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Cluster Report 8: Access and Parking Management

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Authors: Prof. M.McDonald, Dr. R.Hall & E.Gilliard
Transportation Research Group
University of Southampton

Prof. G.Sammer, O.Roider, Dr. R.Klementsitz
Institute for Transport Studies
University of Natural Resources and
Applied Life Sciences (BOKU), Vienna



THE CIVITAS INITIATIVE
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1 Introduction

The history of access and parking management in Europe is a long and honourable one. A great deal has been achieved by projects in this field. The demonstration projects in this cluster deliver a series of further steps forward.

There is a logical progression in the sub-clusters of measures. First, we look at parking management, where innovations in design, communications and enforcement brought about real change. From parking management, we move to the exclusion of most traffic whilst maintaining access for residents and other priority visitors. The next sub-cluster tackles the intractable issue of creating an environment in which driver behaviour responds to sustainability measures. Finally, we describe a sub-cluster of measures in which Low Emission Zones work towards integrated strategic plans for sustainability.

The 23 measures within this cluster form, therefore, into 4 broad sub-groups:

- (a) Parking management (5 measures)
- (b) Exclusion of non-priority traffic (6 measures)
- (c) Traffic behaviour change (5 measures)
- (d) Clear Zone / LTZ / LEZ (7 measures)

Table 1.1: Access and parking related measures

City	No.	Measure Title	Outline Description	Success of implementation ¹	Success of outcome ¹
(a) Parking management					
Burgos	6.5	Parking strategy and management	Increase parking capacity and enforce efficient parking	1	2
Debrecen	6.5	Access and parking management for Debrecen city centre	Delivery limited to signal countdown for car traffic at junctions	2	2
Preston	7.3 & 7.5	Parking strategy and parking management	Parking pricing structure to act as demand management	1	1
Toulouse	6.1	New parking management	Reduce parking by 20% and shift priority to residents' and short-stay parking	3	3
Venice	6.7	Parking management for Mestre	Real time information and signing for park & ride with a parking price structure discouraging parking in the centre	2	2
(b) Exclusion of non-priority traffic					
Burgos	6.2	Integrated access restriction strategy	Traffic restrictions and pedestrian facilities	2	3
Debrecen	6.6	Accessibility scheme for the conference centre pedestrian zone	A design competition for a pedestrian zone	2	1
Krakow	6.1	Integrated access control strategy	Wider access-controlled area, with social consensus, to benefit public transport and non-motorised users	1	-
La Rochelle	6.1	Develop and extend access control zones	Create a 'strolling zone' in the cultural area and safe walking and cycling in the commercial centre, also saving bus travel time	1	3
Norwich	6.3	Time control access restriction	Part time access restriction [not delivered as planned]	1	1
Ploiesti	6.6	Development of a clear zone	Pedestrian zone in the city centre, to improve urban quality of life	3	3

City	No.	Measure Title	Outline Description	Success of implementation ¹	Success of outcome ¹
(c) Traffic behaviour change					
Krakow	6.4	Enforcement of access restrictions	Electronic access control for the restricted zone in the city centre	1	-
La Rochelle	6.2	Design access control scheme for tourist coaches	Reduce coach access through information provision	2	2
Malmö	6.1	Extended environment zone	Freight access restricted to environmentally friendly vehicles	3	2
Norwich	10.3, .4 & .5	Priority access for clean goods vehicles; Development of Freight Holders' club; Urban consolidation centre	'Freight club' to plan load consolidation and identify priority routes, to reduce freight impact on the city	0	1
Venice	6.8	Access management for the city centre in Venice – LTZ buses	Higher charges for buses to reduce numbers, with reductions for Euro IV engines to reduce pollution	2	2
(d) Clear Zone / LTZ / LEZ					
Genoa	7.1	Integrated access control strategy and road charging scheme	Access control; freight and parking pricing schemes; study for road user charging	-	1
Norwich	6.2	Low emission zone	Traffic rules to improve air quality in restricted zone	3	3
Odense	6.10	Environmental zones	Restricting car movement and through traffic in housing areas and city centre	3	3
Preston	6.3 & 6.4	City centre Clear Zone	Clear Zone strategy, initial 20 mph zone; pedestrian crossing to reduce severance	3	3
Preston	6.5	Improve traffic regulation through access control	Creation of a limited access "Quarter" around the University area	3	3
Stuttgart	6.3	Policy options for access restrictions	Design and implementation of a policy to reduce pollution	3	2
Suceava	6.4	Extension of low emission zone	Access restrictions on polluting public transport vehicles, with improved pedestrian infrastructure	2	2

Note 1: Rating of success: 0=not successful, 1=moderately successful, 2=successful, 3=very successful

Table 1.1 also shows the ratings of success of the measures in relation to the implementation process and the outcome. The estimated ratings were made by the CIVITAS projects themselves and collected at the end of the project. In relation to other clusters, cluster 8, Access and parking related measures, is characterised by a very successful implementation process and an average success of the outcome.

2 Implementation

2.1 Parking Management

This section describes the implementation lessons learned from the five measures in section (a) above: Burgos 6.5, Debrecen 6.5, Preston 7.3 & 7.5, Toulouse 6.1 and Venice 6.7

The following implementation steps and issues have been identified:

- Analysis of basic parking data and facilities

Existing data, analysed by factors such as the supply of and demand for parking spaces and their level of use and turnover, give important information for the design of the scheme and the regulation applied. An analysis of the existing parking areas (including on and off-street parking as well as P&R facilities and traffic counts) and specific problems within these areas can be supported by holding focus group discussions with different stakeholders.

- Definition of target area and user groups

The exact definition of objectives is not only important to outline the project but also vital for presenting the project to the public and the local authorities. It is essential to define the target area/zones and the user groups (considering residents, visitors, shopkeepers, deliveries, heavy vehicles, commuters, etc.). In many instances, this will lead to re-categorising parking places: for example, long-stay spaces may become short-stay; council-staff car parks may become shoppers' parks; general car parks near public transport nodes re-designated for park and ride. Similarly, there may be changes to existing parking facilities (e.g. changing time restrictions to allow greater turnover of parking spaces for shoppers).

- Identification of a differentiated tariff system

Many cities introduced parking tariffs which encourage the use of public transport and P&R facilities but also provide special conditions for different user groups such as residents, disabled drivers, visitors, deliveries and heavy vehicles. The new tariff strategies can provide for a scheduled, incremental increase in price and/or perimeter of tariff areas (e.g. Toulouse and Preston).

- Political and legal approval

As all projects deal with the need for political and legal approval, it is advised to hold working groups and/or stakeholder meetings to put this issue on the agenda. It is essential to consult the local authorities for political approval from the very start of the project. The CIVITAS projects focused on each scheme's ability to resolve problems caused by parking in the demonstration cities.

- Installation of associated infrastructure

In some measures, as in measures in other clusters, static signals and variable message signs informed drivers about car parks and/or P&R facilities. The signposts can indicate the direction to the nearest (free) car park, the name of the interchange car park and the number of places available. The construction of attractive infrastructure for non-motorised traffic at P&R facilities (e.g. cycle parking, segregated foot/cycle paths) can gain an increase in usage of public transport (e.g. Preston).

- Control and enforcement concept of the measures

The control and enforcement of the desired measures (e.g. supported by the "multa-car" in Genoa) should discourage parking in prohibited areas and should include fines for violations.

- Marketing and promotion

The measures can be promoted by information material such as maps, leaflets and brochures, letters and/or awareness campaigns. The documents produced can give information about the alternative mobility possibilities available, location and price (public transport, car sharing options, bicycle hire, etc.). There is also the possibility to promote and regularly update the process of the project on official

websites. Additional educational campaigns for drivers and children, as in the city of Burgos, can be used as an accompanying measure to promote the new parking schemes and reduce illegal parking.

- **Monitoring**

Monitoring is critical to show both what future developments are needed and the return on investment from the measures enacted. In parking management, monitoring is also necessary to enable politicians to demonstrate the benefits of the measures when criticisms arise from citizens or businesses who want the return of free parking.

2.1 Access control

This section provides a précis of the lessons learned from the access control measures. The analysis groups the three sections ‘exclusion of priority traffic’, ‘traffic behaviour change’ and ‘Clear Zones’.

Within CIVITAS II there are access restrictions for different purposes, such as:

- Access control for special vehicle-groups such as private cars or tourist coaches (La Rochelle, Venice)
- Access control only for sensitive areas or zones such as city centres or conference centres (Debrecen, La Rochelle, Krakow, Genoa, Burgos), or
- Access control only at certain times (Norwich).

Other access restrictions aim at reducing motorised traffic by the establishment of Clear Zones and environmental or Low Emission Zones (Preston, Ploiesti, Malmö, Suceava, Norwich, and Odense).

The following implementation steps and issues can be identified:

- **Identification of the target area and access criteria**

The area and streets to be under access restriction should be identified first. This needs to be done to set the outer boundaries, where control points or other access restriction measures will be set up. If the restricted access is only for certain vehicle types it is essential to define access criteria and control (e.g. easy access for residents, public buses, employees, goods deliveries, etc.). There is the need to authorise permissions for neighbourhoods and give access control cards. Traffic may need to be reorganised for a new scheme for the distribution of goods within the area. If necessary a new parking space programme has to be developed. If there is the plan of extending existing pedestrian areas or restricted-access-areas it is possible to divert traffic by opening an adjacent street from dead end into a one-way by pass (Suceava). There is also the possibility to install different levels of pedestrian areas.

- **Analysis of basic conditions and target groups’ needs**

Data regarding vehicle speed and flow and traffic counts, pedestrian and cycling activities, parking arrangements and bus fleet composition need to be collected and analysed. If the goal is the establishment of an environmental zone, it is vital to examine the air pollution situation before implementation. The needs and priorities of the stakeholders (especially the residents of the area, bus and taxi operators or other commercial operators, craftsmen and shopkeepers’ associations, couriers as well as police, city and district councils) have to be taken into consideration and can be found out by surveys and/or round table discussions.

- **Design of charge systems/pricing policies and its impacts**

There are different concepts of access restriction. One is to design a charge or pricing system. The following points give some ideas of managing the restrictions by pricing vehicles’ access:

- congestion charge scheme – intended to tackle congestion and drive towards modal shift in favour of public transport or other modes
- pollution charge scheme
- toll fees, with fixed tariff for specific vehicle class
- mobility credit concept (Genoa).

For the enforcement of these measures, it is possible to introduce emission based tariff systems. The complexity of the tariff structure varies, but has cost implications for enforcement (e.g. in Venice, the structure checked destination, vehicle size and even the nature of the party: school trips and cruise passengers have different rates from other groups). Emission-based systems require some standardised determination of energy efficiency of vehicles. Another way of an indirect charging policy is to raise the parking fees inside the area.

- Consultation and approval

At all events it is necessary to get the acceptance and/or support of the neighbourhoods, as they are the ones being directly influenced. For an efficient and successful implementation it is necessary to inform and consult the affected stakeholders (inhabitants of the area, commercial operators, craftsmen and shopkeepers' associations, couriers and professional carriers as well as police, city and district councils, ecological clubs). Architecture competitions as in the city of Debrecen can raise public awareness and they are a good starting point for consultations.

- Construction and/or testing of technical devices

Access restriction involves the closure of parts of streets for all traffic or preventing access for certain vehicle groups. There is a series of possibilities to implement the measure. The following listing gives a short overview of potential measures:

- (Automated rising) bollards: buses and emergency vehicles can be equipped with transmitters pulling down the bollards automatically when they approach the entrance gates
- Electronic identification system (electronic access control system)
- Check-in gates (staff controlled)
- Cameras (CCTV) with or without automatic image recognition
- Legal ban for certain vehicle groups such as heavy vehicles.

- Complementary measures

There are also measures that work alongside access restriction within the area/zone:

- Traffic calming treatments like chicanes or mounting humps, with priority routes for public transport or bicycles, giving reduction of speed
- Recommended routes and parking areas for coaches with internet support (La Rochelle)
- Interactive information system for non-motorised traffic on information screens
- Additional pedestrian crossing places to harmonise traffic flow and reduce emissions
- Count down signals for pedestrians, cyclists and cars (Debrecen)
- Additional cycle infrastructure such as racks
- Junction regulations with public transport priority or non motorised mode priority
- Cohesive parking strategy
- Improvement of public transport stops (seating facilities, lighting ...)
- Dedicated lanes for special user groups (public transport, cycling, loading)
- Courses of Eco-driving and 'engine switch-off' areas (Norwich).

- Communication, information and promotion

Communicating with stakeholders should start at the very beginning of the project and can be done by producing and sending out brochures and/or postcards to citizens and coach drivers/operators. It can be useful to make the information available in different languages and on the internet, especially if the measure concerns the tourist industry.

For a mobility credit system, there should be a user-manual that is also available on the internet.

It is also helpful to use media such as tourist information newspapers or – in case of strong effects of the measure - to hold a press conference with an official press release and a press kit.

As the project unfolds, promotion can raise awareness of the improvements in quality of life provided by the access restrictions. Festivals and events in pedestrian areas can reinforce this message.

3 Drivers and strategies to overcome barriers

The tables below show, by sub-cluster, the drivers (Table 3.1) and barriers (Table 3.2) encountered, as reported by the individual project teams.

3.1 Drivers

Drivers were asked about in an open question format. They were asked to be reported only if they were recognized as being more than what would normally be expected. To give a better overview and to compare the different measures with each other, categories have been created. A tick mark indicates that the specific driver was indicated at least once in the evaluation for the measure.

3.1.1 Parking management

Measures dealing with parking management particularly profited from meeting existing user interests and demands as well as the political commitment due to existing measures within the same context

- Existing supportive plans, policies and infrastructure

Important drivers for new parking management are existing infrastructure as well as ongoing plans and projects that already support the project's goals, which create a level of commitment. In addition the necessary political support should be established.

- Meet the users' needs

Meeting the demands of the different user groups and communicating the goals in presentation meetings or site visits allows residents, shopkeepers and other stakeholders to understand the benefits of the measure and gain their support. The provision of different tariff schemes for individual user groups leads to residents finding a parking space more easily and visitors being encouraged to use public transport. As it is the overall goal to improve user-service, a project gaining more satisfied residents can be a role model for other cities.

3.1.2 Access control

Access control measures mainly benefited from local support and stakeholder involvement as well as existing supportive regulations and plans dealing with this topic.

- Support of local residents', economies' and industry's needs

As access restriction mainly concerns keeping out unwanted traffic from sensitive areas but allowing residents, public transport, necessary delivery services and emergency vehicles into the area, it is a clear measure to improve quality of life. Sometimes even only clear and increased loading/unloading restrictions in the city can be an improvement and cooperation with the stakeholders will be much easier (Norwich).

- Collaborations and stakeholder involvement

Collaborations with key stakeholders such as tourist offices (Krakow) or the freight sector (Burgos) support the process of implementation.

- Information throughout the process

The project can be supported by allowing an open process of continued publicity and promotion. To create a website and educational campaigns can inform the target groups about the projects achievements so far and state the goals of the process. In some cases, for example measures targeted at tourists and coach drivers, it can be helpful to make information available in several languages.

Table 3.1: Drivers

City	Measure	Driver related to above expected...				
		engagement / commitment of organisation or persons involved	experience and know-how of persons involved	support from outside the project team to implement measure	good structures / cooperation / management within project team	unsatisfying situation before and/or need to improve the situation
(a) Parking management						
Burgos	Parking strategy and management (06.05)	✓		✓		✓
Debrecen	Access and parking management (06.05)	✓		✓		
Preston	Develop on and off-street parking pricing policy (07.03)	✓		✓		
Preston	Develop on and off-street parking pricing policy (07.03)	✓		✓		
Toulouse	Definition and implementation of a new parking management policy (06.01)		✓			✓
Venice	Parking management strategies (06.07)				✓	
(b) Access control						
Burgos	Integrated access restriction strategy (06.02)	✓				
Debrecen	Accessibility scheme for the conference centre and pedestrian zone (06.06)	✓				
Genoa	Integrated access control strategy and road charging scheme (07.01)	✓		✓	✓	
Krakow	Enforcement of access restrictions in Krakow (06.04)	✓				
Krakow	Integrated access control strategy (06.01)	✓				
La Rochelle	Design access control scheme for tourist buses (06.02)	✓				
La Rochelle	Develop and extend access control zones (06.01)				✓	
Malmö	Extended environmental zone for heavy vehicle and enforcement (06.01)	✓		✓		
Norwich	Introduction of Low Emission Zone (06.02)			✓		✓
Norwich	Introduction of time controlled access restrictions (06.03)			✓		
Norwich	Priority access for clean goods vehicles (10.04)			✓		
Odense	Implementation of environmental zones (06.10)			✓	✓	
Ploiesti	Development of a clear zone (06.06)				✓	
Preston	Air quality assessment and clear zone strategy (06.03)					✓
Preston	Develop clear zones and extend pedestrianisation (06.04)			✓		
Preston	Improve traffic regulation through access control (06.05)					✓
Stuttgart	Policy options for access restrictions (06.03)	✓		✓		✓
Suceava	Extension of low emission zone (06.04)	✓		✓		
Venice	Access management for the city centre (06.08)	✓		✓	✓	

- Existing supportive regulations and projects

Existing regulations concerning air quality and noise emissions are supportive, as there is a political commitment to act in their spirit. In some cases the data provided from previous projects can be taken as an input.

3.2 Strategies to overcome barriers

Measures dealing with parking management dealt with political and technical barriers (see Table 3.2 (a)), so the following strategies to overcome these barriers were identified:

3.2.2 Parking management

- Round table discussions and stakeholder meetings

Parking projects often face some resistance or lack of acceptance by users, politicians and/or other stakeholders such as shopkeepers. Parking is a sensitive issue for residents and local businesses, so politicians may deny support until a substantiated knowledge and information transfer has taken place. There can also be conflicting responsibilities amongst authorities that need to be sorted out by consultations and/or round-table discussions.

- Stringent contractual conditions for quality and deadlines

Some projects face delays and missing deadlines because of internal re-organisation of the project teams, dependence on private suppliers or delays in production and data acquisition. It is recommended to have stringent contractual conditions concerning the quality and the deadlines with project partners. Delays also occur from abandoning or changing the original concept by enlarging the target area, adding another milestone or starting a new collaboration during the project. These delays, however, contribute to achieving the goals and can therefore be acceptable.

- Budget control group

Some projects face cost increases and budget modifications or find themselves restricted by budget limits. A strict control system by a local committee can supervise the budget situation and prevent such problems at an early stage.

3.2.1 Access control

Access control measures faced different problems throughout the process. However it seems striking that most of them faced political barriers as well as technical problems (see Table 3.2 (b)), so the following strategies to overcome these barriers were identified:

- Round table discussions and stakeholder meetings

Some measures of access restriction can seem too controversial to be accepted and timescales have to be agreed on in order to get political and stakeholders' support. When the political reluctance is too strong, traffic calming features can be used as first steps instead. Especially when there is a plan to charge vehicle groups for accessing the specific area there might be a lack of political will to push the process (especially when elections are coming up). Meetings, site visits and negotiations along the way enhance the project, as different views and opinions can be discussed and can lead to an agreement.

- Knowledge of the specific legal framework

In some cases the legal requirements are not adequate for the intended measures. There may be alternative ways to achieve the objective: in Genoa, powers did not exist to introduce road charging, but did for regulation of technological devices for detecting and charging vehicles entering certain zones. There might be no clear legislation regarding access to controlled public spaces, areas or limited access rules so the competent authority might have to develop special rules for this purpose.

- Acting according to technological possibilities

It is possible to implement congestion and pollution charges through cordon based schemes. Time-based schemes imply the tracking of all entrances and exits to/from the area and are therefore very complex. The wide application of a mobility credits system is not mature for technological reasons as there is the need to track all vehicles' displacements and install some kind of on-board unit in every vehicle. It is, however, possible to implement this system into a closed universe of users such as the freight distribution sector in a closed area. It is important to assure the function of remote controls and receptors of rising bollards as emergency vehicles need to be able to get into and out of the access restricted area at all events. Old access cards have to be invalidated when residents move out of the area to prevent misuse.

- Stringent contractual conditions for quality and deadlines

As delays may occur from unforeseeable difficulties with private companies (starting from the company responsible for the printing matters (i.e. brochures, information materials) to the one responsible for the software of the GPS tracking files), there is a need for stringent contractual conditions for quality of the product and deadlines.

- Public involvement and media

Cooperation and open dialogue with the public using different media, personal meetings or round table discussions help to communicate the goals of the project and can minimise negative or unjustified media reporting.

Table 3.2: Barriers

City	Measure	acceptance barrier	delays during the project	financial barrier	institutional barrier	lack of labour resources	legal barrier	management barrier	market barrier	organisational barrier	political barrier	spatial barrier	technical barrier
(a) Parking management													
Burgos	Parking strategy and management (06.05)			✓	✓					✓	✓		✓
Debrecen	Access and parking management (06.05)		✓								✓		✓
Preston	Develop on and off-street parking pricing policy (07.03)	✓		✓		✓						✓	✓
Preston	Improved parking management (07.05)	✓		✓		✓						✓	✓
Toulouse	Definition and implementation of a new parking management policy (06.01)	✓									✓		
Venice	Parking management strategies (06.07)							✓			✓		✓
(b) Access control													
Burgos	Integrated access restriction strategy (06.02)			✓	✓					✓	✓		✓
Debrecen	Accessibility scheme for the conference centre and pedestrian zone (06.06)		✓	✓							✓	✓	
Genoa	Integrated access control strategy and road charging scheme (07.01)										✓		✓
Krakow	Enforcement of access restrictions in Krakow (06.04)										✓		✓
Krakow	Integrated access control strategy (06.01)			✓									
La Rochelle	Design access control scheme for tourist buses (06.02)							✓		✓			✓
La Rochelle	Develop and extend access control zones (06.01)	✓								✓	✓		✓
Malmö	Extended environmental zone for heavy vehicle and enforcement (06.01)						✓						
Norwich	Introduction of Low Emission Zone (06.02)	✓		✓		✓				✓			
Norwich	Introduction of time controlled access restrictions (06.03)	✓									✓		
Norwich	Priority access for clean goods vehicles (10.04)	✓						✓					✓
Odense	Implementation of environmental zones (06.10)		✓	✓						✓	✓	✓	
Ploiesti	Development of a clear zone (06.06)						✓						✓
Preston	Air quality assessment and clear zone strategy (06.03)							✓					

City	Measure	acceptance barrier	delays during the project	financial barrier	institutional barrier	lack of labour resources	legal barrier	management barrier	market barrier	organisational barrier	political barrier	spatial barrier	technical barrier
Preston	Develop clear zones and extend pedestrianisation (06.04)							✓					
Preston	Improve traffic regulation through access control (06.05)											✓	✓
Stuttgart	Policy options for access restrictions (06.03)	✓		✓	✓		✓				✓		✓
Suceava	Extension of low emission zone (06.04)	✓					✓					✓	
Venice	Access management for the city centre (06.08)	✓		✓	✓					✓	✓		

4 Impacts

4.1 Parking Management

The five measures in this sub-cluster focus on changing parking behaviour, mainly in city centres. Most involve moving parking to off-street sites, some via park & ride and one through new underground parking. Many of the measures also include management interventions such as pricing, signing and signalling to encourage behaviour change. Table 4.1 summarises outputs and impacts.

Table 4.1: Achieved Outputs and Impacts for parking

City	Outputs	Economy Energy Environment	Transport	Society
Burgos 6.5	<ul style="list-style-type: none"> 2,199 new underground public car parking spaces real time information displays on space availability pricing structure encouraging short stays surface parking regulations and enforcement new police car (“multicar”) equipped with imaging technology on-going stakeholder debates 	<p><i>Economy</i></p> <ul style="list-style-type: none"> Est. 4,000 km reduction in “lost mileage” searching for parking space <p><i>Energy</i></p> <ul style="list-style-type: none"> Est. 4,000 km reduction in “lost mileage” <p><i>Environment</i></p> <p>Not measured</p>	<ul style="list-style-type: none"> Illegal parking fell 2,000 daily in the city generally and on the “red route” by 100 a month est. 4,000 km reduction in “lost mileage” total parking grew from 700 in 2000/2004 to 1025 vehicles per day in 2008, while spaces grew from 3,320 to 7,615, so overall occupancy fell; the City feels that there has been a reduction in on-street parking 	<ul style="list-style-type: none"> In a 2007 survey, 0% agreed parking was well managed, 76% disagreed, with 24% neutral; in 2008, 9% agreed, 33% disagreed, 58% ‘neither’ 80% disagreed with parking policy in 2007 and this fell to 40% in 2008 outside the zone, 90% disagreed in 2007 and 80% in 2008; this is believed to reflect people’s frustration at having lost their ‘free’ (often illegal) on-street parking
Debrecen 6.5	<ul style="list-style-type: none"> Electronic countdown displays showing both drivers and pedestrians the seconds remaining to the signal change park and ride signed but use not measured within CIVITAS 	<p><i>Economy</i></p> <p>Not measured</p> <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <p>Not measured</p>	<ul style="list-style-type: none"> The countdown system “provides better traffic flow (due to better preparation more vehicles can pass the junction) and improved traffic safety (before red signal the drivers can break in advance)” 8.5% rise in throughput of cars at signals 	<ul style="list-style-type: none"> 41% of drivers said countdown improved junctions 58% felt that drivers are less stressed and 75% that co-operation between drivers and pedestrians has improved drivers gave countdown a score of 64 (out of 100) for impact on traffic safety and 60 for effect on traffic speed
Preston 7.3 & 7.5	<p>Preston: review of all parking: public, private, on-street and off-street</p> <ul style="list-style-type: none"> new working relationships: Car Parking Working Group with private and public sector publicity of parking options <p>Leyland: change of waiting time rules, to more short stay</p> <ul style="list-style-type: none"> former council-operated, all-purpose car park on Station Approach switched to rail park and ride under-utilised land 	<p><i>Economy</i></p> <p>Not measured</p> <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <p>Not measured</p>	<ul style="list-style-type: none"> Rail park & ride at Leyland (19 spaces) has increased 45%; there remains anecdotal evidence of overflow parking onto neighbouring streets 	<p>Not measured after implementation</p>

City	Outputs	Economy Energy Environment	Transport	Society
	brought within the car park; improved footpaths, lighting, design and information <ul style="list-style-type: none"> • integration with bus and rail • more disability parking 			
Toulouse 6.1	<ul style="list-style-type: none"> • Incremental application of parking restrictions and charges to sub-zones within the city centre • residents' pass gives discounts, limited to one vehicle per household • shopping and market areas have varied restrictions, including some short periods of free parking • parking monitoring unit "to scrutinise the changes in the supply and demand for city centre parking" 	<p><i>Economy</i> Not measured</p> <p><i>Energy</i> Not measured</p> <p><i>Environment</i> Not measured</p>	<p>From 2005 to 2007:</p> <ul style="list-style-type: none"> • Parking provision stayed at over 11,000; the share of pay spaces trebled, to 60% • occupancy rates fell from 92% (reflecting a high level of illegal parking, double parking etc.) to 75%; but sectors outside the zone now suffer occupancy rates as high as 125% • illegal parking down from 13% to 8%, but "nearly 20%" in nearby zones • compliance 42-61% in residents' parking areas, but only 18-42% in the shopping areas • time looking for parking was 3.5 minutes in the residents' zone, 4 in the shopping zone and almost 10 in the free parking zone • short-stay rose from 40% to 60% in the zone 	<ul style="list-style-type: none"> • In 2006, and again in 2007, subscribing residents felt it took less time to find a parking place; non-subscribing residents and visitors noticed improvement in 2006, but the majority saw 'no change' in 2007, though c. 1/3rd found further improvement • most visitors and non-subscribing residents were dissatisfied by the scheme in 2006; this fell in 2007 to around half • subscribing residents were largely very satisfied in 2006; in 2007, three quarters were very satisfied, though 17% were dissatisfied • subscribers reached 50% of available places though only 10% of eligible homes had subscribed, leading to concern that future subscriptions could overwhelm provision
Venice 6.7	<ul style="list-style-type: none"> • Mapping of supply and demand for parking; survey of flows searching for parking; measurement of turnover time, leading to a parking strategy • 8 new park and ride sites, bringing total spaces to 2100 • differentiated tariffs to encourage park and ride and discourage central on-street parking • real time information panels showing parking availability and directions; some solar-powered, using GPRS data • increased enforcement • marketing and information campaign 	<p><i>Economy</i> Not measured</p> <p><i>Energy</i> Not measured</p> <p><i>Environment</i> Not measured</p>	<ul style="list-style-type: none"> • increase in park & ride use over 300% to 213,000 p.a., with a further rise to 265,000 estimated for 2008 • traffic into the city has grown by 3.3%, by comparison with the 10% forecast • in the most congested times, morning & evening peak, traffic has fallen by 9.9% • between 2006 and 2008, car mode share fell from 44% to 42% (attributable to several measures) • parking fines have fallen from 27,600 in 2005 to 14,500 in 2007 	Not measured

This group of measures provided almost 5,000 new or re-designated off-street parking spaces, along with traffic signing and pricing incentives to park off-street and away from centres.

Measures to facilitate behaviour change included two new real time information systems, with an interesting innovation in Mestre (Venice): experimental real time information panels using solar power and GPRS data. This provides both a reduction in environmental impact and cost savings, since power cabling and phone lines do not need to be laid and maintained.

Demand management pricing structures varied: in Venice people were discouraged from parking in the centre and encouraged to park & ride; in Toulouse, by contrast, the application of parking pricing to only some central zones led to parking overcrowding in those zones which remained free. Many schemes took the opportunity of the new measures and price structures to increase residents' parking and disability parking.

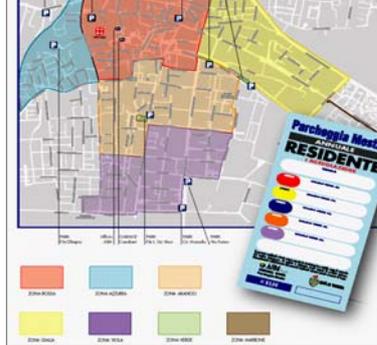
Enforcement was a key facilitator, including the innovation of “multicar” in Burgos (shown in the photo, right). This is a police car equipped with imaging technology so that violations can be captured and the data relayed back promptly for automatic processing.



All the measures benefited from consultation and debate, including a joint working group formed with private sector parking providers in Preston.

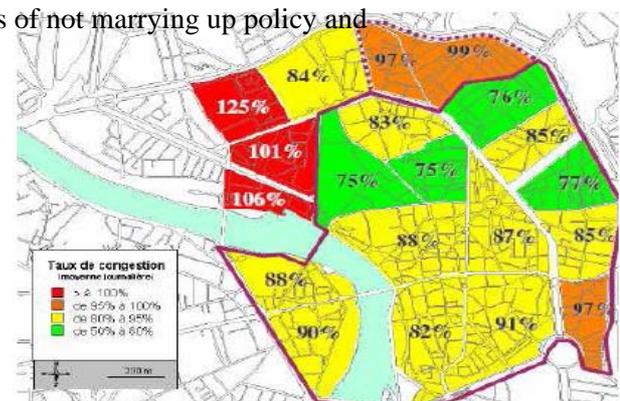
Results

Some very positive results were created from these outputs. In Burgos, illegal parking was cut by 2,000 offences a day; lost mileage searching for parking was cut by 4,000 km, and the citizens' view of parking management shifted from wholly negative to largely accepting. In Mestre (Venice, pictured left), park & ride increased by 300% to over 250,000 users per day and congestion has been reversed in the morning and evening peak. The key to these achievements was marrying physical with policy measures and maintaining political, stakeholder and citizen dialogue.



Even small measures can have a real impact, such as the change of parking use and improvement of paths, lighting and ambience in Leyland (Preston) which led to a 45% increase in rail park and ride. In the same way, the relatively low-cost measures in Debrecen look positive, with drivers responding warmly to the unusual initiative of making ‘countdown’ at traffic lights available to cars as well as pedestrians, and the provision of park and ride signs to existing edge-of-town event sites has anecdotally a positive response.

The warning of the consequences of not marrying up policy and provision comes from Toulouse, where introducing small-zone parking charges led to overcrowding in nearby areas (pictured right), and the offer of residents' passes, although limited to one per household, occupies 50% of the available space with the initial 10% take-up. Time taken to find a parking space was 3.5 minutes in the residents' zone, 4 minutes in the shopping zone and almost 10 minutes in the free parking zone, as drivers head for the perimeter to find free parking on increasingly overcrowded streets.



4.2 Exclusion of non-priority traffic

Three sub-clusters of measures centred on access control. Many of these also included parking management and most include some element of another sub-cluster. Nonetheless, they have been grouped according to the main principle driving the project.

The first of these three groups contains six measures which created or extended exclusions for traffic, with exceptions for residents, deliveries, etc. The outputs and impacts are outlined in Table 4.2.

Table 4.2: Achieved Outputs and Impacts for exclusion of non-priority traffic

City	Outputs	Economy Energy Environment	Transport	Society
Burgos 6.2	<ul style="list-style-type: none"> • Pedestrian zone enhancement, walkways, seating • city traffic plan to shift through traffic to new ring roads • rising bollards to exclude non-resident cars • traffic control centre monitoring • promotion and media events 	<p><i>Economy</i></p> <ul style="list-style-type: none"> • Higher property values, residential and business <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> • CO₂ emissions (whole city) stable despite growth in population and industrial development -• NO_x fell from an annual average of 83.4 µg/m³ in 2004 to 81µg/m³ in 2007, against a rising trend -• small particulates fell from 95.5 µg/m³ in 2004 to 51.75 µg/m³, partly due to other factors 	<ul style="list-style-type: none"> • Car trips crossing the city centre: 2,023 daily in 2000/04; 420 in 2006/07 and 220 in 2008 and the fall is estimated to be even higher at weekends • vehicle speed on approach to the historic centre fell from 65km/h to 56 km/h (still above the 50 km/h limit) • pedestrians more than doubled: 8,810 to 18,970 • cyclists from 30 per day to 248 	<ul style="list-style-type: none"> • 40,000 people “enjoying” the centre at weekends • reduced fear of cars • awareness from 75% in 2007 to 81% in 2008 • in 2007, 58% agreed with the system, 16% disagreed and 26% neither; in 2008, only 21% agreed, 14% disagreed, 65% neither, which may suggest that the access system had become normal • perception of ‘importance’ of the system polarised with experience: in 2007, 66% agreed that the restrictions are important; in 2008, 77% agreed, but disagreement also rose, at 11% compared with 8% in 2007; “neither” fell from 26% to 12%
Debrecen 6.6	<ul style="list-style-type: none"> • Design competition for a pedestrian zone to remove c. 300 on-street parking spaces 	n/r	n/r	Awareness raising
Krakow 6.1	<ul style="list-style-type: none"> • Small but strategic restricted zone extensions (310m) • two public squares restored to pedestrian use by closing 300 parking spaces • access improved for public transport walking & cycling 	<p><i>Economy</i></p> <ul style="list-style-type: none"> • Fuel savings est. 230 litres per day, in the zone <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> • NO_x fell 1350gm/day; CO fell 16kg/day; noise levels only a small change, c. 0.4dB 	<ul style="list-style-type: none"> • 1100 fewer car trips in the zone • tram journey times fell slightly, 0.9 mins on average, and reliability increased significantly: variation in journey times fell 53% to 3.2 minutes on in-bound journeys and 12% to 7.4 minutes outbound 	<ul style="list-style-type: none"> • Perception of travel times among public transport users was: no change 45%, shorter 49%, longer 6%; frequent travellers were more likely to have noticed a reduction in journey time • perception of travel times among drivers was overwhelmingly “no change”, at 96%
La Rochelle 6.1	<ul style="list-style-type: none"> • Two ‘strolling zones’ in distinct city areas • automated rising bollards and traffic lights, with access for buses, residents and deliveries • the zones are badged according to their attractions, which assists with information dissemination 	<p><i>Economy</i></p> <ul style="list-style-type: none"> • Assuming a 10 year life, the NPV is a cost of under 300,000 Euros for the entire measure <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> • Air quality has improved 	<ul style="list-style-type: none"> • Before, “<i>illegal car/trucks traffic and parking were very common</i>” but no numbers for either zone • parking fines after implementation were c. 37% below what would have been expected without the measure, though fines may not correlate directly with violations 	<ul style="list-style-type: none"> • 90% awareness among cyclists and pedestrians using the zone; 80% felt safer from traffic and c.80% felt the work was useful or would have a positive impact • in a full urban survey, 94% support this type of city centre zone; 73% felt it reduced crime • 40% knew of the measures; 30% “<i>have already strolled on the ‘Coursive’ zone</i>”; awareness and use highest among city residents • among those aware of the zone, 82% felt it improved peace and quiet, and 63% cleanliness • business views varied: bars

City	Outputs	Economy Energy Environment	Transport	Society																								
				/restaurants like the zone, shops /offices neutral, hotels /services nervous about customer parking																								
Norwich 6.3	<ul style="list-style-type: none"> Experimental part time closures of two streets: one abandoned, the other moved to permanent closure 	<p><i>Economy</i> Not measured</p> <p><i>Energy</i> Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> In both streets, complete removal of traffic reduced noise from 52db to 44db block paving and limited access produced no shift in noise levels, as the block paved surface is noisier 	<ul style="list-style-type: none"> Traffic over the whole day fell, though it was higher in the two hours before street closure pedestrian figures also fell, and “support the traders’ concerns” access restrictions alone cut half the traffic speeds fell with restricted access, but many were still over 20mph, which was the driver for full closure after full closure, pedestrians increased 	<ul style="list-style-type: none"> Both traders and traffic strongly supported the St. Benedict’s Street closure beforehand, but the majority opposed closure once they had experienced it in St. George’s Street, 80% found traffic too intrusive before the partial closure, and 50% still found it too intrusive when access was restricted 																								
Ploiesti 6.6	<ul style="list-style-type: none"> 1.2km² control zone scheme establishing regulations and measures for a Clear Zone priority for clean public transport, cyclists and pedestrians: streetworks, lights and environmental works to create a unitary area controlled parking zone; new parking spaces created by narrowing the street access control technologies residents issued free access cards enforcement consultation during design; promotional activities during construction and immediately prior to launch 	<p><i>Economy</i></p> <ul style="list-style-type: none"> Rents from restaurants and businesses using street space: €6600 in summer 2008 and rising scheme cost (studies, paving, furniture, plants, bollards, signs, access cards) under €300,000 <p><i>Energy</i> Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> Traffic pollution in the zone fell by 10-13%: <table border="1"> <thead> <tr> <th></th> <th>% fall</th> </tr> </thead> <tbody> <tr> <td>CO</td> <td>12.6</td> </tr> <tr> <td>NOX</td> <td>13.4</td> </tr> <tr> <td>N20</td> <td>11.9</td> </tr> <tr> <td>SO2</td> <td>11.9</td> </tr> <tr> <td>CO2</td> <td>12.1</td> </tr> <tr> <td>COV</td> <td>12.3</td> </tr> <tr> <td>PM</td> <td>12.6</td> </tr> <tr> <td>PM10</td> <td>12.8</td> </tr> <tr> <td>PM2_5</td> <td>11.8</td> </tr> <tr> <td>PM1</td> <td>10.8</td> </tr> <tr> <td>Benz</td> <td>12.6</td> </tr> </tbody> </table> <ul style="list-style-type: none"> Pollution over the city did not fall, but is dominated by non-traffic pollutants. 		% fall	CO	12.6	NOX	13.4	N20	11.9	SO2	11.9	CO2	12.1	COV	12.3	PM	12.6	PM10	12.8	PM2_5	11.8	PM1	10.8	Benz	12.6	<ul style="list-style-type: none"> Traffic in the clear zone and adjacent streets has fallen by 11% traffic congestion is reduced by 89.2% 	<p>Opinions:</p> <ul style="list-style-type: none"> Before, businesses rated the environment and traffic pollution the largest problems (from a prompted list: traffic itself rated not much of a problem, but pollution from it very much) public opinion rated traffic pollution the worst problem, cleanliness (not ‘clean environment’) next, then noise pollution, traffic congestion... this list was longer and included stray dogs, public toilets and other things; even on the long list, traffic pollution had 30% of the overall comments afterwards, 47% agreed with the measure (among drivers, 41%) and 34% disagreed (drivers, 43%) the majority of businesses agreed with the measure in a separate survey, 58% of public transport users named the access controlled area spontaneously as the primary CIVITAS measure since the measure, residents in surrounding areas have asked for similar zones
	% fall																											
CO	12.6																											
NOX	13.4																											
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The six measures in this sub-cluster illustrate the complexities of excluding non-priority traffic. Two schemes largely failed; three delivered significantly reduced plans and the other succeeded partly because it built upon an existing restricted area and created ring-roads to remove traffic from the centre.

Despite the difficulties, in many places there was success in creating an atmosphere of a traffic-free area whilst still allowing access to priority traffic such as residents and freight and in some cases mobility impaired drivers, cyclists and public transport. The pictures below illustrate ‘rising’ bollards, which are moveable to permit access for those with access cards (left: Burgos; right, La Rochelle).

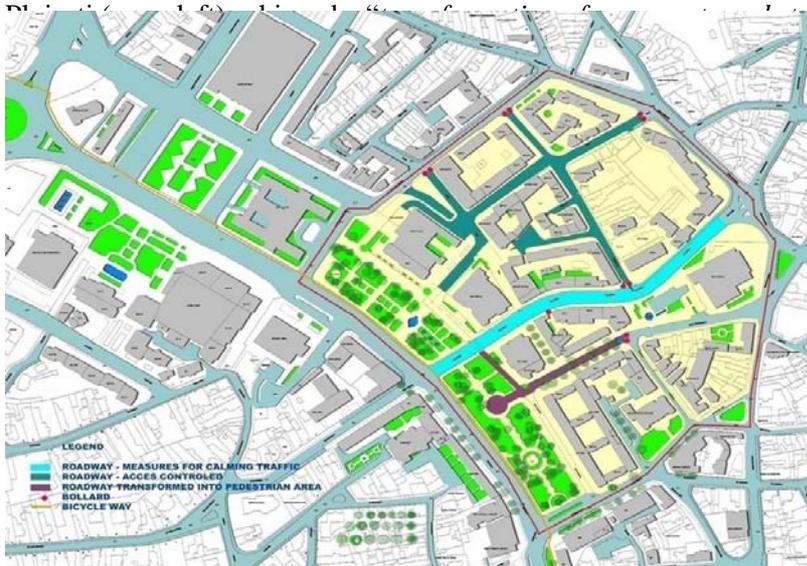


The implementation of access restriction schemes was smoother where the immediate local needs were taken into account, as well as the needs of wider traffic. In La Rochelle, exceptions are tailored to the zones, with one area permitting access to workers and freight, the other to residents.



This marking of the ‘Nautique’ zone in La Rochelle shows that measures to exclude non-pedestrians may be complex or expensive to have a real impact. The two marked spots on the access control zone, simply closing access to the strip for all except

The measures between them produced seven enhanced or extended pedestrian zones. In Burgos, 30% of the historic centre was limited to pedestrians by the CIVITAS programme, providing “comfortable and safe areas for walking, resting and enjoying”.



sets into a unitary area (through) lights and green spaces.

The six measures also provided four cycling schemes and three city-centre public transport priority schemes. There were also parking innovations, with some removal of spaces in two cities and street narrowing in a third to create more appropriate parking.

The key facilitator was consultation before and during the scheme, with promotion at launch and afterwards. In any transport scheme this is useful, but when taking away traffic

space or limiting parking, it is essential to work with those who perceive they are having something taken away, especially stakeholders such as local businesses, and to promote the benefits.

In Norwich, lack of engagement at political level moved the scheme from its planned site. Local opposition later saw one street closure abandoned. The other became a full time closure, instead of the intended demonstration of part-time closure.

The two pictures (right) are from Burgos's campaign to promote the quality of life in the city provided by the measure.

Consultees require confidence that they can affect the design. In Krakow, after consultation with “*inhabitants of the zone, shopkeepers associations, road management structures, Police, city council, district councils, ecological clubs... Many adaptations (were) taken into account*”. One impact is that, although the scheme has been delivered only in part, the consultation and debate during CIVITAS has secured the basis for success in future phases.



One strength in this sub-cluster was that many cities showed flexibility when the original goals proved undeliverable for political or practical reasons. Debrecen held a design competition which may be a useful example to other cities; Norwich achieved a street closure which benefits pedestrians and businesses. Krakow, prevented by contractors' failure from completing the traffic exclusion scheme, nonetheless restored two public squares to pedestrian use, removing 300 parking spaces, and improved access for public transport, cyclists and pedestrians.

Results

The measures produced strong results, even in many cases where full delivery was not possible. Higher property values and business rents were measured in Burgos and noted anecdotally in Norwich. Ploiesti points to the value of renting the street space reclaimed from parking to provide cafes and other businesses.

There were clear, though generally small, benefits in both emissions and noise. Only in Ploiesti was there a substantial fall in pollution, where parking lots were rededicated to pedestrian Squares.

The transport impact, as intended, was particularly strong. In Burgos, vehicle speed approaching the city fell 14%; cycling rose from 30 cyclists a day to 248 and through traffic fell to almost 10% of the level before the measure. In Krakow, with only part of the scheme delivered, there were still 1100 fewer car trips in the zone daily and this was delivered without drivers finding any inconvenience; tram journey times improved slightly and had a great improvement in journey time reliability. In Ploiesti, traffic in the ‘clear zone’ area fell by 11% and congestion by 89%, even though the entire scheme was not delivered. Violations are noted to have fallen in several cities, though mostly this is not measured. In most cities, pedestrians grew, by over 100% in Burgos and steadily over time in Norwich.

The results show that, whilst allowing access for priority vehicles, the zones reduced the sense of traffic. Several schemes record reduced fear of traffic and improvements in experience in the measure areas. In La Rochelle, people throughout the wider urban area were aware of the strolling zones and many had used them.

Acceptance was interesting, as, in Ploiesti and Burgos, views were polarised. In Burgos, experience of the scheme led to more people supporting it, but the proportion who ‘disagreed’ also rose. In general, residents and businesses support the schemes once they are in place. La Rochelle provides further insight into business attitudes: acceptance varies by business type, with restaurants and bars supporting restrictions strongly and hotels and service industries most concerned.

4.3 Traffic behaviour change measures

Five of the access measures introduced innovations to bring about behaviour change to reduce the impact of traffic on cities. The outcomes and impacts of these measures are outlined in Table 4.3.

Table 4.3: Achieved Outputs and Impacts for traffic behaviour change measures

City	Outputs	Economy Energy Environment	Transport	Society
Krakow 6.4	<ul style="list-style-type: none"> • Test of an electronic identification system • shift from enforcement by guards to electronic access control • one gate selected for implementation of the electronic system, with careful monitoring 	<p><i>Economy</i></p> <ul style="list-style-type: none"> • “the income coming from fines for drivers can quickly cover... the costs of the optical recognition system” <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <p>Not measured</p>	<ul style="list-style-type: none"> • In streets close to the gate, vehicles fell by 61%; overall, vehicles fell from 2561 to 2242 per day (12%). • speeds in the surrounding road network fell by 0.1% • the efficiency of the electronic i.d. system was measured at over 88% 	<ul style="list-style-type: none"> • Not measured: the rules did not change, only the enforcement method
La Rochelle 6.2	<ul style="list-style-type: none"> • 700 brochures showing coach bypass routes and drop-off zones to avoid the town centre sent to tour operators and travel agents • downloadable GPS route maps to guide coaches to drop-off zones and suitable parking facilities 	Not measured, due to lack of impact of the scheme	<ul style="list-style-type: none"> • Most coach drivers proved unaware of the new information, but felt that the brochure and GPS would be useful 	n/a
Malmö 6.1	<ul style="list-style-type: none"> • Wider geographical coverage of the environmental zone • heavy vehicle emissions standard requiring gas vehicles or other low emission vehicles 	<p><i>Economy</i></p> <p>Not measured</p> <p><i>Energy</i></p> <ul style="list-style-type: none"> • gas powered vehicles rose to 4% in 2007, from less than 1% in 2005 • the response was a wide switch to newer vehicles in order to meet emission standards, rather than to gas powered vehicles <p><i>Environment</i></p> <ul style="list-style-type: none"> • Estimated 97 tonnes p/a reduction in CO₂; 33 tonnes less NO_x and 1.2 tonnes p/a reduction in PM₁₀ 	<ul style="list-style-type: none"> • 94% compliance with the new standards in the zone; 90% in the surrounding areas; • around 40% of non-compliant lorries are registered in the city and 90% in the region 	<ul style="list-style-type: none"> • The majority of freight operators knew about the old zone; around 50% felt that it was a positive policy and 40% had no strong opinion • 60% said the new scheme would not affect their activities • anecdotal evidence suggests that the new zone accelerates the retirement of older vehicles although less so for small operators • enforcement for foreign vehicles is seen as important
Norwich 10.3, .4 & .5	<ul style="list-style-type: none"> • Demonstration site for consolidation of deliveries • liveried consolidation vehicles permitted to use bus lanes • a ‘stakeholders club’ as a freight forum 	<p><i>Economy</i></p> <ul style="list-style-type: none"> • First year fuel consumption reduction est. 297.2 litres <p><i>Energy</i></p> <ul style="list-style-type: none"> • Modest gains, from the 88 HGV trips saved <p><i>Environment</i></p> <ul style="list-style-type: none"> • Modest gains, from 88 trips 	<ul style="list-style-type: none"> • 88 HGVs used the consolidation centre • no decrease in cycling in bus lanes as a result of (small numbers of medium sized) freight vehicles using the lanes 	<ul style="list-style-type: none"> • Only 8% of citizens had heard of the consolidation centre, but 53% had heard that the consolidation centre’s clean fuel vehicles would be using the bus lanes, which may be due in part to the traffic signs
Venice 6.8	<ul style="list-style-type: none"> • Coach tariffs to encourage Euro IV vehicles 	<p><i>Economy</i></p> <p>Not measured</p>	<ul style="list-style-type: none"> • Coach volumes usually grow with tourism; in 2007, 	Not measured

City	Outputs	Economy Energy Environment	Transport	Society
	<ul style="list-style-type: none"> European communication campaign targeting tour operators and travel agents leaflets to tourists arriving on Euro IV coaches, thanking them for travelling sustainably staff at the entrances to the LTZ trained to recognise energy-efficient buses 	<i>Energy</i> Not measured <i>Environment</i> Not measured	tourism grew, but coach volumes fell 5% <ul style="list-style-type: none"> mode shift of tourists coming from short distances (<70 km) to alternatives such as train or bus by June 2008, Euro IV 5.45% of the fleet, from 0.45% in March 2007 	

CIVITAS measures are demonstration projects, which makes the design, testing and implementation of new tools an important part of the work. In these five measures, innovation dominates. This represents the next step in the process of creating sustainable parking and access control: behaviour change to reduce the impacts of motorised access on centres.

The measures include two significant technological innovations, four ‘persuasion’ techniques and three new sets of regulations.

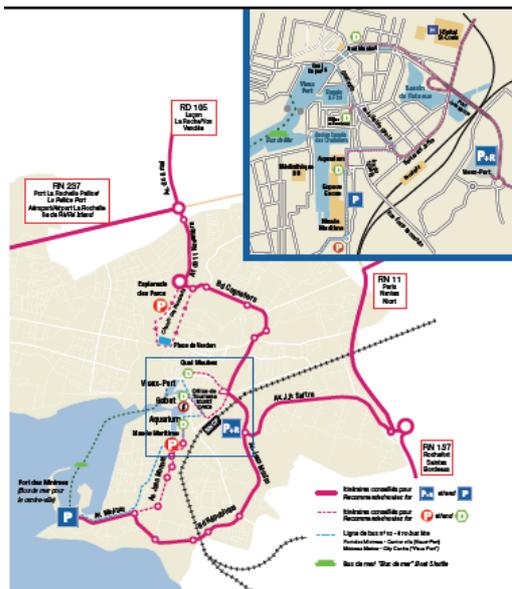
Krakow introduced a new ‘electronic identification system’ for the enforcement of access restrictions. The system recognises the vehicle’s plate number and takes a photograph of the driver’s face. La Rochelle introduced a GPS route guidance system, which is downloadable from the internet, to direct tourist coaches to drop-off zones and coach parking, avoiding the centre.

Regulations were introduced in Malmö to extend the environmental zone and to ban more polluting heavy vehicles within the extended zone.

In Venice, a new structure of coach tariffs (pictured, below) was introduced. The aim was to make it cheaper to reach tourist destinations with Euro IV vehicles and thus to encourage cleaner fleets. The complexity of this tariff structure would not suit all cities. It has a significant cost disadvantage is that it needs to be administered by staff at control points, as the depth of detail (e.g. types of party) requires direct communication with visiting drivers.

Charge difference (%) between old and new tariff rates Venice	EURO 4	NON EURO 4	
		Low Season	High Season
Ordinary	0,0	+ 77,8	+ 88,9
Hotel Buses	- 88,9	- 66,7	- 66,7
Minibus	+ 12,5	+ 37,5	+ 50,0
School trips	+ 45,5	+ 63,6	+ 118,2
Exception (e) (Port/Airport/Railway)	+ 800	+ 900	+900
Exception (f) (Port/Airport/Railway)	0,0	+ 50,0	+ 50
Other exception (g-h-i-j)	+ 100	+ 50	+ 50
Resident (k)	-100,0	-100,0	-100

The measures in Malmö and Venice include significant elements of ‘persuasion’. In La Rochelle, the GPS guidance was accompanied by a brochure (below), which shows coach drivers bypass routes and drop-off zones to avoid the city centre.



In Norwich, a mix of regulation and persuasion was used. First, a Freight Club was formed, designed as a discussion forum for policy and plans and also as a means to arrange load-sharing. Secondly, a demonstration ‘consolidation warehouse’ site was opened, aimed at persuading operators to consolidate delivery loads to reduce the number of trucks in the city. Further, a regulation was introduced enabling the consolidation warehouse vehicles to share bus lanes and priorities, thus offering time savings and journey reliability for deliveries. One of the valuable aspects of this measure was the exploration of different ideas and possibilities with the freight operators – thus testing ideas with the market before introducing them.

Results

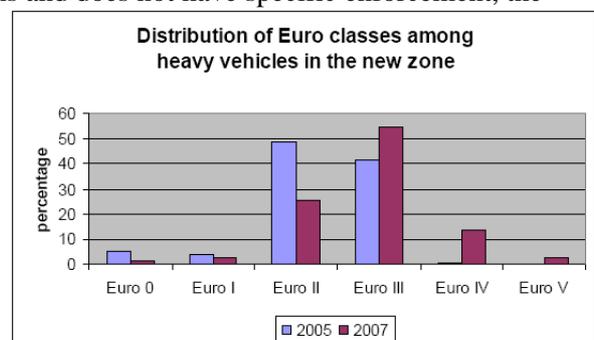
In Krakow before the measure, over 60% of vehicles entering the restricted zone were in violation of the restrictions. The objective was to test an electronic identification system, both for functionality and effect. In the last three months of the trial, the system was over 88% accurate. The impact was significant, with 61% of vehicles removed in the trial area and 12% overall in the centre.

The La Rochelle experiment did not produce an early impact, since a survey showed that coach drivers generally did not know of it, or of the brochures. The technique of persuasion via the tour operators has since switched to direct contact with drivers. This has valuable lessons for other cities which may wish to communicate with coach drivers: the industry does not appear to feed information through from corporate levels to the drivers, so direct communication is necessary.

As with behaviour change measures for personal mode choice, traffic behaviour change takes time to show results. In its first year of operation, the Norwich consolidation warehouse saved only 88 HGV deliveries.

The slow time frame for this type of measure also affected Malmö, where the city campaigned with Stockholm, Göteborg and Lund for a change in national law to provide consistent environmental standards and to empower agencies other than the police to carry out enforcement. This change in legislation was not forthcoming, so Malmö introduced a local regulation.

Although this regulation is not advertised by traffic signs and does not have specific enforcement, the reduced measure has had good effects. There is 94% compliance in the zone and even 90% compliance outside the zone. Gas vehicles quadrupled to 4% of the total and the graph on the right shows the increase of newer fleets with cleaner engines. Moreover, in interviews freight operators voiced little resistance to the scheme, although they felt it important that equal treatment be given to foreign LGVs, so the rules must be applied to those vehicles as well as to local vehicles.



Venice achieved the significant result of decoupling growth in coach numbers from growth in tourism, as many trips have switched to other modes. Beyond that, there has been “a constant increase in the proportion of Euro 4 compliant coaches both

for buses and minivans”. This is seen as likely to be a combination of the Venice scheme and “the increase of Euro 4 engines in the global tourist coach market”. By June 2008, Euro IV was 5.45%, up from 0.45% in March 2007.

4.4 Clear zone / LEZ / LTZ

The seven measures in this sub-cluster demonstrate the introduction or extension of ‘clear zones’ (Low Emission Zones / Low Traffic Zones). Some cities in other sub-clusters also introduced LEZ-related measures, but have been grouped with measures which share a different key feature. A summary of the outputs and impacts of clear zone measures is given in Table 4.4.

Table 4.4: Achieved Outputs and Impacts for clear zones / LEZ / LTZ

City	Outputs	Economy Energy Environment	Transport	Society														
Genoa 7.1	<ul style="list-style-type: none"> Access control in the historic centre by ANPR gates and bollards residents’ parking and goods delivery; strict enforcement of penalties against other vehicles parking pricing policy “BLUAREA” divides the zone into smaller areas, to discourage residents from driving in the zone parking review led to a 21% increase in the offer, mainly through shift from long- to short-stay re-design of traffic circulation discourages vehicles from crossing the city road pricing studies suggest “potentially high positive results” possibly by extending to private cars the “Mobility Credits” freight pricing scheme 	<p><i>Economy</i> Not measured</p> <p><i>Energy</i> Not measured</p> <p><i>Environment</i> <ul style="list-style-type: none"> Modelled from the 12.38% reduction in traffic; from the initial base of 7,100 vehicles a day in the LTZ emissions (tons p.a.) fell by: <table border="1"> <tr> <td>CO2</td> <td>26.09</td> </tr> <tr> <td>CO</td> <td>2.07</td> </tr> <tr> <td>NOx</td> <td>0.06</td> </tr> <tr> <td>PM10</td> <td>0.01</td> </tr> <tr> <td>VOC</td> <td>0.36</td> </tr> <tr> <td>TSP</td> <td>0.02</td> </tr> <tr> <td>C6H6</td> <td>0.02</td> </tr> </table> </p>	CO2	26.09	CO	2.07	NOx	0.06	PM10	0.01	VOC	0.36	TSP	0.02	C6H6	0.02	<ul style="list-style-type: none"> Average reduction in vehicles per day 12.38% over the LTZ as a whole traffic flows on major routes have fallen between 3.4% and 6.7%, with an overall reduction of 7,600 vehicles per day (this may reflect all 14 CIVITAS actions, rather than just this measure). Public transport journey times have fallen 3% on those same major routes, with a 3% increase in passengers 	<ul style="list-style-type: none"> 38% in a household survey felt parking availability had increased, 44% unchanged and 18% reduced; it was regarded as most effective outside the central district, since pressure on parking in the centre remains strong for 2-wheel parking, 12% felt that provision was ‘more than sufficient’ and 54% ‘sufficient’; 34%, however, still felt that 2-wheel parking is insufficient, a view shared by the Municipality 30% said BLUAREA improved ‘order’ in the centre as a whole, 58% no change and 12% ‘worse’; in their own home zone, feelings were more polarised: 42% ‘better’ and 23% ‘worse’
CO2	26.09																	
CO	2.07																	
NOx	0.06																	
PM10	0.01																	
VOC	0.36																	
TSP	0.02																	
C6H6	0.02																	
Norwich 6.2	<ul style="list-style-type: none"> In a street already limited to buses, taxis and delivery vehicles, rules introduced to improve air quality bus operators required to meet emissions criteria in at least a proportion of the fleet; the most frequent bus routes face stricter emissions criteria than the least frequent engine switch-off regulation in the zone 	<p><i>Economy</i> <ul style="list-style-type: none"> Retro-fitting costs c. £10,000 per bus </p> <p><i>Energy</i> <ul style="list-style-type: none"> Eco-driver training yielded fuel savings from 11% to 20% with an (unweighted) average 16.04% </p> <p><i>Environment</i> <ul style="list-style-type: none"> NOx fell slightly in the LEZ and rose in nearby streets 3 out of 8 monitoring stations show levels of NO₂ </p>	Not measured	<ul style="list-style-type: none"> In a public survey, 17% of people were spontaneously aware of the LEZ and 76% agreed with it once informed 														

City	Outputs	Economy Energy Environment	Transport	Society
	<ul style="list-style-type: none"> grants for part of the cost of retrofitting buses to achieve emissions standards eco-driving training for bus drivers since the fleet must operate throughout the city, the LEZ has now been drawn more widely 	<p>below the national limit, and the others, though still high, are falling</p> <ul style="list-style-type: none"> PM₁₀ fell steadily from high levels to very close to the national limit of 20 µg/m³ engine switch-off: NOx in the normal cycle has a mean 512ppm compared with a mean 160ppm at start up 		
Odense 6.10	<ul style="list-style-type: none"> City centre: design of incentives, requirements and technical potential to improve the conditions for pedestrians and cyclists in the city centre crossings 'green waves' and 'countdown' for cyclists and pedestrians; interactive info screen showing cycle routes, bus schedules, and events; 'scanners' rewarding cycling activity with entry into a lottery housing areas: definition of residential area types, mapping of opportunities and weaknesses signs, physical speed measures, barriers, access restrictions, safety features in one post-war near-centre area and one modern housing suburb both: consultation with stakeholders on barriers, issues and timing; website, press coverage, flyers and posters to engage public interest 	<p><i>Economy</i></p> <ul style="list-style-type: none"> Est. €3.9m p.a. in accident savings <p><i>Energy</i></p> <ul style="list-style-type: none"> Not calculated, though some short trips converted to cycle or walk so a small reduction in energy consumption is expected <p><i>Environment</i></p> <ul style="list-style-type: none"> Not calculated, though some short trips converted to cycle or walk so a small reduction in energy consumption is expected 	<ul style="list-style-type: none"> Traffic speed fell 12% in the modern neighbourhood and 22% in the post-war housing area car use fell in the near-centre area by 35% and in two control zones by 12% but grew in the suburb by 6% cycling grew in the suburb by 62% and remained stable in the mature area, where it was already higher pedestrian activity showed no change no results are given for cycling and pedestrian movement in the city centre 	<ul style="list-style-type: none"> 61% in an online survey felt speed has fallen; speed 'too high' fell from 72% to 31%; positive views of road crossing grew from 24% to 61% to "what is the best thing about living in your neighbourhood?" the answer "not much traffic" rose by 50% public involvement in designing the restrictions, signs and safety measures has increased "<i>local identity and local civic pride and... social interaction and interdependence between residents</i>"; the proportion of residents chatting every day rose from 22% to 28% the information screen has 608 users a month use of the cycle scanners is not recorded, but the lottery appealed to the elderly reaction to the green phases and countdown for pedestrians and cyclists is not recorded
Preston 6.3 & 6.4	<ul style="list-style-type: none"> Clear Zone strategy designed for the city 20 mph zone introduced with pedestrian and cycle enhancements wide pedestrian & cycle junction with associated walkways and calming to overcome severance between the city and the University zone signal innovation: high level repeater 	<p><i>Economy</i></p> <ul style="list-style-type: none"> The NPV of the scheme is estimated at less than 80k GBP p.a. over a 20 year life <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <p>Not measured in this zone</p>	Not measured	<ul style="list-style-type: none"> Among people passing through the 20mph zone, 50% find it easier to get where they want to go; 60% felt safer from traffic; 37% like the crossing sites; 51% said the quality of materials improves the area (7% disagreed); 45% find walking and cycling more pleasant; 17% are more inclined to walk or cycle

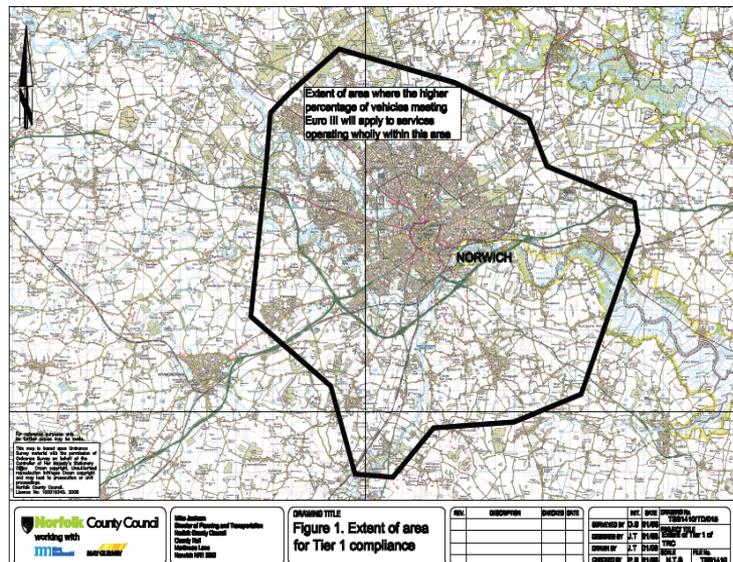
City	Outputs	Economy Energy Environment	Transport	Society
	<p>signals at 50V rather than 240V, saving energy and enabling isolated repair</p> <ul style="list-style-type: none"> consultation with residents using artist's impression of the works 			<ul style="list-style-type: none"> at the new junction, 81% easier to get where they want to go; 82% felt safer from traffic; 83% that the crossing is in the right place; 43% more inclined to walk or cycle; 89% felt the materials enhance the area
Preston 6.5	<ul style="list-style-type: none"> "The Adelphi Quarter" created as a distinct identity in the University area 20 mph zone enhancements for cyclists and pedestrians maintained through routes to the city by focusing them around the perimeter of the zone 	<p><i>Economy</i></p> <ul style="list-style-type: none"> NPV of the cost of the scheme is only 50k GBP p.a. over 20 years; revenues from penalty notices are not counted as income <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> NO₂ fell by between 0 and 10% at measurement sites between 2007 and 2008 PM₁₀ fell between 0 and 6% and CO by between 0.01% and 11% on Adelphi Street itself, NO₂ fell by 16 to 20% in the carriageway and between 0.01% and 12% in the footway 	<ul style="list-style-type: none"> Accidents "appear" to have fallen in 2006, walk was the main mode; taxi and car used socially but otherwise not a major mode; in 2008, just over 50% walked, which is no change between 2005 and 2008, cars travelling in and out of the Quarter fell by 15%; driver-only fell by 11% from 2007 to 2008 local traffic counts show cars and freight down within the zone and general traffic moved to the perimeter 	<ul style="list-style-type: none"> 77% of pedestrians, 66% of bus users and almost 50% of cyclists viewed the new provision in the Adelphi Quarter positively 61% said that the new measures have encouraged them to walk more during the day and 26% at night 12% were encouraged to cycle more during the day and 3% at night a majority felt that the improvements were good or very good for the attractiveness of the area and for pedestrians, but less so for cyclists
Stuttgart 6.3	<ul style="list-style-type: none"> LEZ introduced in increments: first, HGV ban over 3.5t.; stage 2: no diesel vehicles with Euro 1 or lower, or ignition without a three-way catalytic converter the heavy vehicle ban was lifted in stage 2 two pedestrian crossings on the "city highway" 8 lane national traffic road; speed limit cut from 60 to 50 km/h progressive signal system at the crossings and related signals, to smooth traffic flow and reduce emissions from stop-start traffic air pollution dispersion measurement /monitoring and an online simulation 	<p><i>Economy</i></p> <p>Not measured</p> <p><i>Energy</i></p> <p>Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> Emission savings from the HGV ban, modelled on the basis of traffic reduction, are estimated at 8% for PM₁₀ and NO_x and 7% for NO₂ LEZ cut emissions by est. 2 to 3%, but these are not cumulative as the HGV ban was withdrawn with the LEZ further savings in 2007 were consistent with reductions throughout Germany which are believed to have been caused by meteorological changes rather than the clean air programme the progressive signalling system was not found to have affected emissions significantly 	<ul style="list-style-type: none"> Est. 9,000 vehicles out of the 300,000 stock in Stuttgart will be affected by the ban, either taken off the roads or refitted with a suitable diesel soot filter the HGV ban reduced vehicles between 5% and 30% at six measured hotspots; a 10% reduction in heavy vehicles over the city simulation suggests that the HGV ban reduced HGV km by 11.5% with the new pedestrian crossings and speed reduction, free-flowing traffic speed fell by 10 to 15 km/h 	<ul style="list-style-type: none"> 96% of people interviewed felt that air pollution was a risk for their health (an effect of the complementary marketing measures which help create the political climate in which LEZ-type measures can be created) from a shortlist of measures to improve the environment, 79% said that the heavy through traffic ban was acceptable and 65% accepted the emission standards restrictions in the LEZ stage 1

City	Outputs	Economy Energy Environment	Transport	Society
	model ● 'round table' for consultation			
Suceava 6.4	<ul style="list-style-type: none"> ● A short bypass to remove through traffic from the LEZ ● eco-routes (alternative fuel buses) introduced in the existing restricted zone, to create an LEZ; eco-routes extended to other parts of the city ● access restrictions over a wider area of the historic city centre: one-way streets, controlled access for residents: increasing restrictions and diversion of through traffic, with full closure late 2008 ● improved pedestrian infrastructure, seats, pavements, green plots, and the city centre park ● events promoting the area as a leisure zone and accustoming citizens to the closure of the zone to traffic ● consultation and marketing 	<p><i>Economy</i> Not measured</p> <p><i>Energy</i> Not measured</p> <p><i>Environment</i></p> <ul style="list-style-type: none"> ● NOx fell by 6% overall, with steep falls in the first year and a small rise in the second year (due in part to more households); daily maximum NOx concentration fell 35% ● particulates (PM₁₀) from 53.33 µg/m³ to 41.81 µg/m³, still above (annually reducing) national limits; daily maximum concentration fell 20% ● the city centre intersection grew noisier, from 72dB to 78dB, attributed to general traffic growth and diversion from the new pedestrian zone ● positive perceptions of traffic noise throughout the city (not only in the LEZ) rose from 22.63% to 28.15%, and negative/partly fell from 66.05% to 59.48% 	Not measured	<ul style="list-style-type: none"> ● Awareness of the LEZ extension grew from 61% in 2006 to 81% in 2008 ● among those aware of the LEZ, satisfied/part rose from 65% to 86%; ● among businesses in the area, 43% satisfied/partly in 2006 and 80% in 2008

The seven measures in this sub-cluster delivered 5 traffic calmed zones, 8 enhanced environments for walking and cycling, 3 wider traffic plans to reduce pressure on the centre, 3 environmental schemes, 6 approaches to consultation to improve decision making and delivery and two novel approaches to measuring impact. Beyond this, individual achievements included electronic access, signalling, residents' and freight access, parking demand management and stakeholder partnership for driver training and engine refitting.

It is in the nature of an LEZ to combine many features in order to achieve the overall result, so this prolific output from seven measures is not a surprise, but it is a significant achievement in 3 short years. There are two contrasting types of measure in this sub-cluster: large measures with several elements resulting in a transformed area; small measures with a specific target.

Among the small measures, Norwich 6.2 demonstrates partnership to achieve LEZ objectives. In England, bus operators are private companies. The city worked with operators to develop and deliver a



strategy over time, for a city centre street which already had restricted access. Progressive emissions criteria were agreed, so that companies which send a lot of buses through the street must meet stricter rules than those with fewer buses; this helps small operators which tend to have less flexibility in updating and deploying vehicles. The City supported the transition for bus operators by providing ‘eco-driving’ training and by part-subsidising engine retro-fits to reduce emissions. Since buses travel through the city to reach the centre, the emissions standards were agreed for a wider zone (pictured above).

As well as the bus engine standards, Norwich introduced an “engine switch-off” regulation in the city centre LEZ. The City’s partnership approach engaged traders in the street to help with compliance; since the “engine switch-off” rule improves the environment for shoppers, the traders remind delivery drivers to switch off their engines.

Norwich tested a new method of measuring emissions. The City, with the University of East Anglia, made a structured comparison of fixed and mobile monitoring. Emissions data were collected both from static diffusion tubes and from a portable monitoring unit on a “slow walk” (pictured). The results were sufficiently clear to give confidence in the more flexible and affordable monitoring method: *“a result within an hour is equated. This compares very favourably with diffusion tubes that would take several tubes, several months before a result is obtained.”*



Stuttgart introduced small, tightly focused measures. First, a ban was introduced on HGVs over 3.5t. In a second phase, the HGV ban was lifted and an emission-based exclusion introduced for all vehicles. In this phase, the standard is not exacting: Euro II for heavy vehicles, and cars must have a catalytic converter. A third phase is planned from 2012, with Euro III the minimum standard.



At the same time, two pedestrian crossings were built on the “city highway B14”, a national traffic road of 8 lanes. With these a speed limit reduction was imposed, from 60 to 50 km/h. The signalling at the crossing and associated junctions was moved to a ‘progressive signalling system’ which aims to smooth traffic and thus reduce emissions.

Stuttgart has also introduced an innovative emissions modelling structure, which is now an online simulation model and will be linked to the traffic control centre to provide real time information on air pollution so that traffic management can respond to prevailing conditions.

Another small and specific set of localised measures was introduced in Preston 6.3&6.4. These were targeted to improve the environment for pedestrians and cyclists in problem areas, along with a more general measure to develop a Clear Zone strategy for the whole city for the future.



The two specific area measures were a wide crossing to reduce severance between the University area and the city centre, and a 20mph zone in one part of the city.

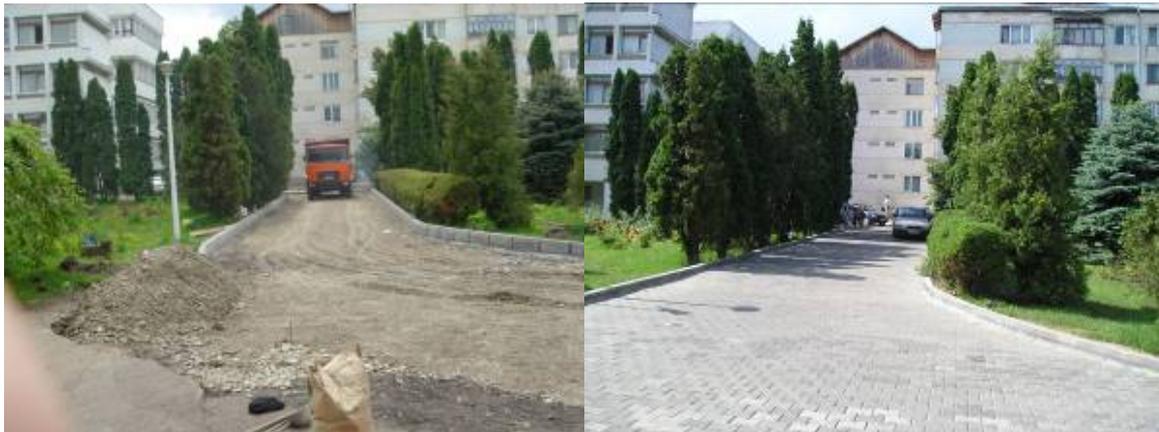
The City used an artist’s impression (far left) in consultation on the scheme (left).

In the ‘large measures’, Genoa showed that conditions can be improved even in cities with a strong history of access control and demand management. Genoa’s first LTZs were introduced in 1989 and the city has built progressively upon those to improve the environment both in the city centre and in outlying areas. In CIVITAS a parking review and revised traffic circulation in the city centre LTZ first reduced pressures on the streets; then the zonal “BLUEAREA” pricing policy introduced a graduated pricing scheme which allowed residents to park only in their local sub-zone for an annual fee of €50 for one household car and €300 for further cars. Access is enforced by ANPR (Automatic Number Plate Recognition) cameras. Also, an innovative “Mobility Credits” scheme was developed to deliver pricing demand management for freight access and studies have been carried out into extending this principle to cars.

Odense was a ‘large measure’ aimed at reducing the impact of traffic. This was in two distinct waves: one in the city centre, applying ITS solutions to ease conditions for pedestrians and cyclists, and one in housing areas. The housing measure chose two areas: a suburb of 1970s cul-de-sacs away from the centre and a post war area close to the centre. These are felt to be representative of typical housing areas in Denmark. The objectives in the two areas are rather different, since traditional grid-pattern housing suffers from the impact of through-traffic and cul-de-sacs do not. The design phase included a citizen engagement exercise, in which the residents in each area gave inputs into the size of the zone, the targets and the rules. These were put into effect through a mixture of speed humps, road narrowings, access restrictions and signs.



Again in the ‘large measures’ bracket, Suceava introduced a significant LEZ in a city with little tradition of traffic management and which has rapidly rising car ownership. 5% of the city centre had previously been designated an LEZ, part-pedestrianised and part closed to traffic in the evenings and at weekends. This measure made 35% of the centre an LEZ. Alternative fuel buses created Eco-Routes into the centre, bringing benefits throughout their routes as well as enhancing the LEZ. Full closure of parts of the city was undertaken on temporary basis for special events in the first instance, in order to acclimatise citizens to enjoying the area as a traffic-free space. Access restrictions were facilitated by traffic circulation schemes to take traffic out of the city, including a short bypass. This is illustrated below, to show that bypasses need not always be lengthy, expensive and heavily trafficked: here, an opportunity was taken to derive a large effect from a small bypass.



5 Upscaling and Transferability

The 23 measures in the Access & Parking Management cluster provide a wealth of knowledge to transfer. Even where there have been failures, lessons have been learned – one of these being how to succeed in delivering some results where obstacles interrupt the original plan. Other cities, and the parking and access management industry, can apply many new or enhanced measures by following these examples.

The diverse nature of the cities makes the measures more easily transferable. Results have been delivered in historic centres (Burgos and Krakow), national and international tourist destinations (Venice and Genoa), cities of regional importance (Toulouse and Norwich), small towns such as Leyland (Preston 7.3&7.5) and large cities, and even in cities whose existence began with and still depends upon their siting as national and international through-traffic routes (Burgos and Suceava). Importantly, there are examples from cities with mature parking and access management schemes and existing LEZs, as well as from cities tackling parking and access as a new problem.

5.1 Upscaling

Most of the 23 measures are part of longer term strategies and will be upscaled. In some instances, such as Norwich 10.3 and Preston 7.3, CIVITAS initiated new policies whose implementation will be incremental over time; in others, such as Burgos and Toulouse, the upscaling will be mainly the application of the principles in other neighbourhoods.

5.2 Transferability

Since many of the measures involve a number of elements, there is a good deal of cross-over between sub-clusters, so the transferability analysis is grouped by detailed intervention, rather than sub-clusters. The list below indicates the key factors which other cities might bear in mind in seeking to apply these measures successfully in their own areas.

Parking management

- An increase in capacity can facilitate a parking revision. In CIVITAS, the increase was generally provided through off-street or underground spaces (Burgos 6.5); reallocation of spaces (Preston 7.3&7.5) or increasing the proportion of short-stay parking to provide greater turnover (Genoa 7.1).
- Pricing structures can influence length of stay, without specific regulation (Burgos 6.5, Preston, Venice 6.7).
- Dividing a large zone into sub-zones can permit priority access whilst limiting parking and traffic throughout the area (Genoa, Burgos, Toulouse).

The parking measures are transferable particularly to cities with rapid traffic growth and/or high levels of violations leading to increasing congestion.

Enforcement

New technologies assist with enforcement, increasing effectiveness and reducing costs. Examples include

- the “multa-car” for parking enforcement in Burgos 6.5

- rising bollards to allow priority access only (Burgos, Preston and La Rochelle)
- Krakow's innovation of a system which photographs the driver and vehicle to enforce access restrictions
- ANPR (Automatic Number Plate Recognition) in Genoa (picture 6.11)

A strong enforcement policy proved important in changing behaviour in Venice, Ploiesti and other cities. Toulouse advises that enforcement of an entirely new scheme might best be 'soft' at first, whilst citizens and visitors learn the new rules.



Other technologies



- Odense (pictured, left) introduced signal countdown for pedestrians and Debrecen showed increases in junction throughput and driver and pedestrian confidence by providing signal countdown to drivers as well.
- Information panels were used in Odense, and Venice demonstrated savings from solar-powered parking information panels using GPRS data.
- Scanning equipment was used to provide residents' access in several schemes. Odense also introduced "cycle scanners" to record activity, with a lottery entry for each time the scheme member scanned a card.
- Downloadable GPS route maps and parking guides to avoid city centres were demonstrated in La Rochelle for coach drivers, but could also work well for other market segments.

Pedestrian and cycling benefits

Measures to reduce traffic access and parking often have pedestrian and cycle access as a target, as well as environmental aims. Some of the techniques and designs in these measures are highly transferable:

- Odense's structured approach to the selection of housing zones for traffic calming showed the distinct gains to be made in both mature and newer housing areas with different traffic characteristics.
- In Burgos, 40,000 people are now enjoying the centre at weekends "going shopping or just walking around".
- Burgos, Krakow, La Rochelle, Suceava and Ploiesti were among the cities which showed benefits from improved walking and relaxing environments with attention to detail regarding street furniture, fountains, green spaces, etc.

Measurement

- New forms of measurement have been developed in CIVITAS, which are transferable to other cities (e.g. Norwich 6.2 and Stuttgart's air pollution dispersion model).
- The measures also illustrate the importance of comprehensive measurement: measures may have unintended consequences, e.g. in Venice 6.8 the measurement set the reduction in coach traffic in the context of higher tourist numbers.
- Measurement facilitates review and refinement: in La Rochelle, the coach direction strategy has been revised with marketing targeted directly at drivers after finding that tour companies had not been passing on the information to coach drivers; in Stuttgart, the separate

measurement of an HGV ban and an emissions standard showed that the HGV ban was most effective, so consideration is being given to reintroducing it.

Cohesion

A key factor in the success of access and parking management measures has been their inclusion in wider strategies, many of which include improved public transport (Toulouse) and cycling and walking (Burgos), or park and ride (Venice):

“For the access control schemes that have delivered significant reductions in local air pollutants there is a strong element of supporting measures in order to help the access control schemes reach their goals.” (SMILE Final Evaluation Report)

“The measures’ full potential may not be achieved unless enhancing combinations of measures are considered. Parking management and zones of controlled access are types of measures that simultaneous or previous implementation of measures of other work packages can enforce.” (MOBILIS Transferability Report)

This is a fundamental benefit of the CIVITAS programme, in which the deliberate intention was to show the effect of several measures in one city, rather than simply the effects of individual measures: *“With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen”*. http://www.civitas-initiative.eu/cms_pages.phtml?id=348&lan=en In all these cities, the cumulative effects have been greater than the sum of the parts, and, in particular, success in parking and access management is often promoted by complementary measures.

One significant area of cohesion was understanding the traffic consequences outside an access zone and creating interventions to deal with these. In Burgos, for example, ring roads were provided; in Suceava, a less costly approach was a small bypass of the central zone, and in Genoa and other cities traffic circulation was changed in order to discourage driving through the centre.

Citizen and stakeholder engagement

Any scheme to reduce traffic access or parking is likely to be politically, socially and commercially contentious, so consultation and marketing are essential. The consultation must include cycles of persuasion and genuine listening: many of the schemes were changed in response to the comments made by consultees and this willingness to work with residents and businesses is a key factor in ultimate acceptance of the measures:

“access and parking management are sensitive measures and shall be carefully implemented. Political willingness, clear knowledge of the needs of residents and/or economical actors, active participation of stakeholders, adequate implementation calendar and large communication actions are great success factors for introducing access management measures. A close interaction between the politicians and technicians is also necessary; the politician shall assist the technicians in the strategy of implementation and spend time to be in relation with the citizens.” (MOBILIS Transferability Report)

Specific example are Burgos, where stakeholder debates continue after implementation in order that the impact of the scheme over time can be managed; Suceava, where special events were held first in the area which would eventually be closed in order to accustom people to using it as a traffic-free area. One interesting result was in La Rochelle, where research found that different types of business have different views of access control, with restaurants and bars finding clear benefits, shops and offices generally neutral and hotels and service industries generally concerned about customer parking. This is an intuitively sound finding but is not often measured, and it may influence the design of future

schemes in other cities: it affects the consideration of where access restrictions are best suited and should remind cities to ensure that consultation is balanced between the different interests so that one 'anti' lobby does not block a scheme which brings wide benefits.

Institutional factors

A range of institutional issues has been highlighted by these measures. One of the critical success factors has been thinking carefully about the regulatory environment. For example, in Norwich, different forms of regulation were used for emissions standards and an engine-switch-off rule, giving more flexibility in management and delivery. In Malmö, the scheme was redesigned because of the difficulty of agreeing national regulations. Many of the project reports call for national or European-wide standards on emissions and even on the type of regulation available.

“Success of the CIVITAS measures has been influenced not only by the technical solutions themselves, but also by optimising the process of planning and implementation.” (SMILE Final Evaluation Report)

The design and planning for Burgos 6.2 took 2 years; in some measures, the major part of the CIVITAS programme was design and consultation with implementation still coming on-stream by the close of the programme.

The impact of institutional factors was seen clearly in Krakow, where contractors failed to deliver underground parking. More positively, in Norwich, the freight distribution depot for transfer from HGVs to smaller vehicles was selected in an existing warehousing site, thus avoiding significant start-up and staffing costs and making room for the timescale of behaviour change.

The table below is taken from the CARAVEL Final Evaluation Report and gives an example of the processes involved.

Recommendations	Actions
<p>1 Stakeholder Involvement</p> <p>Integrate stakeholder involvement as an essential component in the planning and implementation of sustainable urban mobility measures.</p>	<p>1.1 Start the stakeholder involvement process after checking some basic requirements.</p> <p>1.2 Identify stakeholders and their needs early on in the process of measure planning.</p> <p>1.3 Set goals and formulate involvement strategies separately for all stakeholder groups.</p> <p>1.4 Ensure a high professional standard as well as a pleasant and motivating atmosphere for all stakeholder events.</p>
<p>2 Mobility Culture / People's Mindsets</p> <p>Realise that changing people's mindsets and ultimately society's mobility culture is a potentially slow process.</p>	<p>2.1 Apply a targeted approach (stakeholder group focussed) for information and marketing campaigns.</p> <p>2.2 Communicate the image of a forward-looking and innovation-oriented community/ municipality.</p>
<p>3 Governance / Institutional Cooperation</p> <p>Review communication channels, administrative processes and operational work conditions for all institutions and actors involved in the measure planning and implementation.</p>	<p>3.1 Critically review current institutional structures in light of a measure implementation.</p> <p>3.2 Assign clear roles and responsibilities to all institutions and actors involved in the measure planning and implementation.</p> <p>3.3 Organise site visits and staff exchanges.</p>
<p>4 Planning</p> <p>Place emphasis on the wider and long-term strategic planning.</p>	<p>4.1 Ensure the consideration of all relevant planning aspects.</p> <p>4.2 Set clear and achievable objectives.</p> <p>4.3 Regularly review potential risks and develop contingency plans.</p>
<p>5 Political Support / Commitment</p> <p>Involve and work closely with (local) politicians to seek their commitment and support.</p>	<p>5.1 Develop and communicate long-term strategies that have a chance to receive above-party level support.</p> <p>5.2 Regularly update (key) politicians about the developments in the measure implementation.</p> <p>5.3 Invite politicians to national and international events and ensure wide media coverage.</p>

6 Conclusions and Recommendations

6.1 Conclusions

1. The primary conclusion is that parking and access management schemes can contribute greatly to the improvement of the environment in cities. This applies both to the environment in the sense of measured emissions and noise and to the ambience in creating a pleasant environment to walk around and contributing to a vibrant economy.

Results

2. The results from the 23 measures reported here include:
 - greater park & ride use (Preston, Venice by up to 300%);
 - a sharp increase in compliance, such as reduced illegal parking by up to 2000 offences per day (Burgos, Krakow, Malmö);
 - improved traffic flow (Debrecen);
 - reduced traffic speeds (e.g. Odense) and reduced fear of traffic (e.g. La Rochelle)
 - commercial benefits (Burgos, Norwich, Ploiesti);
 - reduction in car and coach trips by up to 12% (Genoa) and congestion by up to 89% (Ploiesti and others)
 - a growth in pedestrians (by up to over 100%) and cyclists (by up to nearly 10 times) (Genoa, Burgos, Krakow, Ploiesti, Preston, Odense, La Rochelle, Venice);
 - a reduction in lost mileage looking for parking (Burgos and others)
 - an increase in the proportion of environmentally friendly vehicles (Venice, Stuttgart),
 - significant emissions reductions (up to 13%) (Norwich, Preston, Suceava, Stuttgart, Genoa, Malmö, Ploiesti, Burgos), as well as fuel savings (by up to 20%).
 - perhaps most important, citizens' perception of how the city centre is managed was improved greatly by these measures, with dissatisfaction falling from 76% to 33% in Burgos; active satisfaction among drivers 58% in Debrecen; drivers perceived no change in travel times despite significant benefit in Krakow; 30% said BLUAREA 'improved order' in Genoa; all measures which were completed had strong positive results in citizen acceptance of traffic policy.

In addition:

3. An interesting feature is that parking and access management appears to produce results in all kinds of cities and circumstances. Cities without a history of parking and access management showed rapid results – but so did cities with a long history of LEZs, parking and access control.
4. The key lessons from these measures relate to implementation. The successes were delivered through innovations in policy and delivery, as well as through new technology, but success was almost always dependent upon consultation and engagement.
5. A shared commitment to improving conditions in the city centre can allow some parts of the planned measure to go ahead even when the full aspiration cannot be delivered – this was shown in Debrecen, Norwich and Ploiesti. In Krakow, 300 out of a planned 500 parking spaces were removed and public squares were pedestrianised, even though an underground car park deemed a pre-requisite for demand shift was not completed.
6. It can take time to achieve the objectives in the sensitive area of parking and access. Examples of projects which have started to build a consensus to lead to strong measures in the future are the Norwich freight access strategy, La Rochelle coach driver information and Genoa's road pricing scheme.

6.2 Recommendations

1. Two suggestions for further work arise from the experiences in this cluster. First, a number of cities (e.g. Norwich and Malmö) have set examples in how to develop regulations to further environmental and access policies. This has proved a difficult process. Whilst cities accept that regulations are subject to subsidiarity, it is hoped that some standards or processes could be developed at EC, or at least at national, level, to avoid each city having to develop local rules and drivers having to learn a range of such rules.
2. The second area for further examination is that several of the measures reported difficulties in obtaining satisfactory bids for tenders, or satisfactory delivery from successful bidders. It might be useful to examine the institutional causes of this and to try to develop some templates or procurement routes which could minimise these problems.

Overall, cluster 8, Access & Parking Management, has provided a valuable set of measures. Together, they show that a great deal can be achieved, through a wide range of measures, in a variety of settings. They also show the implementation routes that lead to success.