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Measure Evaluation Results

BOL 3.2 Pricing and Monitoring Policy for Parking

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Executive Summary

The aims of the MIMOSA measure 'Pricing and monitoring policies for parking' looked to improve parking policies, to optimize the use of parking spaces, to reduce space allocated for parking facilities in the urban area, and to develop specific tools for enforcement and information.

. Consequently new tickets with a bar code and updated parking meters were introduced to improve the efficiency of the process. New types of access permits with bar code for residents were distributed and extended to other stakeholders with rightful access to the core of the city centre, the so-called Limited Traffic Zone.

On the side of parking regulation enforcement, new palmtops for on-street parking controllers were introduced. These devices are an important part of the system allowing for both the control of tickets and permits, and the collection of relevant information for public transportation planning and management. The public transport company TPER manages the on-street parking as specified in the parking regulation plan of Bologna Municipality. Fares, time of payment and reductions are under the responsibility of the Municipality.

The measure was implemented in the following stages:

Stage 1: Analysis for the application of telematics systems to access permits (October 2008 – October 2009) An analysis for the substitution of the existing access permit system to the Limited Traffic Zone was conducted: the new permits are on a plastic card of a different colour and text depending on the typology, with an identification bar code.

Stage 2: Devices for control and enforcement for agents (October 2008 – October 2009) The Pocket PCs for mobility operators to control on-street parking spaces have been replaced with new devices and improvements to the software have been implemented to facilitate control procedures. In fact they can read bar codes on new tickets and permits and also recognize car plates through an Optical Character Recognition (OCR) system. Palmtops are equipped with GPS and GPRS that allow them to exchange information with the central system.

Stage 3: Revision of parking fares and improvements in management tools (October 2009 – October 2011) Fares for on-street parking have been revised in order to derive a more efficient use of the urban spaces. This entailed a complete update of all the parking meters, which are now connected through remote control. An information campaign was carried out in order to make citizens aware of the change. At the same time, the printing of bar codes on parking meter tickets was activated. This feature makes control procedures faster and more reliable.

Stage 4: Realization of new bar code permits and improvements in management (October 2010 – December 2012) Some categories of people can request permission to access the Limited Traffic Zone. New types of permits provided with bar code were introduced with the aim of improving and rationalising the management of the permits themselves. Bar codes make enforcement more efficient too. Citizens now have the possibility to request the permit via internet.

The evaluation was mainly carried out through surveys in order to investigate qualitative indicators. One survey was addressed to a random sample of citizens, to know their opinion about on-street parking policies and another addressed all control operators to measure their acceptance of the new palmtops.

As far as parking policies are concerned, **the key-results of the evaluation** showed that citizens generally acknowledge the benefits of applying a fare to on-street parking in areas

with higher levels of congestion: 56% of 500 people think that the payment of on-street parking can facilitate them to find a free parking place. Feedback from control operators showed criticisms especially about bar code reading functionality: 81% of the controllers did not see improvements in their activity after the implementation of this feature, while the opinion on plate reading functionality was positive for around half of the operators (47%). On the basis of these findings, an improved version of the palmtops software was implemented.

One of the barriers was the low acceptance for innovative technology among parking controllers who were reluctant to use the new tools. **The second barrier** is due to the complex and long procedure for the introduction of new permits on the city level which slowed down the implementation of the measure.

The driver of the measure was the support of the Municipality which maintained and strengthened its action to support the guidelines on access restriction to the city centre. The activity of fare collection and enforcement, under the responsibility of TPER, were carried out in an effective way.

From Bologna's experience, **two main recommendations** can be formulated. Firstly, actions that involve long term planning and implementation such as those exploited in this measure need continuous cooperation with the offices of local government. Secondly, involvement of field operators in the development of the measure's concept is a key issue for the success of projects. In Bologna internal communications had to be redefined and further improvements had to be achieved during the implementation process.

In the future, software on palmtops will be improved further to better fit the need of public workers.

A Introduction

A1 Objectives

The measure objectives are:

High level objectives:

- Improvement of air quality

Strategic level objectives:

- Demand management strategies: Develop strategies to reorganize and control mobility in the city aiming to reduce congestion especially in the city centre

Specific measure objectives:

- Improve parking management in order to reach an optimisation of parking spaces and a related increased availability of space in narrow areas of the urban area.
- Technological development for Information/reservation/enforcement with a consequent improvement in the management of parking.

A2 Description

Objective of this action is to improve parking policy and management in order to reach an optimisation of parking spaces on-street.

The activities related to on-street parking are:

1. Revision of the parking fares and improvement in management tools: this revision implied the complete update of all the parking meters and vertical signs, the update of the payment vouchers “scratch and park” and a widespread information campaign to citizens.
2. Centralized control of the parking meters through GPS and GPRS that allows on line control of breakdowns and strongboxes status (about 800 parking metres controlled) Bologna is the first big Italian city to achieve the complete centralization of parking meters.
3. Renewal of Pocket PCs for on-street parking controllers and software improvements: these devices are able to read the bar code on tickets and, if necessary, to print the fines. A specific tool allows the OCR (Optical Character Recognition) reading of the licence plate.
4. Realization of new access permits for the city centre: the new permits are on a plastic card with an identification bar code. The bar code allows all data on the permit and its owner's details to be linked to a central data base; this is then easy to update without any need to go physically to the office and substitute the card.

B Measure Implementation

B1 Innovative Aspects

New economic instrument - Parking policy based on fare differentiation depending on the parking zone: Bologna on-street parking fares are higher in city centre and lower in peripheral areas.

Use of new technology/ITS - The parking control was improved with the adoption of palmtops for the controllers that allow the ticket check through the bar code, the licence plate reading through an Optical Character Recognition tools and the printing of the fines.

B2 Research and Technology Development

The R&D activities for the measure concerned the study for the realization of the technology update of the access permits (introduction of the bar code) and implementation of the devices for the improvement of parking control and enforcement (control through bar code and OCR- Optical Character Recognition)

B3 Situation before CIVITAS

The main problem of the city of Bologna concerning parking management, common to many other medium size historical cities, is the lack of space, that generates problems and difficulties; especially in the city centre, this situation contributes to an increase of the following problems:

- illegal on-street parking that obstructs the normal traffic flow, in particular for public transport;
- vehicles roam around the area, looking for free spaces;
- insufficient parking availability for residents in the city center.

The Municipality addressed this problem in many different ways and the most important concept was to tackle this with an integrated approach where parking and mobility topics are considered. The goal was to find the best balance between demand and supply in order to not incentivise demand, once the optimum parking availability had been reached.

An important number of parking spaces was provided in the city centre by small garages; they sometimes had a difficult relationship with the city when a new regulation policy was introduced. The parking policy, integrated in the Traffic master plan, foresaw an important intermediary work in order to guarantee economic activities (such as small public garages) in the city centre and to look for the best solutions promoting intermodality, Park&Ride and accessibility in the Limited Traffic Zone (LTZ).

On-street parking control operators were equipped with Pocket PCs with fewer functions. The devices did not have advanced interfaces, and operators had to insert information about the car and ticket or permit, following guided procedures. They could store just a limited quantity of data, so any new features or applications to improve management systems could not be implemented.

B4 Actual Implementation of the Measure

The measure was implemented in the following stages:

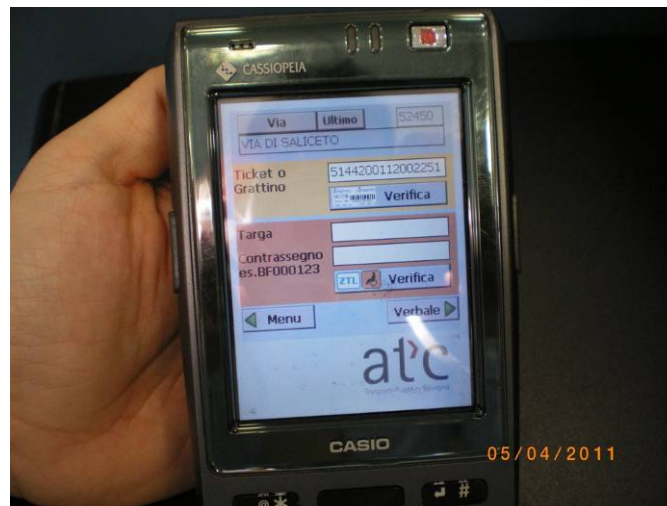
Stage 1: Analysis for the application of telematics systems to access permission (Oct 08 – Oct 09)

The analysis activity for the substitution of the existing access permission to the LTZ was completed: the new permits are on a plastic card of a different colour and text depending on the typology with an identification bar code.

Stage 2: Devices for control and enforcement for agents (Oct 08 – Oct 09)

The Pocket PCs for mobility operators to control on-street parking spaces have been replaced with new devices, and improvements on the software have been implemented to facilitate control procedures.

Figure B4.1 - New Pocket PCs for on-street parking controllers



Stage 3: Revision of the parking fares and improvements in management tools (Oct 09 – Oct 11)

The main activities realized can be summarized as follows:

- A complete revision of the parking fares. This revision required:
 - the complete update of all the parking meters
 - the update of all vertical signs
 - the update of the payment vouchers “scratch and park”
- An information campaign addressed to citizens:
 - on ATC web site (with the complete update of the pages and the realization of an interactive map),
 - through local newspapers,
 - with the distribution of leaflets on the windscreens of car parked in the relevant areas.
- Centralized control of the parking meters through GPS e GPRS that allows on line control of breakdowns and strongboxes status. From 5/4/2011 all the parking meters

(about 800) are centralized. Bologna is the first big Italian city that realized the complete centralization of parking meters.

- At the same time we activated the print of the bar code on the parking meter tickets in order to allow controllers an easier check through their portable devices. The bar code control allows the collection of data on the use of parking meters. These activities went further with the introduction of bar code on all parking tickets and also on access and parking passes.
- The software tool for management of parking meters was completely redesigned in cooperation with the system supplier :
 - Visualization of information on a cartographic map
 - Introduction of the alarm signal escalation if the alarm is not managed
 - Creation of the historical database
 - Sharing of operation alarms with the supplier with regard to breakdowns and “running out of paper”
 - Optimisation of operational alarms with regard to strongboxes substitutions
- We realized a system for the generation of fines using the controllers' portable devices.

The devices are equipped with cameras that allow the controller to take pictures of the parking offences.

Figure B4.2 - Parking tickets with bar code



Stage 4: Realization of new bar code permits and improvements in management tools (Oct 10 – Dec 12)

New barcode permits for access and parking in the Limited Traffic Zone have been defined. The solution realized has these main objectives:

- a) Improve and rationalize the management of the permits through the introduction of the bar code that allows all data on the permit and its owner's details to be linked to a central database which is easy to update without the need to substitute the card.
- b) Reduce the needs for users to go physically to the permit office thanks to the possibility of using the Internet, e-mails, faxes and letters to communicate variations concerning the permits.
- c) Reduce the costs of the card production and the administrative costs for service management

The new permits are on plastic card of 8,5X5,4 cm. (thickness 0,4 mm.), with an hologram and the bar code. The different types of permits are identified by the colour and the text. The

plastic material and the colours of the card are resistant to high temperatures and to the exposure to sunlight.

The bar code contains an alphanumeric string that identifies the permit owner; all the data are stored in the permit database.

Data are updated in real time from the permit operators office; the complete architecture foresees also the integration with the Motorizzazione Civile database that provides data concerning the vehicles emissions characteristics and eventual change in the vehicle owner address or vehicle number plate.

The variations to the permits are transmitted to the palmtops of the parking controllers at the start of every work shift.

First typologies of permits issued are those that allow the owners of natural gas, gpl or electric cars to pay reduced fares on long term tickets. (See figure B4.3). By the end of 2012 we will gradually issue the other typologies of permits as existing permits are renewed and new customers request them.

Figure B4.3 – Examples of permission for natural gas/gpl and electric/hybrid vehicles, with bar code.



B5 Inter-Relationships with Other Measures

The measure is related to **Measure 2.2 “Park and Ride System”**. The measure foresees the increase and improvement of interchange parking areas where people can leave their private car and use public transport and bicycles to reach their final destination in the city.

It's clear that the realization of park & ride areas contributes to the reduction of cars entering the central area of the city with consequent positive effect also on availability of parking on-street.

C Impact Evaluation Findings

C1 Measurement Methodology

C1.1 Impacts and Indicators

Table C1.1.1: Indicators.

Evaluation area	Evaluation category	Impact	N.	Indicator	Source of data	Month
Economy	Benefits	Operating Revenues	1	Operating revenues	Accounts ATC	37
	Costs	Capital Costs	2	Capital Costs	Accounts ATC	45
		Maintenance and Operating Costs	3	Maintenance cost	Accounts ATC	45
Society	Acceptance	Awareness	4	Awareness level	Survey	45
		Acceptance	5	Acceptance level	Survey	45

With this measure we developed activities addressed to improve on-street parking management and the management of the access permission to the city centre introducing innovations from the organizational and technological point of view.

Indicator 1-3 “Economical evaluation area”:

To evaluate the measure from the economical point of view we consider:

- revenues of on-street parking tickets
- capital costs for the realization of the measure

Indicator 4-5 “Society evaluation area”:

In order to evaluate these indicators we realized two surveys:

- Between 11th and 14th June 2012 we conducted a telephone survey with a random sample of 500 citizens, in order to evaluate on their awareness and acceptance of the management of on-street parking in Bologna. It is important to assess it because the long term policy of the Municipality is to create new areas with on-street parking, in order to better regulate the use of urban space. Success of new measures is strictly connected to the capability to understand citizens' needs and to correctly explain and communicate changes.
- between 17th and 21st May 2012 we carried out a survey among all the control operators (75 people), to evaluate their impression and acceptance of the new technologies introduced for parking control . We wanted to investigate the opinion of all the personnel effectively involved in the control activity, in order to have a real picture of their perception and about the weight of eventual problems and cope with them.

The evaluation would have been more complete if we had the possibility to collect data before/after concerning the modal split of the transport modes. These data are not available

at the moment and they are only measurable through the population census. With this information we could have measured change in mobility behaviours.

C1.2 Establishing a Baseline

Baseline data show the situation before the realization of improvements in on-street parking management and control:

- the control of parking permits and tickets was completely manual with high possibilities of errors.
- both tickets and access permits were on paper with no identification code.
- most of the parking meters were stand alone and the control of breakdowns and strongboxes status needed the direct inspection from operators.

C1.3 Building the Business-As-Usual Scenario

The improvements realized in on-street parking management were fundamental for the success of the parking policy of the city:

- the realization of the centralized control of parking meters allowed improvements in the efficiency of the system: real time control of the parking meters and immediate notification of breakdowns in order to plan maintenance interventions
- the possibility of having an efficient and quick control on-street thanks to the new palmtop devices is another factor that increases the system efficiency and discourages ticket evaders.

The realization of these two actions is fundamental to guarantee the revenues: if we hadn't improved the system, the level of revenues from the parking tickets would have progressively decreased. On the other hand the operational costs for maintenance and operation of the parking meters would have increased.

The realization of the new permits with the bar code and the development of the new management system leads to a decrease in operation costs: fewer personnel will be necessary for the front office because citizens can renew or change data of their permits through e-mails, internet without going physically to the office.

C2 Measure Results

The results are presented under sub headings corresponding to the areas used for indicators – economy, energy, environment, society and transport.

C2.1 Economy

Table C2.1.1: On-street parking in Bologna - Revenues and Costs (Euro).

Indicator	2009	2010	2011
n. 1 - Revenues	11.026.810	10.913.205	11.571.047 (1)
n. 2 - Capital costs - Palmtops, Parking meters (2)	9.480	18.960	23.100
n. 3 - Maintenance and operating costs	1.827.902	1.700.363	1.839.375

(1) On-street short term parking fares changed on 5th April 2011. Fares of tickets valid for one month or more didn't increase.

(2) Capital costs here displayed refer to purchase of palmtops for parking controllers and the purchase of new parking meters. Costs for palmtops are 94.800 Euro, while costs for parking meters are 41.400 Euro. Figures in the table above are set according to the quote of depreciation per year (ordinary rate for this kind of assets is 20% per year, but 10% for first year of use)

A slight reduction of revenues was registered between 2009 and 2010, due to an effective decrease of cars parked because of unfavourable economical situation. Increase of revenues are mainly the consequence of fare increase.

As far as maintenance and operating costs are concerned, we observed a decrease in 2010, that was the result of general policies for cost control of the company.

C2.2 Energy

Not applicable

C2.3 Environment

Not applicable

C2.4 Transport

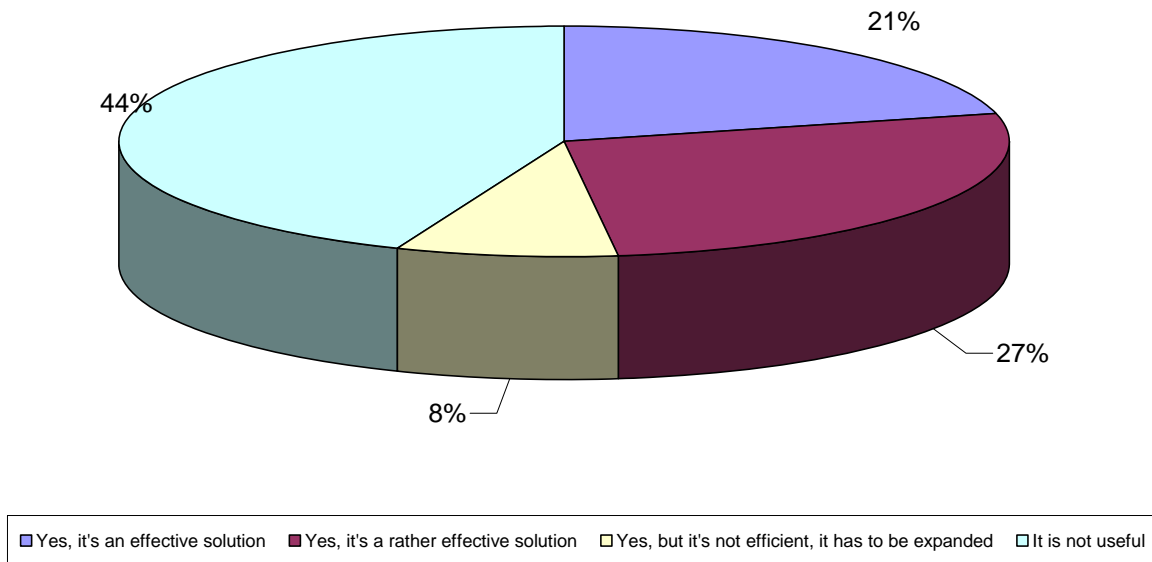
Not applicable

C2.5 Society

Indicator 4-5 "Society evaluation area":

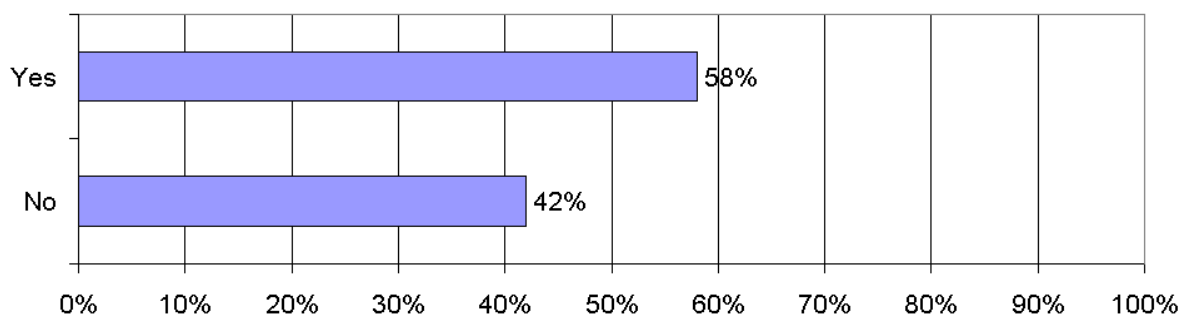
We asked citizens their opinions on the management policy of on-street parking, asking questions on different aspects of the solution applied in Bologna. About 56% has a positive opinion on paying for on-street parking as a way to decongest parking spaces in relevant areas (See fig. C2.5.1). About 8% even think that the pay for parking should be further expanded.

Figure C2.5.1 – Question: Do you think that the payment for parking on-street allows to find easily a free space for parking? (500 answers)



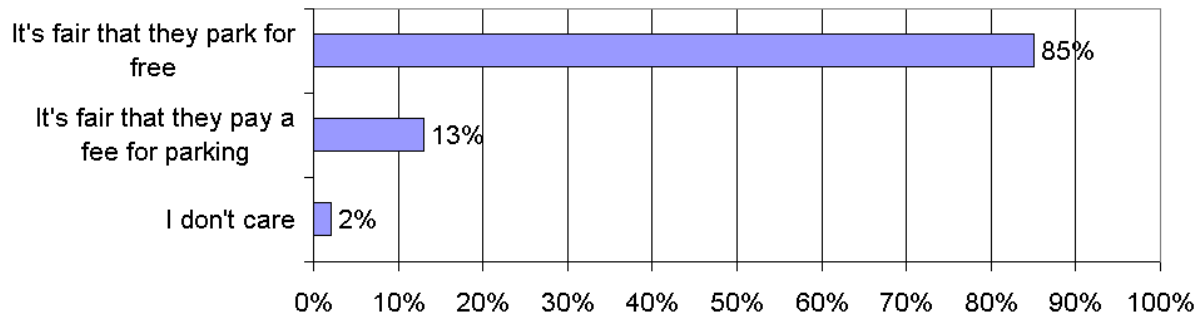
We asked also if they consider it correct, as applied in Bologna, to have different fares for different zones (higher in the city center lower in the periphery). About 58% answers that they agree. (see fig. C2.5.2)

Figure C2.5.2 – Question: Do you think that it's correct to fix parking fares taking into account the distance from the city center (higher in the center, lower in the periphery)? (500 answers)



85% of those interviewed agree that people should not pay for parking in their residence zone; about 13% think that they should pay a certain amount (see Figure C2.5.3).

Figure C2.5.3 – Question: Referring to residents of zones where on-street parking payment is applied, do you think that: (500 answers)



According to the results of the survey, citizens mostly agree on the guidelines chosen by the local government, as far as parking policies are concerned, in order to regulate the use of the urban space. It is commonly agreed that residents should continue to park for free close to their homes, but 44% of the sample assess it as useless to apply fares for parking in more crowded areas.

As concerns the survey to controllers of on-street parking our objective was to evaluate the satisfaction and acceptance of the technological improvements:

- Checking parking tickets with palmtops through the bar code
- Automatic reading of licence plates with the OCR (Optical Character Recognition) system
- Use in general of new technologies for the control procedures

The opinions expressed from controllers show that on one side there is an improvement in the control procedure with the bar code but on the other side the check is difficult in particular conditions (for example if the bar code is not well visible behind the car windscreen or because of the sun light).

Opinions on bar code readers are not positive. Just 19% of the controllers found that this feature could improve their activity.

Concerning OCR licence plate reading, controllers are divided between positive (47%) and negative opinion (53%) about improvement of their activity as a consequence of using the new devices.

The answers to the general question on the utility of new technologies for tickets controls show about 59% of positive opinion while the other 41% is sceptic.

Tab. C2.5.1 - Results of the survey to park tickets controllers (75 answers)

	Very Much	Fairly	Not much	Not at all	Total
Bar code: Does it simplify your job?	6,7%	12,0%	41,3%	40,0%	100,0%
Bar code: Does it reduce errors?	6,7%	18,7%	40,0%	34,7%	100,0%
Bar code: Does it speed control?	4,0%	14,7%	24,0%	57,3%	100,0%
OCR Licence plate reading: Does it simplify your job?	17,3%	32,0%	22,7%	28,0%	100,0%
OCR Licence plate reading: Does it reduce errors?	16,0%	33,3%	24,0%	26,7%	100,0%
OCR Licence plate reading: Does it speed control?	10,7%	32,0%	25,3%	32,0%	100,0%
Control technologies: Do they improve your job?	16,0%	42,7%	24,0%	17,3%	100,0%

We can analyse feedbacks from the operators splitting them in two.

One aspect is related to the adjustments that have to be expected while introducing new tools and procedures, the other is connected to the initial mistrust of innovation, which can be generally observed, regardless of the effective quality of the systems (17,3% of the controllers declared that technology couldn't improve their job at all) .

After that, controllers have been asked to report malfunctionings encountered in their everyday activity; those feedbacks have been collected and they lead to a new version of the software: palmtops have been upgraded in the first days of October 2012.

We can expect that, along with the upgrade of the devices and the acquisition of experience about the operational aspects of the palmtops, agents will increase their level of acceptance.

C3 Achievement of Quantifiable Targets and Objectives

No.	Target	Rating
1	Improve parking management in order to reach an optimisation of parking spaces and a related increased availability of space in narrow streets of the urban area.	**
2	Technological development for Information/reservation/enforcement with a consequent improvement in the management.	*
<p>NA = Not Assessed O = Not Achieved * = Substantially achieved (at least 50%) ** = Achieved in full *** = Exceeded</p>		

According to Municipality measurements, application of policies on access to LTZ and parking fares, from 2006 to 2011, has lead to a significant reduction of daily access to the centre by 20%.

Data on the first part of year 2012 show a further reduction by 10% on the average number of accesses compared to same period of 2011.

Efficient fare collection, and consequent punctual enforcement are key issues for the success of measures related to the parking management policy. Parking meters collect around 90% of the revenues for short term tickets (and around 80% of the total revenues for parking fares): their correct working and management is fundamental for the realisation of those policies.

Referring to the technological innovation, we started issuing new permits with bar codes for clean vehicles, and this will be extended to the other typologies within 2012. New palmtops for ticket controllers are already in use, but some features needed to be fixed and some procedures have to be fine tuned: a new version of the software of the palmtops has been released.

C4 Up-Scaling of Results

The measure is applied to the whole urban area in all the streets where parking is subject to payment. Depending on whether the Municipality will institute payment of on-street parking in other parts of the city, the achievements of this measure could be expanded on a wider area.

C5 Appraisal of Evaluation Approach

During the evaluation process we obtained very useful feedbacks, especially on the acceptance of the new devices by operators. They gave us the opportunity to go deeper following the findings of the evaluation, and introduce consequent enhancements.

The evaluation would have been more complete if we had the possibility to collect data before/after concerning the modal split of the transport modes use. These data are not available at the moment and they are only measurable through the population census. With these information we could have measured change in mobility behaviours.

Another important item would have been the possibility to know how long cars occupy parking places. For the future we are considering to use data from parking meters and palmtops in order to have a punctual analysis and an accurate statistical evaluation about the use of public space.

C6 Summary of Evaluation Results

- **Parking policy acceptance** – The survey to citizens showed that citizens value the utility of applying a fare to on-street parking in areas with higher level of congestion.
- **Feedback from controllers** – Negative opinions on the new palmtop features have given valuable information and lead us to improve the communication channels with the controllers. This drove us to a better setting of the devices and to new and more effective operational procedures. We expect better acceptance and more punctual data following the new software release.

C7 Future Activities Relating to the Measure

Further improvements will be implemented on the software of the palmtops, in order to enhance their functionalities. Feedback of operators will allow us to fine tuning technical features and operational procedures.

D Process Evaluation Findings

D1 Deviations from the Original Plan

- **Delay in permissions distribution** – Within the period of exploitation of the measures, two elections have occurred. This has slowed down the agreements with the Municipality offices. We started to issue permits for clean vehicles (which can benefit from fare reduction on long term parking tickets). The large scale substitution of existing permits had to be revised. The issuing of the new permits will begin within year 2012.

D2 Barriers and Drivers

D2.1 Barriers

Overall barriers

- **1 Organisational issues** - The change of access permits system and criteria has a big impact on citizens and on their mobility behaviours. Every decision has to be carefully evaluated, before being taken, together with local government. Up to now we could start only the issuing of few typologies of permits. We are waiting for the decision of the Municipality in order to go on with the new permits distribution.
- **2 Acceptance of new technologies and processes** – As far as innovation in devices and/or procedures impacted on every day activities of parking controllers we encountered some resistances to change

D2.2 Drivers

Overall Drivers

- **1 Political issues** – Strong commitment of the Municipality to rationalize and optimize the management of the “on-street parking” and to create a efficient system for the management of entrance permission to the city centre is needed. The Municipality has maintained and strengthened its action to support the guidelines on restriction of access to the city centre. In such a contest the activity of fare collection and enforcement, under the responsibility of ATC, can be carried out in an effective way.

D2.3 Activities

Implementation activities

- **Planning of the measures** - Planning with the Municipality of a gradual substitution of access permits starting with the new issues. This activity was implemented to overcome barrier n. 1
- **Feedback from operators** – following the survey results we collected some feedback from parking controllers related to critical issues of the new palmtops. Such information led us to define requirements for a new release of the palmtop software. This activity was implemented to overcome barrier n. 2.

D3 Participation

D3.1 Measure Partners

- **ATC spa** – as the company in charge of parking management on behalf of Bologna Municipality in the whole Bologna urban area followed the planning and development of all activities.
- **Bologna Municipality** – as local authority is directly involved in mobility/parking policy and planning. It is involved in all activities for the planning and authorization point of view.

D3.2 Stakeholders

- **Citizens entering Bologna city center** – Punctual and effective enforcement of the laws referring to on-street parking guarantees a correct use of the urban spaces, avoiding irregular parking. It makes possible for citizens to have access to the centre, under certain conditions, when they really need it.
- **Bologna Municipality** – Municipality defined the guidelines for the exploiting of the measures and made ATC responsible for their realisation. The correct and effective fulfillment of the tasks influences the success of Municipality's policies and the achievement of its objectives.

D4 Recommendations

D4.1 Recommendations: Measure Replication

- **Political issues** – Actions that involve long term planning and implementation such as those exploited in this measure need a continuous cooperation with the offices of the local government.

D4.2 Recommendations: Process (Related to Barrier-, Driver- and Action Fields)

- **Involvement of the operators** – Involvement is a key issue for the success of projects that rely on field operation. We had to refine internal communication and further improvements have to be achieved, so, we recommend to treat this aspect as a fundamental factor.