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Measure Evaluation Results

BOL 3.3 New Regulation in Pedestrian Areas in the City Centre

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Executive Summary

The city centre of Bologna is well known for its urban cultural heritage which attracts a large number of tourists every year. To preserve and promote the historic heritage of Bologna specific measures were implemented with the specific aim at reducing motorized vehicles traffic in these special areas. In 2006 a Limited Traffic Zone was implemented and in 2000 eight pedestrian areas were created with a controlling system based on 23 automatic retractable pillars.

In the frame of MIMOSA project, the city of Bologna wanted to go further in reducing motorized vehicle traffic in the historical centre. The measure 'New Regulation in Pedestrian Areas in City Centre' aimed at updating the previous software for controlling the pillars. The main specific objectives are to prevent unauthorised access and to design a new regulation system addressing the needs of the visitors and of the residents of these areas. The design of the system took into account the current mobility behaviours and the growing flows in the city centre. Furthermore, this system enabled to collect valuable data on the traffic flows in the city centre which provided basis to elaborate appropriate strategies integrated in the current overall traffic concept of the Municipality.

The present measure is strongly interdependent with two others MIMOSA measures BOL 2.1 'Integrated PT Fare System' and BOL 2.4 'Recharging System for Season Tickets on Contactless Smart Cards'. Indeed, the access to the semi-pedestrians areas was integrated into Bologna's "mobility card" - called MI MUOVO card - developed in the frame of the measures BOL 2.1 and BOL 2.4. The aim of the MI MUOVO card is to provide access to a large range of mobility activities with one single card such as public transport ticketing, electronic pillars release, car sharing and parking payments.

The measure was implemented in the following stages:

Stage 1: Definition of new system features (October 2010 - July 2011) First a technical analysis was conducted to identify the necessary adjustments of the existing management software to integrate the new system. Based on the results of this analysis the technical implementation plan was elaborated and the tender procedure for the selection of a subcontractor in charge of the implementation was conducted.

Stage 2: Testing and application of the new system (February 2012 - April 2012) After a test on one electronic pillar in February 2012, the new software was installed to all semi-pedestrian areas. As the existing system, the new system is based on an automatic release mechanism of the pillars by recognition of registered smart cards.

Stage 3: Launch of the new system (2012) This stage was implemented in close cooperation with the stakeholders involved in the MIMOSA measures BOL 2.1 'Integrated PT Fare System' and BOL 2.4 'Recharging System for Season Tickets on Contactless Smart Cards'. 3,000 MI MUOVO smart cards were distributed to residents and parking space holders to replace the previous ones.

The **evaluation strategy** of this measure sought to focus on a number of indicators regarding transport and society issues to evaluate both the effective reduction in traffic flows in semi-pedestrian areas and residents' levels of acceptance of the new implementation measure.

Considering that this measure was introduced in Amendment 2, the evaluation was conducted in a restricted period which affected the quality of the results. Current available results are partial and they do not provide much information on how effectively the system has been integrated with the new smart card. The effects of successful integration between

mobility tools are visible in the long term, and more than a few months are required to demonstrate its effectiveness.

Nevertheless, as regards the effectiveness of the measure in controlling access to limited zones, the results showed significant reduction in the number of entrances: a decrease of 42% of vehicles entering the semi-pedestrian areas was calculated between 2009 and 2012 which means that around 250 less vehicles accessed the zones each day of the week. This positive results can be directly linked to the implementation of the new system. Indeed, unlike the previous card, the MI MUOVO card is personalised which contributed to dissuade drivers to illegally use the card.

Similar to other measures in Bologna, **barrier** and **driver** both relate to the political support. Following an absence of political leadership for a year and a half, the City of Bologna voted in a new mayor and Mobility City Councillor in May 2011. Since their arrival they have shown great interest in sustainable mobility issues. It has therefore been possible to tackle the difficulties and barriers encountered with more efficacy. Hence, eventually, for this measure it become a driver.

Some **recommendations** can be made for cities which are interested in the implementation of similar interventions. First, the project initiators should be aware and take into account the several aspects related to the daily habits of citizens using the focused area, including mobility behaviours related to commercial and working activities. One of the challenges of such a measure is to reach the objective to reduce the motorized vehicles traffic in the area and still meet the mobility needs of the residents. Secondly, it should be clear at the early stage of the measure development that one company would be in charge of the software development and management and another company would be responsive of the maintenance of the infrastructures.

As part of a set of bundled measures, the present measure contributed to enlarge the range of mobility services available on the single mobility smart card designed for the citizens of Bologna. The concept of the MI MUOVO card is innovative and its highly convenience and interactive aspects contribute to encourage current citizens of Bologna to use intermodal transport. Indeed, the card includes currently e-ticketing for different transport services (bus, train, car sharing, etc) and with diverse operators. The card is also compatible with other products, and makes it possible for several transport operators to operate in the same area. The smart card was made compatible with the Calypso protocol, an international [electronic ticketing](#) standard for microprocessor [contactless smartcards](#), originally designed by a group of European transit operators from Belgium, Germany, France, Italy and Portugal. Therefore, further products or services can be integrated into the card and diverse operators can be including in the system. With a long-term perspective, the compatibility of the card with systems in other cities using Calypso can be seen as a future potential of European intermodality network. A first step towards this vision would be the publication of a common rules paper for the implementation of these smart cards to help standardize this technology.

A Introduction

A1 Objectives

The Measure objectives are:

(A) High level / longer term:

- To improve the quality of life.

(B) Strategic level:

- To implement demand management strategies, reducing the number of motorised vehicles in restricted areas and guaranteeing flexibility in access regulation and control.

(C) Measure level:

- To reduce unauthorised access to semi-pedestrian roads which ensure a low environmental impact in selected parts of the city, through more effective regulations and enforcement.
- To introduce new, more user-friendly access control for residents of inner-city areas using the new MI MUOVO smart card.
- To improve the quality of data on recorded access to semi-pedestrian roads, providing more information about residents' mobility habits.

A2 Description

The Municipality of Bologna set out to create a new flexible management system for access to specific central zones of the city which are already part of the Limited Traffic Zone (LTZ) but are considered of particular historical prestige. They therefore needed further restrictions to increase their value and touristic appeal. Given their particular historical prestige and popularity as visitor destinations, these central zones needed more flow restrictions than the LTZ, in order to guarantee better conditions and improve the quality of visits. Eight pedestrian areas were protected by 23 pillars, which were installed in the year 2000. (see Picture A.2.1).

This Measure was aimed at updating the previous software for controlling the pillars in order to further protect the city centre from unauthorised access and improve semi-pedestrian roads which ensure a low environmental impact in the city. The new system was designed to respond more effectively to the growing demand for movement. In particular the new software needed:

- to be fully integrated with other mobility tools (MI MUOVO, smart card);
- to be controlled via the internet;
- to collect reports and charts on user habits;
- to monitor every single electronic pillar for every single time slot.

The new software was connected to a database that manages access permits (see Measure 3.1, which covers this activity) and was installed on all electronic pillars. The contactless access feature was maintained, but the technology was updated to integrate it with other mobility tools available in the Municipality (specifically the new MI MUOVO smart card).

The Measure was designed to create a synergy between other mobility solutions already implemented during Mimosa (see Measures 2.1 and 2.4). By integrating the smart card with

this Measure, the Municipality aimed to give residents a unique tool which manages all mobility activities and integrates multiple transport modes and all operators, thereby simplifying everyday life for residents.

The new smart card system, including different services such as public transport, electronic pillars, car sharing and parking payment, will simplify the problems connected to mobility.

FIGURE A2.1: Pedestrian areas in Bologna protected with electronic pillars



Source: Municipality of Bologna

B Measure Implementation

B1 Innovative Aspects

New IT system - Introduction of a new IT system to manage electronic pillars, controlling access restrictions and guaranteeing a better quality of life. The use of a single protocol made it possible to introduce a single mobility card.

B2 Research and Technology Development

The main problems of the old (pre-measure) system were as follows:

- i. its strictness: the software was developed on the supplier's platform, but was not easily modifiable and could not be easily integrated with other accesses management systems. If the user of obsolete software needed some modifications, these were often unavailable or very expensive (old algorithms had to be rewritten, wasting time and money);
- ii. the improper use (misuse) of passwords: passwords were given to everybody who was entitled to enter the limited traffic zone (e.g. residents, hotels, shops, public services, ambulances). *Unfortunately the Municipality faced the problem of people "passing on" the password, and as a result more people accessed the centre than were entitled to do so.*

Furthermore, the Municipality faced difficulties in managing a single supplier for both the software and the mechanics. Difficulties related to the maintenance of pillars and to software maintenance and management. The core business of the supplier who designs the software is often not the same as that of the supplier who repairs mechanical failures. The former is more interested in developing and researching new technological solutions than maintaining something which has already been produced. Considering that the software management and the mechanical aspects of the pillars were very different, the Municipality decided to hire two separate suppliers.

In order to permit the Measure development, RTD analysis was designed to provide a preliminary technical and technological definition for the new system. RTD consisted of a study into the main needs of the city. The results of this first step of the analysis demonstrated the possibility of reducing incoming flows in the selected limited zones. Access has grown significantly in recent years (thanks to word-of-mouth among residents), thereby reducing the effectiveness of the system. The second phase of RTD activity aimed to provide the public administration with comprehensive market research: to decide how the objectives could best be reached through the available supplier.

The research activity was carried out with the assistance of a private consultant (Laboratori Marconi). The results were preliminary, in order to match the system characteristics with the Municipality's needs, particularly the possibility of integrating the system with other tools (e.g. RITA or SIRIO) and more flexible pillar management without being linked to the overall system modification. Based on the research results, the public tender specifications for the software management were drawn up .

The requirements of the new service were:

- Use of the CALYPSO protocol (see description below);
- Flexible password use and the possibility of personalising them.

The CALYPSO protocol is widely used in the Emilia-Romagna Region (which adopted it for its regional ticketing system) and by public transport companies. Its introduction allowed the Municipality to work with a system which can easily be integrated and a database which can “speak” to others. The new protocol was integrated with a new mobility smart card (electronic purse) which can be used for many mobility topics (e.g. parking payments, access to LTZ, season ticket payment, etc.). The new instrument was expected to:

- i. be more agile and flexible, considering that the protocol already had a huge local application;
- ii. manage access requests from systems other than the smart card, such as mobile or entry phones;
- iii. integrate the old smart cards (currently used by many residents) and pillars which will be gradually be replaced with new MI MUOVO cards and pillars (the system could not be switched off, so it was indispensable that it could work with the old card too).
- iv. reduce smart card purchasing costs for the Municipality, with a single smart card for multiple mobility systems.

The flexibility was useful for password assignment. Users in every category could have their own password, and if necessary their own personal code; in this way it would be easier both to spot misuse and find out who was responsible for it.

The main objective of this phase of work was to separate the two parts of the project: the implementation of the new software and the scheduled and extraordinary maintenance of the physical, electrical and mechanical infrastructure. Firms who design and implement software are not normally interested in maintenance problems, unlike those who do this as their core business. Separating these two activities provided a better solution for the optimization of the service. The analysis was useful in understanding how these two aspects can be separated and defining the tasks involved. The objective above can be considered to have been achieved. Three companies submitted a bid for the software contract and one of them won it. The public bid for software management enabled financial savings.

B3 Situation before CIVITAS

In 2000, 23 electronic pillars were installed in the centre of Bologna to protect the city’s historic zones from traffic. The electronic pillars were active 24 hours per day. They were lowered automatically every day from 6 am to 10.30 am and from 3.30 pm to 4.30 pm to allow authorized freight delivery vehicles to load and unload goods. They could be programmed for specific events (for example a construction site); at other times of the day they were “up” (closed).

The procedures to open them were as follows:

- **Smart card system** for residents, taxi drivers, owners of internal parking spaces and commercial activities
- **Multiple password system** with a different key for each institutional user (to check misuse) carrying out transversal activities in the city (police, public services, ambulances);
- Call through **entry phones** installed on a small column at the entrance to the LTZ (also used to call hotels, garages and other services located in restricted areas);

- **Siren-sensitive sensors for emergency vehicle** access (ambulance and fire-fighters) and **radio frequencies system** for fire-fighters which recognised the fire service's radio frequency, lowering the pillar.

The system was managed by a server with several clients: one in the Municipality of Bologna for ordinary maintenance management, and others in different locations, such as the Municipal Police Department or the traffic light centre, for extraordinary maintenance.

Thanks to the Mimosa project, the city saw a chance for technical integration which would benefit both residents and the Municipality.

B4 Actual Implementation of the Measure

This Measure was introduced with Contract Amendment 2, and thus did not start until 2010.

Stage 1: Defining new system features (from October 2010 to 2011)

- Technical analysis of how to use the existing infrastructure by modifying the management software (see section B2);
- Technical implementation plan: definition of technical requirements and functional mode of access to pedestrian areas and preparation work for the tender;
- Awarding of the public contract for the new software (July 2011).

Stage 2: Testing and application of the new system

- New software application and testing on one electronic pillar (February 2012)
- The new software was extended to all electronic pillars (April 2012).

Stage 3: Implementing the new system (2012)

- Together with ATC/TPER, 3,000 Calypso smart cards were distributed to residents and parking space holders to replace their old ones (Mifare protocol) (please see ATC Measure 2.1).
- The changeover to new Calypso smart cards for electronic pillar users was coordinated with ATC/TPER Measure 2.1 in order to better manage the two actions. For this purpose, a letter explaining the new system was sent to residents and parking space holders.

B5 Inter-Relationships with Other Measures

The Measure was interrelated with the following measures:

- 3.1 - Road pricing policies. The new IT software was integrated with the database which manages the permits.
- 2.1 - Integrated PT fare system: the new system for electronic pillars uses the Calypso smart card, which can also be used for Public Transport season tickets and services (see MRT 2.1).

Although these three measures share the same technological background, it is important to note that they had their own domain of application. Measure 3.3 was applied to a small portion of the city centre where pillars were installed. Both Measures 3.1 and 2.1 were applied to a larger area of the Municipality and related stakeholders: the whole city (with particular reference to the LTZ) for BOL 3.1; the whole urban area for Measure 2.1.

As explained below, a user satisfaction survey (September/October 2012) was carried out to establish to what extent the new software had improved P.T. use; this can be considered a bundled indicator for Measures 3.3 and 2.1.

C Impact Evaluation Findings

C1 Measurement Methodology

C1.1 Impacts and Indicators

The first “practical” objective of the Measure was to improve semi-pedestrian roads through more effective regulation with a new IT system, thus solving the problem of misuse which the Municipality has faced over the years. For this reason the number of registered accesses with multiple passwords (average daily number and max. number of transits per day) was monitored. The average values recorded by the old system were compared with data obtained after the new software implementation (indicators n. 1 and 4).

Secondly, the Measure aimed to introduce new access services for residents of inner-city areas. The effect of the Measure was evaluated considering the number of complaints/suggestions recorded by the customer relationship service, comparing data before and after the system implementation. In addition, a survey (September/October 2012) assessed whether the introduction of the new smart card had improved public transport use, asking residents directly about their willingness to use public transport before and after the system implementation (indicators n. 2-3).

The following tables give details of the selected measure indicators.

TABLE C1.1.1: Measure Indicators

Indicator	Evaluation area	Evaluation category	Impact	Indicator	Source of data
1	Transport	Transport System	Traffic Flow Levels	Average daily number of accesses using multiple passwords and max. number of daily accesses	Pillars
4	Transport	Transport System	Traffic Flow Levels	n. of weekly accesses to pedestrian areas (with multiple passwords)	Pillars

TABLE C1.1.2: Common core indicator

Indicator	Evaluation area	Core indicator	Evaluation category	Impact	Indicator	Source of data
2	Society	Core Indicator 14	Acceptance	Improvement in quality of regulation for access to sensitive areas	number of complaints or general comments	Municipality's customer relationship system

TABLE C1.1.3: Measure Bundled Indicator

Indicator	Evaluation area	Evaluation category	Impact	Indicator	Source of data
3	Society	Acceptance	Awareness	Improvement in the use of PT (*)	Survey

(*) Bundled indicator for Measures 2.1 and 3.3

Detailed description of the indicator methodologies:

Indicator 1 Average daily number of accesses using “multiple passwords”. The multiple passwords were given to public utilities (Bologna rescue team, Italian military corps, environmental services, energy and water services, Municipal Police, Prison Police, offices responsible for police force, public order and relative administrative services, fire-fighters). The indicator shows the average number of accesses to pedestrian areas using the multiple passwords. By comparing the baseline results with data from after the new system was introduced, a reduction in unauthorised access was expected. Data is available from November to December 2008, all of 2009, between January and 18th March 2010 and since May 2012; no data is available for 2011 because the system was not switched on.

Frequency: every day.

Unit: number of accesses with *multiple passwords*.

Domain: all vehicles

Indicator 2 Improvement in quality of regulation for access to sensitive areas; this was measured by comparing the number of contacts from residents (complaints or comments about accessibility to pedestrian areas) and the same number 3 months after the new system was activated.

Indicator 3 Improvement in the use of PT, which was measured through a survey of residents. On this occasion, residents were asked about the situation “before” and “after” the introduction of the new smart card.

Frequency: one survey was carried out after the Measure implementation (September to October 2012)

Unit: number of residents who said they were more willing to use public transport through the services covered by the card (compared to the “before” situation, with the old software).

Domain: residents using the new smart card service.

Indicator 4 N. of weekly accesses to pedestrian areas during a winter week (all vehicle types except motorbikes). The indicator shows the number of weekly accesses to pedestrian areas with multiple passwords, in order to verify the reduction in unauthorised access. The indicator investigated the situation over a week characterized by high volumes of incoming traffic. The month chosen was February, characterised by high volumes of traffic flows caused by bad weather conditions, such as freezing cold and rainy days which make transport modes other than the car more difficult to use.

Frequency: every day.

Unit: number of accesses per entrance point.

Domain: all vehicles (except motorbikes) with multiple passwords.

C1.2 Establishing a Baseline

The baseline for evaluation is data obtained before the Measure implementation, when the 'old' system was in use.

Indicator 1 The baseline covers data collected from 2008 to 2010, also showing the maximum number of daily accesses recorded (with multiple passwords) during 2008-2009-2010. Unfortunately, the system was not always on-line during the entire period of the baseline:

2008 data is available from 14th November to 31st December;

2009 data is available for the whole year;

2010 data is available until 18th March;

2011 data is not available.

The period between 15 May and 15 June 2009 was chosen as the baseline for indicator 1. This is the only period which allows a good comparison with data available after the Measure implementation (beginning May 2012). Data from July, August and September is often unrepresentative of the traffic flow because it is affected by "holiday flow reductions".

Indicator 2 Data refers to contacts received during 2008.

Indicator 3 In this case, the source of data was the results of the survey carried out in September/October 2012 (only one survey was carried out after the system implementation). In order to obtain useful data for comparison with the results, the baseline results were calculated by asking residents what the "before" situation was like. These results were then compared with the scores obtained considering the "after" situation.

Indicator 4 The baseline is represented by a typical winter week. Considering that 2008 data refers only to November and December, and taking into account that no differences in system regulation occurred between 2008 and 2009, the baseline for indicator 4 is data obtained in February 2009.

The old software, and consequently the baseline data, does not include access when the pillar was already lowered (for example: access to attend to another vehicle, time slots for loading/unloading of goods...).

C1.3 Building the Business-As-Usual Scenario

In order to evaluate the impact foreseen by the measure implementation, the business-as-usual scenario should be analysed considering historical data, to evaluate what would happen without the new system implementation.

The business-as-usual for **indicator 1** was calculated using the average value of days between 15th May and 15th June 2009.

With reference to the society **indicators (n. 2 and 3)**, it is probable that without the Measure implementation, the number of complaints – and above all people's willingness to use public transport through the card – would be the same as that stated during the survey. As a result a substantial coincidence with the baseline was assumed.

With reference to **indicator 4**, considering that the situation remained constant between 2008-2009 and 2012, and given that without the Measure, no further implementation would have occurred, the BAU would have maintained the same average values recorded before Measure implementation (February 2009).

C2 Measure Results

The Measure was introduced with Contract Amendment 2 and the activities progressed to schedule. After testing on one electronic pillar, the new software was extended to all other electronic pillars and has been operative since the middle of May 2012. In September 2012 Measure results were collected for comparison with the baseline. A satisfaction questionnaire was produced to determine whether the implementation of the Measure really had improved and facilitated access for the authorised users.

C2.1 Economy

Not applicable.

C2.2 Energy

Not applicable.

C2.3 Environment

Not applicable.

C2.4 Transport

Indicator 1 Average daily number of accesses using “multiple passwords”.

The following tables show accesses to sensitive areas. The first two tables concern average daily access in all the years of Mimosa. Data analysis must take into account that the Measure was implemented in the early part of 2012; data from 2008 to 2011 is not related to Measure improvements. As the results show, the new system significantly decreased access both during the week and at the weekend.

TABLE C2.4.1: Average daily number of accesses using “multiple passwords”

2008(*)		2009(**)		2010(***)		2011(°)	2012	
week day	weekend	week day	weekend	week day	weekend		week day	weekend
555	404	656	494	414	338	n.a.(**)	380	288

Source: electronic pillars

(*) 2008 data is from 14th November to 14th December.

(**) 2009 data is from 15th May to 15th June.

(***)2010 data is from 15th January to 18th March; after this the system stopped working.

(°) 2011 data is not available due to the server breaking down.

TABLE C2.4.2: Comparison between Mimosa and BaU (pre Mimosa) data

Mimosa weekday (weekend) (2012)	BaU	Δ Mimosa - BaU	Δ % Mimosa - BaU
380 (288)	656 (494)	- 276 (- 206)	- 42% (- 42%)

By processing the data for each day of system activity, it was also possible to extract the maximum number of accesses recorded throughout the periods in question (where data was available)..

TABLE C2.4.3: *Maximum number of accesses per day using “multiple passwords”*

2008		2009		2010		2011	2012	
week day	weekend	week day	Weekend	week day	weekend		week day	weekend
698	512	771	596	688	574	n.a.(*)	470	421

Source: electronic pillars

(*) 2011 data is not available due to the server breaking down.

TABLE C2.4.4: *Comparison between Mimosa and BaU (pre Mimosa) maximum daily accesses*

Mimosa weekday (weekend) (2012)	BaU and Baseline	Δ Mimosa - BaU	Δ % Mimosa - BaU
470 (421)	771 (596)	-301 (-175)	- 39% (-29%)

Results show a significant reduction in accesses with multiple passwords, both in average daily values and the maximum number of incoming vehicles. The comparison above, although not calculated over an entire year, reveals the good results obtained by the new regulation for access. Decreased daily access is a good result: the new system is not more complicated than the older one, and nor does the new implementation risk denying access to authorised users. Access restrictions concern unauthorized vehicles exclusively. This is one of the main objectives of the Measure and the results show that it has been achieved.

Indicator 4 N. of weekly accesses to pedestrian areas during a winter week

The data below shows the number of weekly accesses/transits into pedestrian areas using multiple passwords during a winter week. As explained in the table, data recorded using the old software (pre-Mimosa) did not include access when the pillars had already been lowered to unload/load goods. Considering that the Measure had not been implemented in February 2012 and that 2013 data cannot be collected yet, average values from a week in May 2012 have been included in the MRT.

TABLE C2.4.5: *Comparison between number of accesses to pedestrian areas with multiple passwords during one winter week*

Mimosa (2012)	BaU and Baseline (2009)	Δ Mimosa - BaU	Δ % Mimosa - BaU
2.750 (*)	4.070	- 1.320	- 32,4 %

Source: Electronic pillars (Municipality of Bologna)

(*) Data refers to an average week in May 2012

Unfortunately data is not completely comparable because it refers to different time periods. The indicator aims to investigate the behaviour of the system during particular days when the

use of private cars is more frequent than other periods. In this sense an average week in February was selected, considering that freezing temperatures discourage people from using mopeds and bicycles or walking to the limited zone. Another comparison was made to produce a better evaluation. In order to compare the same periods, the number of weekly accesses to a limited area with multiple passwords was calculated for May 2009 (to compare the same period of 2012). The results obtained show no significant difference in the number of incoming flows with multiple passwords between May and February 2009; there are slightly more accesses in May than in February (4,100 weekly units). Overall it can be assumed that there were no wide variations in accesses with multiple passwords for every week concerned, except for holiday weeks. This aspect allows comparison between 2012 and 2009 data. The significant reduction in flows obtained shows that more than 30% of incoming flows to limited zones were probably unauthorized. A high reduction in accesses was pursued, denying unauthorized access.

C2.5 Society

Indicator 2 Number of complaints or general comments about accessibility to pedestrian areas

The following table summarizes the number of complaints received in 2012, the first year of the new system implementation, and the pre-Mimosa data (for disaggregate data on every area and the reasons for each complaint, see Reference point 1). As the data shows, the number of complaints decreased significantly in 2012. Fewer contacts received in 2012 means that the new system is more efficient and the quality of the service has increased.

TABLE C2.5.1: *Number of contacts from residents*

Mimosa (2012)	BaU and Baseline	Δ Mimosa - BaU	Δ % Mimosa - BaU
8	18	- 10	- 55%

Source: Municipality of Bologna

Indicator 3

As mentioned above, a survey was carried out in September/October 2012 after the system implementation to obtain useful data on how the new card had made it easier to use public transport. The first question investigated whether residents used their smart card for public transport season tickets, as the table below shows. The results underline how, at the moment, the new smart cards are not widely used for PT season tickets and demonstrate residents' initial resistance to changing their habits. Less than 6% of people interviewed said that they used their new smart card, which is a very low value. It will probably take residents more time to fully understand the potential of the new smart card. . In this sense, the card must completely integrate all mobility solutions and operators to attract more users.

TABLE C2.5.2: Results of questions on the use of Smart Cards to top up P.T season tickets

Do you use the NEW SMART CARD to top up your P.T. season ticket?			
	Number	% of absolute	% of Valid
Yes	13	5,2	7,8
No	155	61,9	91,9
No answer	1	0,2	0,3
Total (valid)	169	67,3	100
System missing*	82	32,7	
Total (absolute)	251	100	

*System missing means that the user cannot currently use their smart card to top up their PT season tickets because their zone has not yet been included.

Two other questions were included to investigate how the new “MIMUOVO card” has changed residents’ P.T. habits. Baseline results were deduced by asking residents what the situation was like “before” the Mimosa project. These results were compared with scores obtained regarding the situation “after” the new Measure implementation.

Question 1 was : “Think about the end of September 2011. Before you received your new card, how often did you use public transport?”

Question 2 was: “Today, at the end of September 2012, now you have your new card, how has your use of P.T. changed?”

The tables below summarise the results of these two questions and show differences between the two years.

TABLE C2.5.3: Differences in P.T. use between 2011 and 2012

	2011	% 2011	2012	% 2012
7 days a week	8	3,2%	7	2,8%
Only working days in a week	9	3,6%	10	4,0%
Several times a week	56	22,2%	47	18,7%
Several times a month	43	17,1%	49	19,4%
10 times a year	12	4,8%	12	4,8%
Less than 10 times a year	46	18,3%	44	17,5%
Never	77	30,6%	82	32,5%
No answer	1	0,4%	1	0,4%
Total	252	100,0%	252	100,0%

The second table details the results shown above and is from the same survey. The sum of every column concerns 2012 answers; every row is the detail of 2011 responses.

TABLE C2.5.4: Comparison between P.T. use between 2011 and 2012. Detailed answers

2011 \ 2012	Total	7 days a week	Only working days in a week	Several times a week	Several times a month	10 times a year	Less than 10 times a year	Never	No answer
7 days a week	8	6	2	-	-	-	-	-	-
Only working days in a week	9	1	8	-	-	-	-	-	-
Several times a week	56	-	-	46	6	-	-	4	-
Several times a month	43	-	-	-	42	-	-	1	-
10 times a year	12	-	-	-	-	12	-	-	-
Less than 10 times a year	46	-	-	-	-	-	44	2	-
Never	77	-	-	1	1	-	-	75	-
No answer	1	-	-	-	-	-	-	-	1
Total	252	7	10	47	49	12	44	82	1

C3 Achievement of Quantifiable Targets and Objectives

No.	Target	Rating
1	To reduce the misuse of access to semi-pedestrian roads which ensure a low environmental impact in selected parts of the city, through more effective regulations and enforcement.	**
2	To introduce new, more user-friendly access control for residents of inner-city areas, using the new MI MUOVO smart card.	**
3	To improve the quality of the data on recorded access to semi-pedestrian roads in order to gain more information on residents' mobility habits.	**
NA = Not Assessed O = Not Achieved * = Substantially achieved (at least 50%) ** = Achieved in full *** = Exceeded		

The targets and objectives of the Measure were widely achieved. As the results show, access to limited zones using multiple passwords decreased significantly, more than 25% for all indicators considered. This means that the new control system is a very useful way of limiting unauthorised access. The new system permits several distinctions between consumers, giving residents an important flexible tool which can meet every user's needs. The high quality of the data obtained by the new system is demonstrated by the possibility of breaking down daily access into different user groups.

The new smart card can be considered a suitable new tool which is more user-friendly than the previous one and useful in integrating all existing mobility options in Bologna. Its limited success means that residents need more time to fully understand it, , but this does not mean that it is not an appropriate tool. In this sense Objective n° 2 is considered to have been achieved in full.

It is significant, even though this was not an objective of the Measure, that the implementation of a new card for PT season tickets did not help increase its take-up by residents, at least not in this initial phase of realization. Considering that the evaluation time was very short, the full impact of the new mobility card cannot be measured yet. It will probably take residents more time to adopt the new card, but it is unclear whether it will improve the use of public transport.

C4 Up-Scaling of Results

An initial up-scaling took place within the Measure itself. After testing on one electronic pillar, the new software was extended to all other electronic pillars and has been operative since the middle of May 2012. However, no further up-scaling is possible for this Measure because it has already covered all pedestrian areas protected by pillars, involving all available stakeholders.

C5 Appraisal of Evaluation Approach

The evaluation approach can be considered correct from the methodological point of view, investigating both the areas of transport and society. These were measured in different ways, also including the residents' involvement.

If this evaluation were undertaken again, the best solution would be to conduct a detailed survey before the Measure implementation, studying the trends of flows at different times and asking residents about their behaviours and attitudes. Nonetheless, the approach of evaluating the "before" and "after" situation in the same survey, by asking the same sample to evaluate the two scenarios, can be considered correct *dummy data* for the baseline.

As reported above, the Measure evaluation time was probably too short to evaluate the full impact of the new mobility card.

C6 Summary of Evaluation Results

The key results are as follows:

- **Key result 1** – *Reduction of 42% in limited zone access with multiple passwords between 2009 and 2012, which means around 250 fewer vehicles every week day.*

C7 Future Activities Relating to the Measure

The Municipality of Bologna has committed to continuously check the system, in order to guarantee the continuity of the Measure objectives and ensure the restriction will not become obsolete compared with the needs of the city.

Future activities will include studies and research activities into potentially enlarging the supply of the new smart card, integrating as many services as possible. Research activity will continue to improve the current regulations in pedestrian areas of the city centre.

D Process Evaluation Findings

D1 Deviations from the Original Plan

This Measure was included in Amendment 2 and started in 2010. However, no deviation from the original plan occurred.

D2 Barriers and Drivers

D2.1 Barriers

Overall Barriers

- Low level of appeal of new smart card services, probably due to the fact that more time was required for them to be taken up and evaluated.

D2.2 Drivers

Overall Drivers

- The Municipality sought assistance from a private consultant whose core business is technological systems. When analysing the market, this partnership gave the Municipality better knowledge of available solutions and enabled it to make the best choice. This contribution was chosen as a driver, considering the consultant's role in accelerating the Municipality's process of knowledge and, consequentially, the whole project.
- Political support - Following an absence of political leadership for a year and a half, the City of Bologna voted in a new mayor and Mobility City Councillor in May 2011. Since their arrival they have shown great interest in sustainable mobility issues. They have shown a strong political will to study and investigate solutions both to extend semi-pedestrian areas and reduce access permits to the LTZ. It has therefore been possible to tackle the difficulties and barriers encountered with more efficacy.
- A motivated team - The Bologna Municipality team was strongly motivated and well experienced, both regarding technical and legal skills. This contributed to the operating efficiency of the Measure.

D2.3 Activities

- **Further studies on road pricing** - New possibilities were agreed on for extending the road pricing system and enlarging pedestrian and semi-pedestrian areas in the city centre. Additional investigations were necessary in order to always adapt and improve road pricing policies based on political will.

D3 Participation

D3.1 Measure Partners

- **The Municipality of Bologna (COBO)** was directly responsible for coordinating and implementing the Measure. COBO also carried out preliminary market research .
- **TPer and ATC:** these organisations cooperated to guarantee the integration of services offered by the smart card throughout the project;
- **LABORATORI GUGLIELMO MARCONI S .P.A.:** The company which won the competition for the software supply.
- **Brav S.r.l. :** The company which maintains the services.
- **Residents:** the primary stakeholders in the project. Residents' comments enabled the Municipality to check the effectiveness of its work.

D3.2 Stakeholders

No information.

D4 Recommendations

D4.1 Recommendations: Measure Replication

- **Managing the resistance to change** – Cities interested in these kinds of measures must evaluate beforehand how many difficulties may occur when Municipality decisions interfere with private habits. Widespread information campaigns must be planned prior to and during the Measure to put across to residents the administration's political commitment and objectives. This means encouraging debate with all stakeholders and continuously fine tuning policy to adapt the restrictions to different contexts (e.g. the decisions to switch off SIRIO or change its operating hours during Christmas time).
- **Giving valid alternatives** – implementation of the Measure must begin with research into alternatives which need strengthening: parking possibilities in proximity to the area covered by the restriction, P.T., alternative transport infrastructures (for bikes or pedestrians) must be guaranteed. Only with these alternatives can the common attitude to choosing the car be changed.
- **In-depth market research** – The great opportunities offered by technological tools make in-depth market research useful in selecting the best solution based on the needs of the city. Time spent on analysing the city's needs and available tools is a useful way of finding the best solution for the specific problem. As often occurred in the technological area, the best solution to a given problem was not necessarily the most expensive tool or the one with more applications. Identifying the best tool is strictly connected to the problem which needs solving, and a good planner will not take it for granted in future replications of the Measure. In this sense the importance of in-depth market research has been reported in this paragraph.

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

Cities interested in replicating the Measure should appoint separate suppliers for pillar maintenance and software implementation and management. The core business of software developers is not maintaining existing infrastructure, but rather implementing new solutions which will keep it competitive. Before the implementation of the new system, this factor had caused many problems with maintenance in Bologna in the past.

Encouraging debate - it is very important to share the Municipality's objectives with all stakeholders involved. This means encouraging debate, directly involving people affected by a *non total* top-down approach but, within reason, by a shared scheme.

Counting on shared interests between offices: Achieving the objectives of the Measure was closely dependent on political will. Local government commitment was decisive for the success of a Measure which introduced potentially unpopular tools.

E References

TABLE E1: Number of comments received on pillars in 2008 and 2012.

Pillars	Numbers of comments	Reason	Numbers of comments	Reason
	2008		2012	
VIA S. STEFANO	1	Request for broken pillar to be replaced	0	-
VIA MENTANA	2	Complaint, pillar functioning badly	0	-
VIA DELLE MOLINE	5	Complaint, pillar functioning badly	2	Smart card malfunction
VIA FALEGNAMI	1	Complaint, pillar functioning badly	0	-
VIA DEL PRATELLO	6	Complaint, pillar functioning badly	2	Smart card malfunction
VIA S.ROCCO	2 1	Complaint, pillar functioning badly Request for broken pillar to be replaced	0	-
VIA ALTABELLA	0	-	1	Smart card malfunction
P.ZA MINGHETTI	0	-	3	Smart card malfunction