



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA  
DIPARTIMENTO DI INGEGNERIA CIVILE,  
CHIMICA, AMBIENTALE E DEI MATERIALI

PROFESSIONAL MASTER'S PROGRAMME 2ND LEVEL

SUSTAINABLE AND INTEGRATED MOBILITY IN URBAN REGIONS

# ACTIONS AND POLICIES FOR SUSTAINABLE AND INNOVATIVE MOBILITY

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*Sustainable Mobility and Infrastructure Sector  
Bologna Municipality*

*Bologna 28/11/2019*

# SUMMARY

● **PLANNING TOOLS:** PUMS + PGTU + Implementation sector plans

● **PUMS+PGTU:** Strategies and medium/short-term actions

● **ACTIONS:**

**Access regulation:** current situation and tools

→ ENVIRONMENTAL ZTL: PUMS scenario

→ GREEN AREA: PUMS scenario

**Shared space**

→ PEDESTRIAN AREAs: PUMS scenario

→ ZONE "30": PUMS scenario

**Other ITS systems**

**Alternative mobility**

**Mobility manager**

**Logistic: PULS**

# PUMS: STRATEGIES

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- **Urban Development Planning and Sustainable Mobility**
- **Metropolitan Public Transport network**
- **Metropolitan Bikeplan**
- **Road network**

**LONG-TERM  
PROJECTS**

- **Pedestrian mobility and Shared space**
- **Innovative mobility and Incentivizing policies**
- **Mobility Manager**
- **Logistic: PULS**

**MEDIUM-  
SHORT TERM  
ACTIONS**

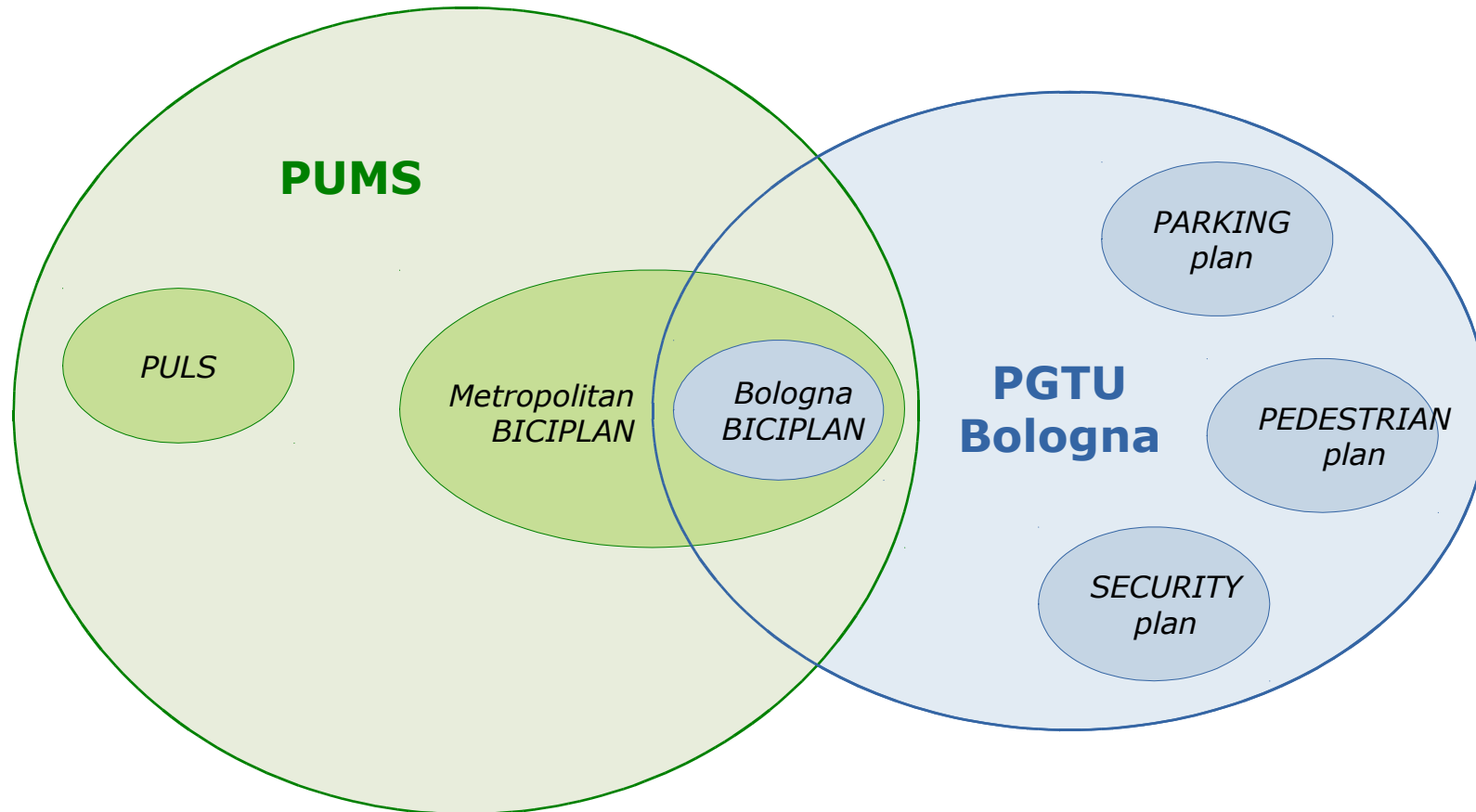
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# PLANNING TOOLS

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**PUMS + PGTU + IMPLEMENTATION SECTOR PLANS**  
are **integrated planning tools** developed at the same time







# MEDIUM-SHORT TERM STRATEGIES

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## TARGETS

-  **Improved circulation and road safety**, with particular attention to the protection of so-called "weak" users (pedestrians, cyclists, people with reduced mobility, etc.);
-  **Reduction of transport costs, energy consumption and, more generally, of expenditure in terms of resources**, with a view to sustainable mobility also from an economic point of view;
-  **Reduction of noise and atmospheric pollution** and redevelopment of the environment and urban spaces, consistent with the existing urban planning instruments.

## STRATEGIES

-  **Pedestrian mobility and Shared space**
-  **Innovative mobility and Incentivizing policies**
-  **Mobility Manager**
-  **Logistic: Sulp**



**MEDIUM-  
SHORT  
TERM  
ACTIONS**



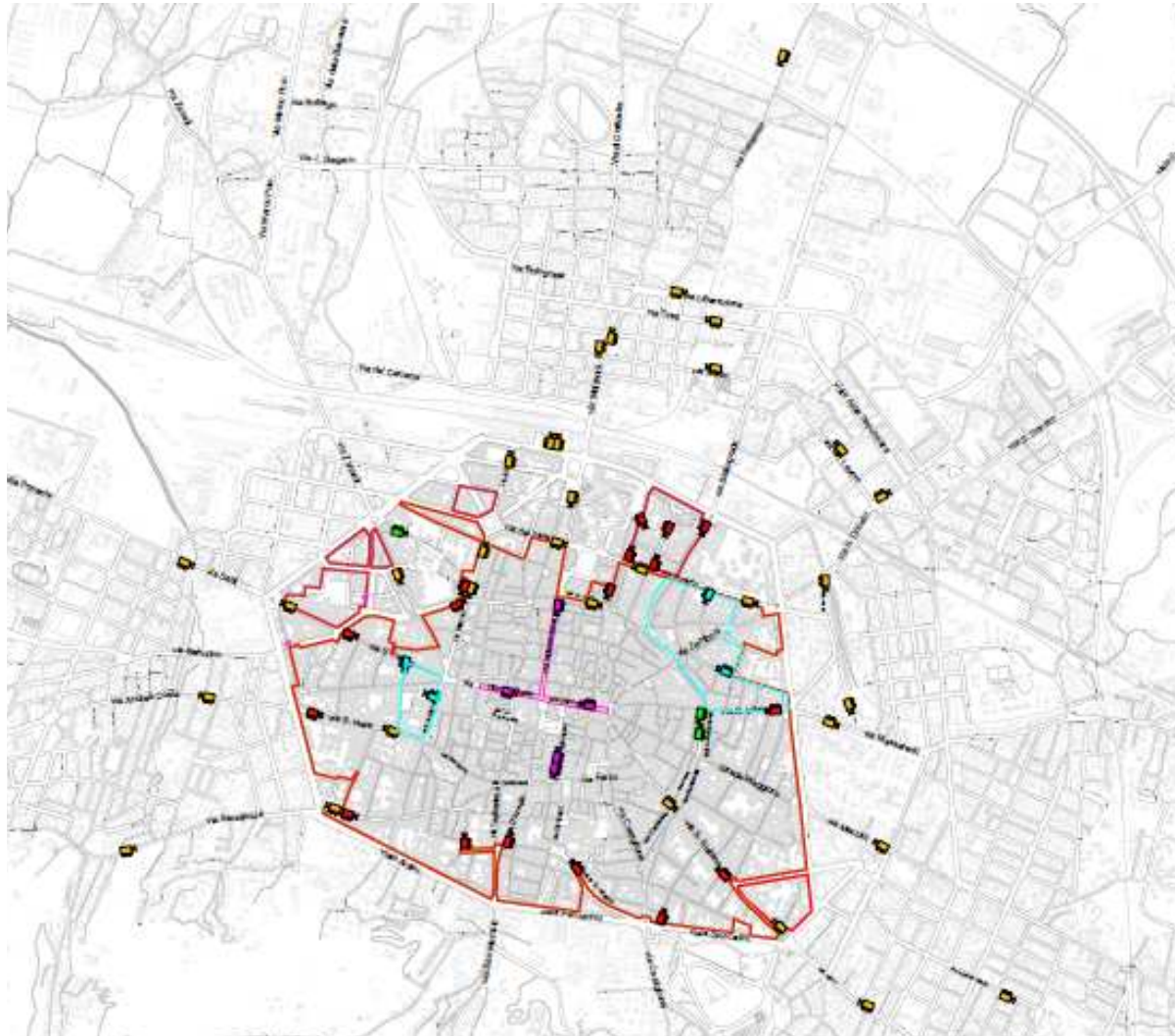
ACTIONS





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# ACCESS REGULATION



# ACCESS REGULATION / CURRENT SITUATION



-  **ZTL (SIRIO)**  
17 gates
-  **Bus Lane (RITA)**  
32 gates
-  **"T" Area (RITA)**  
3 gates
-  **"U" Area (RITA)**  
2 gates

# ACCESS REGULATION / CURRENT SITUATION



Tool:  
**SIRIO**

Launched in **feb. 2005**

Gates monitored: **17**

Ltz area: **3.2 km<sup>2</sup>**

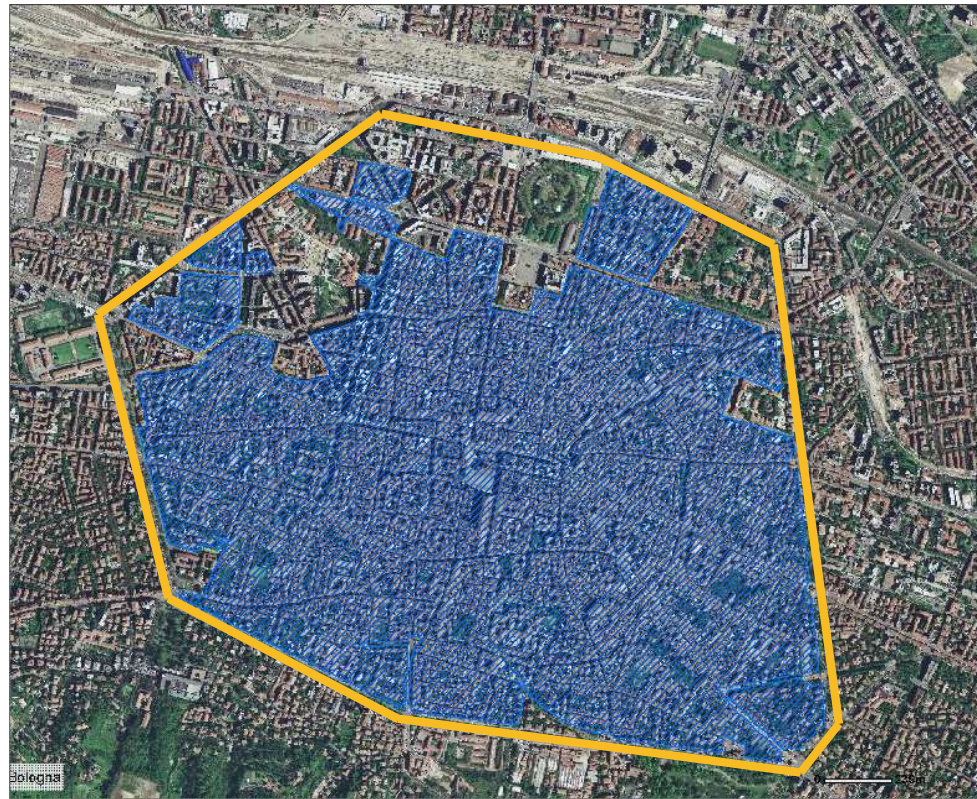
Restriction hours: **7am ÷ 8pm**

N. Authorized access: **~60.000**

**Automatically generated fines**  
for transgressors by the system

Old Town ———

ZTL Area ———





# ACCESS REGULATION / CURRENT SITUATION



Tool:

## RITA

Enforcement system for access to bus lane, "T" and "U" areas

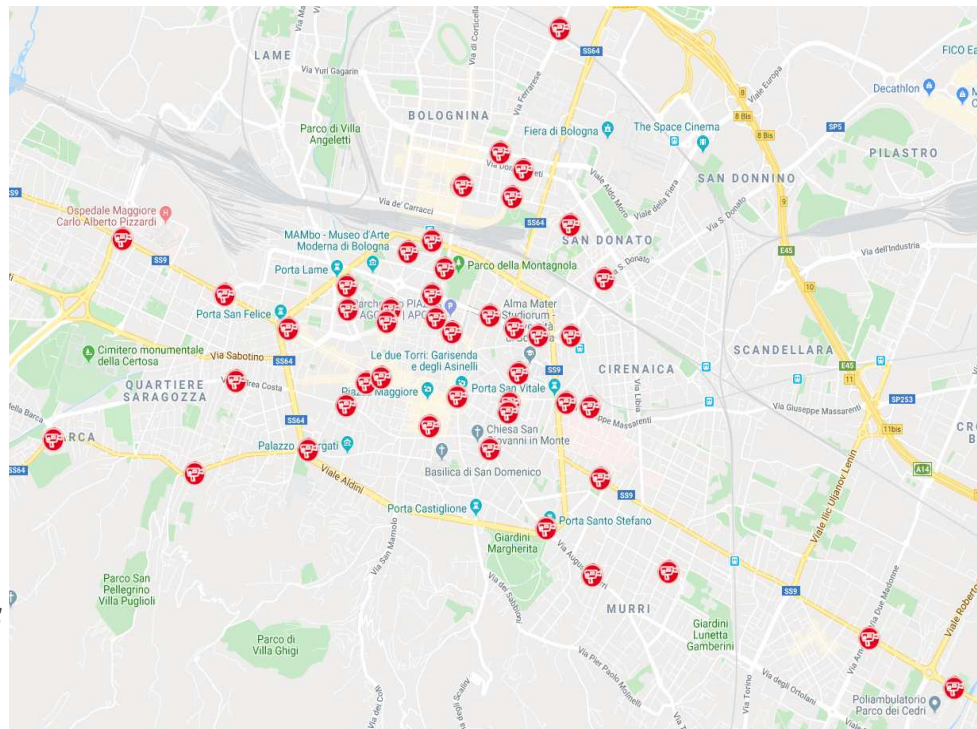
Access control to:

- Bus lanes: **34 gates**
- APU: **5 gates**
- "T" Area: **3 gates**
- "U" Area: **2 gates**
- ZTL San Francesco: **2 gates**

Control of **cars and motorbikes**

Restriction hours: **24/7**

**Automatically generated fines**  
for transgressors by the system



# ACCESS REGULATION / CURRENT SITUATION



Tool:

## AUTHOMATIC PILLAR

Enforcement system for access to pedestrian areas

*N. pillars: 22*

*Pedestrian areas monitored: 9*

*Total area monitored: 29.000 m<sup>2</sup>*

*Access system: keypad code or smartcard contactless (RFID)*

*vibrophonic system for emergency vehicles rapid access*

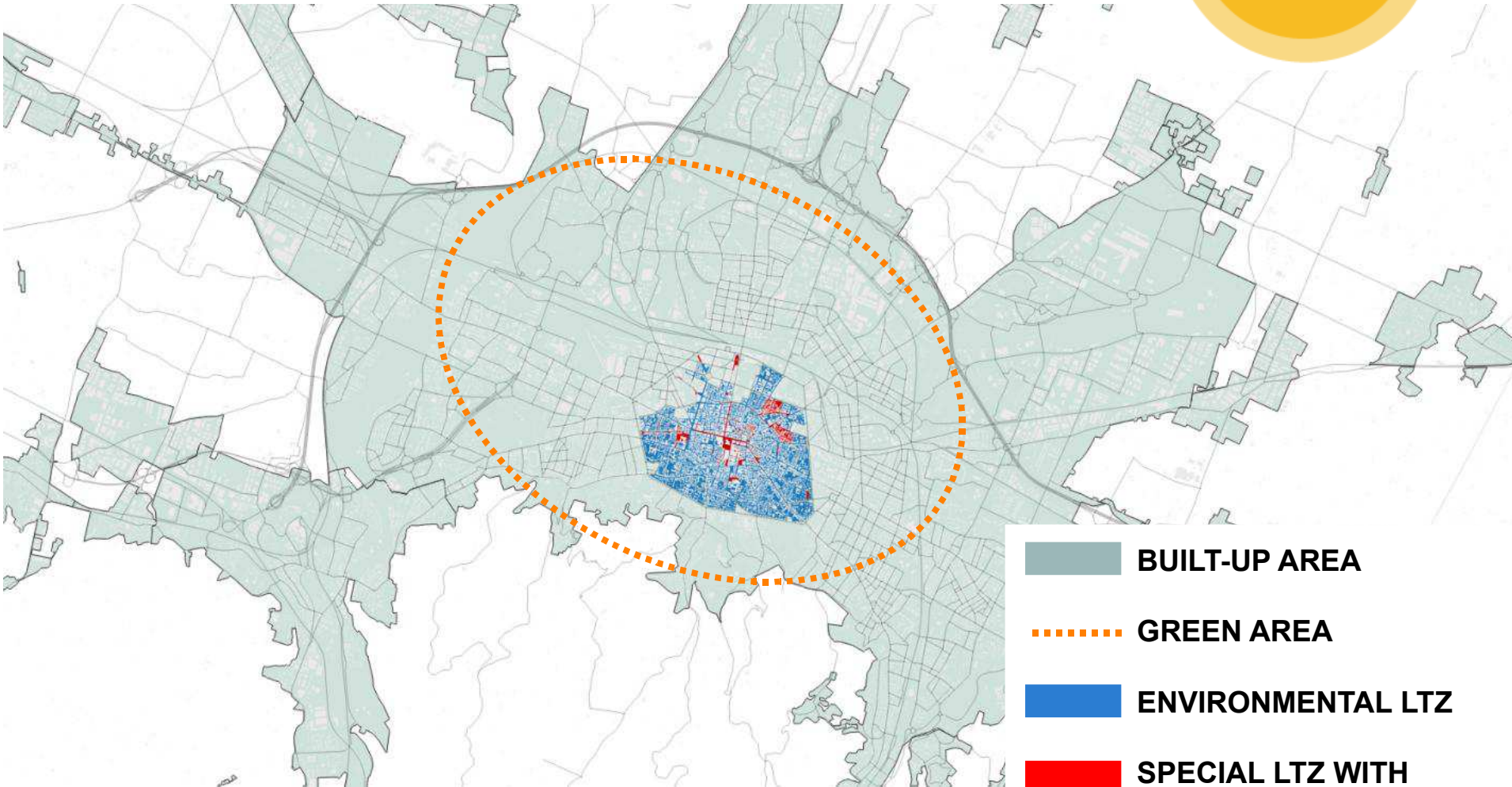
*Restriction hours: 24h working day*

*Remote program/control system*



# ACCESS REGULATION / PUMS SCENARIO

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-  BUILT-UP AREA
  -  GREEN AREA
  -  ENVIRONMENTAL LTZ
  -  SPECIAL LTZ WITH PEDESTRIAN AREAS
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# ACCESS REGULATION

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LIMITED TRAFFIC ZONES



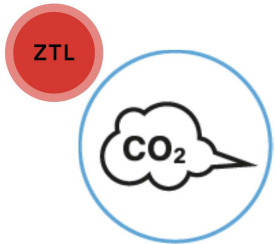


## ENVIRONMENTAL ZTL

*Activation in metropolitan urban centers of **new ZTLs and enhancement of existing ones**, including ZTL Old Town of Bologna*

-  **Environmental criteria:** progressive inhibition of all PAIR rules non-compliant vehicles, including resident's. Release will be denied to non-environmentally sustainable vehicles
-  **Logistics:** introduction and optimization of specific delivery time slots
-  **Moped and motorcycles:** extension of the environmental criteria to these vehicles
-  **Time slot:** validity time slots not lower than the 7-20 range, with possible progressive extension





## Stop polluting vehicles


### **Renewal of the fleet of vehicle**

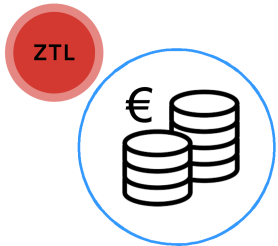
R (resident), Pa (car parking), T (temporary), Ip (public interest), M (doctors), and school guide marks will no longer be issued progressively to these vehicles:

- from 1 January 2020: Euro 0 (diesel, benz, Gpl, metan)
- from 1 January 2021: Euro 1 (diesel, benz, Gpl, metan)
- from 1 January 2022: Euro 2 (diesel, benz)
- from 1 January 2023: Euro 3 (diesel)
- from 1 January 2024: Euro 4 (diesel)
- from 1 January 2025: Euro 5 (diesel)

**NB:** The measures do not relate to the H marks and are excluded all families, residents in the center, with Isee less than 14,000 euros: they will be guaranteed a mark, regardless of the category of the vehicle possessed.

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## Mobility Bonus

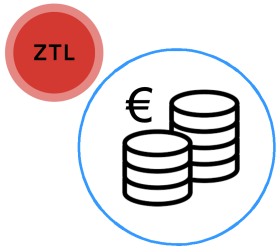
### **Provision of contributions to citizens**

All residents in the historic center, who voluntarily undertake not to request a new access pass to ZTL (R), will be entitled to the sustainable mobility bonus.




The bonus lasts for one year and can take a maximum of two years. The bonus will be provided by Tper with vouchers for **public transport, taxi / NCC, car sharing or bike sharing chosen by the user.**

Furthermore, there are discounted bus passes from the second child onwards for the age group from 14 to 19 years. For those over 70 who are left without a pass for access to the Ztl, a free bus pass is provided for ten years, as an alternative to the mobility bonus.



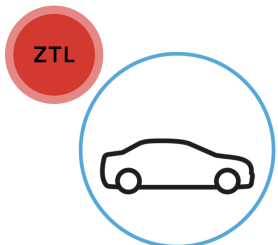


## Bonus 2020

-  **500 €** for families who renounce a R or Pa pass  
(472 in 2020 combined with cars euro 0)
-  **700 €** for families who renounce the only R or Pa pass  
(347 in 2020 combined with cars euro 0)
-  **1,000 €** for families who renounce two R or Pa pass  
(68 in 2020 combined with cars euro 0)







## Residential parking fee

From January 2020 the access pass to the LTZ will be limited to one car per family unit. The access pass also give the right to free parking within their area of residence.

The payment of roadside parking for residents only, with a single fee of 120€ /year, has been established, both from the second car per family unit in the historic center, and from the third car outside the historic center.



# ACCESS REGULATION

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GREEN AREA

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# GREEN AREA / PUMS SCENARIO

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## GREEN AREA

*Activation of a **Green Area** in Bologna city*



**Testing:** new rules developed to limit the access on the entire territory of the town



**Medium/Long term:** progressive extension of environmental control to other areas affected by the measure, starting from those in which public transport services guarantee greater accessibility



ACTIONS

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SHARED SPACE



# SHARED SPACE

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PEDESTRIAN  
ZONES



# PEDESTRIAN AREAS / CURRENT SITUATION

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## **"T DAYS" (Pedestrian area)**

Videomonitorated with RITA – weekend and holiday



## **"UNIVERSITY" ZONE (Bike/pedestrian area)**

Access forbidden to car and motorbike – 24/7



## **"SAN FRANCESCO" (Bike/pedestrian area)**

Access forbidden to car and motorbike – 24/7



## **PIAZZA ALDROVANDI (Pedestrian area)**

Access forbidden to car and motorbike – 24/7



## **AZZO GARDINO ZONE (Pedestrian area)**

Videomonitorated - Access forbidden to car and motorbike – 24/7



## **STADIUM ZONE**

Access forbidden to car and motorbike – Only during event



## **ZONES WITH AUTOMATIC PILLAR**

Only authorized vehicles can access these areas.






- "Quadrilatero"
- "ex Ghetto Ebraico"
- "Altabella"
- "S.Stefano"
- "Montegrappa"
- "Pratello"
- "Falegnami"
- "Moline"



# PEDESTRIAN AREAs

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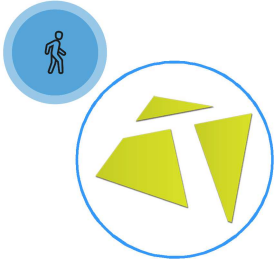


-  **PEDESTRIAN AREAS**
-  **ZTL**
-  **T AREA**
-  **SPECIAL ZTLs**
-  **Tdays  
PEDESTRIAN AREA**



# PEDESTRIAN AREAS / FOCUS

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## T-DAYS

During T-Days the **three main roads** and some other streets at the heart of Bologna's historical centre become a "**pedestrian and cyclists only**" zone.

The streets are **closed to motorized traffic** including buses and taxis.

It take place **every weekend and holidays** (since 2012)





# PEDESTRIAN AREAs / FOCUS



## “University” Area

Semi-pedestrian zone progressively implemented with partial enforced activity

### ACCESS RULES:

- **2 cameras** and **electronic pillars**
- semi pedestrian area **h0-24**
- enforcement system **also for motorbikes**
- access **authorisation only for residents** and freight operators

### RESULTS OBTAINED:

- **cars/motorbikes** traffic: **-70%**
- **bus users** in the area increased: **+25%**
- **on-street parking** availability for residents increased (about **+50%**)
- **respect of new measure**: fines for non authorised access halved
- **pollution decreased**



# PEDESTRIAN AREAS / PUMS SCENARIO

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## NEW PEDESTRIAN AREAS

*Establishment of **new pedestrian areas**, with entry passages regulated by video cameras*



into hystorical center of **Bologna city**



into urban centers of **other municipalities** of metropolitan area

**No more authomatic pillars**



**Installation of new videocameras**



# SHARED SPACE

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ZONE "30"



# ZONE "30" / CURRENT SITUATION

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30



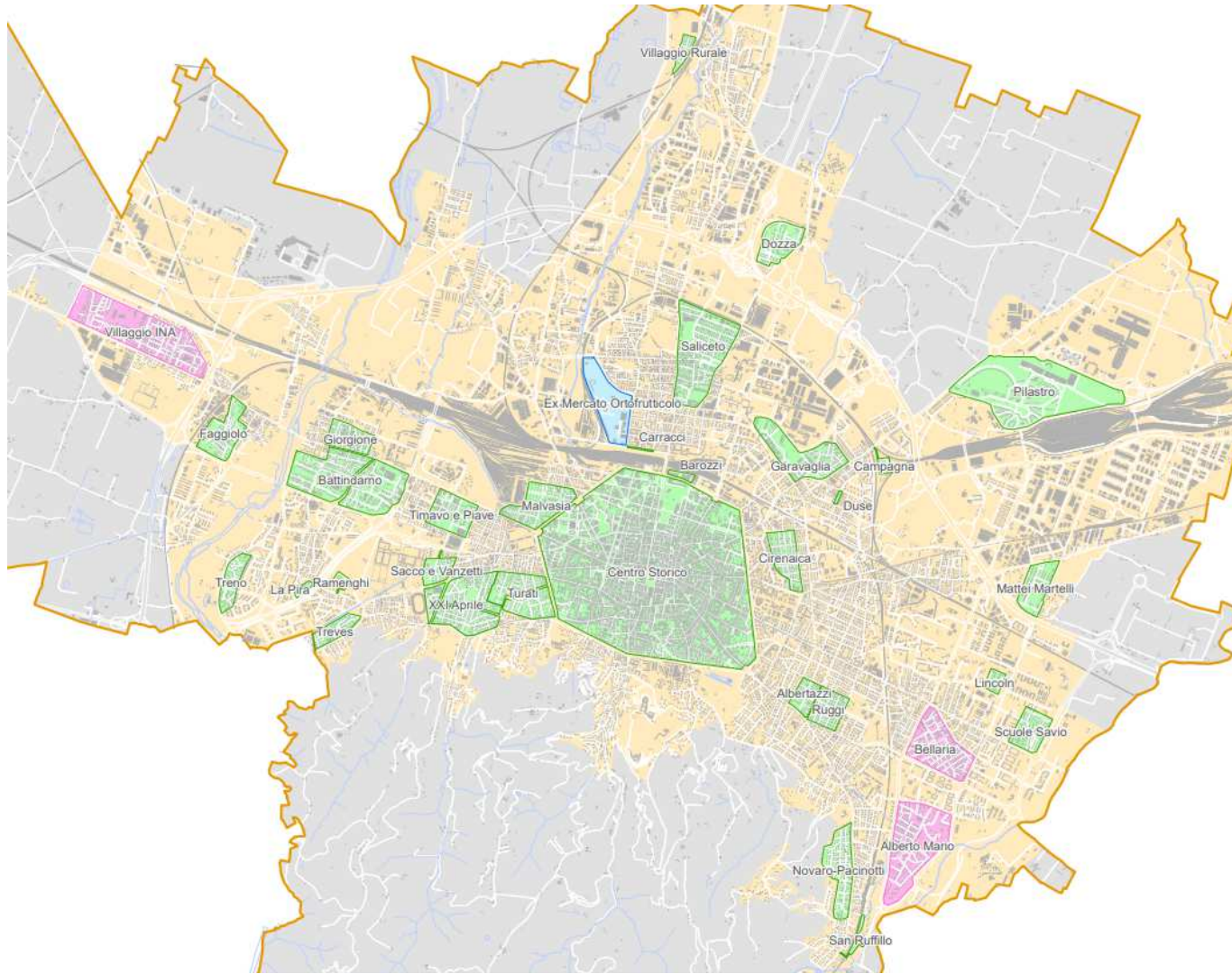
## Zone "30"

"Environmental islands" in which the maximum permitted speed is 30 km/h, characterized by interventions of traffic moderation



# ZONE "30" / CURRENT SITUATION




30





### EVOLUTION TO "CITY 30"

*Expansion and obsolescence of the concept of "Zone 30"*

-  **Maximum speed limit at 30 km/h** (otherwise 50 km/h) in all urban network roads, excluding the ones mainly intended for vehicular transit
-  **Widespread interventions** for traffic moderation and infrastructural rearrangement
-  **Information and awareness actions** for road users



ACTIONS

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**OTHER ITSs**



# ITS SYSTEMS

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## STARS

Remote control system for traffic light infringements

Control of the respect of red light at **26 intersections** identified for their high danger:

- the system is active **only when the traffic light is red**
- the system takes **two photos to check** for infringements
- in the event of **congested traffic**, the system has **special filters** to prevent the reporting of accidental infringements

**-50% average reduction in accidents**  
**-61% average reduction of injured people**





# ITS SYSTEMS

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## SPEED DETECTORS

Speed detection and signaling system

Speed detection and signaling of exceeding the limits allowed in points of the municipal area particularly sensitive for their high danger:

- **29 detectors** installed
- always active detectors **powered by PV panel**
- **the detectors indicate the detected speed on a display;** if the limit is exceeded, the display flashes and changes color

**The aim is to moderate the speed of the vehicles, and in the future can also serve as warning signs for speed cameras**



# ITS SYSTEMS

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## AUTOVELOX

4 Speed detection station to sancion cars when limits are exceeded



**The aim is to moderate vehicle speed and improve traffic safety**



ACTIONS

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# ALTERNATIVE MOBILITY



# ALTERNATIVE MOBILITY



## BIKE SHARING

**Mobike:** bike sharing free floating (normal and electric vehicles)

- **Contracting office:**
  - SRM - Agenzia Mobilità
- **Procurement procedure:**
  - Competitive dialogue
- **Award:**
  - IDRI Bike BK srl
  - Italian company that has developed the «MOBIKE» platform in Italy
- **Service concession and management:**
  - until December 2023



Giugno/settembre 2018

Dicembre 2018

Giugno 2019

2.000 biciclette  
in 90 postazioni  
«Mobike hub»

2.200 biciclette  
in 240 postazioni  
«Mobike hub»

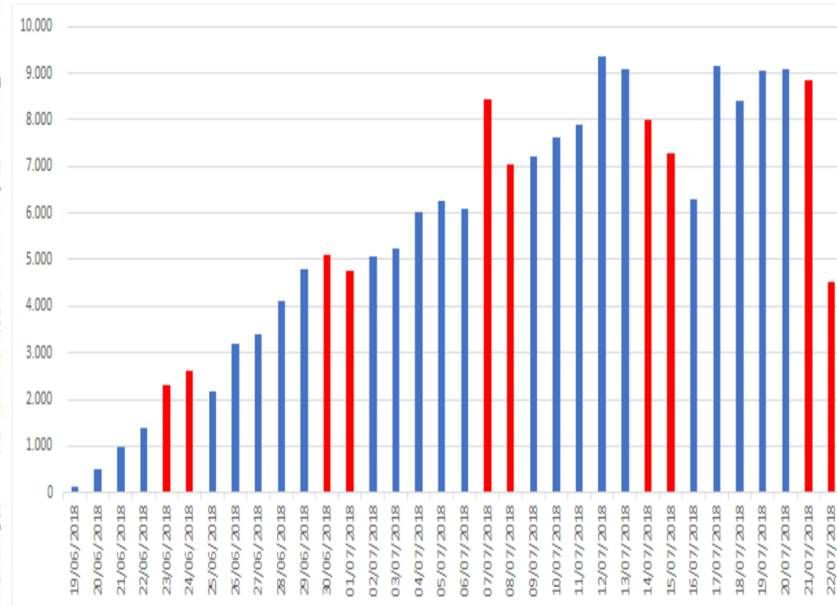
300 biciclette  
a pedalata assistita

# ALTERNATIVE MOBILITY / BIKE SHARING

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Almost 9.000 movements per day  
(Taking maps)

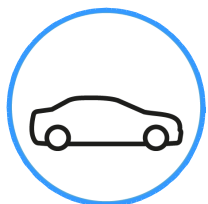


91% of rentals are shorter than half an hour



# ALTERNATIVE MOBILITY

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## CAR SHARING

**Enjoy:** car sharing free floating

**Corrente:** car sharing with electric vehicles

- **Contracting office:**
  - SRM - Agenzia Mobilità
- **Procurement procedure:**
  - public notice aimed at individuals willing to perform the new service according to the rules of the Municipality of Bologna
- **Award:**
  - ENJOY
  - OMNIBUS



# ALTERNATIVE MOBILITY / CAR SHARING

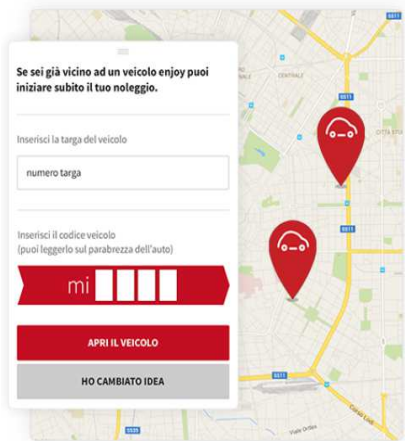


**National operator of the sector** that inaugurated the new car sharing service in Bologna

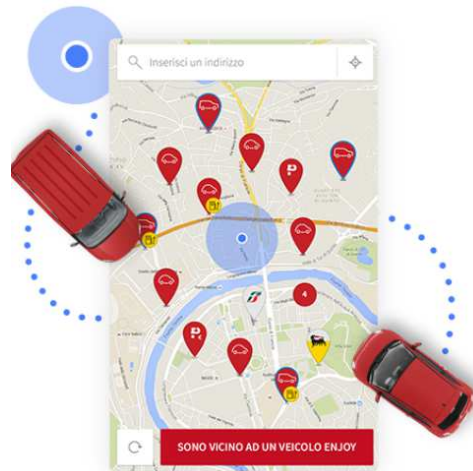
**100 cars** in service

**Enjoy-Trenitalia Partnership**

The service can also be **used in other cities** where ENJOY is present



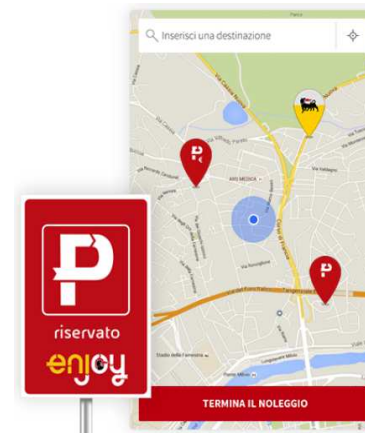
**1**  
Find the  
nearest vehicle



**2**  
reach the vehicle with  
the app integrated GPS



**3**  
Unlock the car  
with your smartphone



**4**  
Easy parking  
everywhere



# ALTERNATIVE MOBILITY / CAR SHARING



**Manager:** Omnibus, a direct consortium company **coordinated by Tper**, the company that manages public transport in the city

**Electric vehicles:** Renault Zoe with 5 seats and a range of over 250 km. 120, initially, to arrive, when fully operational, to 240.

The vehicles available are located in **public areas or in dedicated parking lots** and with a charged battery (recharged by the manager)



Fino a 280 auto  
sempre disponibili



100%  
elettrico



Non paghi  
la sosta



La prendi, la guidi e la lasci  
dove vuoi



Scarichi l'APP  
ti registri e parti subito



Paghi con carta credito  
direttamente dall'APP



Accedi alla ZTL e circoli sulle  
preferenziali



Fino 300 km  
di autonomia

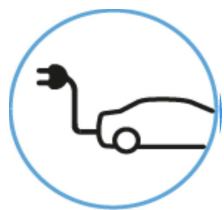


Sempre pronta, pensiamo noi  
a caricarla



# ALTERNATIVE MOBILITY

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## ELECTRIC MOBILITY

### ACTUAL SITUATION - Car float circulating in Bologna

anno	Benzina	Gasolio	Metano	GPL	ibride	elettriche	Altro e n.d.	Totale	Quota ibride+elettriche
2005	147.394	44.862	5.750	6.141			30	204.177	
2006	139.909	46.452	6.546	8.331			37	201.275	
2007	134.087	48.305	7.836	8.987			39	199.254	
2008	125.524	48.672	9.337	13.993			35	197.561	
2009	119.375	49.130	10.843	17.537			34	196.919	
2010	114.730	50.351	11.485	19.887			30	196.483	
2011	113.360	53.691	11.766	19.686			28	198.531	
2012	109.679	55.286	11.909	20.022			44	196.940	
2013	104.557	56.212	12.326	20.316	954	36	13	194.414	0,51%
2014	102.369	59.055	12.866	21.062	1.417	42	13	196.824	0,74%
2015	99.997	62.199	13.275	21.447	1.958	53	13	198.942	1,01%
2016	98.063	65.371	13.365	21.638	2.931	70	12	201.450	1,49%
2017	96.831	69.700	13.461	22.034	4.273	75	12	206.386	2,11%

### ELECTRIC / HYBRID CAR PERMITS - free/partial parking ZTL access

	31/12/16	31/12/17	18/07/18
AUTO ELETTRICHE	213	353	579
AUTO IBRIDE	8930	12408	13628



## ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

- **Existing public recharging points:**
  - 28 columns in 20 locations
- **New agreements with electricity operators:**
  - - **ENEL:** installation of 30 new charging stations
  - - **BE CHARGE:** installation of 30 new charging stations
  - - **ENERNIA:** installation of 5 new charging stations
- **Columns in private areas:**
  - - **PNIRE call** for bids (€ 500,000.00)  
The proposed initiative provides for a municipal contribution for the installation of recharging points in condominiums, parking lots, distributors, companies.



## ELECTRIC MOBILITY PROMOTION THROUGH REGULATION


### **1) Approved measures:**

- Stop issuing Euro 3 diesel and Euro 0-1 petrol from July 2018
- Stop release of Euro 4 diesel operating permits from July 2019
- Restriction to ZTL hybrid cars from May 2018 (not resident in Bologna)
- Parking facilities and electric car accesse

### **2) PUMS/PGTU targets: ZTLA e Area Verde**

Progressive inhibition to vehicles not complying with PAIR standards by gradually denying the issuing of the vehicle identification card environmental classes

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## INCENTIVES FOR THE PURCHASE OF ELECTRIC BICYCLES AND CARGO BIKES


**Funding of € 300,000** from the Ministry of the Environment

The Municipality of Bologna has launched this fourth initiative with **incentives for the purchase of pedal assisted bicycles** (€ 300.00) **and cargo-bike** (€ 600.00).

With the previous four calls since 2011, the **purchase of around 3,000 pedal assisted bicycles** has already been funded.

With this announcement, the purchase of an **additional 968 electric bicycles** was encouraged, characterizing the city of Bologna leader in the diffusion of electric bicycles.

### **Incentive status:**

- Fund completed 7 months after activation
  - The aim of the PGTU is the search for new funds and in any case the continuation of the incentive
- 
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# ALTERNATIVE MOBILITY

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## ELECTRIC MICROMOBILITY

- Adhesion to the **testing of electric scooters** into town center



# MAAS – MOBILITY AS A SERVICE

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## SMART DIGITAL PLATFORM AND APP

- It is essential to help the development of **intelligent platforms** that guarantee the integration between the various innovative transport modes already in place (sharing mobility, electric mobility, smart ticketing, etc.), favoring greater recognition and usability by users towards full realization of the so-called *Mobility as a service*



ACTIONS

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**MOBILITY MANAGER**



# MOBILITY MANAGEMENT

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*Mobility management* is a concept that concerns the **promotion of sustainable mobility** as well as managing the demand for private transport by changing the attitudes and behavior of users.





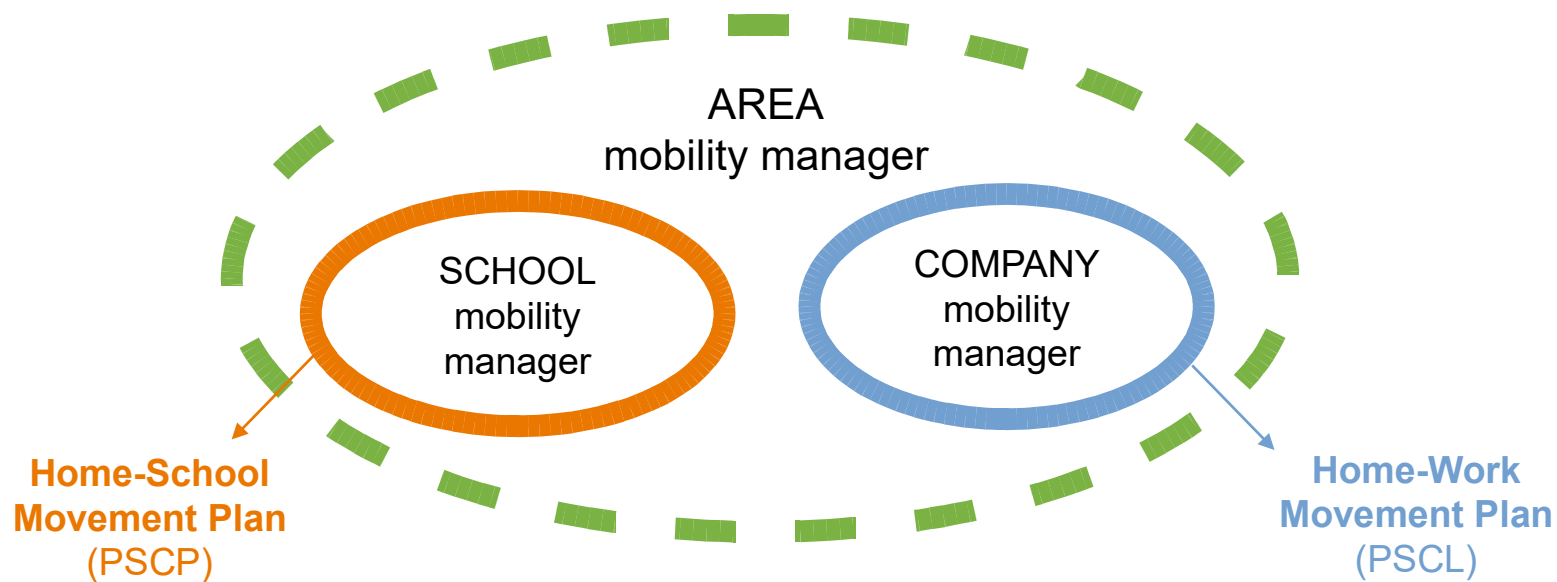
# MOBILITY MANAGER

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**AREA MOBILITY MANAGER** is a figure of **support and coordination** of company mobility managers, established at the Mobility Sector of larger Municipalities or Metropolitan Cities, with territorial competence.

Its duties are:

- **maintaining links** with municipal facilities and local transport companies,
- **promoting** area mobility initiatives,
- **monitoring** the effects of the measures adopted
- **coordinating** the companies' PSCLs.



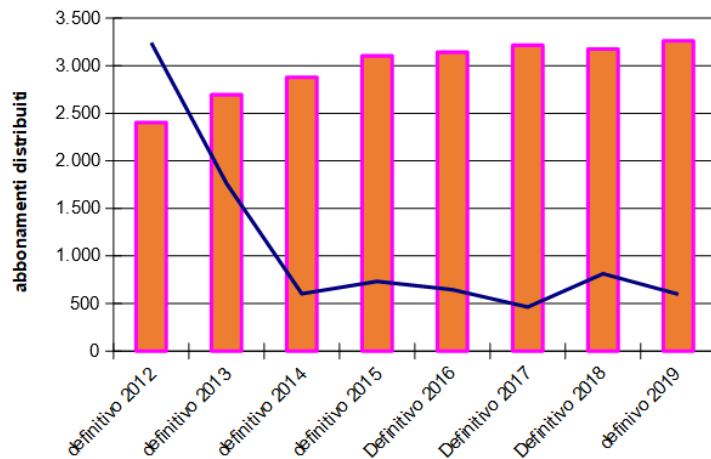
# MOBILITY MANAGER / ACTIONS FOR WORKERS MOBILITY

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## TPL FACILITATION (from 5%+5% → to 15+15%)

Gli abbonamenti "vuoto per pieno", il caso del Comune di Bologna



Convention, with a duration of three years, which provides the commitment of TPER SpA to contribute with a tariff facilitation of 5% of the face value of annual personal season tickets for the entire TPER network (urban, suburban and railway with integration to the urban area), compared to a commitment of the companies of at least 5%.

Recently, with the Council Resolution, the subsidy has been increased from 10% to 30%: with this provision it is believed that it will be possible to involve an audience of 15,000 annual subscribers.



# MOBILITY MANAGER / ACTIONS FOR WORKERS MOBILITY

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## TPL CALL

- **7 companies** (of which 2 new, that is for the first time that they have purchased season tickets in the MM agreement), the maximum assignable contribution is **€ 65.925,58**.
- The call for tenders will be renewed with a contribution of **€ 137,902.65**



## MM CALL

- **7 companies** (of which 3 new), the maximum assignable contribution is **€ 89.746,77** (total project costs **€ 218.423,53**)
  - Bike mobility;
  - IT support and systems for corporate and inter-company car pooling;
  - Development of company sustainable mobility
  - Corporate car sharing facilitation plans
  - Interventions aimed at the diffusion of electric mobility



# MOBILITY MANAGER / ACTIONS FOR STUDENTS MOBILITY

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## SUSTAINABLE MOBILITY HOME-SCHOOL

- **Walking Bus Project**  
"Bologna a scuola si muove sostenibile"
- Home-School safe routes  
and **temporary school island**



## PEDESTRIAN SAFETY

- **Education initiatives** on pedestrian  
Mobility in schools and social centers
- **Guidelines** to ensure efficacy  
and success of pedestrian areas



# MOBILITY MANAGER / ACTIONS FOR STUDENTS MOBILITY

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## SINGLE INTEGRATED TICKET

- SFM (Metropolitan Rail way Service)
- Metrobus BRT – extra urban networks
- Tram



## STUDENTS FREE PASS

- Students resident in Bologna (0-13 years)



ACTIONS

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LOGISTIC: PULS



# LOGISTIC: PULS

## VISION AND OBJECTIVES

A carbon free urban freight distribution by 2030, through actions able to fulfill requirements of freight transport demand, guaranteeing high service level concerning environmental, economic and social sustainability.



### Climate protection

Contribute to climate protection by reducing or eliminating the greenhouse gas emissions (CO2) by 2030.



### Land use

Reduction of road congestion through delivery optimization and adoption of new schemes.



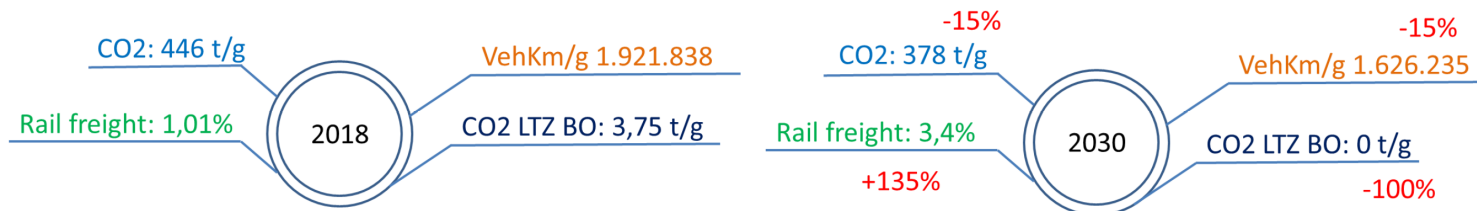
### Development

Development of the logistics market ensuring high levels of service and innovative demand fulfillment.



### Efficiency

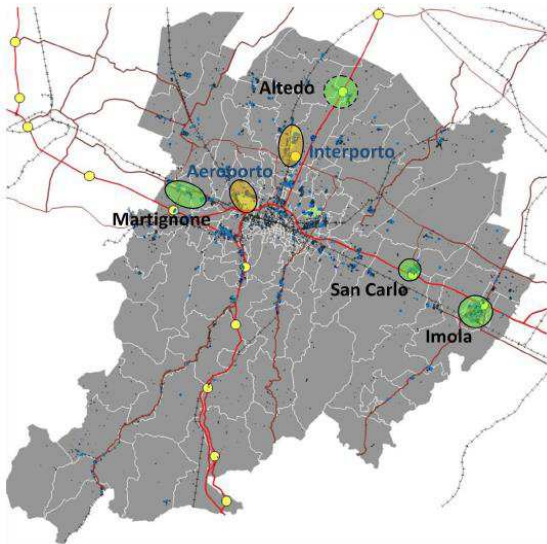
Reduction of logistic sprawl through logistics clustering and localization of companies to achieve precise environmental and social performances.



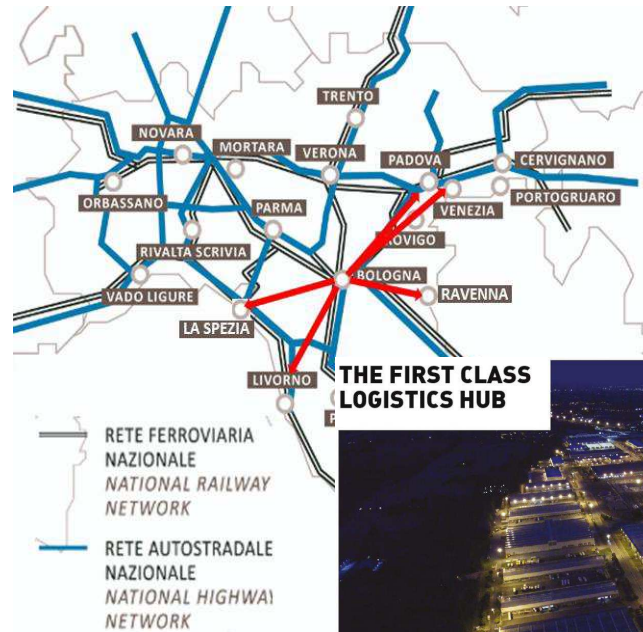
TODAY SUSTAINABLE MOBILITY REPRESENTS THE **40%** OF MOBILITY,  
WHILE THE **60%** IS NOT SUSTAINABLE  
**THE CHALLENGE IS TO COMPLETELY REVERSE THE CURRENT SITUATION OF THE  
TRANSPORT MODES, REACHING**  
**60 vs 40**  
**TOMORROW, WHILE 60% WILL BE REPRESENTED BY SUSTAINABLE MOBILITY,  
WHILE 40% BY NON SUSTAINABLE ONE**

# LOGISTIC: PULS

4 SPECIALIZED LOGISTIC SETTLEMENTS IN DEFINED AREAS OF THE METROPOLITAN AREA



IMPROVE THE ROLE OF INTERPORTO AS THE MOST IMPORTANT LOGISTIC HUB IN OUR TERRITORY FOR RAILWAY FREIGHT TRANSPORT



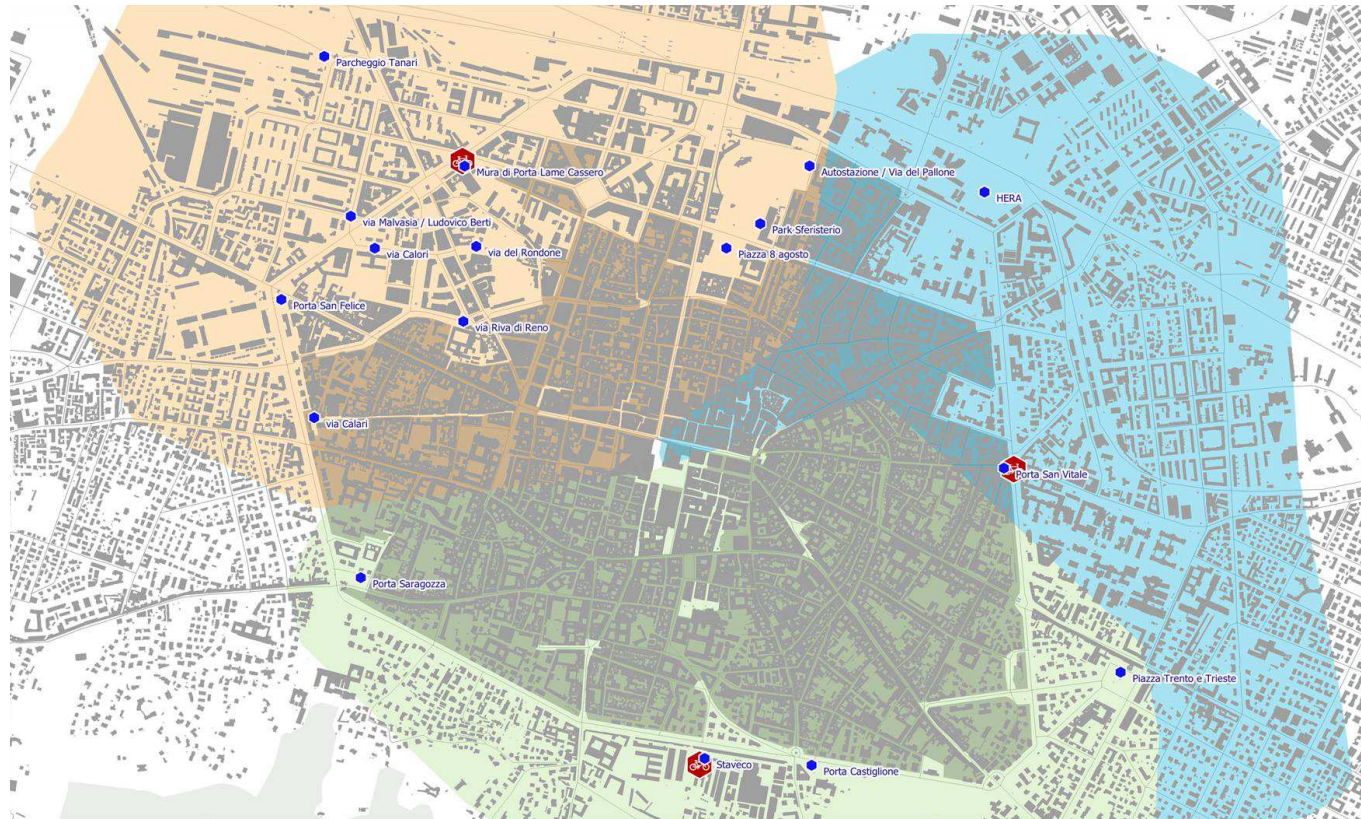


# LOGISTIC: PULS

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## URBAN FREIGHT DELIVERY: HOW TO REDUCE IMPACTS?

REGULATE FREIGHT ACCESS TOWARDS A URBAN DISTRIBUTION TOTALLY CARBON FREE...



# LOGISTIC: SULP

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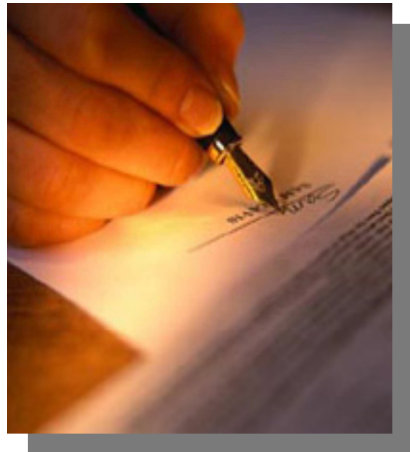
## URBAN FREIGHT DELIVERY: HOW TO REDUCE IMPACTS?



DEVELOPING INNOVATIVE LOW EMISSION MEANS OF TRANSPORT AS CARGO-BIKE IN DYNAMIC LOADING BAYS...



Thank you



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Sustainable Mobility and Infrastructure Sector*

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