Access restricted

Understanding Transport Demand Management

webinar

Ing. Antonio Pio Morra - City of Bologna

25 March 2014 14h00 - 15h30
BOLOGNA: OVERVIEW

| Pedestrian Areas | ~ 12,000 | 0.88 |
| Limited Traffic Zone - L.T.Z. | ~ 45,000 | 3.20 |
| City Centre | ~ 53,000 | 4.51 |
| Municipality Area | ~ 373,000 | 140.85 |
| Overall demographic size | ~ 650,000 |

DAILY MOVEMENTS --> about 2 MLN
(Peak times --> about 200,000)

<table>
<thead>
<tr>
<th>MODAL SPLIT (internal movs)</th>
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<tbody>
<tr>
<td>Cars (driver)</td>
<td>28%</td>
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<tr>
<td>Cars (passenger)</td>
<td>7%</td>
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<tr>
<td>Motorbikes</td>
<td>11%</td>
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<tr>
<td>Public Transport</td>
<td>26%</td>
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<tr>
<td>Bicycle</td>
<td>7%</td>
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<tr>
<td>Pedestrian</td>
<td>21%</td>
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Internal 45%
Exchange 28%
Crossing 27%
The Municipality of Bologna has been involved over the last few years in a plan intended to limit the negative effects of traffic. These are, first and foremost, traffic congestion and air pollution, longstanding problems in many Italian cities and throughout the Po area in particular.

**Critical Factors:**
- Congestion due to private cars and parking
- Air and noise Pollution
- Road accidents

**Areas:**
- Environment (sustainable accessibility)
- Mobility (wide accessibility)
- Safety (protect “weak” road users)

**PGTU - Urban Traffic Plan**
(Approved by the Municipality of Bologna Council in June 2007)

- Reduces air and noise pollution
- Improves Road Safety
- Encourages more eco-compatible vehicles
- Increases public transports
- Saves energy in the transports sector
- Achieves widely-available but sustainable access
SIRIO: Enforcement system for access in LTZ - Launched in Feb. 2005

- LTZ Area: 3.2 km² (around the 80% of the city centre)
- Restrictions from 7 AM to 8 PM (since May ‘12: restrictions active every days)
- LTZ Access control: 9 gates monitored by cameras
- Number of LTZ Access Authorisations: around 60,000
- The system automatically generates fines for transgressors

![LTZ area map](image)
RITA: Enforcement system for access to bus lanes and “T” and “U” Areas

- Access control to the “T” Area (3 main central roads) : 3 gates
- Access control to bus lanes : 16 gates
- Access control to the “U” Area (university zone) : 2 gates
- Control of cars and motorbikes
- Restrictions are effective 24h a day every day
- The system automatically generates fines for transgressors
TRAFFIC ACCESS CONTROL: UNIVERSITY AREA

UNIVERSITY AREA
~53,000 MQ
access rules
- 2 cameras and some electronic pillars
- semi pedestrian area hh0-24
- enforcement system for motorbikes too
- access authorisation only for residents and freight operators
- free access ticket for guests...
TRAFFIC ACCESS CONTROL: UNIVERSITY AREA

- 2 cameras and some electronic pillars
- semi pedestrian area hh0-24
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- free access ticket for guests...
TRAFFIC ACCESS CONTROL

SIRIO e RITA

**SIRIO** - 9 gates in LTZ

**RITA** - 3 gates in “T” area

**RITA** - 16 gates to control bus lanes

**UNIVERSITY “U” AREA**
2 gates to control semi pedestrian area
LTZ “pay-to-access” ticket
Tickets have been introduced to allow people, not otherwise entitled, to occasionally access the LTZ area.
Features:
• daily ticket (5 €)
• 4-Days ticket. Valid for 4 consecutive days (12 €)
Limits: Each month, only 3 daily tickets (or just one 4-Days ticket) for vehicle.
“PAY-TO-ACCESS” TICKET

1 - Validation of the ticket
2 - Text secret code and car plate number, via SMS, WEB, CALL CENTER
3 - SIRIO authorisation released

Access trend

Tickets used: about 125 per day

the system assures flexibility without increase too much accesses in the LTZ
- 25% of unauthorised cars in LTZ
- 30% in the 3 main roads in the centre
- 70% of unauthorised vehicles in “U” area
- 70% of unauthorised cars in PT dedicated lanes

Beside such successful results in terms of traffic indicators, the LTZ control access has allowed the city Administration to carry out an ambitious strategy to improve livableness of the city centre.
CISIUM is an integrated platform in a distributed environment to manage and integrate a set of instruments for traffic planning, control and monitoring.
Based on Utopia software, CISIUM platform integrates: georeferencing tools (cartography), models of traffic prediction, event management and a Travel Planner tool

Main functionalities:
- Centralised traffic light control (sensors and traffic light equipment)
- Integration with the Limited Traffic Zones/bus lanes control gates
- Integration with the real time bus control centre for bus prioritisation
- 47 Variable Message Signs
- Real Time Traffic Information on web, sms, email, satellite GPS car navigator systems

Main benefits:
- Real time traffic monitoring
- Powerful tool for traffic planning
- Real time information for road users
The Utopia System for traffic light regulation

- 180 intersections controlled UTOPIA Urban Traffic Control System
- About 1,000 inductive loops
- Dynamic phase optimisation
- Analyse and diagnostic tools
- Prioritisation of bus
ITS IN BOLOGNA: CISIUM

Level service of streets and traffic monitoring in real time

- Speed Factor (SF): to indicate the average speed available for a single road segment.
- Congestion Index (CI): to indicate the level of congestion of a whole road graph (i.e.: a row of road segments); different road graph will be typified in the road network map using different colours to show the different CI.

Data Source:
- Inductive loops at traffic lights
- Bus fleet (GPS connection to detect vehicles speed in real time)
- 5 equipped vehicles going around (in different days and time)

real-time image of road events and roads’ level of service

real-time information available also within Google Maps
ITS IN BOLOGNA: CISIUM

Real time traffic

Cisium elaborate:
Traffic lights data
Bus travel times

traffic congestion level
Manual data entry
• accidents
• public works
• traffic deviations
communication to users
- SMS
- E-Mail
- VMS

automatic information:
- traffic level
Travel planner integrates P&R services, bus and private traffic prediction:

- Cars, bicycle or walking: it takes into consideration restricted area limitations
- Bus: bus lines, timetables, orari, travel times and walking distance
- Park and Ride: nearest parking lots and their connection to PT
ITS IN BOLOGNA: CISIUM

Video Message Signs Network

- 47 VMS in the urban and metropolitan area
- Information about traffic rules, events
ITS IN BOLOGNA: Variable Message Signs

9 VMS - LTZ
3 VMS - T Area
2 VMS - U area
ITS IN BOLOGNA: Variable Message Signs

U Area

Via Belmeloro

Via Bertoloni
ITS IN BOLOGNA: Variable Message Signs

LTZ

Via Riva di Reno

Via Santo Stefano
ITS IN BOLOGNA: Variable Message Signs

Date and time
Time radio signal

Traffic Info

ZTL

Zona Universitá
ITS IN BOLOGNA: Variable Message Signs

15 VMS for Parking Info
7 Car Park connected to the centre
ITS IN BOLOGNA: Electronic Pillars

- 8 controlled pedestrian areas
- 23 electronic pillars
- 29,000 m² in the inner city
Planning to regulate and improve freight distribution in Bologna

- 2005 - Air Quality Plan: introduction of Intelligent Transportation Systems ITS for automatic enforcement
- 2006 - City Freight Delivery Plan
- 2007 - Urban Traffic Plan
- 2008/2009 - “Van Sharing” Project and European Community financed project (Civitas Mimosa and Smartfreight)

The topic of freight distribution in the city has been approached using to advantage the synergy and integration between Intelligent Transportation Systems (for traffic monitoring and management) introduced by the Air Quality Plan and the road pricing policy introduced by the City Freight Delivery Plan.
67% of the trips with saturation < 25%
only 12% of the trips with saturation > 50%
own account operators (i.e. small operators) have a lower delivery rate
than third party operators (i.e. large companies)
own account operators do not have the economic power to invest in
physical big structures (as large companies have) “just in time” modality,
no co-ordination and inefficiency

slots often already taken by other vehicles (mainly other lorries)
slots not present/too far
The City Freight Delivery Plan (launched on 2006)

Goals:
- Optimisation of access in LTZ
- better organisation of the distribution processes in the urban area
- Conversion toward less pollutant vehicles
- Promoting joining process between small operators and optimising load/upload process
- Optimising road and parking slot occupation

Actions for freight operators - 2 phases:

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
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| Phase 1 | Pricing policies implementation  
Access rules depending on pollution category |
| | Implemented |
| Phase 2 | Access rules refinement  
Van Sharing Project |
| | Implementation in progress |
Information Communication Technology system (ICT) for freight distribution in urban areas

- Coordinate freight distribution operations within a city and develop new traffic management measures towards individual freight vehicles through:
  - open ICT services;
  - on-board equipment;
  - integrated wireless communication infrastructure
- Improve the interoperability between traffic management and freight distribution systems
LTZ access has initially based on an authorising/enforcing system: the support of ITS (SIRIO and RITA systems) has also allowed the deployment of pricing policies for the LTZ.

1. Payment of yearly freight delivery permits
The permits, which were previously released for free and with no time limit to all operators, have been issued under the payment of a yearly subscription, which varies in relation to the pollution category of the vehicle (i.e. Euro category), and with a validity of 2 years.
Prices: from 25 € to 300 € per year

2. LTZ “pay-to-access” ticket
Tickets have been introduced to allow people, not otherwise entitled, to occasionally access the LTZ area.
Features:
• daily ticket (5 €)
• 4-Days ticket. Valid for 4 consecutive days (12 €)
Limits: Each month, only 3 daily tickets (or just one 4-Days ticket) can be used for the same vehicle.

![Graph showing ticket usage]

Tickets used: about 125 per day
the system assures flexibility without increase too much accesses in the LTZ
Phase 1 - first results

- Reduction of LTZ access permits delivered:

**BEFORE PRICING POLICIES:**

- 66,000 TOTAL PERMITS AT 31/07/06
- 22,710 DELIVERY PERMITS
- \( = \) 30,000 DELIVERY VEHICLES

**AFTER PRICING POLICIES:**

- 60,000 TOTAL PERMITS AT 26/10/06 (\(-10\%\))
- 16,671 DELIVERY PERMITS (\(-27\%\))
- \( = \) 21,535 DELIVERY VEHICLES (\(-28\%\))

- CNG/LPG/Electric lorries, before almost non existent, raised considerably (today about 5\%) and good results also for conversion toward Euro vehicles.
From 2006 the access to the inner city (“T” area), controlled by enforcing cameras, has been modulated on temporal windows depending on the pollution category of the vehicles:

- 3.5 hours/day for non-Euro vehicles
- 7.5 hours/day for Euro vehicles
- 9.5 hours/day for CNG*/LPG*/Electric vehicles

*Compressed Natural Gas
*Liquefied Petroleum Gas

From 2008 the same rules are extended to the University “U” Area as well
Phase 2a. Access rules refinement

Improvement of the access rules in the "T" and "U" area and extension of the same policy to the entire Limited Traffic Zone, taking into account the pollution level of the freight vehicles.

**AREA “T” e AREA “U”**

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<td>AREA “T” e AREA “U”</td>
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<tr>
<td>Veicoli metano/GPL - contrassegni DSV, DSG, DSI, F</td>
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<tr>
<td>Veicoli ECO - contrassegni DSV, DSG, DSI, F</td>
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<tr>
<td>Veicoli NON ECO - DSV, DSG, DSI, F</td>
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<tr>
<td>contrassegno A</td>
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<td>ZEV</td>
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**Attuazione Piano Merci**

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<th>AREA “T” e AREA “U”</th>
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<tr>
<td>29.00 - 6.00</td>
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<tr>
<td>Veicoli metano/GPL - contrassegni DSV, DSG, DSI, F</td>
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<td>Veicoli ECO - contrassegni DSV, DSG, DSI, F</td>
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Phase 2a. Access rules refinement

Improvement of the access rules in the “T” and “U” area and extension of the same policy to the entire Limited Traffic Zone, taking into account the pollution level of the freight vehicles.

### ZTL

#### Stato attuale

| Area ZTL                  | 7:00-7:30 | 7:30-8:00 | 8:00-8:30 | 8:30-9:00 | 9:00-9:30 | 9:30-10:00 | 10:00-10:30 | 10:30-11:00 | 11:00-11:30 | 11:30-12:00 | 12:00-12:30 | 12:30-13:00 | 13:00-13:30 | 13:30-14:00 | 14:00-14:30 | 14:30-15:00 | 15:00-15:30 | 15:30-16:00 | 16:00-16:30 | 16:30-17:00 | 17:00-17:30 | 17:30-18:00 | 18:00-18:30 | 18:30-19:00 | 19:00-19:30 | 19:30-20:00 |
|---------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Veicoli metano/GPL1GEV - contrassegni A, DSV, DSG, DSI, F |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Veicoli ECO - contrassegni A, DSV, DSG, DSI, F           |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Veicoli NON ECO - contrassegni A, DSV, DSG, DSI, F       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

#### Attuazione Piano Merci

| Area ZTL                  | 7:00-7:30 | 7:30-8:00 | 8:00-8:30 | 8:30-9:00 | 9:00-9:30 | 9:30-10:00 | 10:00-10:30 | 10:30-11:00 | 11:00-11:30 | 11:30-12:00 | 12:00-12:30 | 12:30-13:00 | 13:00-13:30 | 13:30-14:00 | 14:00-14:30 | 14:30-15:00 | 15:00-15:30 | 15:30-16:00 | 16:00-16:30 | 16:30-17:00 | 17:00-17:30 | 17:30-18:00 | 18:00-18:30 | 18:30-19:00 | 19:00-19:30 | 19:30-20:00 |
|---------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Veicoli metano/GPL1GEV - contrassegni A, DSV, DSG, DSI, F |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Veicoli ECO - contrassegni DSV, DS |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Veicoli ECO - contrassegni A, DSG, F |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Veicoli NON ECO - contrassegni A, DSV, DSG, DSI, F |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
Phase 2b. Van Sharing Project (in progress)

Actions for freight operators

- made on a technological platform
- based on conceptual (virtual) unified centre
- physically distributed architecture
- new consortium of small operators

Features:
- Trip programming and connection to real time Traffic Control Centre via On Board Equipment
- Advanced Vehicle Monitoring for a fleet network
- Rationalisation of load/unload procedures
- At least 30 vehicles fuelled by CNG
- Parking area and transit point (“physical” deposit)
- Reserved parking slot remote booking and enforcement

Route Planning, Loading Factor Optimisation, Park Booking
RFID devices are installed on vehicles for ID
- Hardware recognition system at each bay (based on reservations)
- RFID of vehicle confirms that use of bay is authorized

Phase 2b. Bookable loading bay system (in progress)
ITS IN BOLOGNA: FREIGHT DISTRIBUTION - VAN SHARING

Traffic Control Centre (CISIUM)
- Traffic data
  - Events
- Retailers requirements
- Cartographic data
- Parking booking

Smartfreight system (Van Sharing platform)

Delivery Plans
SCOUT: innovative mobile cameras - such device consists of a camera suitable to detect illegal parking and to support enforcement activity by Municipal Police officers.

The process consists of:
- taking a photo of the car illegally parked (e.g.: in double row on bus lanes)
- automatic number plate recognition and fine process activation since the photo detection
- a GPS/Galileo satellite application on board can provide the exact position of the vehicle in order to avoid dispute when the fine has been issued

Objective:
- reduction of illegal on street parking
- improve Public Transport service

Photos taken with SCOUT device
Enforcement activity runs in two main bus lanes crossing the city center

First results obtained:
- “Number of fines” --> -68% of fines comparing 2010 to 2008: citizens presently know and accept this kind of enforcement and consequently have changed non-correct behaviours
- “Accuracy of PT timekeeping” --> first positive results on PT regularity after SCOUT implementation
ITS IN BOLOGNA: STARS

STARS: automated enforcement of traffic lights - enforcement activity to automatically fine transgressors.

Camera take photos of vehicles passing junction when traffic light is red, photos are sent to Municipal Police Department where agents check and validate them and fines are automatically sent to transgressors.

16 crossroads are now equipped with stations for cameras to control traffic lights respect.

Objective: accidents reductions at crossroads.

Results obtained:
- on junctions equipped with STARS road accidents and injuries have reduced of about -45%
- very low legal complains (unlike the Italian scenario)
ITS IN BOLOGNA: New Technologies

**Speed measurement devices** for vehicle speed violation detection
Vehicle activated signs that illuminate to indicate to a driver that they are exceeding the speed limit

**New STARS**: 10 New photo Enforcement systems for Red Light

**Autovelox**: 4 fixed speed enforcement devices
Implementation of these measures (and others) has been made possible also by EU funded projects.

The Municipality of Bologna intends to continue the work for sustainable mobility and to make local movements more environmental-friendly. Actually the city is strongly committed in Local Public Transport improvement. Today an ambitious Plan for “A city center again” is running to strongly reduce personal car use and related traffic congestion, air and noise pollution. The city centre is being interested by many measures and interventions to favour cycling and walking, in collaboration with citizens and stakeholders involved in a public consultation phase (from Dec.’11 to March’12) First steps have been already implemented (e.g.: T-Days as a stable measure).

Regional, National and European support will be decisive to fulfil the strategy for the future implementations and make the city of Bologna a greener and smarter city.
BOLOGNA: Urban Mobility Policies

- 20 new RITA cameras
- 9 new SIRIO cameras
- 11 new cameras for semipedestrian areas
- LTZ enlargement via the relocation of 4 SIRIO cameras
Access restricted
Understanding Transport Demand Management
25 March 2014

Thank you

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