-S vehicle replaces ... personal cars	Study year	Source
4 (in some cases 5) providers in Great Britain	-	-	-	2008	Myers, Cairns (TRL) 2009
Existing customers	40.3 %	25.8 %	14	-	-
New customers	37.9 %	24.2 %	9	-	-
Customers from 2 C-S “mobility point” stations in Bremen, Germany	-	-	-	2005	Free Hanseatic City of Bremen 2005
Private customers	30 %	55 %	-	-	-
Business customers	21 %	67 %	9	-	-
Various providers, Germany	16 %	33 %	-	2003	Maertins 2006; Knie, Canzler 2005
Mobility, Switzerland	26.3 % (private motor vehicle in 520 households) 5.3 % (business vehicles of 142 commercial C-S customers)	-	-	2005	Swiss Federal Office for Energy 2006

Table 7: Survey results on car ownership in households of car-sharing customers

A Swiss study⁴⁶ proved that there is an annual reduction of 200–290 kg CO₂ per car-sharer. The total fuel use for transportation in Aalborg was reduced by approximately one percent. This reduction was caused by two factors. First, car sharers drive less and the total number of kilometres driven by the population is reduced. Second, because car-sharing organisations select environmentally friendly cars, the specific energy consumption level per kilometre is reduced considerably. With increasing participant numbers, the total fuel use in Aalborg will decrease even further.

In many countries, a car is still a status symbol. We need to create a shift away from a car culture toward a culture of mobility. Such a culture would value simply using a car when you need one as opposed to owning a private car for occasional use and otherwise have it consume valuable space.

46 Haefeli, U., Matti, D., Schreyer, C. and Maibach, M. (2006): Evaluation Car-Sharing. Final Report on behalf of the Swiss Federal Energy Agency (Schweizer Bundesamt für Energie), Bern.

CARPOOLING

Estimates within CIVITAS II show that carpooling schemes with about 2,200 members are able to save up to 300 tonnes of CO₂ and to remove about 1,600 single occupant vehicles from peak time traffic within 33 months. A U.S. study⁴⁷ points out carpooling has the potential to save significant amounts of energy, equivalent to express bus services, but at lower cost. A single flexible carpooling route involving 150 commuters could save up to 6.3 terajoules (TJ) of energy per year (the equivalent of 200,000 litres of gasoline) under certain circumstances of distance and congestion levels and taking into account the savings by both the participants and remaining traffic.

Sharing rides saves money for the individual, because the costs of travel and parking are divided by the number of car occupants. Charges for carpooling are generally low and in some case paid by the employer, but vary depending on the mechanism by which the matching service is accessed. The costs are lower for society due to a more efficient use of resources.

The simple act of travelling together makes journeys less stressful and more sociable. In the longer term it might also lead to a significant reduction in congestion. Private companies that offer parking spaces to their employees on private land can decrease the number of parking spaces needed by encouraging their employees to share a ride and to use fewer cars.

CYCLING

Many cities now promote cycling as it is considered an excellent means to replace car travel that reduces the use of fossil fuels and contributes to an improvement in the urban environment and air quality.

- Cycling offers the opportunity of daily zero-emission mobility as it replaces fossil fuel driven vehicles; decreased reliance on the car for certain trips (e.g. home-work) will also decrease people's reliance on the car for other purposes and create an increasing tendency to use the bicycle.
- As a facet of urban development, cycling enhances the attractiveness of urban areas and has the potential to help create a new structure of local mobility which can replace even more cars.
- Cycling can support traffic-reducing patterns of settlement. Creating the possibility for a large modal share of cycling allows the development of dense urban neighbourhoods and the reduces the need for long distance travel.
- Consistent cycling promotion can also trigger increased cooperation and coordination among various stakeholders (local authorities, public transport, environmental and mobility agencies).

As a result, many CIVITAS and other European cities are setting ambitious objectives for cycling and realising significant results.

47 Shaheen S. (2009), Flexible Carpooling: Exploratory Study, ITC Davis.

City, country	Cycling modal share		Evolution
	Current	Goal	
Berlin, DE	13 %	-	↗ 100 % (1993–2008) (6.5 % in 1993)
Bristol, UK	5 %	10 % (by 2015) and 15 % (by 2020)	↗ 17 % (since 2008) cycling numbers are growing at over 10 % a year
Brno, CZ	2.8 %	-	↗ 40 % (2 % in 2000)
Brussels, BE	5 %	20 % by 2020 (Iris 2 plan)	↗ 194 % (1.7 % in 1999)
Budapest, HU	2 % according to (old) official data / 5 % – estimates	5 % according to cycling master plan / Signed the Charter of Brussels, so 15 % by 2020	2 % in the past
Copenhagen, DK	above 20 % (cycling to work: 34 %)	50 % (by 2015); cycling to work: 40 % (by 2012)	-
Dresden, DE	16 %	-	↗ 33 % (2003–2008) (12 % in 2003)
Ferrara, IT	30 %	-	↗ 43 % (21 % in 1996)
Graz, AT	14 %	-	↗ 75 % (in 1982–2004) (8 % in 1982)
Groningen, NL	57 %	-	-
Ljubljana, SLO	10 %	15 % (by 2020)	↗ 20 % (1994–2003)
London, UK	2 %	5 % (by 2025)	↗ 117 % (since 2000)
Munich, DE	14 %	-	↗ 40 % (in 2002–2008) (10 % in 2002)
Odense, DK	26 %	50 %	↗ 20 % (1999–2002) ↗ 50 % (1990–2000)
Oslo, NO	-	8 % (by 2015)	5 % in 2002
Paris, FR	3 % (2008)	-	↗ 48 % (2001–2006)
Riga, LV	1–2 %	-	When cyclists were (unofficially) counted, their number had increased by almost 100 % in 2 years (200 in 2008 and 400 in 2010).
Seville, ES	6.6 %	Signed the Charter of Brussels, so 15 % by 2020	The % of cyclists has more than tripled in the last 3 years.
Vienna, AT	5 %	10 % (by 2015)	↗ 67 % (3 % in 2001)
Warsaw, PL	1–2 %	-	1 % in 2001

Table 8: Changes in modal split in different EU-cities⁴⁸

48 ECF, European Cyclists' Federation

BARRIERS

Car-independent mobility options when not imposed by direct constraints on the use of the private car are generally welcomed and encounter few barriers when implemented. Only a lack of financial means is often a true barrier for the achievement of significant local measures. Some constraining legislative barriers (especially in relation to the reservation of parking places) can be found in relation to car-sharing. Some barriers and challenges for a significant success are specified here.

CAR-SHARING

From car-sharing operations in various European cities the following can be learned:

1. Car-sharing has a high potential of success if both citizens/residents and businesses are targeted in a complementary manner. Business usage takes place more during the day, whereas citizens use it more outside working hours and on the weekends.
2. Car-sharing schemes need to be set up on a sufficiently large scale in terms of vehicles and customer base in order to attain some economies of scale and to be able to realise a significant success.
3. Collaboration with local or regional public transport organisations is necessary to increase the quality of service; the complementarity with public transport, carpooling and cycling allows car-sharing to become a true alternative to private car ownership.
4. Communities and local administrations are also important partners for two reasons. First, community administrations are important employers and they cause a good deal of work-related traffic which can be addressed through the use of car-sharing vehicles. In addition, supportive local policy can lead to permission to use public space for car-sharing stations and promotional support through local or regional information and awareness campaigns.

CARPOOLING

From the introduction of carpooling in European cities the following can be learned concerning the obstacles:

- Flexible working hours make coordination of car pools difficult or almost impossible.
- Organisations which are located close to central public transport stations are more likely to have a large proportion of public transport users and very few carpoolers, which in itself is not a problem in terms of alternative mobility, but indicates where carpooling advocates should focus their efforts.
- Availability of company cars to employees also for private use reduces carpooling. In such cases it would be more valuable to offer carpooling in a package of alternative mobility options as a replacement for company cars.
- Carpools are said to be inflexible in unexpected situations (picking up of children or partners, etc.). Marketing should focus on carpooling as an additional service that for example replaces the second private vehicle and a guaranteed ride home programme should be established for emergency situations.
- Companies are reluctant to offer benefits such as reserved parking spaces to certain groups of employees; dedicated marketing should focus on the social responsibilities of a company and how a carpooling service can contribute to its socially responsible image.

CYCLING

Cycling promotion measures are in general well appreciated by all stakeholders. The main barriers to fast development of a cycling culture are related to existing road infrastructure and the (often false) perception of cycling being a dangerous activity.

- Since the favouring of private car traffic from the second half of the 20th century, cycle infrastructure has been neglected, even removed during road and traffic management planning and from legal legislation and regulation. Cycling needs to be reintroduced to allow for adequate planning for cycling.
- The (sometimes slow) calendar of road infrastructure renewal which provides the opportunity to introduce cycle infrastructure can also delay the construction of a basic essential cycle network.
- Cycling in certain Member States is perceived as a dangerous activity in local traffic. A careful planning of cycle infrastructure, cycle education, and targeted marketing to overcome these often false perceptions should be put in place.

CASE STUDY

Car-sharing in Aalborg, Denmark

In order to address the increase in private car ownership that tends to accompany increasing modal shares of private cars, the CIVITAS VIVALDI project (2002–2006) in Aalborg introduced a car-sharing scheme. The scheme was a combined private/public scheme but operated on a commercial basis. From a tender process the car rental company Hertz was selected as operator. The idea was to combine individual citizen memberships with private company and public institution memberships. The number of car-sharing cars (11) and locations have remained almost the same since 2004, with a few cars relocated and a few withdrawn from the scheme. These decisions have been made by the car-sharing operator Hertz.

The City of Aalborg Technical and Environmental Department is a corporate customer of the scheme.

While it is not involved in the operation or size of the scheme, it has discussed with Hertz the location of the vehicles. The city of Aalborg promotes the car-sharing scheme on the city's website and traffic portal.

At the end of the CIVITAS VIVALDI project there were a total of seven car-sharing stations and eleven cars. It has been estimated that one percent of the energy consumption from transport has been saved through this measure and that car ownership in some cases – especially among younger people – has been postponed. There are eight cars in the scheme in the continued measure and an increasing number of members. The Aalborg example is a small-scale example and the incentive to join is limited because of the low number of cars in the city.

CASE STUDY

Car-sharing in Bremen, Germany

Car-sharing in Bremen has continued to grow since the end of CIVITAS I in 2006. The local car-sharing organisation has continued to target private car users and enterprises in a complementary manner. The customer base is more than 7,500 users (May 2012) and includes a fairly large number of business users. This was facilitated by the cooperation with the local chamber of commerce and other professional organisations in Bremen. Particular to Bremen is the special cooperation between the main local organisation cambio CarSharing and the municipality of Bremen leading to a successful integration in neighbourhood parking management (least-cost planning principle).

In Bremen special attention was given to business customers. Special offers, services and packages created an increase in business participation, making the total participation rate high and the concept work well. Because of the CIVITAS VIVALDI project

the use of car-sharing increased by more than 42 percent, with more than 3,500 users counted in 2005. Since CIVITAS VIVALDI, the use of car-sharing in Bremen has grown further to more than 5,000 users in August 2009 and more than 7,500 in May 2012.

Furthermore, car-sharing in Bremen could always count on the support of the local authority. In fact, the local Committee for Transport and the Committee for Environment subscribed to the ambitious goal of having 20,000 car-sharing users in Bremen by the year 2020, i.e. four times more than the current number of users. Bremen, in its role as a city-state, is now involved in promoting car-sharing and legislative change on the federal level. The Bremen car-sharing measure has gained worldwide recognition as it was selected as an outstanding urban mobility showcase by the organisers of the World EXPO 2010 in Shanghai.



CASE STUDY

City Car Club in Bristol, United Kingdom

A city car club was established in Bristol. Car club parking spaces are located in residential areas, maximising the accessibility of the scheme. Through CIVITAS VIVALDI, the car club was expanded and electronic booking and a smart card systems introduced. The process of designating on-street parking spaces for the exclusive use of the car club through a legal order was also established. The car club is operated on a commercial basis by City Car Club. As of May 2009, there were 1,286 members and 45 shared cars in Bristol.

The Bristol City Council carried out activities such as additional promotion, legal process to designate on-street parking spaces and their implementation, planning guidance and planning contribution negotiations/agreements. Other parties involved are property developers that made a financial contribution through the planning contribution system.

Since the end of CIVITAS I in 2006 the City Car Club has continued to grow in terms of members, cars and parking spaces and is now operated on a commercial basis. There was a surge in membership in 2008 with economic conditions cited as the main reason for choosing the club instead of owning a car. Membership numbers doubled between May 2008 and May 2009 to 1,286.

The long-term effect seems to be positive. 72 per cent of those who join a car club have either given up a vehicle or deferred the purchase of one. Research from a variety of sources has shown that one car club parking space can reduce the number of local cars by between 6 and 10 vehicles. This can help to alleviate local on-street parking pressures in densely populated areas. As the car club continues to grow, the benefits of less car ownership and fewer carbon emissions will continue to multiply.

CASE STUDY

Carpooling in Stuttgart, Germany

The online carpooling service Pendlernetz Stuttgart (Commuter Network Stuttgart) is a free Internet-based system that arranges door-to-door carpools for commuters in the Stuttgart region. The Pendlernetz was established by the City of Stuttgart in 2002 to improve the mobility options of citizens and visitors in the region. The system features:

- Communication via SMS and e-mail
- Geographically referenced route mapping
- An automatic data transfer of public transport information

Registered users can enter their travel data and the system calculates appropriate trips down to street level. Personal preferences are considered, as are time and cost requirements in a defined route corridor. The user receives the entire route on a map including passenger collection and drop-off points.

Starting in 2005, the service was expanded to encourage event-oriented carpooling. An event data pool was integrated into the Stuttgart carpooling system that included football games, concerts, and other major events. During the 2006 World Cup in Germany, a special Internet portal was launched to help people set up carpools to football games all over Germany.

Over 120 companies and 40 municipalities in the Stuttgart region are linked to the portal. Daimler-Chrysler and Bosch are among the 35 companies that have integrated the Pendlernetz system into their companies' Intranet platforms to organise carpooling among their employees. Stuttgart's carpooling portal received over 800,000 hits in 2008, up from 200,000 in 2005.

A 2008 promotion campaign showed posters with a blank silhouette and offered commuters the opportunity to "be the face of the 2008 Pendlernetz" campaign.

Within the CIVITAS project CARAVEL, the system was introduced in other regions of Germany with a focus in North Rhine-Westphalia, the most populated region of the country. After CIVITAS CARAVEL, the company which had developed the system took over. Today the Pendlernetz is marketed country-wide with some 80,000 hits per months. The system received particular interest when increasing fuel prices and the economic crisis were the main topics in public discussion. Nevertheless, the commuter network Pendlernetz with a regional focus is less successful than the lift share services for long-distance trips (Mitfahrzentrale) where the economic benefits clearly compensate for the personal constraints associated with these shared trips.

The current challenges and next steps for a further extension and sustainable exploitation of the service are:

- The development of a smart phone application (which fits the usage patterns of commuters better than an Internet site)
- A strengthened awareness campaign aimed at potential customers (regional commuters) and multipliers such as larger employers and user associations (e.g. automobile clubs)
- The development of integrated regional mobility concepts in cooperation with public transport operators (in order to reduce the impact of a stand-alone application for the Pendlernetz)

CASE STUDY

Cycling in Krakow, Poland

As part of the CIVITAS CARAVEL project (2005–2009), the city of Krakow piloted a bike sharing programme, BikeOne, which included 100 bikes at 12 stations around the city (4 stations were added in the second year). The intention was to increase use of bicycles as a means of transport. Bike rental facilities were located at bus/tram stops in order to create an integrated approach to sustainable mobility and to promote the combined use of sustainable modes, especially within the historic city centre. Before BikeOne, a total of approximately 100 rental bicycles were available in the city through various private companies. The bike share was a test of self-service bike rental.

The BikeOne bikes are available 24 hours a day, 7 days a week but the system only runs from March to November. All the elements are municipal property but the system is operated by a private company that won the tender (until November 2011). Customers pay a subscription fee and a rental fee for each use. The first 20 minutes are free of charge.

In the initial five weeks of implementation, an average of 80 trips were taken per day (a total of 2,761 trips). 643 people registered for the system and 204 rented bikes at least once.

In spring 2012, a call for tenders went out to run a much-expanded programme, including 150 stations and 1,500 bikes. The successful bidder will have the right to operate the service for ten years and to earn money from rentals and advertising. Cyclists will be able to pay at the stations, over the Internet, by credit card or cash, and eventually via the new Krakow City Card.



Locations of the loan bicycles in the original BikeOne.

CASE STUDY

Integrated package of measures: Promotion of cycling and ambitious urban mobility measures in Odense, Denmark

Odense is an atmospheric city on the green island of Funen in the heart of Denmark. With 185,000 inhabitants, Odense is the third largest city in Denmark and from 1999 to 2002 it was officially “The National Cycling City of Denmark”.

Within CIVITAS, Odense participated in the MOBILIS project (2005–2009). The project work of the Danish city included the integration and quality improvements of sustainable modes, the implementation of environmental zones and interactive traffic training for children. Each element included a combination of measures comprising campaigns, citizen involvement and physical improvements, with a particular focus put on the promotion of cycling.

Fostered through the CIVITAS MOBILIS project, the city administration developed a website including an interactive route planner and a wide selection of maps of cycle paths. It is also possible to report problems on a cycle path on the site. The information goes straight to the city’s service section, which then repairs the path. The cycle parking facilities for bicycles in the town centre, at bus stops and at the railway station have also been improved. A special focus was put on design and protection against theft. As an extra service, drinking water machines and six bicycle pumps were installed along routes to and from the city centre and harbour area.

To maintain the focus on cycle traffic safety Odense offered a special service for injured cyclists. If a cyclist is in an accident and has suffered a head injury, the casualty department offers a new cycle helmet. Safety and security were also enhanced through the active prioritising of cyclists and pedestrians at cross-roads and count-down displays at traffic lights. Through the provision of an interactive information system (large screens in public

urban locations) cyclists and pedestrians receive information on the traffic situation, real-time information on transport connections and other urban news. The screen was set up in front of the theatre supplementing the “green wave” for pedestrians. Besides these physical improvements various activities and campaigns drew attention to the quality of cycling and the advantages it offers. Odense approached some 25,000 people through direct marketing (at the door) and at child care facilities. These activities also included the promotion of cycle trailers as an alternative to a second car. In addition Odense developed and produced an Internet-based cycle training programme for children. All schools in Odense were invited to participate and 12 out of 53 schools did so. Many schools chose not to participate as they were already involved in a high number of other external programmes related to different topics.

In particular older people responded positively to the four new “cycle scanners” which the city of Odense put up in the summer of 2006 to market cycling and get in dialogue with the cyclists. The scanners were intended to motivate more people to cycle by having every scan of their health insurance card count as a number in a monthly lottery. The scanning was only accepted when a detector loop found a bicycle on the pavement. The scanner returned the acceptance by a light and a sound. Multiple registrations of the same person within the same hour were deleted. Winners were drawn randomly and their names sent to the planning department every month for inclusion in the lottery. This activity continued for one year. Unfortunately heavy rain was a severe challenge to the technical devices, and eventually led to a breakdown. Nonetheless, the concept is still unique and was a great success in promoting cycling.



3.8 Sustainable Urban Mobility Plans (SUMP)

WHAT IS THE SOLUTION?

CIVITAS offers a variety of solutions to tackle important urban challenges and problems faced by cities. It is a particular strength of the initiative to provide knowledge and experiences from all across Europe on the implementation of complementary and integrated packages of measures. CIVITAS promotes clean and innovative urban transport solutions and places particular emphasis on participation (of stakeholders and citizens), integration, institutional cooperation, and the evaluation of impacts and processes. It is also committed to sustainability and aims to achieve lasting benefits for its demonstration cities as well as potential take-up cities.

The European Union is now strongly promoting the SUMP planning concept which reflects the sustainable and innovative features of the CIVITAS Initiative. Both the Action Plan on Urban Mobility and the Transport White Paper⁴⁹ promote the wide take-up of Sustainable Urban Mobility Plans in Europe (SUMP). A Europe-wide interpretation of SUMP has been missing for the longest time. This chapter offers a Europe-wide definition and description as developed in cooperation with over one hundred experts and practitioners in the context of the European SUMP reference project Eltis plus (see www.mobilityplans.eu).

A Sustainable Urban Mobility Plan (SUMP) is a way of tackling transport-related problems in urban areas more efficiently. It builds on existing practices and regulatory frameworks in the Member States, its basic characteristics are:

- A participatory approach – involving citizens and stakeholders from the outset and throughout the planning process;
- A pledge for sustainability – balancing economic development, social equity, and environmental quality;
- An integrated approach – considering practices and policies of different policy sectors (e.g. transport, land-use, environment, economic development, social inclusion, health, safety), authority levels (e.g. district, municipality, agglomeration, region), and between neighbouring authorities (inter-municipal, inter-regional, trans-national, etc.);
- A clear vision, objectives and a focus on achieving measurable targets that are embedded in an overall sustainable development strategy;
- A move towards cost internalisation – reviewing transport costs and benefits also across policy sectors, i.e. taking into account the wider societal costs and benefits.

49 Action Plan on Urban Mobility, 2009, Transport White Paper, 2011.

An SUMP aims at achieving a sustainable urban transport system, by addressing at least the following objectives:

- Ensuring the accessibility offered by the transport system to all, in line with the objectives below;
- Reducing the negative impact of the transport system on the health, safety and security of citizens, in particular the most vulnerable ones;
- Reducing air pollution and noise emissions, greenhouse gas emissions and energy consumption;
- Improving the efficiency and cost effectiveness of the transportation of persons and goods, taking into account the external costs and
- Contributing to the enhancement of the attractiveness and quality of the urban environment and urban design.

The policies and measures defined through SUMP should comprehensively address all modes and forms

of transport in the entire urban agglomeration: public and private, passenger and freight, motorised and non-motorised, moving and parked.

It is important to emphasise that a Sustainable Urban Mobility Plan builds and expands on existing planning documents. It is in this sense not an entirely new plan which needs to be developed. The EU-promoted Guidelines on Developing and Implementing a Sustainable Urban Mobility Plan (2011)⁵⁰ describe and provide examples for individual SUMP elements which are suggested for take up in cities depending on their individual needs and planning contexts.

Developing and implementing a Sustainable Urban Mobility Plan should be understood as a continuous process which comprises the elements and tasks illustrated in the figure of the SUMP planning cycle below. The graphic overview of this process presents these elements in a logical sequence. In practice these activities can run partially in parallel or include feedback loops.

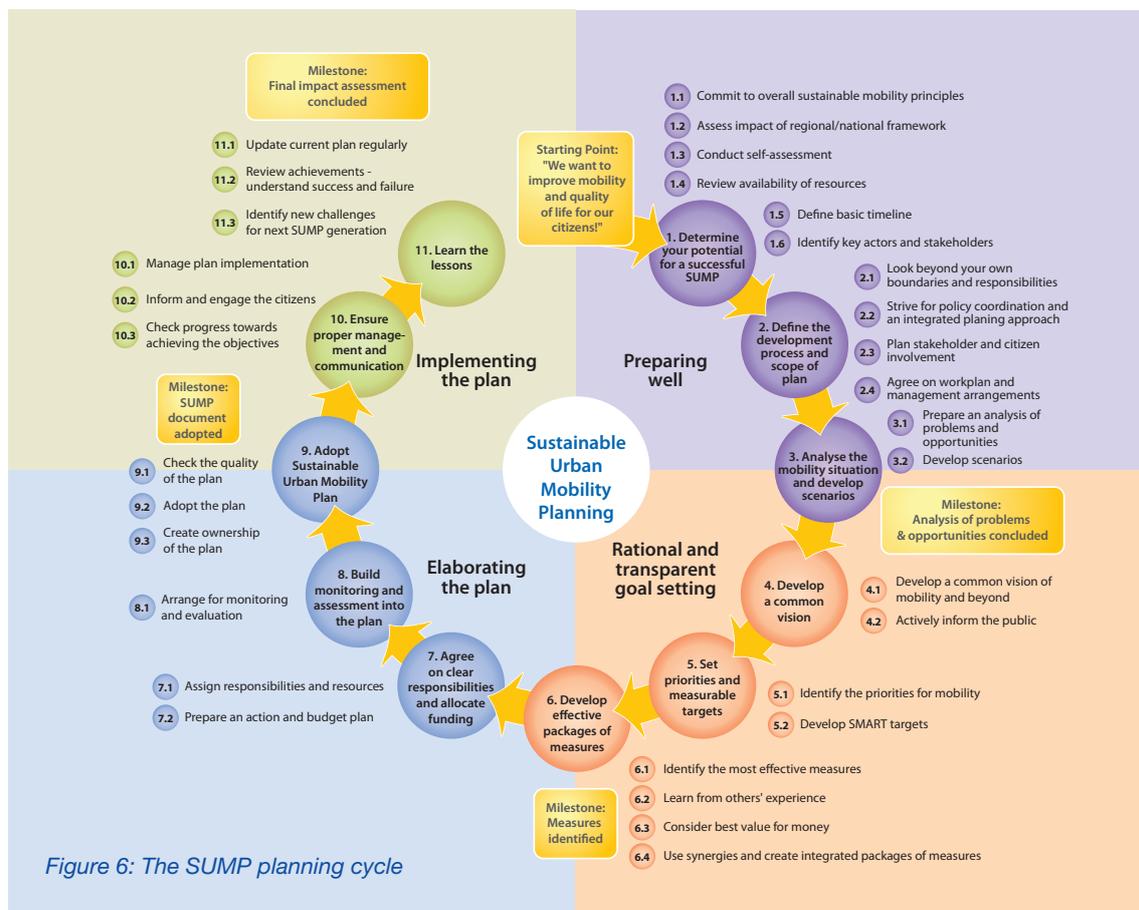
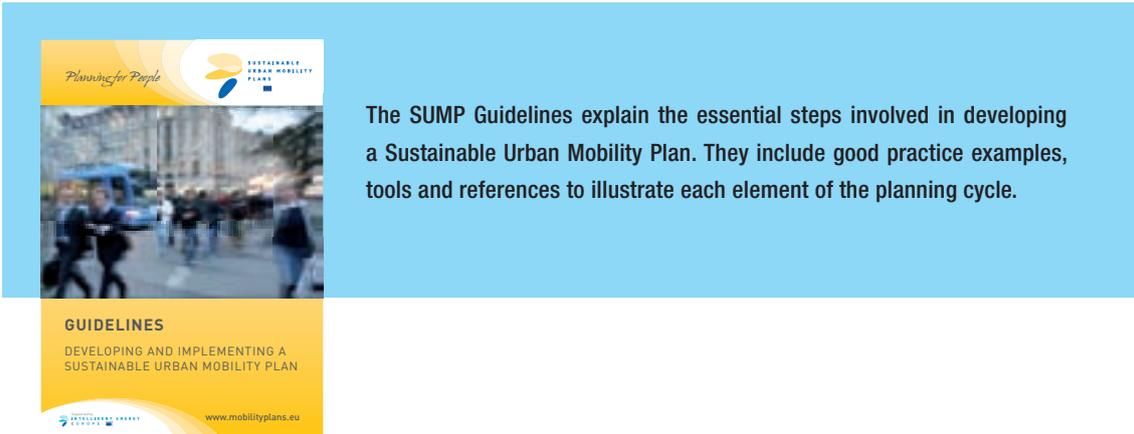


Figure 6: The SUMP planning cycle

50 Bührmann, S., Wefering, F., and Rupprecht, S.: Guidelines – Developing and Implementing a Sustainable Urban Mobility Plan, 2011.



The SUMP Guidelines explain the essential steps involved in developing a Sustainable Urban Mobility Plan. They include good practice examples, tools and references to illustrate each element of the planning cycle.

BENEFITS

SUMP is a concept that is ultimately supposed to benefit a city's citizens and their quality of life. The figure below depicts the various puzzle pieces which contribute to the overall quality-of-life aim.

Benefits of developing and implementing an SUMP may differ from one city to another. Experience from over one hundred experts and practitioners consulted within the SUMP reference project Eltisplus shows that the following benefits can be associated with an SUMP:

- Better quality of life – SUMP means planning for people rather than cars and traffic. It carries an emotional message expressed, for example, in the aim for higher quality public spaces or improved children's safety.
- An improved image of the city – SUMP contributes to the perception of a city as attractive for living, working and visiting, innovative and forward-looking. Such an image is an important factor in attracting people to live in a city and for businesses to invest there.
- Improved mobility and accessibility – People-focused urban mobility planning ultimately results in improved mobility for citizens and it facilitates access to urban areas and their services.
- Environmental and health benefits – Working towards air quality improvements, noise reductions and climate change mitigation leads to positive health effects and significant savings in health-related costs.
- Potential to reach more people – SUMP offers opportunities to reach more people and better respond to the needs of different user groups.
- Citizen- and stakeholder-supported decisions – Planning for people means planning with people. Through citizens and other stakeholders, decisions for or against urban mobility measures can obtain a significant level of “public legitimacy”.
- Effective fulfilment of legal obligations – SUMP offers an effective way to tackle and fulfil legal obligations such as the European Commission's Air Quality Directive or national noise regulations.
- More competitive cities and access to funding – SUMPs can provide access to funding available for innovative solutions – potentially offering a decisive advantage over other cities when competing for public funding.
- New political vision, integration potential – SUMP offers a long-term and strategic vision. It encourages an effective planning culture which aims at the integration of policy sectors, institutions as well as cities and their surroundings.

Sustainable Urban Mobility Plans		
Transport of people and goods	Vision how the urban areas should look twenty+ years from today	Mobility being mobile, not necessarily transporting something
Participation of citizens and stakeholders	Quality of Life expressed in space for people, better air, less noise, improved health and reduced health cost, ecosystem health, less traffic, less pollution, time and cost savings of sustainable urban mobility solutions, etc.	Integration of all relevant sectors, disciplines, and decision-making levels
Sustainable balancing economy, ecology, environment + inter- and intra-generational justice		Human Needs to move freely, safe, efficient, and at affordable prices
Urban Area encompassing a city and its surroundings, the functional city		Planning Culture holistic approach moving away from engineering-based and infrastructure-based approach
Evaluation focusing on achievable and measurable targets	Strategic Plan resulting from a process building on existing planning practices	Accessibility of urban areas and their services

Figure 7: Contributing elements for the overall quality-of-life aim

CASE STUDY

Vision building in Lille, France

In Lille, the development process of the Plan de Déplacements Urbains (Sustainable Urban Mobility Plan) started after the big urban regeneration movement in the 1990s. The new TGV terminal created the opportunity of establishing an entirely new neighbourhood called Euralille that also serves as an international, national, regional and local public transport node. Planners have the vision of a city that is economically strong, with an international

profile. The renovation of public spaces currently dominated by traffic plays an important part in creating an attractive city. One of the strategic questions raised was the choice between the further development of the metro system and surface public transport (bus and tram). The city opted for surface transport development as a means to restructure, redesign and redefine public spaces.

CASE STUDY

Integrated package of measures: Mobility policies and citizens involvement in Nantes Métropole, France

In the development process of its third SUMP for the period 2010–2030, Nantes Métropole organised a citizens' workshop on mobility behaviour changes in October 2009. This was also a sign of the strong political commitment to involve citizens in the definition and implementation of public policies: citizen dialogue is a key aspect of Nantes' policy.

18 inhabitants representing the entire conurbation volunteered to work together for three weekends in order to present concrete propositions. This brainstorming process first included training by mobility experts and local stakeholders to provide them with technical tools to develop their own ideas. The citizens were then asked to react and draft suggestions on how to trigger mobility behaviour changes, which measures could encourage changes in habits, and on the acceptability of such measures. They then presented their work to the politicians for it to be taken into account in the reflection on the next sustainable urban mobility plan.

This citizen workshop was based on a new vision of public policy trying to determine a) how to help

citizens become active in the neighbourhood they live in and b) how to best relay their ideas and involve them in the definition of future policies.

Even though final decisions remained the politicians' responsibility, citizens were enabled to bring in new ideas from their daily life in their neighbourhoods.

The success factors of the experiment were the following:

- A clear objective given to citizens with precise questions to avoid creating false expectations about the extent of the responsibility they had been given.
- A strong technical and political back-up.
- The fact that citizens were provided with technical support that allowed them to develop valuable proposals.
- At the end of the process, feedback provided to citizens on which proposals were integrated in the final Sustainable Urban Mobility Plan and which were left out and for what reason.

CASE STUDY

Public participation and the development of the city's Sustainable Mobility and Public Space Plan in Vitoria-Gasteiz, Spain

The City of Vitoria-Gasteiz has a population of 233,000. It is the capital of the autonomous community of the Basque Country. Unspoiled by massive urban sprawl, the city has always been noted for its careful planning, human dimension and the care that has been taken to balance new development with environmental concerns and social initiatives.

On the other hand, the unprecedented growth of the city and projects such as the urban tramway and plans to replace the existing underground railway line make it necessary, more than ever before, to initiate a debate on sustainable mobility in Vitoria-Gasteiz.

In March 2006, Vitoria-Gasteiz began to prepare its Sustainable Mobility and Public Space Plan, in order to face the following challenges:

- Reorganise traffic, so that vehicles crossing the city travel via the basic roadway network, freeing up secondary thoroughfares.
- Redefine its public transport network in order to improve the efficiency of the system in terms of accessibility and coverage.
- Consolidate its network of bicycle paths by maintaining most of the existing pathways and thereby form a series of main routes to ensure the maximum use of bicycles as a means of urban transport.

- Set up a pedestrian network to minimise the coexistence of pedestrians and cars to allow the interconnection of the main points of interest in the city through a series of walkways.
- Identify the infrastructure demands for parking and the space required for the loading and unloading of goods.
- Reduce the environmental impact of noise pollution in the streets.
- Increase the accessibility to public space.

The city strongly promoted public participation in the development of its Sustainable Mobility and Public Space Plan. The public participation was set up in line with its Citizens' Pact for Sustainable Mobility. The information flow was organised not only vertically from the city council to citizens, but also introduced citizen-to-citizen exchange.

A volunteer campaign fostered exchange with more than 27,000 people and included over one hundred volunteers. Unanimous approval of the Plan was assured through a strong consensus among all political groups, and coordination of technical areas that were used to operating separately.

CASE STUDY

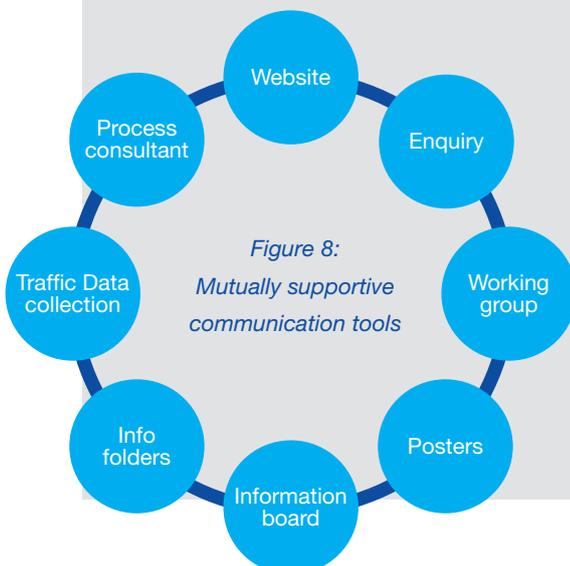
Dialogue with citizens in Odense, Denmark

At the level of individual measures, citizen and stakeholder participation helps to better embed policies into the local context. The City of Odense tested a strategy for environmental zones in Odense municipality within the CIVITAS Initiative – a strategy to implement a 30 km/h speed limit in residential areas. Odense, with its 185,000 inhabitants, is the third largest city in Denmark. Over 26,000 commuters travel to Odense each day. The city is one of the country's largest university towns with over 17,000 enrolled students. The environmental zone demonstration project was set up in two residential areas, Bolbro and Korup. The objective of the environmental zones was to increase the quality of life of residents. In order to achieve that, it was necessary to reduce the impact of motor vehicles on residential environments and increase traffic safety and feeling of security. That would also increase the use of public road space for social interaction and bring back the streets to children living in the areas. To fulfil the objectives the local project group initiated a dialogue with the local citizens.

It has been a huge success to involve the citizens through working groups. The citizens take the project to heart more easily and this gives the municipality the opportunity to get a local angle

on the project, and improve the results. The local residents know the areas better than the municipality administration because they live there and see the everyday problems. The residents could also be local safety ambassadors setting the standard.

Overall, 40 persons volunteered of which six people for one neighbourhood and seven for the other were chosen. They held five meetings in Korup and seven in Bolbro. At the meetings, the physical project was discussed as well as the local campaign and the opening event. The local knowledge led to changes in the original project and a better adaptation to the specific neighbourhoods. Although it was time consuming, it was ultimately understood that the project was not only about infrastructure, but also required a change of attitude. The average speed dropped by 12 percent in Korup and 22 percent in Bolbro, while through-traffic volumes dropped by 35 percent. Due to the valorisation of the citizens' perceptions it is known that 61 percent of the residents believe that the traffic speed has dropped and that the number of residents who consider crossing the roads safe has increased from 24 to 61 percent. Even though the Danish were already frequent cyclists, cycling increased by 62 percent in the two pilot areas.



A number of initiatives were developed, such as:

- Implementation of a website www.levendeveje.dk
- Questionnaires conducted before and after the project
- Flyers, briefly presenting the project, handed out to households
- Posters displayed in the implementation areas
- Information boards in the implementation areas for posting news
- Establishment of a working group in each area
- Ongoing information to the local press
- Presentation of the suggested solutions in the local areas for those interested and
- Local campaigns and side events

CASE STUDY

The role of SUMP in the transformation of Gent, Belgium

Gent is an example of a CIVITAS city which committed itself early to the principles of SUMP and successfully transformed from a car and traffic dominated to a people and quality of life focused city.

The City of Gent is situated in the East Flanders region of Belgium. It has a population of 243,000 and is well placed with good transport connections to the rest of the country and beyond. It has been implementing mobility plans and sustainable transport measures since the late 1980s, with increasing degrees of success. Today, the city centre is popular with both citizens and tourists, and was ranked among the top three most authentic destinations worldwide by National Geographic in 2008.

In the 1980s, the historic city centre of Gent was congested with private vehicles. In 1987, the city introduced its first attempt to reduce city centre congestion; it was however, not a comprehensive mobility plan, but a “traffic cell” plan. The aim was to prevent traffic from going through the historic city centre, regain public space and make the area attractive for shoppers and tourists. It was achieved by creating an inner city ring road. Traffic that entered the city would enter the ring road but could not proceed to the heart of the city; only public transport and bikes were permitted to enter. The plan achieved its objective and there was a large reduction in private car use in the city centre, but the plan was hugely unpopular with the local population. The City of Gent recognised that the plan was poorly planned, as there were no accompanying measures, such as bicycle policy, parking policy, public transport or refurbished streets and squares to help people access the city centre sustainably. As a result there was a drop in consumers visiting the shops and under heavy protest from local shopkeepers the plan was withdrawn after six months.

Another significant problem leading to the withdrawal of the plan was the poor communication and promotion of the plan. This important lesson would be a significant part of future mobility plans implemented by the City of Gent.

The 1997 mobility plan was essentially the same plan as the 1987 traffic plan. However, this time basic measures were added into the scheme or had previously been implemented that helped facilitate the mobility plan:

- No through traffic in the city centre; only public transport taxis and bikes allowed
- Comprehensive bike policy to promote cycling (implemented in 1993)
- Increased public transport frequency and coverage
- The construction of underground car parks
- A dynamic parking guidance system
- The renovation of public spaces

In the early stages of the plan, there was major opposition from local citizens and shopkeepers due to the experience of the last mobility plan. The plan proceeded however and the measures were implemented after a period of consultation, communication and promotion to the local population, overcoming the significant problem that blighted the 1987 traffic plan.

This led to a more successful outcome than the 1987 mobility plan due to the changes and lessons learned. The city was less congested and this led to a safer and more comfortable environment for shoppers and tourists. Surveys taken in the city showed that Gent had become a more pleasant place to live and visit than before the implementation of the 1997 mobility plan. →

→ The role of SUMP in the transformation of Gent, Belgium

The 1997 mobility plan was a success but it was not a comprehensive mobility plan for the region as it focused only on the city centre. In 2003, the city began to develop another mobility plan, one that aimed to encompass the whole of Gent. The plan was deemed to be more technical and scientific with the inclusion of scenario building and research. There was also a greater emphasis on the cooperation of different actors involved in transport in the region (road agency, waterways agency, public transport companies, railway companies, etc.) and also for auditing the plan and regularly updating its progress. The content of the plan aimed at defining the goals towards sustainable mobility, defining the network for cars, bicycles and public transport, and defining a parking policy. There was also an agenda to create measures that would accompany the plan. These included a campaign to

communicate the plan and promote it to the citizens and stakeholders, and also an invitation to local companies and schools to create their own Green Travel Plans.

The 2003 mobility plan was far more comprehensive than the previous plans and because of that there was a large list of objectives to be addressed that is far from completion today (2012).

The success that Gent has enjoyed with its (sustainable) urban mobility plans has been largely dependent upon the success of the plan communication and the involvement of its citizens. The lessons learned from previous mobility plans and a changing philosophy within the council on communication have led to the communication plans being introduced, not only in subsequent mobility plans, but also in large scale transportation projects.

Gent: Informing the public

In 2007, the City of Gent and five other partners launched a project to transform the main railway station, Gent Sint-Pieters, and the land around it into a huge mixed use development with good intermodal connections by 2020. A project this large needed a concerted information and consultation strategy to gain and maintain public acceptance. This resulted in a permanent information point with maps, videos and a 3D model, a regular newsletter for local residents, events in schools and “dialogue cafes” to give people the chance to comment in detail on the project. Twice a year, the public is invited to visit the construction site. On those occasions, 400 to 800 people are invited in small groups to see the work close up and to receive more explanations from project partners and engineers.

4. Ingredients for success

From the long list of CIVITAS measures carried out and evaluated, lessons can be learned in terms of which ingredients to use to make a measure successful. Ingredients for success can never be regarded independently from the context. However, some general conclusions may be drawn for a number of aspects that are, regardless of the actual content of the measure, pre-conditional for a good outcome. These aspects are related to processes, circumstances and quality. Some of the aspects can be influenced. Other aspects are criteria that must be fulfilled in order to get a good result. If they are not fulfilled, a good result is unlikely.

Ingredient	Elements of ingredient	Explanation
Quality	Technically sound, market research, apparent benefits	Only good measures give good results. The actual content must be sound, if possible good market research must give information on its feasibility. Apparent benefits shortly after introduction induce more success.
Relevance	Culture, urgency, adequacy	A measure must fit the situation. Moreover, it must fit in the present mobility culture. A measure must be the right solution for a pressing problem.
Inclusive management	Stakeholder engagement, institutional and regional co-operation and personal commitment	Inclusive management is the strategy to involve all relevant stakeholders in the policy and implementation process, each in their own right. Good inclusive management leads to legitimisation of the policy and support for it and thus contributes to success.
An integrated approach	Supporting measures, inclusion in global master plan/urban mobility plan	Measures do not stand alone. When fitted into a larger scheme, within a broader policy base, there is more chance of continuity, of financing, of political support and of success.
Funding	Government responsibility, market stimulation for start-up	A sound financial basis is a condition sine qua non for any policy measure, as by definition in free market societies, government funds because the market fails to do so.
Public and political support	Awareness, media strategy, political commitment, legislative support	Public support is regarded as support outside the group of people directly affected. Public support is indirectly important for the success of a measure, its working is indirect.

Table 9: Ingredients for success



4.1 Quality

The ingredient quality refers to the actual content of the measure: only good measures promise good results. This is something that can in general be influenced by the measure leaders, but not always.

TECHNICALLY SOUND

Measures must work, in technical terms. In process evaluations carried out by CIVITAS METEOR⁵¹ and CIVITAS CATALIST⁵², “Technology” is reported as an important driver for success or failure. Technology plays a crucial role in measures related to clean vehicles and where ICT is involved. It must not fail, otherwise the whole measure will lack success. This means that serious measures must be beyond experimentation: proven technology is preferred.

MARKET RESEARCH

Measures must work, in market terms. Market research is the instrument to make an adequate ex-ante estimation of success. More specifically, before taking measures that involve behavioural change (i.e. modal shift), questions on market potential and market share must be asked. This market research may not only give knowledge on scale and success rate to be expected, but also on the details that are important in the final design of the measure.

APPARENT BENEFITS

Many of the successful measures report that success creates support and consequently more success. Tangible evidence of benefits may convince initially doubtful opponents, for example. The case of Gothenburg’s inner city freight distribution (chapter 3.2) demonstrates this phenomenon: the apparent success of the scheme and clear benefits to companies convinced initially hesitating companies to participate. This process may work in any type of measure. It stresses the point of monitoring and evaluation: evidence must be collected.

51 CIVITAS METEOR Deliverable D6: CIVITAS 1 Cross-Site Evaluation, 2008.

52 CIVITAS CATALIST Deliverable D5.1: CIVITAS Long-Term Evaluation Report – Part A “Initial Overview”, Appendix, 2008.



4.2 Relevance

Measures must relate to stressing problems and fit the local situation. This touches upon the subject of transferability: measures successful in one city may not be successful in another, for they are not appropriate for the local problem or situation.

CULTURE AND LIFESTYLE

Culture and lifestyle refer to the user end of measures. The example of car-sharing works very well to show how culture may work in favour of or against the measure. Car-sharing requires a certain attitude of end users, for instance: willingness to share a car with others, low interest in car ownership. It is the attitude of people who regard a car only functionally, and not so much emotionally. Apparently, this lifestyle attitude can be found in North-Western cities such as Bremen, Aalborg, Amsterdam, Stuttgart and Norwich (cities with examples of successful car-sharing schemes). So far (see chapter 3.7), there is some evidence to show that this lifestyle attitude is now also picking up in Southern (Burgos) as well as Central and Eastern Europe (Kra-kow, Debrecen).

URGENCY, PROBLEM PRESSURE

Problems must be large enough and urgent enough to make measures work. The evaluation gives evidence of problem pressure being one of the strongest drivers.⁵³ Pressing problems always set off the political drive, the policy machinery, open financial means, etc. The bigger the problem, the greater the chance that something

at all will be done about it. This stresses the point of presenting a problem as an urgent problem, preferably across thematic fields. The air quality problem in Dutch cities shows a fine example of this phenomenon. Air pollution caused by traffic had been a problem for years. Only after, due to European air quality norms, building plans were frozen because of excessive levels of pollution, air quality became an urgent problem and serious measures against pollution were carried out in several cities.

THE MEASURE FITS THE PROBLEM

The relationship between problem and solution must be obvious, direct and strong. This helps convincing stakeholders, politicians and end users and makes discussions a lot easier. For instance (case of Bremen) the relationship between the problem parking pressure and the solution car-sharing is obvious, direct and strong. Lower car ownership means less demand of parking space. Mobility management schemes on the other hand usually have a broader set-up and comprise a wider variety of measures. In the communication, it is important to relate all steps and sub-measures to specific problems.

53 CIVITAS-CATALIST Deliverable D5.1: CIVITAS Long-Term Evaluation Report – Part A “Initial Overview”, Appendix, 2008.



4.3 Inclusive management

Inclusive management is the strategy to involve all relevant stakeholders in the policy and implementation process, each in their own right. Good inclusive management leads to legitimisation of the policy and support for it and thus contributes to success.

CITIZEN PARTICIPATION AND STAKEHOLDER INVOLVEMENT

Citizens are important stakeholders and not all stakeholders are citizens. Stakeholders (see also chapter 2.4) may be the public transport company, local shops, other companies, financing institutions, car drivers and public transport users, other levels and departments of government, neighbouring municipalities, lobby groups and associations, etc. Sustainable Urban Mobility Plans (SUMP, see chapter 3.8) have participation as a basic characteristic, as is demonstrated with the urban mobility plan of Gent: citizens are encouraged to take part in decision-making.

ENGAGEMENT STRATEGY

Many different ways of involving stakeholders may lead to success. Strategies to do so vary from country to country (following national legislation) and may also be part of the local culture. Anyway, it is clear that the strategy must fit the measure and in the end involve all relevant stakeholders. This is essential, not so much because engaging them is the democratic way to do things, but by all means to prepare for support and success. There is no blueprint for an engagement strategy, but it is anyway important to distinguish appropriately between different groups of stakeholders and the four levels of participation (see chapter 2.5), from low to high: informing, consulting, co-deciding and co-operating. Examples of Vitoria-Gasteiz (see chapter 3.8) and Odense (see chapter 3.7) demonstrate how good engagement leads to success.

INSTITUTIONAL AND REGIONAL CO-OPERATION

Most obvious, but often very difficult, is good co-operation between different departments within the city administration, and between neighbouring authorities. Although organisational formats of cities vary greatly, the essential co-operation is mainly between the departments of transport/mobility and urban planning. Successful measures show good co-operation between these two disciplines on the political level (different councillors working together) and on different executive and professional levels. Other disciplines or departments that may be involved: environment, communication, finance, health, enforcement, procurement. It is important to work on the relationship with colleagues outside the inner circle.

PERSONAL COMMITMENT AND PERSISTENCE

In CIVITAS, there are examples of 'champions': people that have committed themselves personally to a certain objective, who have been doing so for years, and have persisted in working on that objective. These people are mainly professionals within the city administration who have stayed in their jobs for quite some time. Politicians often change, politics often change, but policy requires consistency and a constant and persistent driving force to gain success. The examples of all clean fuels and vehicles projects in Stockholm (chapter 3.1) show that constant attention to this subject for over ten years gives results.



4.4 Integrated approach

Measures must not be regarded as stand-alone. When fitted into a larger scheme, within a broader policy base there is more chance of continuity, of financing, of political support and of success.

SUPPORTING MEASURES

Measures nearly always come in a ‘package’. For instance, car-sharing must be supported by providing parking space for the shared cars, specifically in cities where parking space is scarce (such as in Bremen). Clean fuel policies are greatly supported by access restriction and tax and parking fee relief (Stockholm, Gothenburg). Note that the supporting measure is often of a different nature, under the responsibility of a different city department and with several side-effects. This requires careful planning and communication.

INCLUSION OF MEASURES IN LOCAL URBAN MOBILITY PLAN

An SUMP should be the high-level and strategic overarching plan, made concrete by a large number of actions: the measures. There is a logical relationship between strategy and action, and therefore each measure fits into the urban mobility plan. In this way, each measure contributes to the high-level objectives of urban mobility policies. This may include objectives such as: reducing congestion by 50 percent before 2020, or achieving CO₂ neutrality by 2045, or reducing air pollution by 20 percent over the next 10 years. Moreover, inclusion of measures in the urban mobility plan shows potential conflicts or synergies between different measures.

INCLUSION OF MEASURES IN URBAN DEVELOPMENT PLAN

Roughly the same goes for measures vis-à-vis the urban development plan. This plan will also have a strategic relevance for the city for a relatively long time-span. Objectives of this plan will be more in the range of sustainability, growth, economic value, employment, health; i.e. a level up compared with the mobility plan. The mobility plan should be in accordance with the urban development plan, so specific measures must fit into both. This will also show conflicts or synergies between mobility-related and not-mobility-related measures.



4.5 Finance

A sound financial basis is a condition *sine qua non* for any policy measure. CIVITAS has shown no exception to that rule. There have been examples of measures for which funding did not extend beyond the lifetime of the project, and which were consequently terminated at the end of this lifetime.

In CIVITAS, we have seen the following types of projects in terms of funding:

- Funding is required because the policy involved is regarded as an essential government responsibility. The measure is by definition not a commercial activity and normally not generating any income. The measure contributes to what is considered an essential government aim, which may be a matter of political choice. Think of most measures related to infrastructure for cyclists and pedestrians, or measures related to cleaning the air (environmental zones). Measures related to climate policy and pricing schemes have a more political connotation. Measures that are clearly funded because of an essential government responsibility have a greater chance of success; politically motivated measures can be in danger after political change.
- By funding measures, the government saves costs on other responsibilities. Measures on behavioural change (marketing campaigns) are usually very cost-effective, because some costs may be saved on infrastructure development. Measures that clearly save costs on other government tasks have a good chance of success.
- Initial funding is necessary for start-up, because initial investment is high and revenues are yet uncertain. Without funding there would be no activity at all, so the government's responsibility is to initiate and stimulate. Income may be generated later, but there is not enough experience for a feasible business model yet. Here, we refer to measures,

by that time, of the experimental type, such as car-sharing and freight consolidation schemes and procurement of clean vehicles. In comparison with ten years ago, markets have now grown to a certain maturity and government funding is less required now. In CIVITAS, there are examples of measures that succeeded in self-sustainability.

All CIVITAS measures evaluated were financed by tax payers' money for one of the reasons described. All relate to European mobility-related policy objectives, for which spending or investing is justified from a local perspective as well as a European perspective.

All CIVITAS measures described were funded by start-up subsidies from the CIVITAS programme. This of course is also a form of funding from governmental origin, be it out of a different budget.

There is a fundamental difference between the cities' own resources and similar external funding. External funding has different objectives from internal funding, such as experimentation (because the measure is innovative), dissemination (because the funder finds good practice must be followed), or contributing to super-local policy objectives. In each of these situations, there is a second objective to the measure that must be met, which adds to the complexity of planning, implementation, etc. External funding also creates opportunities otherwise impossible. The downside of external funding for essential government responsibilities is of course dependency upon, if not addiction to, external resources.



4.6 Public and political support

Public support is regarded as support outside the group of stakeholders, to be distinguished from stakeholder support. Public support may not be directly essential for the success of a measure, it generally works only indirectly.

GENERAL AWARENESS, PUBLIC OPINION, MEDIA STRATEGY

Public opinion has many faces and is difficult to control. The city would want to communicate a measure as necessary and adequate to solve a problem. Good press results in enthusiasm, bad press results in declining political support. Negative press would probably focus on either (I) overspending public money, (II) non-existing problems, (III) not credible solutions, (IV) all sorts of negative side-effects. The communication strategy would be to avoid negative messages as such, or rather to broadcast positive aspects of a measure. In other words, the why, the what and the how are important, plus the benefits the measure creates.

The content of this message should not be too difficult, considering that for well-prepared measures all relevant arguments must have been exchanged already (to get the required funding, for stakeholder support, to get political support, to have departments working together, etc).

For a media strategy, timing is important. It is crucial that journalists are supplied with information during the preparation phase of the measure. Awareness of the problem, the different avenues for the solution and benefits, if possible proven benefits, must be fed to the press in good portions. This requires permanent open communication with press representatives.

LOCAL POLITICAL COMMITMENT

Political support is a precondition for a measure. The strength of the support is important when a measure gets into 'bad weather': if a political party or an influential individual politician is strongly committed to the subject (the measure), there is a better chance for continuation. Examples from Bucharest and for the implementation of parking restrictions in general demonstrate this. Intelligent programming of measures (for example, to set off just before council elections) may also help to get political support. It must be noted that strong political commitment involves a risk; political changes may be very negative for a measure that has been stamped with a specific political colour.

LEGISLATIVE SUPPORT

Specifically for those measures that involve access restrictions, tax relief or financial support, it is essential that the measure is supported by proper legislation. For instance, law must enable an environmental zone, otherwise it would be impossible to enforce. Another example is the incentives that were given to users/buyers of clean vehicles (tax relief, free parking spaces) in Sweden. Sometimes national legislation is required, and this may take some time before being settled. In the Swedish case, it certainly helped that the top three cities in the country, Stockholm, Gothenburg and Malmö, were working together with similar measures.



5. Take-up of CIVITAS measures

Transferability concept (Chapter 5.1)

Intervening factors and causal mechanisms

Decision making process

Social and cultural aspects

Urban context

Real Cases of Transfer (Chapter 5.2)

In CIVITAS, measures and concepts have been realised in many different ways. Eight concrete CIVITAS transfer cases are described offering a variety of means which can be used to facilitate or organise transfer.

CIVITAS



5.1 Transferability concept

On the regional and national level but also globally, a growing alignment of all kinds of policies ('policy convergence') can be observed. Increasingly, economic, social and political practices and strategies as well as organisational and administrative structures show a tendency to grow more alike.^{54/55}

More and more policy choices of different countries or social systems are interdependent, that is, a choice made by one decision maker impacts the decision process of other decision makers and is likewise influenced by them.⁵⁶

The CIVITAS Initiative with its projects actively responds to this situation as it is all about the transfer of successful policies on the urban (local) level so that other cities can relate their own work to these good practices in order to achieve similar results in sustainability. However, what exactly are the processes applied and how does transferability work? Basically two main concepts will have to be distinguished: policy diffusion and policy transfer.

Policy transfer describes the process of transferring knowledge concerning policies and practices, but also administrative arrangements, institutions or ideas. Based on past or present good practices, the knowledge will be transferred between two political systems or political units on the urban, national or international level. In the CIVITAS context, the concept is applied when two or more cities exchange knowledge and information on specific sustainable transport measures. Policy transfer studies emphasise the specific character (content) of policies and their modification through-

out the transfer process. Moreover, they allocate attention to the behaviour and role of institutions and individual actors during the implementation process of a certain policy. Transferability thus heavily depends on the interplay of different stakeholders such as governments, private entities, financial institutions, NGOs or research organisations. It must be noted that policy transfer does not only include simply copying successful solutions. Policy transfer also allows for the possibility to make substantial changes to the policy in question. In this respect, policy transfer may, but not necessarily has to, result in policy convergence.

Whereas transfer studies take a micro perspective, **policy diffusion** takes a macro view. In other words, policy diffusion is concerned with the question of how policies, programmes or ideas are being transferred within a group of states or sub-national units and how an innovation is communicated among various members of a social system.⁵⁷ In CIVITAS, the concept can be found when many cities cooperate in order to learn from good practice examples. Whereas policy diffusion in the past was solely considered a phenomenon spreading around an innovation centre, recently new communication patterns and the availability of information (e.g. Eltis) have influenced the traditional diffusion models.

54 Drezner, D. (2001): "Globalisation and Policy Convergence". In *International Studies Review*, (13), pp. 53-78.

55 Holzinger, K., Jörgens, H. & Knill, C. (2007): Transfer, Diffusion und Konvergenz: Konzepte und Kausalmechanismen. In K. Holzinger, H. Jörgens & C. Knill (Eds.): *PVS-Politische Vierteljahresschrift – Transfer, Diffusion und Konvergenz von Politiken*, 38.

56 Braun, D. et al. (2007): *Ex Pluribus Unum: Integrating the Different Strands of Policy Diffusion Theory*. In K. Holzinger, H. Jörgens & C. Knill (Eds.): *PVS-Politische Vierteljahresschrift – Transfer, Diffusion und Konvergenz von Politiken*, 38.

57 Rogers, E.M. (2003): *Diffusion of Innovation*.

INTERVENING FACTORS AND CAUSAL MECHANISMS

The conditions determining speed and extent of transferability (covering both policy transfer and diffusion) can be divided into intervening factors and causal mechanisms. Concerning the intervening factors, the literature differentiates between three main groups:^{58/59}

- The economic, institutional and socio-cultural characteristics of the countries that are concerned with the transfer or diffusion process
- The specific characteristics of the actual policies and the policy area concerned
- The technical capacity of a political actor to act, that is, political decision making capacities

Responding to the intervening factors, the FP7 research project NICHES+ (2008–2011) developed a methodology for assessing transferability of innovative urban transport concepts. It uses a six step approach as follows:

1. Clarify the impacts and measures of success of the innovative concept.
2. Identify if up-scaling is required and subsequently take it into account as appropriate.
3. Identify the main components of the innovative concept and its context relevant to transferability (examples of components include 'strategies and policies', 'finances', and 'stakeholders'). NICHES+ used a specially designed matrix for the transferability checklist assessment.

4. Identify the main characteristics of each component and their level of existence/achievement in the current context (examples of the characteristics of 'strategies and policies' include 'pollution reduction', 'accessibility', and 'land use').
5. Assess the likely ease or difficulty in achieving the necessary level of the characteristic in a receiving city.
6. Consider the set of values across the characteristics and assess the likely potential for transferability and any conditions that may be required.

Five mechanisms can be identified:

- Similar but independent responses to parallel problem pressure
- Harmonisation (common norms)
- Imposition (coercion)
- Competition
- Transnational communication

In particular 'transnational communication' summarises a number of 'sub-mechanisms' such as the impact of international organisations, emulation, lesson-drawing, transnational problem solving and learning.⁶⁰

58 Holzinger, K. & Knill, C. (2007): Ursachen und Bedingungen internationaler Politikkonvergenz. In K. Holzinger, H. Jörgens & C. Knill (Eds.): PVS-Politische Vierteljahresschrift – Transfer, Diffusion und Konvergenz von Politiken, 38.

59 Busch, P.-O. & Jörgens, H. (2007): Dezentrale Politikkoordinierung im internationalen System – Ursachen, Mechanismen und Wirkungen der internationalen Diffusion politischer Innovationen. In K. Holzinger, H. Jörgens & C. Knill (Eds.): PVS-Politische Vierteljahresschrift – Transfer, Diffusion und Konvergenz von Politiken, 38.

60 Holzinger, K. & Knill, C. (2007): Ursachen und Bedingungen internationaler Politikkonvergenz. In K. Holzinger, H. Jörgens & C. Knill (Eds.): PVS-Politische Vierteljahresschrift – Transfer, Diffusion und Konvergenz von Politiken, 38.

DECISION MAKING PROCESS

Regarding transferability, in particular the decision making processes must be considered when taking up practices from other cities: In which decision making context was the original plan conceived? Whereas a long-standing tradition of public engagement exists in some countries, in others decision making is done by elected politicians and an advisory group of experts. In some cases, national legislation may facilitate (in others hinder) the implementation of certain decisions, for example the take-up of electric vehicles can be facilitated largely by tax regulations.

May et al. (2005)⁶¹ distinguish three broad approaches for the decision making process:

- In a vision-led approach, an individual political leader (such as a mayor) has a clear vision of the future form of a city and this individual pushes through the policy instrument. Due to the fact that this approach depends on an individual political leader, it is vulnerable to any political change.

- A plan-led approach involves the specification of problems and objectives and the use of formal assessment methods. This approach depends greatly on professional planners and has the risk of losing support outside the professional circle (i.e. any other stakeholder).
- A consensus-led approach involves different stakeholder groups into the discussion on any stage of development; agreements and common strategies must be reached in each stage. This may lead to delay and inactivity when agreements cannot be reached.

May et al (2005) analysed the decision-making process for 60 European cities. Of course, mixed approaches are common and a combination of plan- and consensus-led approaches is most common (44 percent): the combination of professionalism and stakeholder involvement.

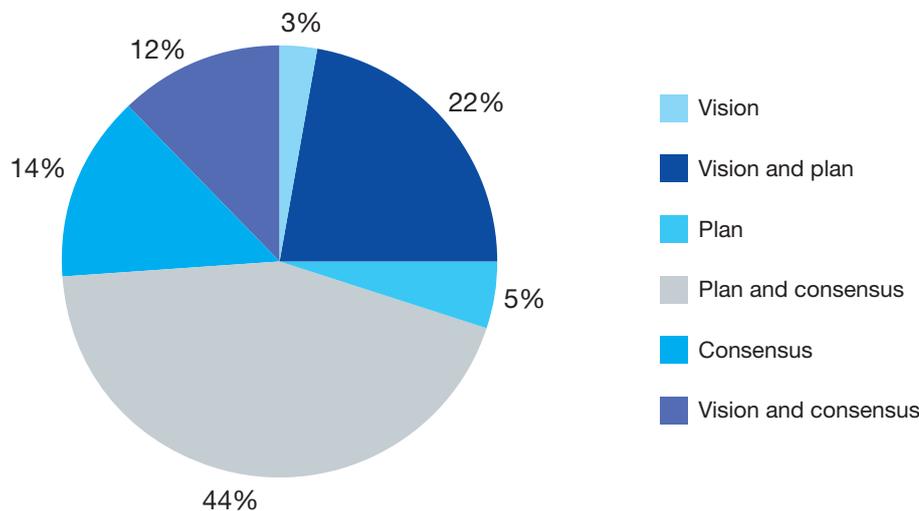


Figure 9: Approaches adopted in 60 European cities (May et al., 2005)

61 May, A.D., A. Karlstrom, N. Marler, B. Matthews, H. Minken, A. Monzon, M. Page, P.C. Pfaffenbichler, S. Shepherd (2005). Decision Maker's Guidebook.

SOCIAL AND CULTURAL ASPECTS

For analysing and understanding the transfer of policies, also individual cultural aspects cannot be overlooked. Attitudes towards enforcement and control (e.g. restricted environmental zones) are determined culturally. What is accepted in one cultural context

may not be accepted in another. Some best practice examples have required a serious long term orientation, which may not be feasible under different cultural conditions.

SOCIAL AND CULTURAL ASPECTS

The replication of a success in a different urban context is subject to certain conditions. There are no cities with exactly the same conditions. Cities can be different from each other in many aspects of transport and traffic conditions (demand, supply, infrastructure, traffic control and management, etc.), geographical, environmental, demographic, socio-economic and cultural backgrounds as well as institutional and legal frameworks. Therefore, it is a challenging task to make sure that success in one city can be replicated in another city.

The success of a measure will depend on many factors, some related to the planning, implementation and operation of the measure while others relate more to the context of the measure in terms of the physical, organisational and institutional aspects. It is therefore important to identify those factors which are key to the measure's success and which must also be addressed in any new location. It is also valuable to identify those factors which have proved difficult and have created barriers to success so that they can either be overcome or transferability avoided where such factors exist.

Overall, three main categories of urban context factors can be distinguished:

- Socioeconomic aspects: size and structure of the population are key factors for planning and evaluation of mobility; aspects such as gender and age distribution, distribution of wealth and, obviously, the degree of motorisation.
- Spatial structure and land use patterns: refers to the supply side of the city – size and spatial structure of the city and larger urban area, density, road, rail and waterborne infrastructure.
- Characteristics of mobility: rate of trips per day and modal choice and modal distribution are the main issues in this part.

URBAN CONTEXT

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5.2 Real Cases of Transfer

CIVITAS has supported a variety of measures and measure package implementations all over Europe. The transfer of a measure or measure package as well as the knowledge and experience from one city to another is an indication of success. However, transfer is constraint by the transport conditions as well as the geographical, environmental, demographic, socio-economic and cultural backgrounds as well as institutional and legal frameworks which may differ, sometimes significantly, between a transferring city and a take-up city.

Consequently, in CIVITAS, measures and concepts have been realised in many different ways. Below, eight concrete CIVITAS transfer cases are described offering a variety of means which can be used to facilitate or organise transfer:

Policy Assessment Workshop in Eindhoven, the Netherlands

Development of the mobility concept for Leoben, Austria

Technical visit by delegations from Bulgaria and Albania to study the integration of transport management systems in Toulouse, France

Establishment of a mobility agency in Ponferrada based on experiences from Burgos, Spain

Technical Workshop on Collective Passenger Transport in Nantes, France

Technical Workshop and Site Visits for Polish cities on Cycling and Walking in Krakow, Poland

Access management and limited traffic zone concept as an example for other cities in Italy, Europe and the world by Rome, Italy

From Europe to the world – CIVITAS at the EXPO 2010 Shanghai, China

CIVITAS TRANSFER CASE

Policy Assessment Workshop in Eindhoven, the Netherlands

Transfer of inspiration and ideas was carried out during a two-day workshop in the city of Eindhoven in September 2010. Eindhoven invited expert professionals from the cities of Toulouse, Rotterdam, Stockholm, Graz and Bremen to discuss the Eindhoven mobility situation. Each of the experts has a long-standing experience in CIVITAS measures and similar activities.

OBJECTIVE

The Eindhoven city council has formulated three important policy objectives:

- Modal shift from car to bicycle (+10 percent) and to public transport (+50 percent)
- 30 percent reduction of car traffic within the Ring in 2015
- Being energy neutral in 2045

The CIVITAS experts were invited to support the city administration in their strategic goals on sustainable transport.

PREPARATION

Participants in the workshop were twelve senior professionals from the departments of transport, environment, urban planning and health. All participants were well-prepared; in a preliminary one-day workshop, the Eindhoven participants were given an overview of all policy actions asked to assess policy aims versus actions, to prioritise, to find personal drives and commitment and to formulate concrete and specific questions to the experts. Please note that participants were from different departments and thus most were not fully informed about the city's plans and actions. The external experts prepared with a reader giving them an overview of the most important aims and actions.



THE WORKSHOP

The external experts presented their own policies and projects only briefly, focusing on the connection between their own cities' high-level ambition and the concrete projects resulting from that. Next, the focus shifted towards the Eindhoven situation, with Eindhoven professionals presenting and showing their plans, projects and results. The CIVITAS experts were then asked to give their impressions of the Eindhoven situation. Finally, in a session with the executive councillor for transport, the experts gave recommendations to politicians and policy makers.

RESULT AFTER THE WORKSHOP

The experts' recommendations were coherent and of much value. The workshop gave new inspiration to the planning agenda of the city. This did not so much change policies, plans or projects, but it did change the city's attitude to problems, how problems relate to each other and the attitude towards communication internally and externally. The agenda became more coherent and better focused. →

→ Policy Assessment Workshop in Eindhoven, the Netherlands

SUMMARY OF WORKSHOP RESULTS**Impressions of Eindhoven**

... on its attractiveness: The CIVITAS city representatives stressed that Eindhoven has many elements that other European cities can be jealous of: the amount of green space, the bicycle infrastructure, the pleasant living atmosphere.

... on the sense of urgency: The problem in Eindhoven is the lack of problems. Because there is no sense of urgency, inhabitants are not in need of any changes. So a problem should be sought that people understand and that they can relate to.

Things to improve

Coherence:

- An important question for Eindhoven to ask is: *What kind of city do I want to be?* Choose a city image; either lights, or sports, or green, or design or something else, but not all simultaneously. Focus will give coherence.
- Create a lively urban atmosphere. The city is for people, to meet other people. Infrastructure is only secondary. Traffic is not the issue, it's the city!

Making choices:

- Another important question to ask: *What exactly is my problem?* It may be congestion, air quality, safety. Measures must relate directly to those problems.

Quick implementation:

- The message must be positive. Put opportunities central, not the problems. And next, show what has already been achieved successfully (bicycle projects, green areas).
- Keep solutions *as simple as possible*. Resist creating complex systems.
- *Work with the willing*. Don't waste too much time on opposition. Start where you can get a success.
- *The devil is in the details*. Be open for the citizen's ideas.

Quick results:

- *Get started!* Start small-scale and expand step-by-step. Make practical custom-made solutions if necessary.
- To achieve anything, one needs *carrots and sticks*. Not only carrots!

CIVITAS TRANSFER CASE

Development of the mobility concept for Leoben, Austria

Leoben with its 27,500 inhabitants is the second largest city of the province of Styria in Austria. It has largely benefitted from the experience of CIVITAS cities, particularly nearby Graz as well as Bremen, to develop its urban mobility concept.

A concept for the reallocation of educational institutions identified the need to establish two school complexes in Leoben. This would bring along significant changes to the urban mobility situation for the entire city, but in particular the most affected target group of around 1,000 students, their parents and teachers as public transport and transport ways would need to be reorganised. The City of Leoben stressed the importance of safety and security within the area, reduction of private car traffic and its attractiveness as an option to get to school by implementing possibilities for alternative car use.

In close cooperation and under the umbrella of CIVITAS, the City of Leoben worked with the cities of Graz and Bremen – two well-experienced CIVITAS cities. Intense knowledge exchange started early by participating in several CIVITAS workshops offered by the City of Graz, but also in bilateral meetings explaining the benefits of the CIVITAS Forum Network. The idea of implement-

ing activities in the field of clean and sustainable urban transport was developed together with the CIVITAS Initiative.

The City of Leoben also cooperated intensely with the City of Bremen. A study visit of delegates, technicians and politicians from Leoben to Bremen was organised. Furthermore, a workshop in Leoben with representatives from Bremen triggered numerous ideas and inputs for a mobility concept that was developed and elaborated within an activity co-funded by the CIVITAS Initiative's Activity Fund.

The know-how exchange helped in developing a pro-active and sustainable mobility concept for the City of Leoben. The city submitted a proposal for the implementation of this mobility concept via a regional funding and it was rated number one amongst all submitted projects.

The experience transfer process guaranteed benefits for all partners. Leoben found itself well accompanied and supported by CIVITAS and its demonstration cities of Graz and Bremen. The City of Leoben has signed the CIVITAS Declaration and a further co-operation with already experienced CIVITAS cities in the field of urban mobility is planned.

CIVITAS TRANSFER CASE

Technical visit by delegations from Bulgaria and Albania to study the integration of transport management systems in Toulouse, France

Toulouse has become a reference and widely recognised leading city in the field of Intelligent Transport Systems (ITS) through years of implementation and experience exchange within the CIVITAS Initiative. The city has transferred its knowledge and experience to other cities through the organisation of study visits and workshops as well as its participation in meetings and conferences.

In April 2009, Toulouse hosted a study visit regarding the “Integration of Transport Management Systems”, offering political representatives and experts from Bulgaria (the City of Plovdiv) and Albania (the Institute of Transport of Albania, the Mission of the Ministry of Public Works and Transport

of Albania and the Municipality of Tirana) an opportunity for information and knowledge exchange in the field of ITS. The study visit was an occasion to learn and get inspiration from the new electronic ticketing system and the visit of the e-ticketing system installations at the “Argoulets” metro station in Toulouse.

Given the gap of development and innovation between the public transport network in Toulouse compared to the Plovdiv and Tirana infrastructures at that time, the study visit generated particular interest by the visiting delegations in the Toulouse transport development strategy.

CIVITAS TRANSFER CASE

Establishment of a mobility agency in Ponferrada based on experiences from Burgos⁶², Spain

Burgos is situated in North-central Spain in the region of Castile and Leon. It has a population of 170,000. It is a leader among Spanish cities in terms of sustainable mobility, making huge efforts to achieve a car-free city centre, the BICIBUR free bicycle loan system and 100 per cent clean public transport. The transport modal share is divided into 40 percent of trips on foot, 30 percent of trips in private vehicles and the other 30 percent of trips on public transport, bicycle, carpooling or collective private transport (data from 2009). The city has implemented a new policy of transport over the last seven years after the presentation of the Sustainable Mobility Plan (in 2005), partly within its CIVITAS CARAVEL project which included the development of a mobility agency.

Besides the city itself, the municipality of Ponferrada is composed of 18 other localities and 25 neighbourhoods and home to 68,900 inhabitants. The City of Ponferrada is the capital of the “El Bierzo” region and is situated in the North-West of the province of León (Autonomous Community of Castilla y León). The City of Ponferrada has several Park & Ride facilities available that facilitate the access to the bus services that bring the passen-

gers rapidly to the centre. The city also adopted an ORA payment system for its on-street parking and opened three underground car parks. Even though the measures are much appreciated and have a true impact on the urban mobility, the majority of travels is still made by private cars. In Ponferrada, a truly new mobility agency opened in spring 2010 on the basis of the strategy as developed in Burgos. This Mobility agency is considered a key element of success in the attempts to strengthen the promotion and integration of the different mobility services. One of the principal results found is that the creation of a mobility agency in Ponferrada had clear positive effects on the usage of alternative mobility (e.g. public transport, cycling). The related website of the agency opened in 2010 and has achieved a very stable use of about 10,000 visits per trimester.

Positive tendencies in terms of modal split and environmental indicators have already been observed in Ponferrada, even if, at this stage, it is difficult to conclude that the activities of the mobility agencies have produced a sustainable effect taking into account the necessary time span to change behaviour.

62 See also reference in the SUMOBIS project, www.sumobis.eu.

CIVITAS TRANSFER CASE

Technical Workshop on Collective Passenger Transport in Nantes, France

Held in Nantes in May 2010, a technical workshop gathered more than 50 participants from eight countries (Austria, Belgium, France, Germany, Ireland, the Netherlands, Sweden and the UK) around the topic of Collective Passenger Transport. Co-organised by the Interreg IVB BAPTS and CIVITAS CATALIST projects, the aim of the workshop was to spark off exchanges of experiences between European cities. Three roundtable discussions on I) public transport networks on dedicated lanes, II) clean vehicles, and III) Intelligent Transport Systems (ITS) were organised. During a site visit, participants also had the opportunity to have a look at the Nantes busway (bus rapid transit) and tram systems which allowed for in-depth views and discussions on technical details such as ramp design or on- and off-board information displays.

In the case of Eindhoven, which was one of the cities participating in the workshop, knowledge gained from the successfully operating system in Nantes helped to avoid planning mistakes: There are several solutions for physically adjusting bus stops in order to support (some) travellers to enter and exit a bus. The example of Nantes convinced the representatives from Eindhoven to design the bus lane lower to the pavement (rather than making bus stop pavements higher) to ease access to the bus. A higher bus stop pavement poses a problem in itself for less mobile travellers, as passengers have trouble arriving at the entry point. A lower bus lane requires some thought in the design process but is hassle-free afterwards.

CIVITAS TRANSFER CASE

Technical Workshop and Site Visits for Polish cities on Cycling and Walking in Krakow, Poland

The “BikeOne” Bicycle Renting System implemented as a CIVITAS measure in Krakow was the first of its kind in Poland. It was demonstrated during a Technical Workshop on Cycling and Walking in June 2009. The workshop participants from nine cities (and 13 departments) from all across Poland (Elbląg, Gliwice, Wrocław, Łódź, Kalisz, Poznań, Warszawa, Kielce, Murowana Goślina) had the opportunity to take part in a technical site visit and demonstration of the bicycle renting system. The details of the bicycle renting system were explained and technical and financial questions were answered by the operator and the representatives from the City of Krakow.

As an additional workshop feature, representatives from the CIVITAS cities of Bremen, Rotterdam, Ljubljana, Venice and Krakow as well as the City of Oslo provided valuable insights into their respective local cycling and walking measures (presentations and discussions were simultaneously translated).

Krakow’s Bicycle Renting System “BikeOne” quickly became famous and earned a good reputation in the whole country. Soon after its official launch, representatives of the City of Rzeszów – a middle sized city in the South-East of Poland – participated in a site visit to Krakow. The site visit was run both by the representatives of the Municipality of Krakow, directly responsible for the implementation of the system and the BikeOne system operator. It focused on practical, organisational and technical aspects of bicycle renting system implementation. The cities of Poznań, Rzeszów, Warszawa (some districts of the city), and Wrocław have learned and taken up experiences from the Polish pioneering case of Krakow and implemented bicycle rental systems. In 2012, the list of cities with interest and ambitions to implement a bicycle rental system includes Gliwice, Bielsko-Biała, Opole, Toruń, Gdańsk, Olsztyn and Szczecin. In some cases, financial constraints have slowed down the implementation process.

CIVITAS TRANSFER CASE

Access management and limited traffic zone concept as an example for other cities in Italy, Europe and the world by Rome, Italy

Access management strategies aim at controlling and reducing traffic flows to special areas of the city in order to reduce congestion and pollution and to raise revenues to be reinvested in transport infrastructures.

Under the CIVITAS umbrella, Rome set a trend at the Italian and European level by implementing the Limited Traffic Zone (LTZ) concept. It even raised worldwide interest expressed through various delegations visiting Rome to study its innovative concepts, including Brazil, China, India, South Korea and Vietnam. In the case of Beijing, Rome supported the implementation of an LTZ in the inner part of the city, i.e. the LTZ which is activated once environmental thresholds are exceeded. Rome has been a pioneer city in Italy as

in 2001 it started running the LTZ system in the central area of the old town with 22 electronic gates from 6.30 a.m. to 6.00 p.m., with the financial and administrative support of the Ministries for Environment and for Public Works.

Rome has also been a pioneer city of CIVITAS – having joined the Initiative at its outset in 2002. During the following ten years, a lot has happened with regard to the topic of access management. Two European cities, Stockholm and London, have implemented systems to prevent private traffic access to the central parts. In Italy, 156 more cities have implemented an LTZ and in Rome the LTZ concept has been enhanced both in terms of new areas and of technology transferred.

CIVITAS TRANSFER CASE

From Europe to the world – CIVITAS at the EXPO 2010 Shanghai, China

The largest World Exposition ever took place in 2010 in Shanghai, China. It was as well the first EXPO in a developing country and the first one focusing on urban sustainability – with its theme “Better City – Better Life”.

As part of the concept, an “Urban Best Practice Area” was reserved for selected projects of urban sustainability. An independent jury led by the director of UN HABITAT selected world-wide about 50 projects for a permanent presentation at the EXPO in Shanghai.

Two out of three transport-related examples were CIVITAS cities: Odense and Bremen. Whereas Odense presented a bicycle paradise, Bremen shared its experiences on car-sharing. Both elements are related and are seen as crucial to solve the increasing traffic problems of the growing cities, especially in Asia. Car-sharing in particular can play a crucial role for a new balance of mobility needs and urban space, as limited space is an urgent issue in Asian megacities.

During the six-month exhibition period, roughly one million people visited the Bremen showcase pavilion in the Urban Best Practice Area of the EXPO. As an important part of the dissemination activities, a two-day CIVITAS workshop was held at the EXPO in September 2010. Car-sharing raised a lot of media attention in China, and, in early 2011, the City government of Shanghai also expressed its interest in supporting car-sharing – with explicit reference to the CIVITAS City of Bremen.



Lewis Chen, former manager of the Shanghai Car-Sharing cooperative and speaker at the CIVITAS CATALIST workshop at the EXPO:

“Bremen became famous in the Asian transport world for its car-sharing success. The big cities in Asia are much more densely built. We face big problems with increasing car-ownership – much more than most European cities do. But the solutions are not yet developed on a similar scale. That is why the exchange is so important – to reach the media, the administration, politicians and of course also the public. The car-sharing presentation of Bremen on the EXPO and on conferences is extremely helpful – especially as it shows the involvement and active support of a municipality. Bremen is a well-known ambassador of the sustainable transport initiative CIVITAS in Asia. It was a good signal for Asian cities to see what impacts car-sharing can have. It was of great importance that the experience was told by a city. Exchange of experience from city to city counts much. A city is neutral and can tell the own practical details. The presentation of Bremen on the EXPO and the thematic workshops have created some impact. I hope we will be able to keep the momentum and to further learn from such active cities.”



6. Lessons learned

Many lessons can be learned from the CIVITAS Initiative. In this handbook, we refer back to the challenges for the urban professional, and demonstrate which policies and which type of measures can be used to overcome these challenges.

The table on the following page shows the connections between the challenges (chapter 2) and the solutions (chapter 3).

CIVITAS has shown the direct or indirect contributions of its measures to the challenges of health, congestion and safety and security (chapters 6.1 – 6.3), and the effects of its measures on mitigating climate change.

For the challenges of participation and strategic planning, CIVITAS has also demonstrated good examples among its measures. These are described in chapters 6.4 and 6.5.



6. LESSONS LEARNED

Solutions \ Challenges	Challenges					
	health	congestion	safety & security	participation	strategic planning	global climate change
Clean fuels and vehicles	very strong connection	weak / indirect connection	weak / indirect connection	weak / indirect connection	moderate connection	strong connection
Urban freight	very strong connection	strong connection	strong connection	strong connection	strong connection	moderate connection
Demand management strategies	very strong connection	very strong connection	moderate connection	very strong connection	strong connection	strong connection
Access restrictions, environmental zones	very strong connection	very strong connection	moderate connection	very strong connection	strong connection	strong connection
Congestion charge	strong connection	very strong connection	moderate connection	very strong connection	strong connection	strong connection
Mobility management	moderate connection	very strong connection	weak / indirect connection	very strong connection	strong connection	strong connection
Mobility agency	moderate connection	very strong connection	weak / indirect connection	very strong connection	strong connection	strong connection
Ecopoints	moderate connection	very strong connection	weak / indirect connection	very strong connection	strong connection	strong connection
Collective transport	moderate connection	strong connection	very strong connection	strong connection	strong connection	moderate connection
New forms of public transport services	moderate connection	very strong connection	strong connection	strong connection	strong connection	strong connection
Access elderly, disabled passengers	strong connection	weak / indirect connection	very strong connection	strong connection	strong connection	moderate connection
Integration of modes	moderate connection	strong connection	strong connection	strong connection	strong connection	strong connection
Transport telematics	moderate connection	very strong connection	strong connection	moderate connection	moderate connection	moderate connection
E-Ticketing	moderate connection	strong connection	weak / indirect connection	moderate connection	moderate connection	moderate connection
Traffic management and control	moderate connection	very strong connection	strong connection	moderate connection	moderate connection	strong connection
Travel and passenger information	moderate connection	very strong connection	strong connection	moderate connection	moderate connection	moderate connection
Less car-dependent mobility options	strong connection	strong connection	very strong connection	very strong connection	strong connection	strong connection
Car-sharing	very strong connection	strong connection	strong connection	very strong connection	strong connection	strong connection
Carpooling	weak / indirect connection	very strong connection	strong connection	strong connection	moderate connection	strong connection
Walking and cycling	very strong connection	very strong connection	very strong connection	very strong connection	strong connection	very strong connection
Sustainable Urban Mobility Plans	very strong connection	very strong connection	very strong connection	very strong connection	very strong connection	moderate connection

■ very strong connection
 ■ strong connection
 ■ moderate connection
 ■ weak / indirect connection

Table 10: Connections between the challenges and the solutions

A healthy environment is one of the responsibilities of a city. Urban planning is an instrument to improve workplaces, living and leisure activities. Through urban planning, people can be encouraged and motivated to more physical activity, to travel shorter distances, and to improve the economic viability of public transport facilities. Only an integrated package of local measures can improve the city's health situation. Such a package comprises a number of steps, from problem identification to communication measures.

First, the main sources of CO₂ and pollutant emissions must be identified. Estimate the potential of emission reductions, including the reduction that results from a shift to alternative transport modes.

Once hot spots of urban vulnerability have been identified, the package of local projects can be put together. Local sustainable development plans should then include travel adaptation strategies and actions to mitigate emissions.

A prioritisation of local projects can help to put a focus on the “low-hanging fruit” first. Start with low-cost, no-lose options that can easily be implemented through local staff and resources. A monitoring plan that follows a defined set of parameters is also important – right from the beginning. The results should be communicated at all levels.

This type of integrated package has been widely experimented with within the CIVITAS Initiative. An example of a local project may be the introduction of clean vehicles and fuels, supported by (1) access restrictions for polluting vehicles and (2) the promotion of alternative transport modes such as public transport, cycling and walking. The mutually supportive nature of the separate measures adds strength to the urban policy.



6.1 Health

How to create a healthy environment for citizens

Strong or very strong connection

→ Clean fuels and vehicles, Urban freight, Environmental zones, Stimulate walking and cycling

POLICY DIRECTIONS

Basically, the health situation improves with cleaner air and/or with more physical activity. The following five basic policy directions – in order of expected impacts – apply to health:

1. **Avoid transport.** This reduces trips, and thus emissions. Examples are: mobility management schemes with flexible working (e.g. working from home enabled by telematics), carpooling and freight consolidation schemes. The impact in reduced emissions can be substantial. Measures featuring access restriction (such as environmental zones) avoid transport, but only locally.
2. **Reduce distances.** Urban planning (compact cities) may help reduce distances between homes and destinations (workplaces, shops, schools, etc.). Reducing distances may also support physical activity; people are more inclined to use more sustainable modes for shorter distances (5 km is a distance perfectly suitable for cycling). The influence of reducing distances may be great, but can only be achieved in the long term. CIVITAS, having focused on mid-term transport measures, does not have such examples in urban planning.
3. **Change transport modes.** Any measure that induces mode change from car to public transport or to cycling and walking helps reduce total emissions (and also gets people engaged in healthy physical activity). CIVITAS can demonstrate many examples of this type of measure; better public transport and better infrastructure stimulate mode change, but car-sharing has also proved effective in mode change (car-sharers are more aware of their mode choices and use bicycles and public transport more often).
4. **Cleaner vehicles.** Changing the vehicle fleet, be it public buses, waste collection or other municipal vehicles, or private cars, may help reduce emissions and thus clean the air. CIVITAS has many examples of this type of measure.
5. **More efficient transport.** Smooth traffic flow is less polluting than congestion. Less congestion thus contributes to clean air. CIVITAS also shows many examples of this type of measure.

TOP 5 EFFECTIVE MEASURES

- A freight consolidation scheme in combination with an environmental zone. If pollution is worst in inner-city areas, removing heavy goods transport from these dense areas is very effective in cleaning up the air. All lorry traffic is banned from the inner city, with the exception of clean vehicles delivering goods to shops and department stores. Indeed, NO_x and particle emissions from lorries amount to far more than those from private cars, and this action reduces lorry kilometres. Examples in Bristol and Gothenburg show that measures of this type can relieve air pollution effectively.
- Clean vehicles for public transport and the municipal fleet. Higher amounts of air pollution originate from larger vehicles, including buses, cleaning vehicles and waste collection vehicles. Cities often have a direct influence on these vehicles, and, collectively, cities can influence the market for clean vehicles. Examples of measures in Stockholm show that buying and stimulating biogas, hybrid or CNG vehicles helps clean the air.
- Carpooling. Examples show that carpooling schemes help to avoid a substantial amount of car trips. Setting up a scheme is relatively inexpensive compared with infrastructure development.
- Car-sharing. Although much talked about in CIVITAS, car-sharing is relatively unknown in many cities. CIVITAS has helped prepare and extend a market for commercial car-sharing schemes in some CIVITAS cities, but car-sharing still has great potential to exploit. Car-sharing is effective in saving valuable (parking) space, which allows more space to be dedicated to pedestrians. There is also evidence that car-sharers drive less and make more use of sustainable transport modes. They thus engage more in physical activity and pollute less.
- Stimulating slow modes by marketing and by providing infrastructure and facilities. Marketing is more cost effective than infrastructure development and bicycle and pedestrian infrastructure is cheaper than car infrastructure. A combination of slow modes with public transport is relatively easy and effective. An increasing volume of cyclists has a double impact: less pollution, more physical activity.



6.2 Congestion

How to create an economically viable and accessible city

Strong or very strong connection

- Congestion charge, New forms of public transport, Traffic management and control, Carpooling, Stimulate walking and cycling

POLICY DIRECTIONS

Congestion is strongly related to city-inbound and city-outbound traffic during peak hours. Basically, congestion can be avoided or reduced with the following policy directions (in order of importance):

1. **Avoid transport.** This reduces traffic, and thus congestion. Examples in CIVITAS are mobility management schemes specifically related to peak-hour traffic (e.g. working from home), carpooling and freight consolidation.
2. **Reduce distances.** Urban planning (compact cities) may help in reducing distances between homes and destinations (workplaces and schools), especially during peak hours. Reducing distances is related to changing transport modes because people are more inclined to use more sustainable modes for shorter distances (5 km is a distance perfectly suitable for cycling). CIVITAS does not have such examples in urban planning.
3. **Change transport modes.** Any measure that induces mode change from car to public transport or to cycling and walking helps to reduce traffic and thus congestion. CIVITAS shows many examples of this type of measure.
4. **More efficient transport.** Management of traffic flows helps to reduce congestion.

TOP 5 EFFECTIVE MEASURES

- Carpooling. Obviously, the most effective way to reduce congestion is to remove cars from traffic. CIVITAS evidence shows that effective carpooling schemes can be set up.
- Congestion charging. The examples of Stockholm and London show the effectiveness of congestion charging in reducing traffic queues. It must be noted that setting up such a scheme requires a major effort – both political and technical – and the charge is usually not sufficient to cover the cost of the scheme.
- Traffic management and control. Traffic flows can be made more efficient with management systems as for example Stuttgart demonstrated during the 2006 FIFA World Cup through its Integrated Traffic Management Centre and complementary measures. Although initial costs may seem high, technological solutions are cost effective in comparison with building new infrastructure.
- Mobility management. Measures carried out in cooperation with companies can be highly effective in reducing congestion. Companies are usually successful in motivating their personnel to change transport modes or to travel outside peak periods.
- Better public transport. Substantially better public transport induces modal change. Toulouse, with its new user-friendly metro system, demonstrates this.



6.3 Safety and security

How to ensure a safe and secure urban environment and mobility

Strong or very strong connection

- Urban freight, Improving public transport access for elderly and disabled passengers, Stimulate cycling and walking

POLICY DIRECTIONS

Safety is stimulated with the following policy directions (in order of importance):

1. **Avoid transport.** Less transport means less accident risk. Notable CIVITAS examples are mobility management schemes, carpooling and freight consolidation.
2. **Reduce distances.** Urban planning (compact cities) may help in reducing distances between homes and destinations (workplaces and schools). Reducing distances is related to changing transport modes because people are more inclined to use more sustainable modes for shorter distances (5 km is a distance perfectly suitable for cycling). CIVITAS does not have such examples in urban planning.
3. **Change transport mode.** Any measure that induces mode change from car to public transport or to cycling and walking helps to reduce accident risks. CIVITAS shows many examples of this type of measure.
4. **More efficient transport.** Although the impact will be small, smooth traffic flows may be safer than congested traffic.

TOP 5 EFFECTIVE MEASURES

- Better access to public transport for elderly and disabled passengers. A large section of this group is most vulnerable in traffic. Public transport is a safe mode of transport. However, for this group it is most important to look at the complete door-to-door transport chain in order to avoid accessibility gaps.
- Freight consolidation. Lorries in inner cities are a major accident hazard for the vulnerable group of pedestrians and cyclists. Reducing their number means less exposure to accident risk. CIVITAS examples show that schemes can be set up successfully, with a substantial reduction of transport movements.
- Stimulate cycling and walking by marketing and by providing infrastructure and facilities. Marketing is more cost effective than infrastructure development, and bicycle and pedestrian infrastructure is cheaper than car infrastructure. A combination of slow modes with public transport is relatively easier and more effective than isolated measures.
- Carpooling. Any measure successful in reducing vehicle journeys will result in improved safety. Carpooling is usually most effective during peak hours.
- Car-sharing. Evidence shows that car-sharers drive less and cycle and take public transport more. The general effect will therefore be a lower accident risk.



6.4 Participation

How to involve citizens and other urban mobility stakeholders

It was found again and again during the CIVITAS Initiative that when citizens and other stakeholders were involved in decision-making processes during the planning, implementation and/or evaluation of measures, implementation was easier and the results better.

Stakeholders may participate in a range of ways: as regards the intensity of communication and impact on decision making, several levels of participation are possible from the lowest level of informing to consulting, co-deciding and cooperation.

CIVITAS has found that it is not always easy, but it is vital to properly involve stakeholders. In general terms, the involvement of stakeholders in the planning and implementation of a measure offers the opportunity to more clearly identify problems. It has been observed within CIVITAS that scepticism (or even mistrust) between stakeholders and decision makers can be turned into trust. Hence, stakeholder participation can be viewed as a means to develop common ground for action and for ongoing cooperation between the city administration and other stakeholders. In this sense, the legitimacy of the planning (and implementation) process is ensured.

IT IS CRUCIAL TO PREPARE STAKEHOLDER INVOLVEMENT WELL

1. The decision about which level of involvement is required may depend on the circumstances. In cases where decisions have already been made and are no longer negotiable, involvement can only be on the lower levels.
2. Depending on the context, organising stakeholder events may be a big challenge; discussion platforms can turn into battlegrounds. Friction can be avoided by careful analysis of stakeholders and their respective opinions.
3. The stakeholder identification process is crucial: who has a stake in the process? Some may be less articulate or less involved in community affairs but still crucial to the success of a project.

The **how to involve** depends on the level of involvement that is required. Basically, the table below may be used:

Target group	Goal	Level of involvement	Methods
Political stakeholders	Favourable vote in council	Passive	Provide with information
	Convince responsible politician	Active	Provide opportunities for comments and suggestions
	Politician must convince other stakeholders	Active support	Create co-ownership
Other public administrations	Legal obligation to inform	Passive	Provide with information
		Active	Provide opportunities for comments and suggestions
		Active	Create co-ownership
Private companies	Inform, educate, raise awareness	Passive	Provide with information (website, posters, folders, news releases)
	Consult	Passive	Provide opportunities for comments and suggestions
	Decide together	Active	Working groups such as a Vision Board (SUMP) or a Mobility Forum
	Act together	Active	Negotiate and performance contract
Associations and lobby groups	Consult	Active	Public hearing
	Act together	Active	Volunteer campaign
Local citizens	Inform, educate, raise awareness	Passive	Provide with information (website, posters, folders, news releases)
	Consult	Passive	Provide opportunities for comments and suggestions; surveys or market research, public hearing
	Decide together	Active	Working groups such as a Vision Board (SUMP) or a Mobility Forum
	Act together	Active	Citizen-to-citizen exchange, volunteer campaign

Table 11: Different levels of involvement and actors in the planning process



6.5 Strategic Planning

How to achieve policy goals while ensuring that mobility needs of society and its citizens are met

A Sustainable Urban Mobility Plan (SUMP) is an instrument to bring mobility planning to a more strategic level. Its focus is not so much on traffic, but on people in the city.

The quote from Fred Kent of Project for Public Spaces sums up the quality of SUMP: “If you plan cities for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places.”

Needless to say, SUMP is the approach to plan for people rather than for traffic. SUMP thus presents a change in attitude from matter-orientation to an orientation toward people. SUMP means planning both for and with people.

The SUMP methodology enables a city to:

- Engage citizens and give other stakeholders a good place in the planning cycle (participation is essential in the SUMP);
- Consider issues of sustainability from the very start of the planning cycle;
- Integrate practices and policy sectors, different levels of government and neighbouring authorities;
- Focus on measurable targets and monitor and evaluate achievement of these targets;
- Internalise costs (and benefits) to society which are still often not accounted for (such as health costs due to the effects of transport).

France, England and Wales⁶³ have legal definitions as well as national guidance on SUMP and are considered the forerunner countries in terms of the development

and implementation of SUMP. Examples from these countries as well as advanced cities such as Gent or Barcelona show that the applied planning approach makes a difference in results. In other words, the benefits of SUMP are not only theoretical; they are very much real and measurable.

Examples from cities with a history in SUMP-like planning approaches, such as Lille, Gent, or Nottingham demonstrate the benefits of this approach. The most notable benefits are the following:

- Planning for people rather than for cars and traffic does make a difference. For instance, the quality of public spaces and children’s safety get higher priority.
- SUMP offers opportunities to engage more people and thus better respond to the needs of different user groups. This also creates a higher level of public legitimacy.
- SUMP forces the city to establish a long-term strategic vision. This in turn encourages an effective planning culture which aims at the integration of policy sectors, institutions as well as cities and their surroundings.
- SUMP contributes to the overall attractiveness of a city as a place to live, work, visit and do business while it helps to improve mobility, accessibility, environment and health.

63 There is no common UK approach. Different arrangements apply to England, Scotland, Wales and Northern Ireland as transport is a devolved matter.



CIVITAS CATALIST Consortium Partners

CIVITAS CATALIST, the dissemination and best practice transfer action of the CIVITAS Initiative ran from 2007 – 2012 and was composed by cities, networks in the field of sustainable urban transport and the environment, as well as research and consulting organisations in the field of sustainable urban transport.

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