

**CiViTAS**  
Cleaner and better transport in cities

**MIMOSA**

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## Measure Evaluation Results

### BOL 3.1 Road Pricing Policies

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## Executive Summary

In 2006 Bologna was the first city in Italy to implement a road pricing policy within its Limited Traffic Zone (LTZ), based on an intelligent transport system. The Limited Traffic Zone is a large central area where every day, between 7 am to 8 pm, the circulation of vehicles has been restricted. The aim of the measure 'Road Pricing Policies' was to improve the Limited Traffic Zone access policy, based on electronic enforcement instruments. The Municipality also set out to complete a semi-pedestrian area within the Limited Traffic Zone, in order to demonstrate the impact of road pricing policy on people's behaviours and environmental awareness. To achieve these objectives, regulation and reduction of access to the Limited Traffic Zone were implemented and at the same time, interventions were made to safeguard the rightful interests of different users, guaranteeing their needs and offering sustainable alternatives to maintain circulation and the parking demand supply equilibrium.

The present measure is strongly interdependent with three other MIMOSA measures in Bologna which shared the same high level objective of improving air quality. The four measures were identified as bundled measures: BOL 1.2 'Cleaner Private Vehicles', BOL 3.1 'Road Pricing Policies', BOL 4.1 'Mobility Managers' and BOL 7.1 'City Freight Delivery Plan'.

The measure was divided into the following tasks:

**Task 1: Fine tuning of the road pricing system (2008 - 2012)** Relevant regional agreements on air quality were approved in 2009 and 2010 which implied the establishment of circulation limitation rules for private vehicles and highly polluting vehicles. At the same time the municipality implemented small projects to adapt the access restrictions into the LTZ such as the installation of a new camera to monitor a LTZ entrance, the extension of the LTZ time-window, the organization of pedestrians and cyclists focused events such as the "T-days".

**Task 2: The completion of a new permits scheme (2010 - 2012)** The new permit scheme to manage and control the LTZ was designed and implemented through a subcontractor. A Decision Support System (DSS) was set up to predict how traffic flows may change depending on changes to the permits scheme. For example, the system can be asked to show the impact on traffic flows of giving free access to methane vehicles at specific times. This innovative tool enabled a more accurate permits scheme and planning. The new permits system became operative in April 2012.

**Task 3: The completion of a semi pedestrian area (2008 - 2012)** Prior to MIMOSA project, a semi-pedestrian area was implemented in the surrounding of the University. In the frame of the present measure, the semi-pedestrian area was extended to 50 hectares and enforcement activities such as an intelligent transport system (based on two cameras) were applied.

The **evaluation strategy** for this measure sought to focus on a number of **indicators** regarding environment, transport and society. They were measured in different ways: data obtained from public IT control systems (LTZ and University areas) and information collected in two surveys (one before and one after the measure was implemented).

Since the present measure is bundled to three other MIMOSA measures, a bundled indicator for these four measures was selected focusing on the level of particulate 10 and particulate 2.5 recorded across the entire city (also in area where MIMOSA measures were not applied).

Several **key results** came out from the impact evaluation. First, all pollutants (CO, CO<sub>2</sub>, NO<sub>x</sub> and levels of particulate) decreased comparing data from before and after implementation, due to reduced access to the Limited Traffic Zone. Secondly, the number of accesses to the

LTZ remained stable comparing the results of the studies conducted before and after the measure. Considering that the LTZ was set up in 2006, several policies regarding environmental issues and mobility needs have been applied prior the measure and the stable results can be interpreted as the achievement of a ceiling (the numbers were already reduced so far that there no relevant reduction was possible). Thirdly, a significant reduction in vehicular access within the semi-pedestrian area was observed: -69% between 2006 and 2012. Finally, an excellent level of awareness of public road pricing policies was confirmed from the two surveys: most the people know the Municipality's most important road pricing policies well.

Indeed, road pricing systems are a sensitive issue not among citizens which often consider private cars as the most convenient transport mode for shopping. For this reason, the shop owners are reluctant to accept the LTZ enforcement that they considered as a threat to their businesses in the city centre in favour of shopping centres providing convenient parking lots in the surrounding of the city centre. This has long been a **barrier** to the implementation.

One of the most important **drivers** of this measure was the political support. After a year and a half of lack of political leadership, the City of Bologna has had a new mayor and a new Mobility City Councillor since 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 efficacies.

Two main **recommendations** can be made for cities which would implement similar interventions. First, it is recommended to be aware of the potential challenges which can result from the implementation of public policies affecting directly current individual behaviours. Therefore, widespread information campaigns must be planned prior to and during the measure to highlight and strengthen the coherence between political commitments and public administration activities. Such campaigns contribute to encourage debates with all stakeholders in order to continuously adapt policies and reach appropriate long-term context oriented solutions. A second recommendation concerns the highly controversial discussion regarding LTZ areas in city centre. To avoid conflict escalation it is recommended to encourage debate and dialog among citizens, shop owners and the municipality.

The results of the evaluation underlined the success of the implementation of the new road pricing policies. The communication campaigns contributed to increase citizens' acceptance for LTZ area. The "T-days", in which the LTZ has been closed to all traffic except for pedestrians and bicycles, has become a particular successful event since advantages of these "protective areas" were visible to all stakeholders. This event will continue in the future along with further considerations to implement other pedestrian zones in the city.

## A Introduction

### A1 Objectives

The Measure objectives were:

- (A) High level / longer term:
  - (1) To reduce pollution emissions in the urban area
- (B) Strategic level:
  - (1) To implement demand management strategies
- (C) Measure level:
  - (1) To improve the Limited Traffic Zone (LTZ) access policy based on economic (dis)incentives and support the implementation of this policy with electronic enforcement instruments;
  - (2) To complete a semi-pedestrian area within the LTZ, in order to demonstrate the impact of road price policy on people's behaviours and environmental awareness;
  - (3) To check and demonstrate the effectiveness of the Administration's urban mobility management, with the support of regulatory measures and the use of IT systems;
  - (4) To address other fields of application and fine-tune current economic (dis)incentives as means of guaranteeing flexibility in the regulation and control of access.

### A2 Description

In 2006 Bologna was the first city in Italy to implement a road pricing policy within its Limited Traffic Zone (LTZ), based on an intelligent transport system (ITS). The LTZ is a large central area where every day, between 7 am to 8 pm, the circulation of vehicles has been restricted. SIRIO, the electronic traffic 'policeman', controls entrance into the LTZ. Video cameras work during these times in the following streets: via Santo Stefano, via San Vitale, via Alessandrini, via Marconi, via Riva di Reno, via San Felice, via Sant'Isaia, via Tagliapietre, viale XII Giugno, via D'Azeglio (see map B.2.2). SIRIO is made up of loop detectors linked to the Municipality police control station. A photo is taken of each vehicle as it enters in order to report its license plate number. The number is matched with a list of authorized vehicles. All non-authorized vehicles are issued with a fine.

Through measure 3.1 Bologna, wanted to redefine and update its current road pricing policy in response to traffic indicators and to allow more flexible access control. In particular, Bologna Municipality carried out a study to develop an IT system that would identify and distinguish vehicles according to different parameters such as vehicle models, size and emissions. This study and the road pricing system it inspired, are innovative actions in Europe's urban transport arena. Revision of the system has finalised the strategy as part of the city's urban traffic master plan. The system focused on the external costs of journeys made with private cars and accordingly makes access control more flexible.

To date, access to the Limited Traffic Zone has largely been based on an authorisation process that grants access to public transport operators, residents and freight deliveries. To

make the system more flexible, the road pricing scheme also enables occasional users to enter the LTZ by paying an access toll.

In addition, the Measure was aimed at completing a semi-pedestrian area within the Limited Traffic Zone (in the University district) in order to demonstrate the impact of road pricing policy on people's behaviour and environmental awareness. This part of the Measure included an urban circulation study, evaluation of road closures and the introduction of video cameras.

The Municipality of Bologna completed its actions to raise social acceptance of road pricing and traffic limitation measures through public events, conferences and the media. A training course on the new software was organised for users and new operators.

## B Measure Implementation

### B1 Innovative Aspects

The innovative aspects of the Measure were:

- **Use of new technology, nationally** – Development of an IT system to identify and distinguish vehicles using different parameters (e.g. emissions). This study and the road pricing system it inspired are innovative actions in Europe's urban transport arena.
- **New conceptual approach, nationally** - The demonstration of a demand management strategy for a semi-pedestrian area within the Limited Traffic Zone (LTZ).

### B2 Research and Technology Development

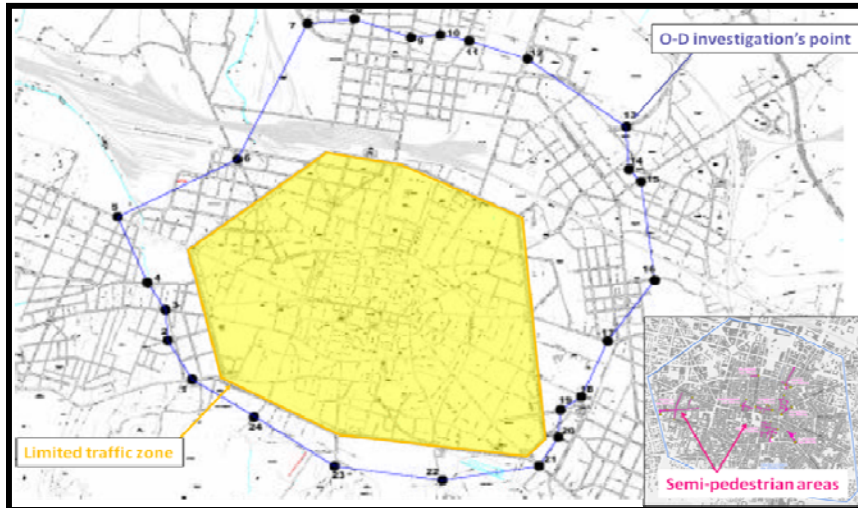
The RTD activity consisted of a preparatory study for road pricing and access scheme analysis, traffic flow simulations and the planning of sustainability schemes. The objective of the RTD study was to obtain detailed knowledge of traffic behaviour near the historic centre and the type of accesses to the area in question. The main purpose was to investigate how residents access central zones, those who needed constant free access (for example residents and traders) and those who could give up permanent access to the area (for example, people going shopping).

In particular, the RTD activity evaluated:

- a) the typology of traffic flows reaching the historic centre of Bologna,
- b) the effects of the automatic access control (SIRIO, implemented in September 2005) produced on the traffic itself,
- c) the authorized access flows,
- d) the problems related to parking,
- e) traffic flows orbiting around the LTZ and thus potentially interested in entering the LTZ itself.

The analysis was based on data from different technological sources to obtain detailed information about flows each day. It encompassed data flows from SIRIO'S cameras, the database of entry permits for the restricted areas and an origin-destination investigation showing the kinds of accesses (categories of vehicles, bands of incoming). The study area is explained in picture B.2.1. The origin-destination investigation was done on the confinement of the LTZ zone; SIRIO's cameras checked traffic flows in the limited zone every day from every possible access road.

**FIGURE B2.1: The Limited Traffic Zone and semi pedestrian areas**



SIRIO consists of 10 cameras; continuous monitoring is provided by 6 RITA cameras, 3 monitoring tools for the T-area (another restricted zone) and 2 for the University district.

**FIGURE B2.2: SIRIO and RITA areas**



Source: Municipality of Bologna

The RTD continuously recorded access at all times of the day, every day of the week, in order to check the difference between periods when SIRIO and other systems were active and when they were not. Drivers are informed about the presence of SIRIO and its activation times by road signs placed at the boundary of the LTZ. In addition, the location of SIRIO is shown on city maps which are available from Municipality information points. Data collection also included peak access evaluation, the percentage of affluence during the day and the daily critical bands evaluation.

The analysis also considered different kinds of access trends during the day, separating registered accesses per permission type (residents, private parking, freight vehicles with

headquarters outside the LTZ area, freight vehicles with headquarters inside the LTZ area, public administrations, disabled people, public services).

Part of the RTD Activity was a study of parking possibilities inside the LTZ. This provided information on the reasons for parking, the type of parking utilized (free, resident, private, business, etc) correlated with the type of access, and the number of users for each type of parking. The results were obtained by matching data from an information campaign realized during 2006. The campaign was aimed at vehicles passing through Bologna beltways, investigating reasons for access and the parking type chosen inside the city centre. Reasons for access into the city centre and the type of parking chosen were investigated, with the amount of access permits given to residents, and the number of existing street parking places in the city centre.

The studies demonstrated that conflict of interests and difficulties in accommodating different needs (shopkeepers, environmentalists) are strongly connected barriers within the Measure. Understanding residents' behaviour and needs is the first step in defining Municipality supply in terms of land use (parking) and access.

In this context, the importance of developing and therefore adopting a targeted technology emerged. The access system should be as flexible as possible and able to adapt itself to transport demand characteristics, while still retaining its original steering function.

As a result, the RTD activity highlighted numerous means of both fine tuning the road pricing policy and preserving all stakeholders' interests. These included:

- **enlarging pedestrian areas**, encouraging access to shopping streets and environmental areas that are penalized by the small size of pavements or by the lack of spaces for pedestrians and cyclists.
- **enlarging interchange ('park and ride') car parks**, located outside the LTZ area, by increasing the number of car parks and encouraging their use with communication – information campaigns, developing modal changes possibilities, agreements with mobility managers policies;
- **defining targeted rules for access**, both by reformulating general access rules (hours and modalities) and through targeted policies aimed at extending the flexibility to particular categories of users;
- **fine tuning freight delivery times**, encouraging deliveries at less critical times, increasing clean vehicle accesses, promoting joining process between small freight operators and optimising load/upload process.

The above results made it possible to test and calibrate traffic limitations, in order to introduce specifically targeted rules and tools. Therefore, the limitations should only be a deterrent to those who do not need to access the city centre.

### **B3 Situation before CIVITAS**

Limited Traffic Zone (LTZ) access was governed by an authorisation policy that also included a payment system. The access control scheme in Bologna was mainly based on an authorization process and not on a general road pricing model. In particular, the authorization process permitted access for: public transport buses, bikes and motorbikes, clients using hotels, garages and service stations, authorized car sharing vehicles, vehicles for disabled people, clean vehicles, taxis, police vehicles, emergency vehicles and street rescue service vehicles, public services vehicles, Italian government and local authorities vehicles.



Access permits were issued to residents, owners of private parking spaces in the LTZ, family doctors and cardiologists with patients residing in the LTZ, freight operators, public interest services operators, parents driving children to school. Temporary permissions were issued for particular needs (e.g. building sites, removals, events).

However, in order to give some flexibility to road users, the road pricing scheme enabled occasional users (all vehicles) to access the LTZ using a road pricing scheme.

## B4 Actual Implementation of the Measure

The measure encompassed the following tasks, including all the planned activities:

### Task 1: Road Pricing fine tuning (from 2008 to the end of the Measure)

- Regional Agreements were approved on the air quality agreement (1). The Agreements state that private vehicle circulation limitation rules are to be followed by cities as well as measures to enhance sustainable mobility – e.g. contributions for public transport fleet renewals, initiatives for bike users etc. (in Autumn 2009).
- Official permission was given for a new camera: the new camera controls a Limited Traffic Zone gate which was not previously monitored.
- Regional agreements on air quality were in Autumn 2010: they include some access limitations for highly polluting vehicles in the whole urban area.
- Testing Phase: as an experiment, the Municipality of Bologna extended the opening times of the LTZ over three months in summer 2010.
- In December 2010 SIRIO was turned off in accordance with shopkeepers' associations.
- Circulation restrictions were introduced as part of the new air quality Agreement in November 2011 and January-March 2011.
- A survey of residents' perception of the LTZ was carried out in February-March 2011.
- Good practice: the new mobility councillor removed access permits for the Municipality Head Quarters (located in the historic centre of Bologna) for all politicians.
- T-days were introduced at weekends and on public holidays: since May 2012, the T-area (Via Rizzoli, Via Ugo Bassi and Via Indipendenza) is open to *pedestrians and bicycles* only, between 8am and 10 pm.
- As a result of the Measure development, the Municipality of Bologna decided to *extend the access restrictions into the LTZ to Saturdays* (May 2012).

### Task 2: New permits scheme (from 2008 to the end of the Measure)

- A tender was awarded to renew the database for the parking and access permits' management software in the LTZ. This new system was expected to be the new basic software platform for an improved functioning of the enforcement (2010).
- New permits scheme completion; this will be a highly innovative data management system that will update the previous technology. Another important characteristic of the new system is that it will be more addressed to users (both: freight operators and citizens) who will be able to check the status of their authorisation (2011).
- A Decision Support System (DSS) was set up to predict how traffic flows may change depending on changes to the permits scheme. For example, the system can be asked to show the impact on traffic flows of giving free access to methane vehicles at specific times. This feature is very important because it allows for a more accurate permits scheme and planning.
- The new permits system became operative in April 2012.

### Task 3: Semi pedestrian area completion (from 2008 to the end of the Measure)

- The 2nd phase of implementation of the semi-pedestrian area (University Area) was completed, maintained and improved (2008-2009). The 1st phase was completed before the MIMOSA project and it covered a smaller area. In short, actions put into practice in the 2nd phase were
  - modification of traffic schemes in the area; introduction of two enforcement cameras

- to control vehicle access;
- implementation of enforcement regulation software;
- during the initial phase of implementation, the municipal police did inform people/vehicle owners about the new regulation;
- start of enforcement activity;
- improvement of procedure after the initial period of implementation (also taking into account residents' and stakeholders' requirements);
- the smart card access recognition system using electronic pillars in the University area and the whole city centre was refined by differentiating various categories of users and limiting improper access to semi-pedestrian areas;
- car and motor vehicle access through tickets and permits assigned by the Municipality to the semi-pedestrian area was monitored to reduce incorrect use of the permits.
- The initial results on use of the semi-pedestrian area were collected. The area covers 50 ha, which comprises most of the University Area. With a few exceptions (e.g.: residents within the area), vehicle access is forbidden every day, both for cars and motorcycles. Access control and enforcement is provided by ITS systems using two cameras.
- Road works began to complete the semi-pedestrian area of part of Via Zamboni, as part of a wider program of urban re-qualification in the semi-pedestrian area (in April 2011)
- Progress was made on the enforcement activities directed to manage access within the Limited Traffic Zone and the University Area.

## **B5 Inter-Relationships with Other Measures**

The Measure was interrelated with measure 1.2, cleaner private vehicles, but with different domains and targets. The road pricing policy was aimed at limiting access to the LTZ area, a small portion of the city, to all vehicles, excluding particular categories requiring access (as explained above). Measure 1.2 included the entire Bologna registered car fleet in all the city territory.

It should be noted that like measure 3.1, measures 1.2 (cleaner private vehicles), 4.1 (mobility managers) and 7.1 (city freight delivery plan) also pursued the same high level objective (improving air quality), even though they had their own targets and domain of application. For this reason a bundled indicator for these 4 measures was the level of particulate 10 and particulate 2.5 recorded throughout the Municipality (even were no Mimosa measures were applied). Average values were collected from fixed points every day.

Obviously this value was influenced by other factors which were not always related to the Mimosa project. However, changes in polluting emissions could be considered connected to traffic conditions and to driver behavior modifications.

## C Impact Evaluation Findings

### C1 Measurement Methodology

#### C1.1 Impacts and Indicators

The new road pricing policies introduced restrictions to vehicular access both to the LTZ and semi-pedestrian areas, in order to limit the circulation of the most polluting vehicles. The first direct expected impact of this kind of decision is a decrease in traffic flow levels. Therefore, in order to highlight the expected results, the evaluation strategy for this Measure sought to focus on transport indicators. These were indicator n. 5 'n. of registered crossings into the LTZ', and indicator n. 9 'the trend of access into the semi pedestrian-area/University area'.

Considering that the Measure's high level objective is improving air quality, great importance was placed on evaluating the direct environmental impact of the Measure within the LTZ (indicators 1 to 4) and throughout the city of Bologna, with the contribution of other interrelated measures (bundled indicator 10).

These policies interfere with private habits, therefore impacts on awareness and acceptance needed to be measured. The Municipality wanted to evaluate, from residents' points of view, how restrictions were adapted to different contexts and exigencies. Therefore, indicators from society's evaluation area were also selected (indicators 6-7-8, the level of awareness, acceptance and spatial accessibility of residents due to Municipality policies).

*TABLE C1.1.1: Common core indicators*

Indicator	Evaluation area	Core Indicator	Impact	Indicator	Source of data
1	Environment	Core Indicator 8	Emissions	CO <sub>2</sub> emissions	COPERT estimate
2	Environment	Core indicator 9	Emissions	CO emissions	
3	Environment	Core Indicator 10	Emissions	NO <sub>x</sub> emissions	
4	Environment	Core Indicator 11	Emissions	particulate emissions	
5	Transport	Core Indicator 21/22	Traffic Flow Levels	n. of crossing into the LTZ area	Loop detectors (SIRIO)
6	Society	Core Indicator 13	Awareness	Degree to which the awareness of the road pricing policies has changed	Survey-questionnaire
7	Society	Core Indicator 14	Acceptance	Attitude survey of Current acceptance of the Measure of restrictions in LTZ	Survey-questionnaire
8	Society	Core Indicator 15	Spatial Accessibility	Attitude survey of perception of physical accessibility of PT network in the LTZ area	Survey-questionnaire
9	Transport	Core Indicator 21/22	Traffic Flow Levels	n. of crossings into the University area	University area camera

**TABLE C1.1.2: Bundled indicator -3.1-4.1-1.2-7.1**

Indicator	Evaluation area	Evaluation category	Impact	Indicator	Source of data
10*	Environment	Core indicator 7	Emissions	Particulate emissions	Data recorded at fixed stations in the centre of Bologna

\* Indicator 10 has been chosen to monitor and check pollutant emissions evolution throughout the Municipality area

Detailed description of the indicator methodologies:

**Indicators 1 to 4 ‘Emissions’** The impact was calculated using an estimate. The COPERT method was applied to the Bologna *car fleet composition by fuel types*, associating a level of emissions to each vehicle type. The driver for these indicators was the number of vehicles recorded by SIRIO. Considering the vehicles recorded by SIRIO, and assuming the number of vehicles have the same percentage makeup of the Bologna running fleet per fuel type registered year by year, the derived evolution of the emissions was calculated using the COPERT method.

It would have been possible to calculate what kind of vehicles entered the LTZ, based on their license plate. However, this would not have been economically viable (in terms of time spent and requested resources). Therefore, the hypothesis presented below is a good approximation.

The measurement was taken once a year (at the end of the year) to check on the results. The unit was kg/day, the domain of the analysis was Bologna city.

In order to apply the COPERT methodology, the following hypotheses were made:

- Average trip made by car into the SIRIO controlled area is 1.3 km (considering the LTZ radius is equal to 650 meters), considering a round trip to the LTZ centre. Other possible effects such as people changing their travel behaviour using bikes/PT or walking instead of going by car were not analyzed, because no systematic data is available for the years considered.
- Average speed: 23.3 km/h (2),
- Emission evaluation on an average week day (February)

**Indicator 5 ‘Number of crossings into the LTZ’ (all vehicle types).** The indicator shows the n. of accesses during an average weekday (without motorbikes), an average Saturday and an average Sunday (February of each year), as shown from the SIRIO database (SIRIO loop detectors).

Frequency: a measurement is taken once a year in February) to check the results. Unit: number of crossings; domain: all vehicles (with access to LTZ area permits), no motor bikes.

**Indicators 6-7-8 (Society evaluation area)** In order to introduce and modify road pricing policies, the Municipality of Bologna took particular care to involve residents and gather their opinions. Surveys were thus aimed at evaluating residents’ degree of awareness (indicator 6), of acceptance (indicator 7) and the perception of city centre accessibility (indicator 8) in order to orient further Municipality decisions and policies. After the Mimosa project was implemented, the Municipality did not think it was necessary to ask residents the same questions in order to evaluate their degree of awareness, acceptance and perception of accessibilities regarding topics that have become part of their life and habits. Society indicators were therefore measured using different questions to show residents’ awareness, acceptance and accessibility of road pricing policies implemented by the Municipality of

Bologna. Therefore, surveys were changed, and no comparison of before/after data was statistically possible.

Indicator 6 'Awareness of the road pricing policies', Indicator 7 'Attitude survey of current acceptance of the measure of restrictions in LTZ', Indicator 8 'Attitude survey of perception of physical accessibility of PT network in the LTZ area' can be deduced from answers to questionnaires distributed to residents of Bologna (see baseline and Measure results for details of questions and sample extraction).

Unit: % of people answering positively to questionnaires. Frequency: the measurement was taken before (2005) and after (2011) the program was implemented to check on the results. Domain: residents of the city of Bologna.

**Indicator 9 'Number of crossings into the University area'** This indicator was selected in order to demonstrate the effects of the Measure in the University area (semi pedestrian area).

Unit: daily average flow of cars entering the University area, recorded by the camera located in via Bertoloni (via Bertoloni was chosen because it is the only one where historical-manual data are available).

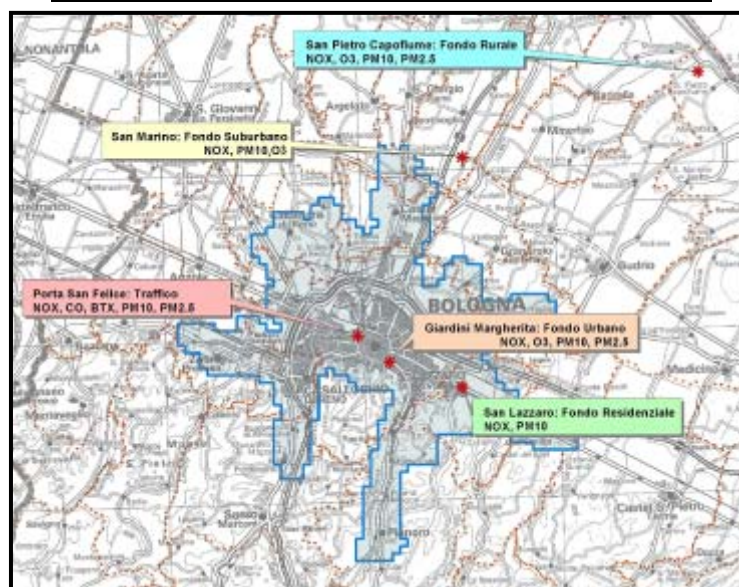
Frequency: measurements were taken before 2006, by manual counts, and after the Measure was implemented to check on the results.

**Indicator 10 'Particulate emissions recorded at fixed stations'**

Indicator 9 was chosen to monitor and check the evolution of pollutant emissions throughout the Municipality, in common with measures 1.2 ,4.1 and 7.1.

The picture below shows the location of the fixed stations in 2011 and their capacity for recording pollutant emissions. Of these, Porta San Felice was chosen because historical data was available for PM 10 and PM 2.5.

*FIGURE C1.1.1: Location of Bologna fixed stations*



Source: ARPA Regional Agency for the Environment

Frequency: data collected every day; data shown in this document is the average value of 365 items of data recorded in a year; Unit:  $\mu\text{g}/\text{m}^3$  (average daily production); domain: data collected from a fixed station located in the centre of Bologna.

## C1.2 Establishing a Baseline

The baseline for evaluation is made up of data obtained before the Measure was implemented:

**Indicators 1-4 (Emissions)** The baseline comprises data for the years 2000 to 2008, applying COPERT to access recorded in Bologna city centre and following the hypothesis reported above. In particular, control policies on improving sustainable mobility had already been implemented before Mimosa.

**Indicator 5 (Number of crossings into the LTZ)** The baseline covers data collected from 2000 to 2008, considering access between 7 am to 8 pm and access recorded every day in February.

**Indicators 6-7-8** The baseline for these indicators consists of answers to questionnaires submitted to residents when SIRIO was introduced (2005). The SIRIO system radically modified the mobility habits both of city centre residents and suburban ones.

A [telephone survey](#) on the introduction of SIRIO was carried out by MEDEC Centro Demoscopico Metropolitano, Bologna using CATI (Computer-assisted telephone interviewing) between 9th and 14th of March 2005 (working days only, between 5pm and 9pm). The sample was extracted considering the area of residence (historic centre and North, South, East and West quarters), gender (male or female) and age group (18-34, 35-64, 65 years and over).

150 interviews were carried out in the historic centre, 500 in other areas of the city. This sample distribution was later corrected through numerical weights. The weights were related to city areas, gender and residents' age groups. Weighting makes it possible to maintain both information representativeness and the correspondence between sampling size and the population size of different areas. The weights were comprised between 0,620 and 1,120. The sample was selected randomly from the public telephone directory, interviewing one person for each telephone number extracted. For this survey and with the adopted sample design, the margin of error (statistic expressing the amount of random [sampling error](#) in the [survey's](#) results) was  $\pm 2,1\%$ , for a desired confidence level of 95%.

**Indicator 6 (Awareness of road pricing policies).** The survey measured awareness of the CIVITAS MIMOSA project using two direct questions.

6.1 – Have you heard of SIRIO, the electronic traffic system controlling access to the city centre?

6.2 – Where did you hear about SIRIO?

**Indicator 7 (Current acceptance of the Measure restrictions in LTZ).** The survey measured acceptance of CIVITAS MIMOSA project using three direct questions.

7.1 – Opinion of possible disadvantages of SIRIO (by grading the following disadvantages: “reduction in customers”; “risk of shop closures”, “residents leaving the city centre”; “city centre becoming isolation and deterioration”; “reduction in safety in the historic centre”; “more difficulty reaching the historic centre”);

7.2 – Opinion of possible advantages of SIRIO (by grading the following advantages: “possible reduction in air pollution”; “possible reduction in noise pollution”, “reduction in historic centre traffic”; “making the city a better place to live”; “better LPT and taxi speed and efficacy”; “more parking for residents and people with access permits”; “more pleasurable shopping ”);

7.3 – Do you agree with the introduction of SIRIO?

**Indicator 8 (Attitude survey of perception of physical accessibility of PT network in the LTZ area).** The questionnaire measured the level of accessibility during the CIVITAS MIMOSA project by asking directly, “What public action should the Municipality of Bologna take to facilitate access to the city centre following the introduction of SIRIO?” (respondants could choose three possible answers from the following: more parking outside the city centre (and PT connections), more PT services, bus ticket discounts for the city centre, city centre access for methane and cleaner vehicles, more city centre permits, other, none).

**Indicator 9 (n. of crossings into the University area)** The baseline is represented by data obtained in 2006 from via Bertoloni before the semi-pedestrian project was implemented. Considering that during 2006 no cameras were installed in the area, data refers to manual vehicle counts made in July 2006.

**Indicator 10 (particulate emissions recorded at the fixed station)** Values of PM10 and PM2.5 recorded at the Porta San Felice checkpoint in the years before Mimosa will be given in the results section. For PM10, data is available from 2003, and from 2004 for PM2.5.

### C1.3 Building the Business-As-Usual Scenario

Access policies must be considered dynamic, taking into account mobility modifications and reacting to environmental or transport factors that may change year by year. Without this measure, the restriction scheme might become obsolete and the risk of conflict with stakeholders might arise.

**Indicators 1-4 (emissions)** The BAU results were calculated considering the BAU hypothesis for indicator 5 reported below, maintaining the same hypotheses referring to the COPERT method reported in the description of indicators.

**Indicator 5 (number of crossings into the LTZ)** From 2008, recorded access showed stable values (an average of 50.000 units per day) which were considerably lower than those recorded before 2005. From 2008, when Mimosa was introduced, access diminished (4% lower than before Mimosa). In order to build the Business as Usual scenario, access was assumed to be equal to values recorded in 2006-2007 (2 years before average), thus assuming constant values for years after 2007.

**Indicators 6-7-8 (society)** The business-as-usual scenario in that case can be considered as coincident with the baseline.

**Indicator 9 (n. of crossings into the university area)** Considering that the semi pedestrian area was completed when Mimosa was introduced and that restrictions to access were introduced with Mimosa, it is possible to argue that without Mimosa the level of access would be the same as before the Measure was implemented, when it was possible to enter the University area.

**Indicator 10** The BAU hypothesis for indicator 10 was calculated using the average value of five years (where possible) before the Mimosa project.

## C2 Measure Results

### C2.1 Economy

Not applicable.

## C2.2 Energy

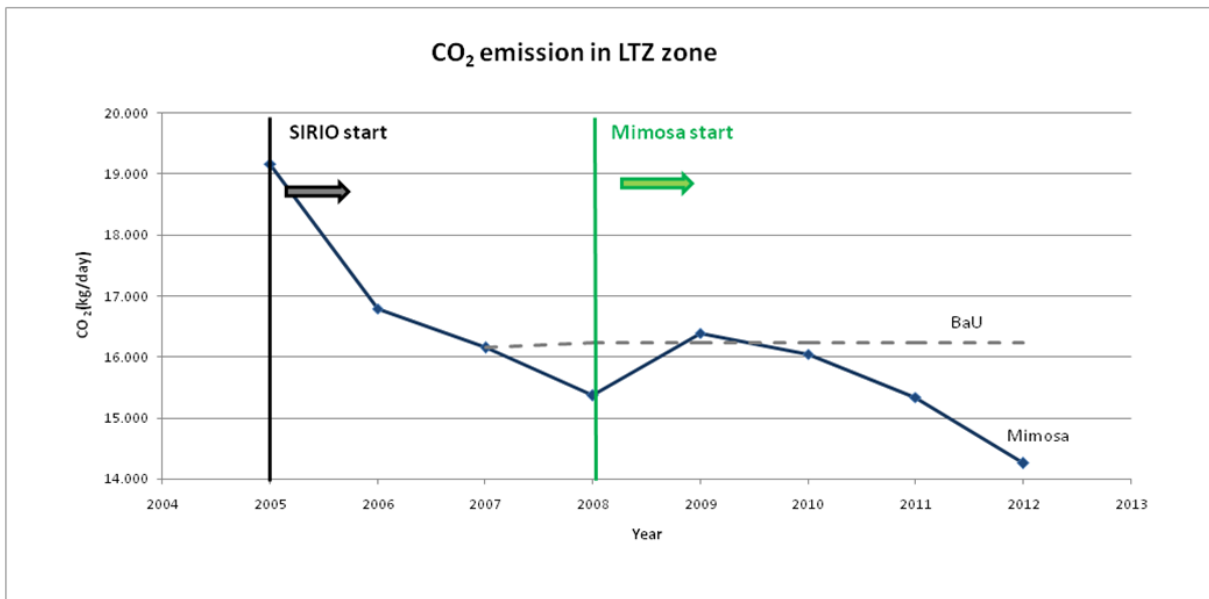
Not applicable.

## C2.3 Environment

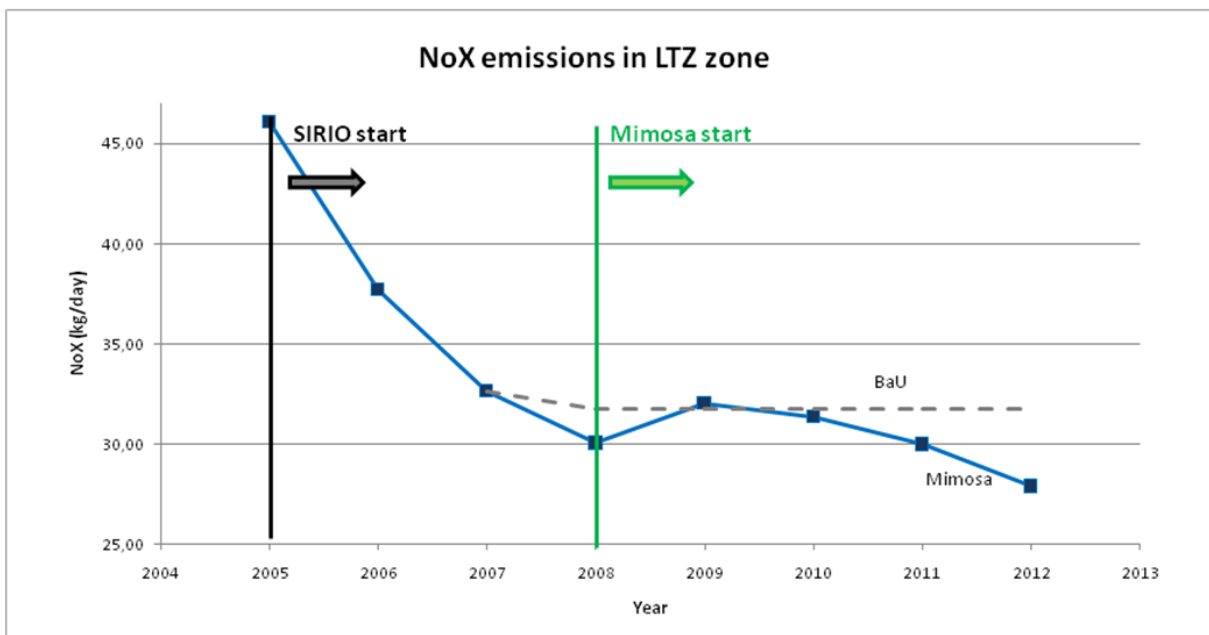
**Indicators 1 to 4 ‘Emissions’** The annual access trend for the historic centre (see Indicator 5) shows how control policies for improving sustainable mobility were already implemented before Mimosa. A decrease in the flow level was seen between 2005 and 2006 when SIRIO was activated; when Mimosa started in 2008, the situation did not change significantly.

By applying COPERT to access flows and following the hypothesis reported above, a decrease can be seen in all emissions indicators.

*FIGURE C2.3.1: average daily CO2 emissions (Kg/day)*

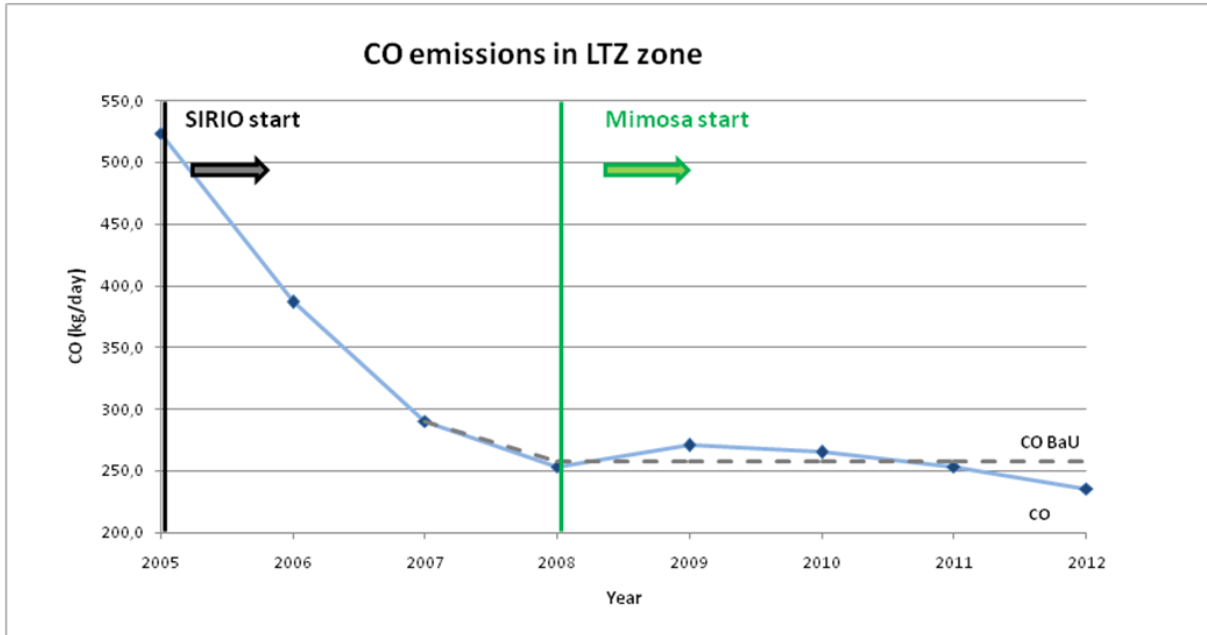


*FIGURE C2.3.2: average daily NOx emissions (Kg/day)*

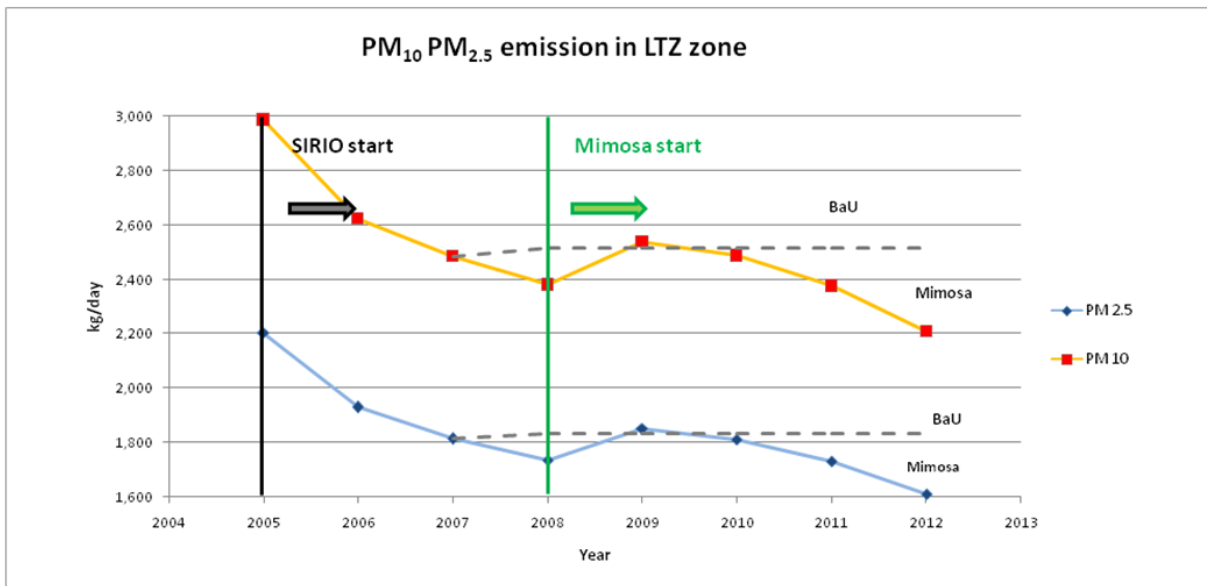




**FIGURE C2.3.3: average daily CO emissions (Kg/day)**



**FIGURE C2.3.4: average daily PMx emissions (Kg/day)**



Source: COPERT

A comparison of results showed a **decreasing value for all emissions** with benefits comparing before and after data.

Trend shows a general increasing of emissions between 2008 and 2009. The reason come from the already obsolete system used to check and allow entrances before Mimosa implementation. Considering the uniqueness of the password and the concrete possibility for citizens to do the “passing words” to reach the LTZ zone, the efforts did by Municipality to limit the entrances were nullify by the diffusion of password through unauthorized citizens. Later trend of entrances (and emissions) continued to decrease as they did since the beginning of 2005. Thus Mimosa helped in the renewal of system and then to protect the historical zone more efficiently.

**TABLE C2.3.1: Environment results, Indicators 1-4, Emissions produced (average working day) [Kg/day]**

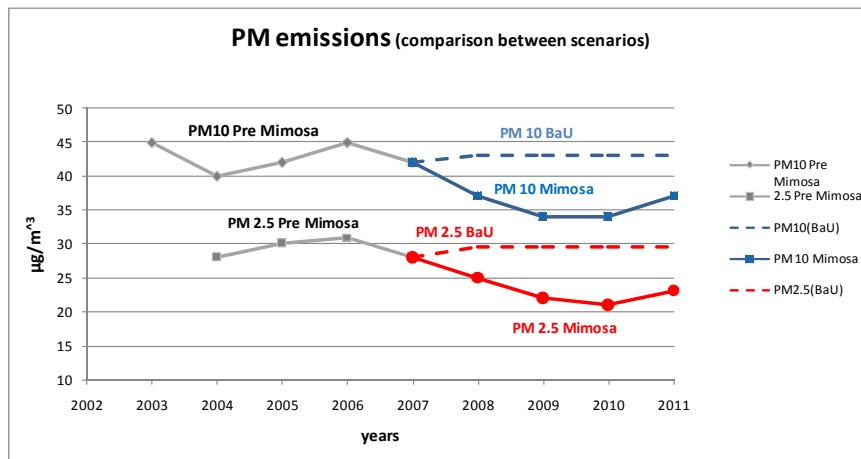
Indicator	pre Mimosa (baseline 2007)	BAU (average 2006-2007)	Mimosa (2012)	Mimosa (2012) vs Baseline (2007)	Mimosa (2012) vs BaU
CO	290,5	257,4	235,3	-55,2	-22,1
CO <sub>2</sub>	16.151	16.228	14.257	-1.894	-1.971
NO <sub>x</sub>	32,65	31,72	27,87	-4,78	-3,85
PM <sub>2.5</sub>	1,815	1,833	1,611	-0,204	-0,222
PM <sub>10</sub>	2,484	2,514	2,209	-0,275	-0,305

Source: COPERT applied to access to Bologna city centre

### Indicator 10 'Particulate emissions' recorded at fixed stations

Concerning the bundled indicator, values of PM 10 and PM 2.5 were recorded at a check point in Porta San Felice and are shown in the graph below. A comparison between 2006-2011 data and 2003-2001 data shows a general decreasing trend in pollution trend, with a slight increase during 2011.

**FIGURE C2.3.5: average daily PMx emissions (µg/m<sup>3</sup>)**



(\*) Threshold Limit Value (Pm10): 40 µg/m<sup>3</sup>

Threshold Limit Value (Pm2.5): 25 µg/m<sup>3</sup> to be reached by 2015 (Decree 155/2010)

Source of data: ARPA Regional Agency for the Environment

**TABLE C2.3.2: PMx emissions, comparison between scenarios (µg/m<sup>3</sup>)**

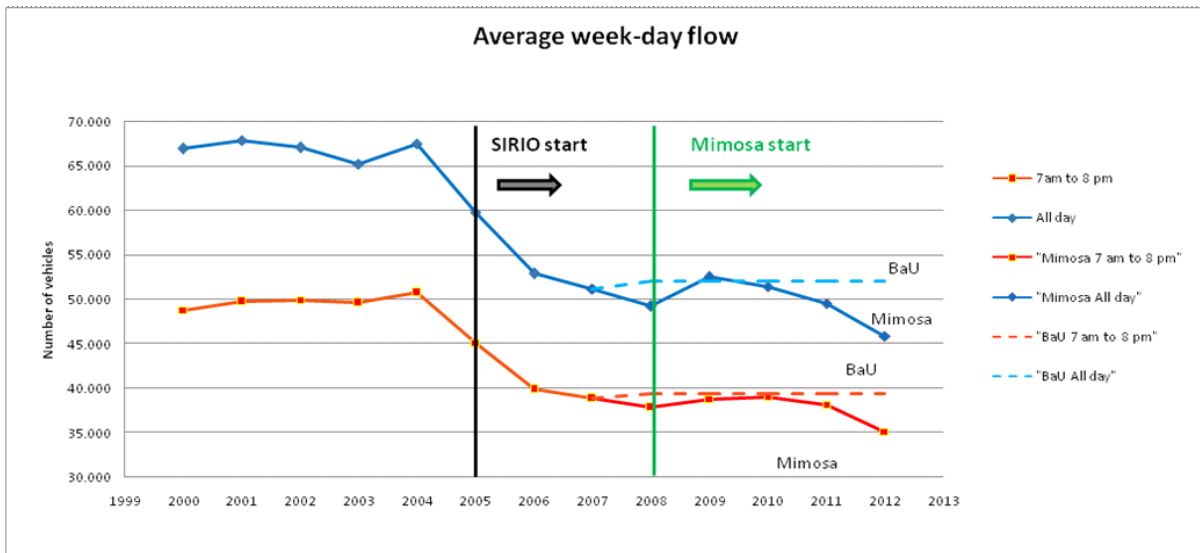
Average daily value (µg/m <sup>3</sup> )	Pre Mimosa (baseline 2007)	BaU (average of 3 years before)	Mimosa (2011)	Mimosa VS. baseline	% Mimosa VS. baseline	Mimosa VS. BaU	% Mimosa VS. BaU
PM 10	42	43	37	-5	-12%	-6	-14%
PM 2.5	28	29,6	23,1	-4,9	-17,5%	-6,5	-22%

## C2.4 Transport

**Indicator 5 “Number of crossings into the LTZ”** The following graphs show traffic flows on different days (average weekday, average Saturday and Sunday).

*Average weekday* - The results related to crossings (access) into the LTZ show little increase for 2009, and stable values for 2010 and 2011 as a result of the Municipality’s regulation policy. Values are still in line with flows recorded after SIRIO was activated.

**FIGURE C2.4.1: Number of crossings into the LTZ (average weekday, February)**

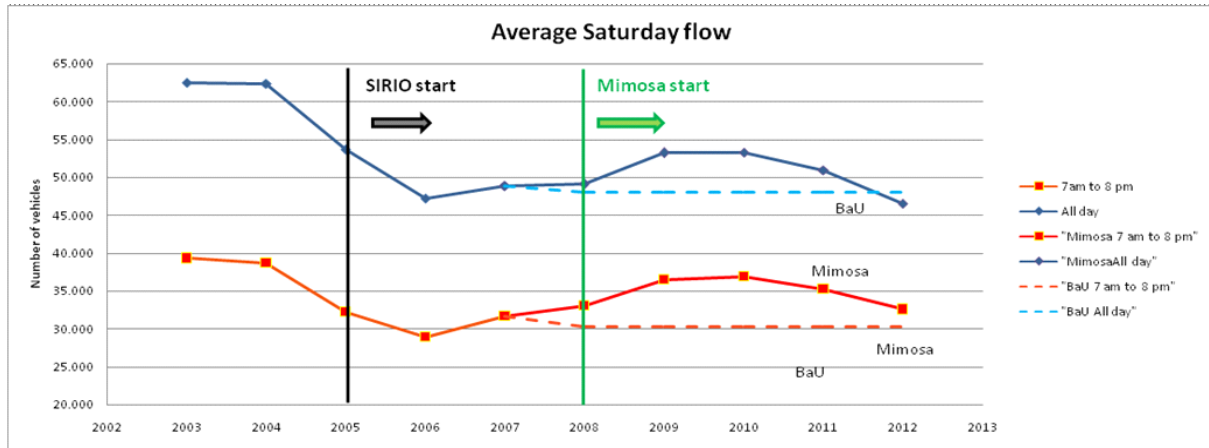


Source: Municipality of Bologna

*Average Saturday* - It is important to note that SIRIO fines activity begun in September 2005; it was suspended from Saturday November 12th 2005 and **on all Saturdays thereafter**. The high reduction in flows recorded between 2004 and 2006 is the result of a radical change in residents’ habits caused by the closure of the LTZ on working days and Sundays. No further decrease in Saturday flows was seen during MIMOSA.

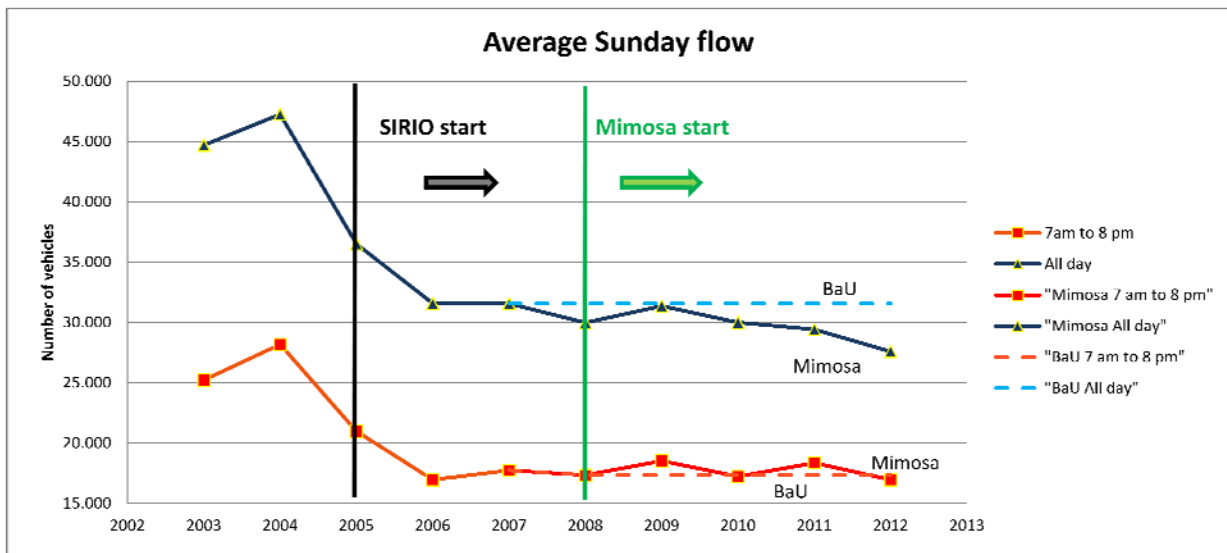
Nevertheless, as a result of the Measure development, the Municipality of Bologna decided to **extend access restrictions into the LTZ to Saturdays**, starting May 12<sup>th</sup> 2012). Positive impacts on flows decreasing are therefore expected in the future.

**FIGURE C2.4.2: Number of crossings into the LTZ (average Saturday in February)**



Source: Municipality of Bologna

**FIGURE C2.4.3: Number of crossings into the LTZ (average Sunday)**



Average Sunday-The analysis confirms the decreasing access trend consolidated over the years.

The following table summarizes the Measure’s effects on traffic flows recorded over the years. Considering that SIRIO was implemented between 2005 and 2006, the data shows a level of stability on access to the LTZ, pursued after years of policies balancing environmental issues with mobility needs. It might be that there was already a ‘ceiling effect’ (the numbers were already reduced so far that there is no relevant reduction possible). MIMOSA contributed to increasing acceptance and made people think positively about road pricing.

**TABLE C2.4.1: Transport results, Indicator 5 ‘Number of crossings into the LTZ’**

Average weekday (February)	pre MimosA (baseline 2007)	BAU (average 2006-2007)	MimosA (2011)	MimosA (2011) vs Baseline (2007)	MimosA (2011) vs BaU
From 7 am to 8 pm	38.860	39.374	38.220	-1,6%	-2,9%
All day	51.171	52.033	49.583	-3,1%	-4,7%

### Indicator 10 “Number of crossings into the University area”

The following table show traffic flow results (cars) recorded by a camera positioned in the University district. A significant decrease in access can be seen after the Measure was implemented (the issuing activity started on October 7<sup>th</sup>, 2008).

**TABLE C2.4.2: Number of crossings into the University area (daily average-weekdays)**

Period	2006	2008	2009	2010	2011	2012
All day	3.700 (manual)	na	Na	1.300 (camera)	1.143 (camera)	1.143 (camera)

Source: Municipality of Bologna

**TABLE C2.4.3: Transport results, Indicator 5**

Average weekday (February)	pre Mimosa (baseline 2006)	BAU (as baseline)	Mimosa (2012)	Mimosa (2011) vs Baseline/BAU (2007)
All day	3.700	3.700	1.143	-69%

## C2.5 Society

Between February and March 2011 a [telephone survey](#) was carried out using the CATI methodology to assess residents' perception of LTZ; it was carried out by MEDEC - Centro Demoscopico Metropolitano, Bologna (statistic company from Bologna): A sample of the population was considered by areas of residence (historic centre and suburbia), gender (male or female) and age group (18-34, 35-64, 65 years and over). Of the 1.500 interviews, 241 were carried out in the historic centre, 1.259 in other areas.

The interesting results are reported and compared where possible with the **baseline**-pre-data in the tables below.

*TABLE C2.5.1: Indicator 6 - baseline*

<b>Baseline survey</b> Indicator	<b>Answer</b>	<b>Total</b>	<b>Residents inside the city centre</b>	<b>Residents outside the city centre</b>
6.1 Have you heard of SIRIO, the electronic traffic system controlling access to the city centre?	Yes	91,6 %	95,3%	91,6%
	No	8,4%	4,7%	9,0%
	Total	100 %	100%	100%
	Cases: 650		93	557
6.2 Where did you hear about SIRIO? (4 possible answers)	Newspapers	72,6%	80,4%	71,2%
	TV-radio	40,8%	35,7%	41,8%
	Brochures and leaflets	19,1%	21,7%	18,7%
	From other people	18,8%	18,2%	18,9%
	Internet	4,0%	2,8%	4,2%
	Other	3,2%	2,8%	3,3%
	Don't remember	0,3%	0,7%	0,2%
	Cases: 596		507	89

Source: Results from SIRIO start up Questionnaire (2005)

The Municipality publicised the introduction of SIRIO across all communications media. The result was an **excellent degree of awareness**.

TABLE C2.5.2: Indicator 6 - after

After results survey Indicator	Answer	Total	Residents inside the city centre	Residents outside the city centre
6.1 - "Did you know that the Municipality recently modified traffic access to the city centre?" <i>The complete question was: "Did you know that the road works in via Mazzini &amp; via Emilia Levante- are part of the modifications the Municipality is making to traffic circulation?"</i>	Yes (*)	82,4%	86,4%	83,4%
	No	17,5%	13,6%	16,6%
	No answer	0,1%	0,0%	0,0%
	Total	100,0%	100,0%	100,0%
	Cases: 1.500	1.500	241	1.259
6.2 - Where did you hear about it? (more than one answer is possible, the most frequent answers are reported)	Newspapers	43,8%	50,1%	42,6%
	Personal experience	23,8%	18,0%	24,9%
	TV-radio	21,0%	20,8%	21,0%
	Road signs	17,1%	11,3%	18,2%
	From other people	16,7%	14,6%	17,1%
	Brochures and leaflets	9,7%	5,0%	10,6%
	Cases	1.500	241	1.259

(\*) Summary: "yes, the modifications affect my habitual trips", "yes, although the modifications do not affect my habitual trips"; "yes, but I didn't go deeper into the matter"  
Results: from residents' perception of LTZ survey (2011)

**An excellent level of awareness was also confirmed from the second survey:** most the people know the Municipality's most important road pricing policies well. This was due to the extensive effort the Municipality put into advertising campaigns both before and during the Measure. It is crucial for the measures success that citizens are informed about the policies which are targeted directly towards them. If citizens know with certain the city regulation, they are more likely to accept the rules imposed them. As in other life circumstances, something we don't know often has a lower level of acceptance then something we know and hence we can understand.

**Indicator 7 'Current acceptance of the Measure restrictions'**. The surveys investigated acceptance of the project using direct questions, shown in the following tables.

**TABLE C2.5.3: Indicator 7-baseline**

<b>Baseline survey</b> Indicator	<b>Answer</b>	<b>A lot + quite a lot total</b>	<b>A lot + quite a lot residents inside the city centre</b>	<b>A lot + quite a lot residents outside the city centre</b>
7.1 – Opinion of possible disadvantages of SIRIO	reduction in customers	36%	41,3%	36%
	risk of shop closures	25,7%	24%	26%
	residents leaving the city centre	19,5%	21,3%	19,2%
	city centre isolation and deterioration	22%	26,6%	21,2%
	reduction in safety in the historic centre	17,8%	22,7%	17%
	more difficulty reaching the historic centre	42,8%	58%	40,2%
	Cases: 650		93	557
7.2 - Opinion of possible advantages of SIRIO	possible reduction in air pollution	69,1%	72%	68,6%
	possible reduction in noise pollution	76,5%	80%	76%
	reduction in historic centre traffic	84,8%	86%	84,6%
	making the city a better place to live	75,1%	69,4%	76%
	better LPT and taxi speed and efficacy	73%	66%	74,2%
	more parking – for residents and people with access permits	65,8%	58,7%	67%
	more pleasurable shopping	69,8%	67,4%	70,2%
Cases: 650				
7.3 – Do you agree with the introduction of SIRIO?	Yes (*)	77,8%	76%	77,8%
	Cases: 650		93	557

(\*) A lot (46,9 %) or quite a lot (30,9%)

Source: Results from SIRIO start up Questionnaire (2005)

During the 1984 referendum, 70,6% of citizens favored limitations to city centre access. If the same referendum had been carried out ten years later, the outcome would probably have been even better. In fact from the 2005 survey, 77,8% of citizens agreed with the introduction of SIRIO, without relevant differences between residents and non-residents.



*TABLE C2.5.4: Indicator 7 after*

<i>After results survey</i> Indicator	Answer	Total	Residents inside the city centre	Residents outside the city centre
During the last 12 months, the quality of life in Bologna:	Improved	3,2%	5,5%	2,8%
	Remained good	51,6%	46,8%	52,5%
	Remained negative	6,1%	9,8%	5,4%
	Got worse	36,5%	34,5%	36,9%
	Don't know	2,3%	3,0%	2,2%
	No answer	0,3%	0,5%	0,3%
	Cases	1.500	241	1.259

Results: from residents' perception of LTZ survey (2011)

The majority of people are satisfied with the quality of life in Bologna. In the last survey done 55% of inhabitants said the quality of life is good. It is true that many other factors may influence the result: financial conditions, health issues etc. and in this way probably the negative results could be interpreted. Mobility in Bologna did not worsen in the last years (during MIMOSA) and probably the reasons of those who answer the "quality of life got worst" refer to economic situation and working conditions.

The **baseline/after results cannot be comparable** considering the two surveys asked for different questions. Nevertheless they are useful because they tested the pulse of citizens satisfactions and can give an indication of the current quality of life.

**Indicator 8 perception of physical accessibility of PT network in the LTZ area.** The surveys investigated the acceptance of the project using direct questions as shown in the following tables.

TABLE C2.5.5: Indicator 8 before

<b>Baseline Survey</b> Indicator	<b>Answer</b>	<b>Total</b>	<b>Residents inside the city centre</b>	<b>Residents outside the city centre</b>
8 - Which public action should the Municipality of Bologna take to facilitate access to the city centre following the introduction of SIRIO? (3 possible answers)	more parking outside the city centre (and PT connections)	50,7%	58,7%	49,4%
	more PT services	57,4%	55,3%	57,8%
	bus ticket discounts for the city centre	54,8%	58,0%	54,2%
	city centre access for methane and cleaner vehicles	12,0%	15,3%	11,4%
	more city centre permits	5,3%	7,3%	5,0%
	None	1,4%	2,7%	1,2%
	Other	4,7%	2,7%	5,0%
	Don't know	4,9%	4,0%	5,0%
	No answer	1,4%	1,3%	1,4%
	Cases: 650			93

Source: Results from SIRIO start up Questionnaire (2005)

The most important actions required to compensate limitations introduced with SIRIO are: increasing PT services (57,4%), bus ticket discounts for the city centre (54,8 %), more parking outside the city centre and PT connections (50,7 %). The survey therefore shows that people expected improvements to PT services, one of the main objectives of the Municipality's policy.

TABLE C2.5.6: Indicator 8 after

<b>After results survey</b> Indicator	<b>Answer</b>	<b>Total</b>	<b>Residents inside the city centre</b>	<b>Residents outside the city centre</b>
8- What are the most important mobility problems (2 possible answers, the most frequent have been reported)	Lack of parking	32,5%	52,2%	28,7%
	Environmental and noise emissions	37,8%	36,4%	38,1%
	Traffic density	23,7%	18,5%	24,7%
	Bike riding is dangerous	18,4%	19,8%	18,1%
	No critical situations	14,1%	6,7%	15,5%
	Non-regulated parking	4,7%	7,9%	4,0%
	Don't know/No answer	0,9%	0,9%	1,0%
	Cases		1.500	241

Results: from residents' perception of LTZ survey (2011)

The most important mobility problem was the **lack of parking**, also confirmed in the second survey; only 5% said that there was a lack of PT services (percentage comprised in "other" answers). Parking requirement is the most common need in all the bigger cities in Italy

(caused by the historical origin of their centers and the incapacity to receive high vehicles flows). Private vehicles users would like to have more parking spaces near all their destinations. Obviously this is not possible, considering the limited physical spaces available, and the environmental consequences. It is also not a sustainable solution since studies show that if the capacity of a road grows up, then the flows growth up too, and congestion phenomenon doesn't change. Increase parking spaces means increase private transport competitiveness. Public administrations have to strengthen public transport, park and ride services in the suburbs and information on mobility services available. While the answers show that citizens would like to use the car, they do not feel that there is a lack of an alternative in form of public transport.

### C3 Achievement of Quantifiable Targets and Objectives

No.	Target	Rating
1	To improve the Limited Traffic Zone (LTZ) access policy based on economic disincentives and support the implementation of this policy with electronic enforcement instruments	**
2	To complete a semi-pedestrian area within the LTZ, in order to demonstrate the impact of road price policy on people's behaviours and environmental awareness	**
3	To check and demonstrate the effectiveness of the Administration's urban mobility management, with the support of regulatory measures and the use of IT systems	**
4	To address other fields of application and fine-tune current economic (dis)incentives as means of guaranteeing flexibility in the regulation and control of access	*
<b>NA = Not Assessed; O = Not Achieved; * = Substantially achieved (at least 50%)</b> <b>** = Achieved in full; *** = Exceeded</b>		

Considering the results of the impact evaluation, the first and third objective were both achieved in full. The Municipality has made great efforts to put into practice an access policy to limit the circulation of polluting vehicles. At the same time this policy, based on ITS systems, needs to be flexible (from the technicians' point of view) so that it could be changed in different periods of the year. The system works and the success is proven by the reduction in traffic flow levels.

The second objective was also achieved in full with the completion of the university area.

With reference to the fourth objective, the identification of other fields of application cannot be completely shown by the indicator results. We can only argue that the system works and that it is flexible because it can be adapted to contingent exigencies. The Municipality aims to continue improving the road pricing system itself.

## C4 Up-Scaling of Results

Up-scaling is not applicable because the Measure already covers the area to which this kind of policy is applied. It would be possible to extend semi pedestrian areas in the future, as the Municipality is now planning to do.

## C5 Appraisal of Evaluation Approach

The chosen evaluation approach is particularly complete, focusing on a number of indicators across the areas of environment, transport and society. These were measured in different ways and from different sources of data.

'no. of crossings into the LTZ' was the most important indicator to be monitored. Nevertheless, in order to optimize all future evaluations, the evaluation could be improved by investigating further if restricting access into the LTZ generated change of behaviours and choice of an alternative means of transport, or simply obliged car drivers to park their cars in proximity to the centre. Another important topic to be investigated would be to ask people if they changed their travel behavior because of the traffic restrictions in the city center.

With reference to the society indicators, the two surveys carried out by the Municipality had different samples and different domains of application. Consequently the results are not comparable from a statistical point of view, even though they gave important information about the general level of awareness among the residents of Bologna. An improvement to the evaluation approach would be to plan two questionnaires with a *panel* of residents in order to make comparisons.

## C6 Summary of Evaluation Results

The key results are as follows:

**Key result 1** – decreasing value for all pollutant emissions, with benefits comparing before and after data.

**Key result 2** – stability of access into the LTZ.

**Key result 3** – significant reduction in vehicular access to the semi-pedestrian area (-69% between 2006 and 2012).

## C7 Future Activities Relating to the Measure

Future activities will include studies and research activities into potentially enlarging the semi-pedestrian area, and research activity to improve the actual road pricing system.

## D Process Evaluation Findings

### D1 Deviations from the Original Plan

None

### D2 Barriers and Drivers

#### D2.1 Barriers

##### Overall barriers

**Conflicting interests** – with particular reference to those who believe the city centre should be open to vehicles (e.g. shopkeepers) and, on the other side, those who want to totally restrict access to the city centre (environmentalists).

**Low level of acceptance** – despite extensive public information campaigns, the level of acceptance (especially for shopkeepers) was low during the implementation of the Measure. Widespread mediation was always necessary in order to implement the measure without delays.

#### D2.2 Drivers

##### Overall drivers

**Political support** – After a year and a half of lack of political leadership, the City of Bologna has had a new mayor and a new Mobility City Councillor since 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 has been strongly motivated and well experienced, both regarding technical and legal skills. This contributes to the efficiency in the operation of the Measure.

#### D2.3 Activities

**Debate has been encouraged** - this activity was linked to the first barrier presented above. The Municipality of Bologna encouraged debate and dialogue among different stakeholders on city centre access. The city always experienced residents' opposition towards traffic restrictions: in Italy, private vehicles are generally considered the most convenient mode of transport for shopping. This is why shop owners strongly believe that the limited traffic zone might damage their incomes and business trends. They believe it will discourage people from shopping in the city centre, in favour of big shopping malls with convenient parking lots (some shop owners even hung signs in their windows opposing the limited traffic zone).

The Administration participated in this debate by organising several meetings with different stakeholders.

**Further studies on road pricing** - this activity was linked to the second driver presented above. New possibilities for extending the road pricing system and enlarging pedestrian and semi pedestrian areas in the city centre have been reached (e.g., forbidding access to the 'T-zone' to motorcycles, modifying rules for freight operators). The additional investigations

were necessary in order to always adapt and improve road pricing policies following the political will (the first driver described above).

**Continuous awareness campaigns** have been organised by the Municipality in order to focus the attention of residents and stakeholders on traffic and pollution issues. This activity is linked to the second barrier presented above.

## D3 Participation

### D3.1 Measure Partners

**Bologna Municipality** – COBO was directly responsible for the coordination and realization of the Measure.

### D3.2 Stakeholders

The distinctive feature of this Measure was to involve different stakeholders:

**Residents** – of the central areas affected by the measure and of the University area; those who were expected to obtain several advantages, in terms of quality of life, from the Measure.

**Car drivers / motorists** - the Measure affected the mobility habits of all car drivers in Bologna, whose access into the city centre was reduced.

**Visitors (shops / leisure)** - as explained above, in Italy, the use of private vehicles to go shopping has been always considered the most convenient mode of transport. The aim of this Measure was to change this habit, giving valid alternatives to these stakeholders.

**Local businesses** which always stood up to the Measure being implemented.

## 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** – implantation of the measure must start with research into alternatives to strengthen: parking possibilities in proximity to the area covered by the restriction, PT transport, alternative transport infrastructures (for bikes or pedestrians) must be guaranteed. Only with these alternatives can the common attitude to choosing the car be changed.

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

**Encouraging debate** - it is very important to share Municipality's objectives with all stakeholders involved. This means encouraging debate, directly involving people affected not by a *non total* top down approach but, within reason, by a shared scheme.

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

## E References

- (1) The air quality Agreements, signed by the Emilia Romagna Region and Provinces and Municipalities of the region, including the City of Bologna, in order to avoid, prevent or at least reduce harmful effects on human health, identify a set of measures for the improvement of air quality: the particular objective to be achieved is the reduction of PM10 concentrations in the region.
- (2) M. Capobianco, G. Zamboni (University of Genoa), 'Valutazione del parco circolante, delle percorrenze urbane e dei fattori emissivi dei veicoli stradali nella città di Genova', VII Expert panel Emissioni da Trasporto Stradale, Rome 16 January 2003