
Climate Protection Strategies in Bologna

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COMUNE
DI BOLOGNA



1. KLIMASCHUTZKONFERENZ DER METROPOLREGION NÜRNBERG

EnergieZukunft heute: Städte und Landkreise als Akteure im
Klimaschutz

Contents

- About Bologna
- Integration of climate strategies in Bologna urban planning and building code
- The 2012 Bologna SEAP



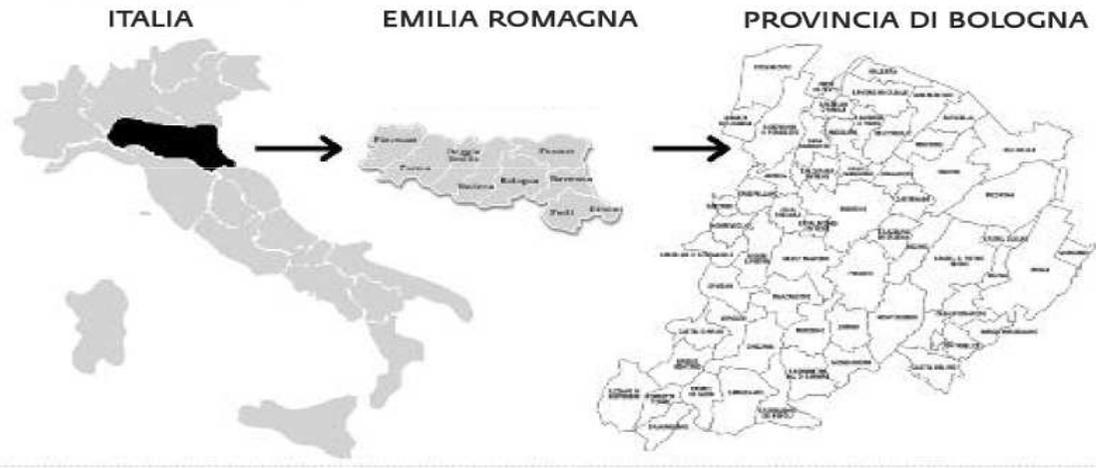
About Bologna



FROM NATIONAL TO LOCAL LEVEL

REGION EMILIA ROMAGNA	PROVINCE BOLOGNA	MUNICIPALITIES 60
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PROVINCIA DI BOLOGNA IS COMPOSED BY 60 MUNICIPALITIES



⑦ **Capital of Emilia-Romagna Region** ⑦ **Crucial railway and motorway junction**

⑦ **Population: 373.592 inhabitants**
(900.000 in metropolitan area)

⑦ Strong presence of **small and medium industry** (Emilian model)

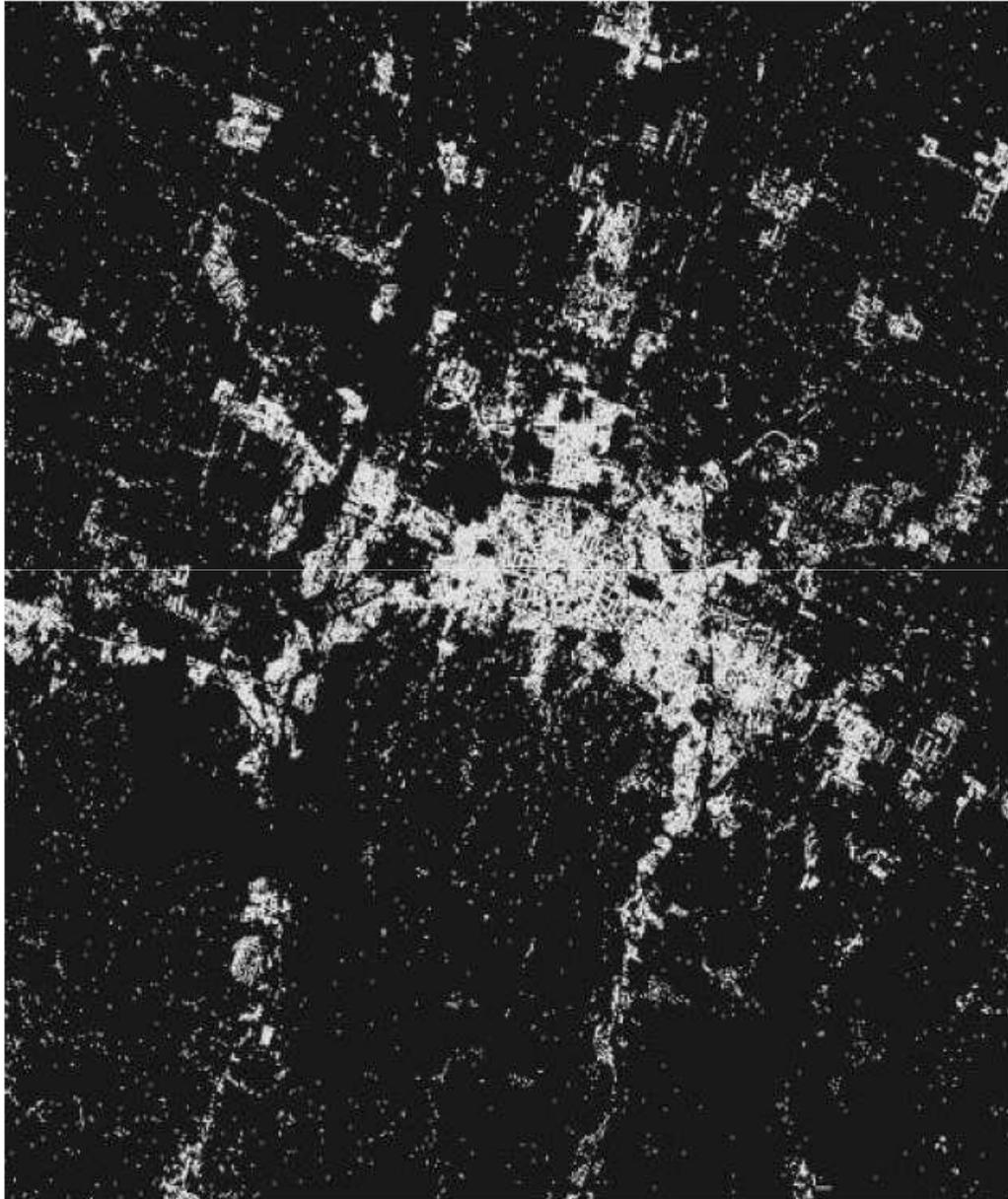
⑦ **Land area: 140,846 Km²**

⑦ **Historical University:** almost 100.000 *students*

An aerial photograph showing a dense network of agricultural fields in various shades of brown, tan, and green. A prominent river winds through the center of the landscape. The overall scene depicts a rural, agricultural region.

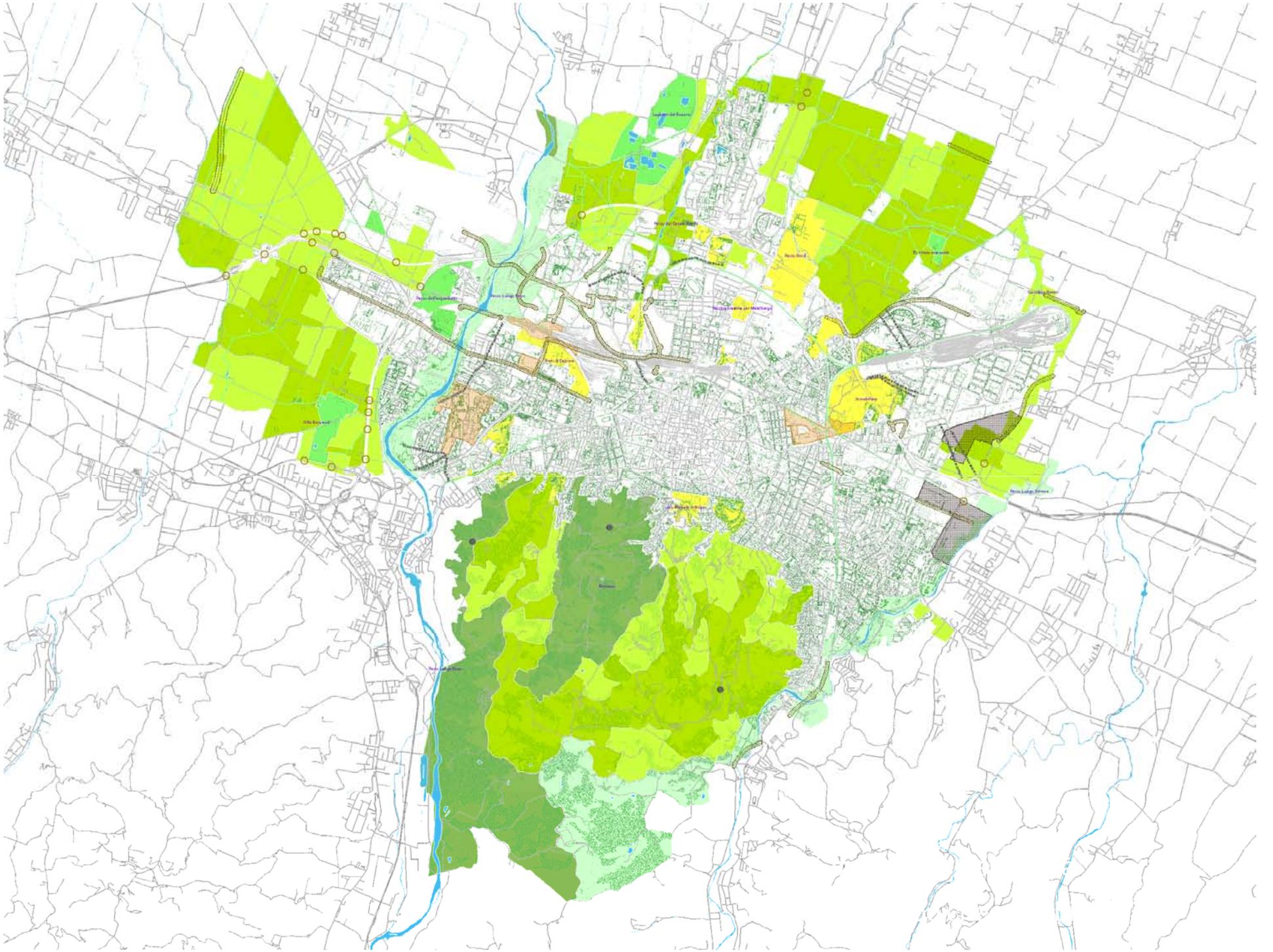
Atlante Booklet

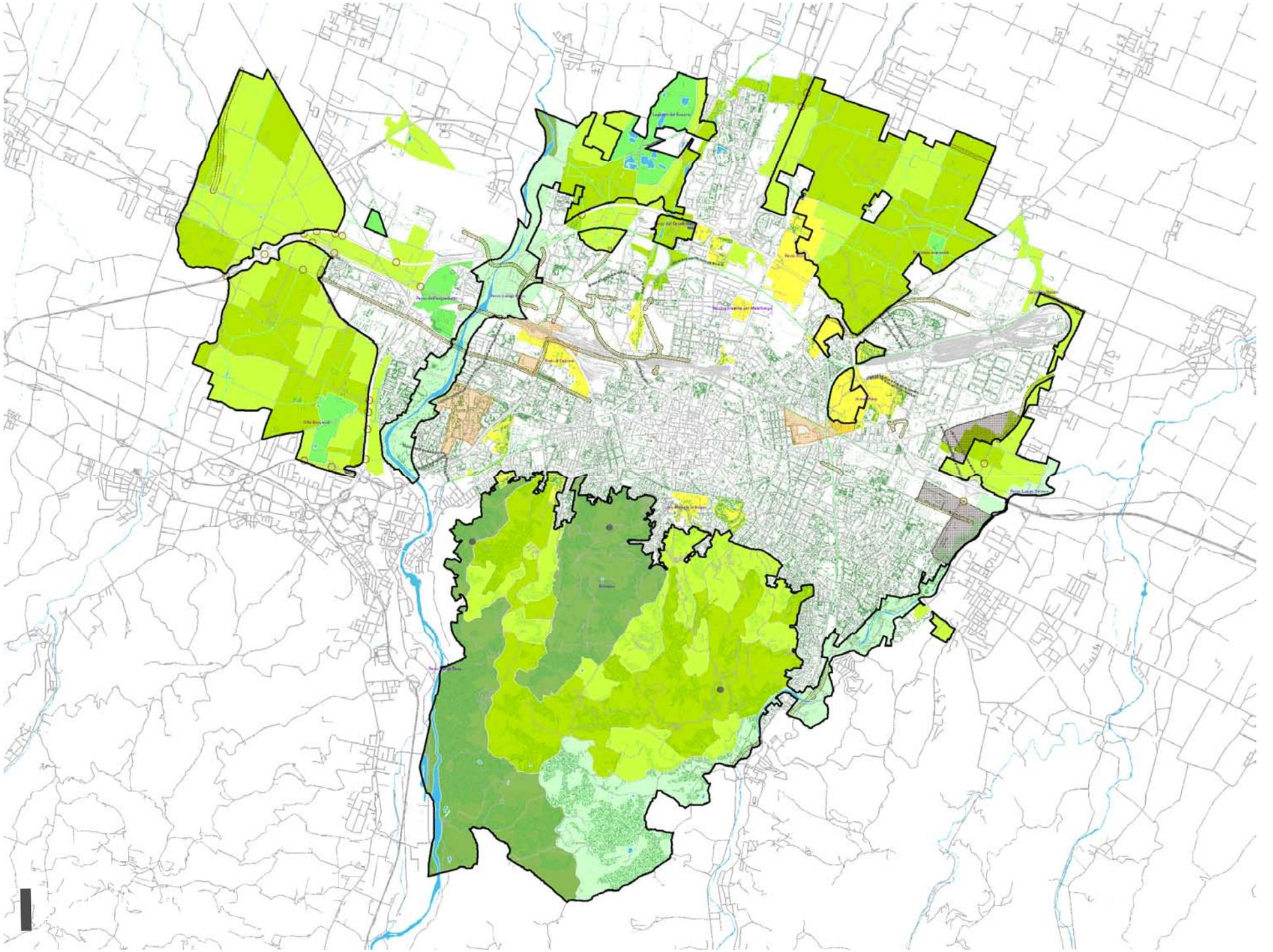
Workshop una nuova alleanza tra città e campagna



La citta' diffusa *The sprawl*

Inhabitants province bologna	984.342 (2009)
Common inhabitants Bologna	377.220 (2009)
Inhabitants in the conurbation bolognese	650.000 (2005)
Inhabitantes expected in 2015	1.000.000 (2005)
Extension of the province	3.700 km
Urbanized area	210 km
Daily trips to and from Bologna	400.000 (2005)
Average daily highway traffic crossing	45% (2005)
Average daily highway traffic exchange	55% (2005)





Adaptation and Integration

Urban Planning

In 2008 the Municipality approved the new **Municipal Structural Plan** (*Piano Strutturale Comunale - PSC*), a planning tool defined by regional laws (L.R. 20/2000).

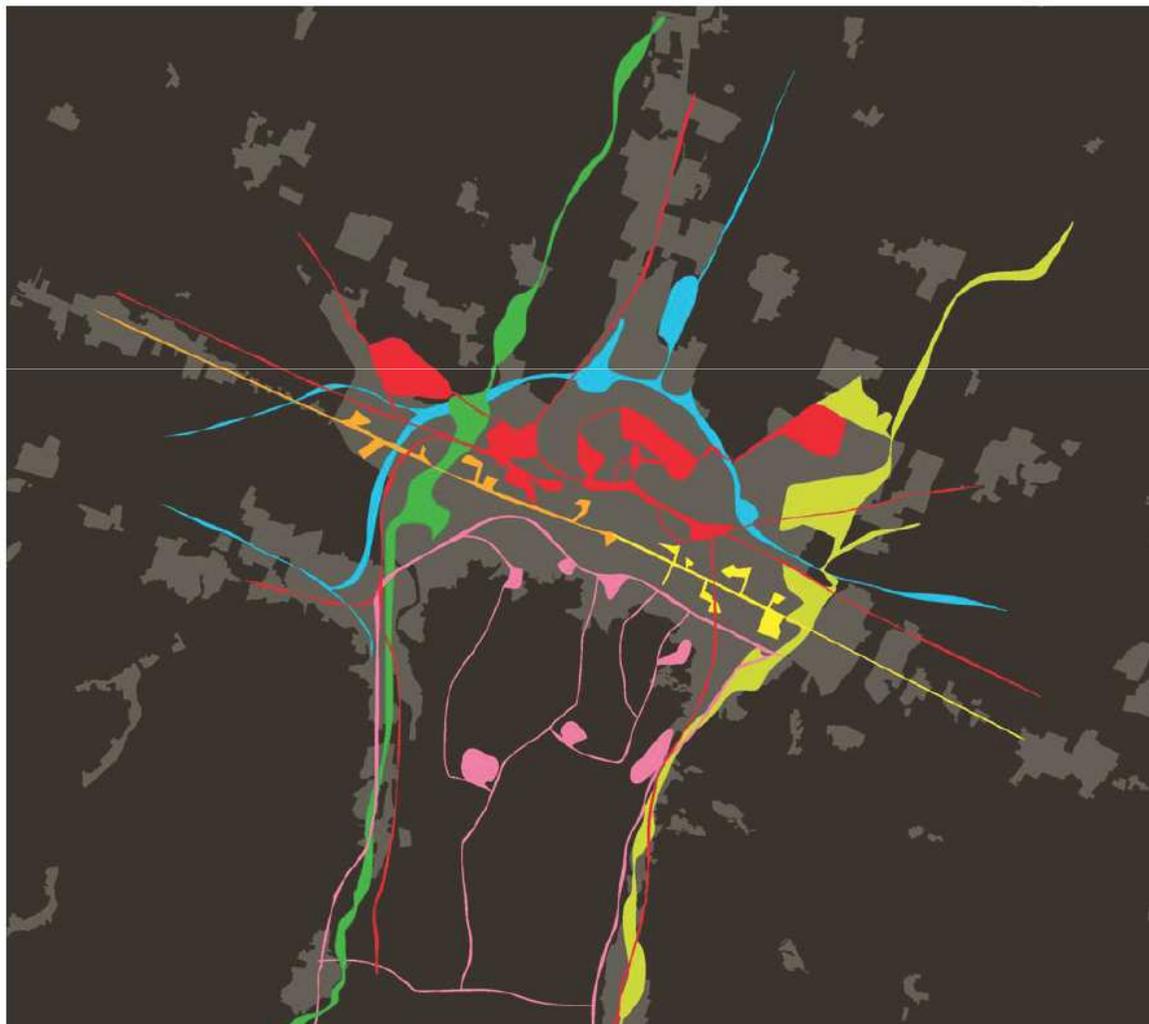
The Structural Plan is valid for the mid-long term (around fifteen years) and lays down the general aims that are then interpreted by the **Municipal Operative Plan** (*Piano Operativo Comunale – POC*) approved in 2010, which however has a term of five years, and by **Urban Building Code** (*Regolamento Urbanistico Edilizio – RUE*) approved in 2009.

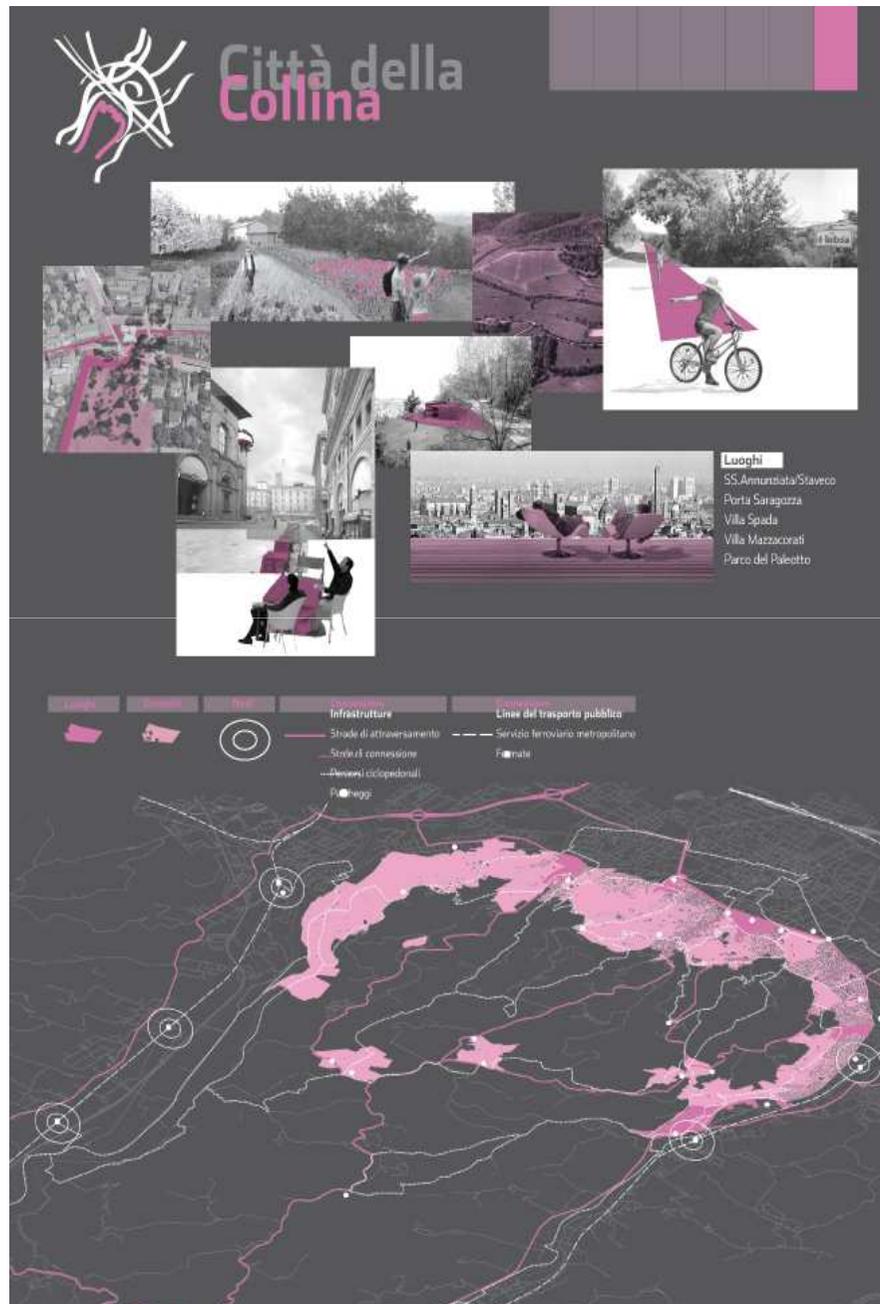
The Municipal Structural Plan bases the feasibility of its forecasts on an **environmental and territorial sustainability assessment** (VALSAT) which considers the environmental impact of proposed actions, associating them with the rules and limits pointed out in environmental sector plans.

In the metropolitan area the PSC identified **“Seven Cities”**, which are strategic figures linking together many different patterns-urbanscapes in a common program of transformation.

Comprehensive scheme of the Seven Cities

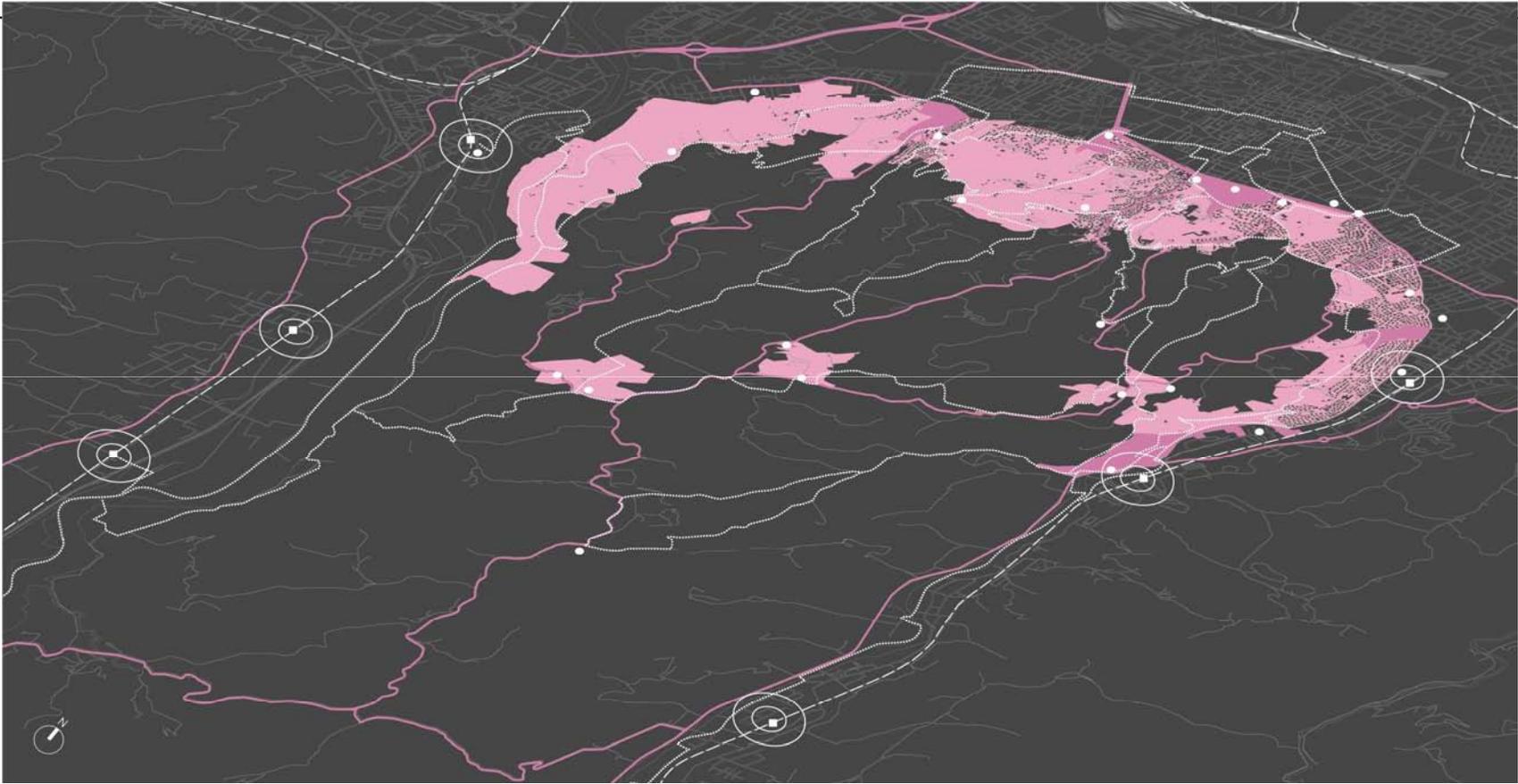
PSC
2007 COMUNE DI BOLOGNA
PIANO
STRUTTURALE
COMUNALE

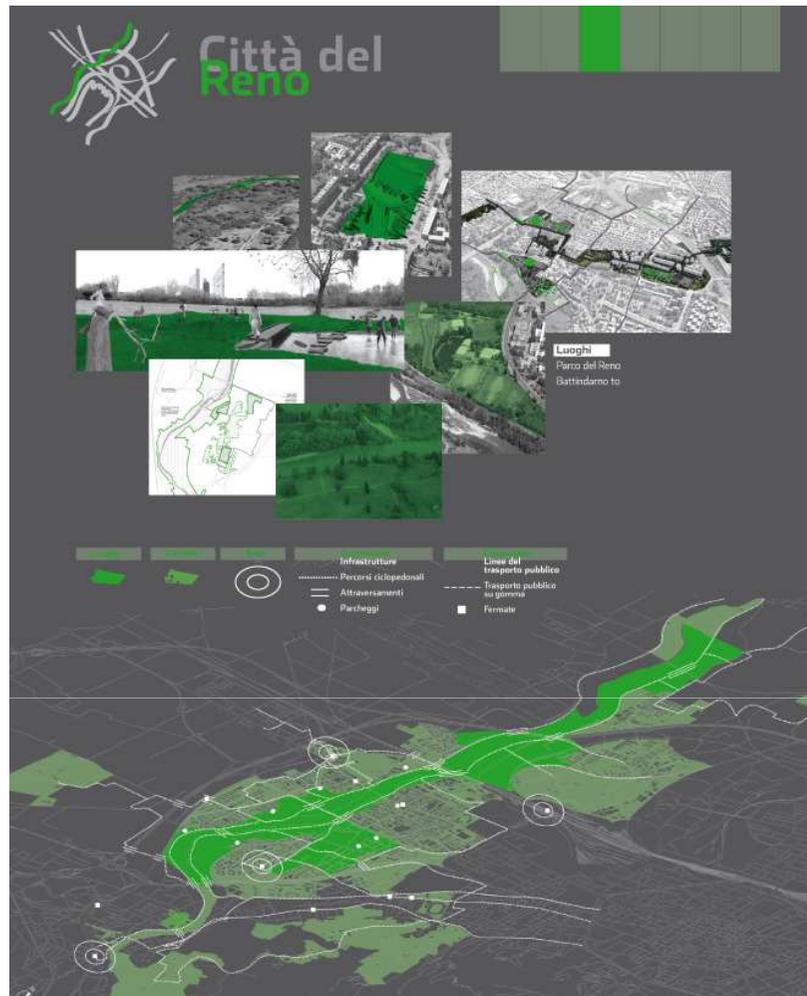




The City of Hills seeks to give a new identity to the part of the metropolitan area which has been subjected to a process of progressive privatization and reduction in its use (almost entirely luxury housing). So, it is important to reconstruct a system of links (corridors, footpaths, car parks) for public use, the identification of places to be designed so that the hills become a “mosaic” of ecological, agricultural, and semi-urban environments that are available for various types of living.

The City of Hills



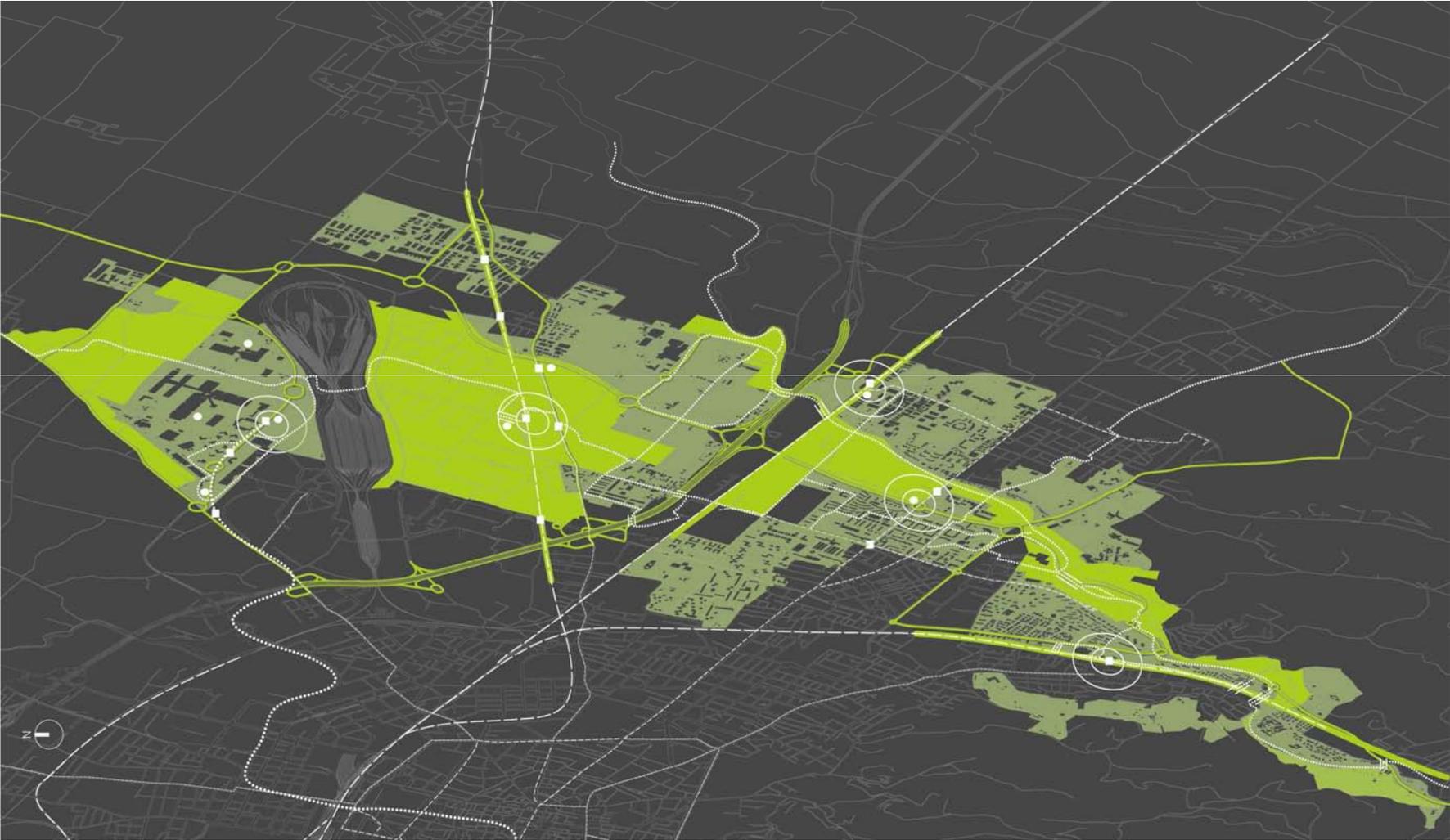


The environment of the river Reno which flows on the west of the city is a unifying element in a discontinuous metropolitan area, consisting of developments which are mainly residential. The strategy is designing pedestrian and cycling links across neighbourhoods and improving existing centralities. **In the City of Savena**, the stream which flows on the east, a new great road, the high speed railway, and new developments are creating a new metropolitan city where residential areas, quality manufacturing and service areas are developed together, interspersed by parklands and natural environments.

The City of Reno

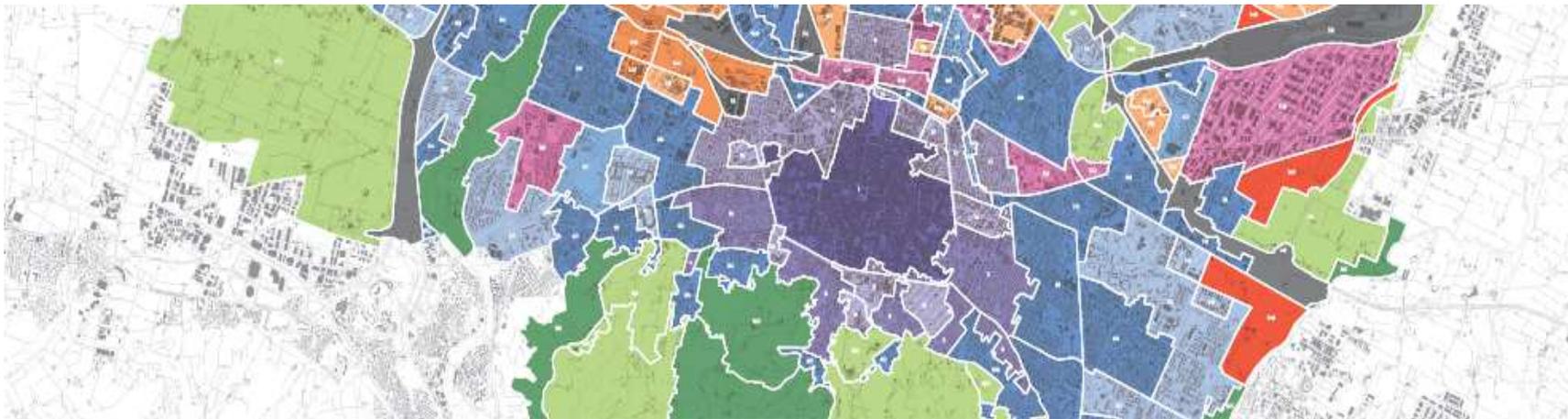


The City of Savena



Energy and Urban Planning

The 2007 **Energy Plan of Bologna (PEC)** made a specific work based on territorial data and GIS system in order to define strategies for different areas of the city and evaluate the energy impact of new settlements and renewal projects. The PEC selects **homogeneous city's areas** (energy urban basins - BEU) for **energetic, urban and environmental characteristics** and defines a **set of specific performance standards** in each BEU to bring a reduction of greenhouse gases emission in each new urban area identified in the new Urban Plan. This allowed an integration of **energy plan strategies within the new city Urban Plan (PSC) and Building Code (RUE)**, in terms of specific rules and requirements for urban projects.



Energy and Building Code

The PEC showed how most of greenhouse gases emissions of the city are determined by the building sector with an annual consumption for heating (170 Kwh/m²) more than double the actual minimum standard for new buildings (90 kwh/m²). In the meantime electric consumption for summer cooling have increased at a quick rate in the last decade.

The **Urban Building Code (RUE)** is characterized by **setting performance to be obtained by buildings instead of defining solutions**. The technical requirements about environmental quality of individual buildings and building complexes introduce additional elements to national and regional standards.

PSC and RUE have integrated at different scales the PEC policies.

At an urban scale:

- study about relation with microclimate (orientation)
- integration of renewables
- extension of urban district heating networks

At a building scale

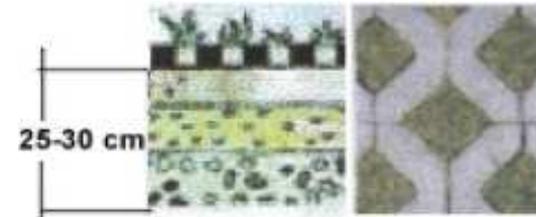
- GIS tool for solar energy availability
- excellence energy standards for new parts of the city and large regeneration
- local standards for efficiency of electric uses (cooling and lighting) in addition to national standards for thermal uses.



Urban Microclimate

The Building Code introduces an **index called RIE (building impact reduction)** which takes into account the **microclimate quality of private and public open spaces** by considering:

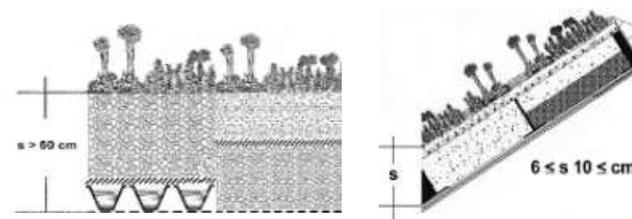
- the amount of green surfaces,
- presence and quality of trees,
- colour and permeability of paved surfaces.



The RIE index applied to the entire area where the intervention is developed gives a value between 0 and 10. Low values of the index correspond to areas largely or completely paved, with no green spaces and no permeability. Values close to 10 are obtained with a high presence of green and permeable areas. In urban areas RIE has intermediate values.

For new constructions and building renovations the following values of RIE must be achieved:

- **basic level: $RIE \geq 4$**
- **improvement level: $RIE \geq 5$**
- **level of excellence $RIE \geq 6$**



The achievement of basic level is compulsory while the achievement of improvement and excellence level contributes to the possibility of getting incentives in terms of building volumes.

Water

In the city of Bologna, the total amount of drinkable water after the peak of 37 and half millions m³ in 1998 fell to 35 millions m³ in 2006. The per capita daily consumption moved from 269 litres to 258 litres: 4.3% less. It is not enough.

PSC and RUE integrate water themes. At the urban scale:

- deliver rain water in local rivers and channels instead of drainage network
- structures (basins) for the reduction of rainwater flow to drainage
- increased permeability of areas

At the building scale:

- rainwater collection for non drinkable uses
- incentives for the re-use of grey water
- incentives for water saving technologies in new buildings



Mitigation

Metropolitan and Regional context

- Bologna Province approved an Energy Plan (**Piano Energetico Ambientale Provinciale**) in 2003
- Since 2010 Bologna Province is **supporting structure** for the Covenant of Mayors
- Emilia Romagna Region has approved in 2007 the **Regional Energy Plan** which is implemented by means of actions plan any three years
- Emilia Romagna Region defines **legal framework and technical standards** for buildings efficiency and energy power plants
- City and Province are now working together in the development of a **metropolitan Climate Plan**



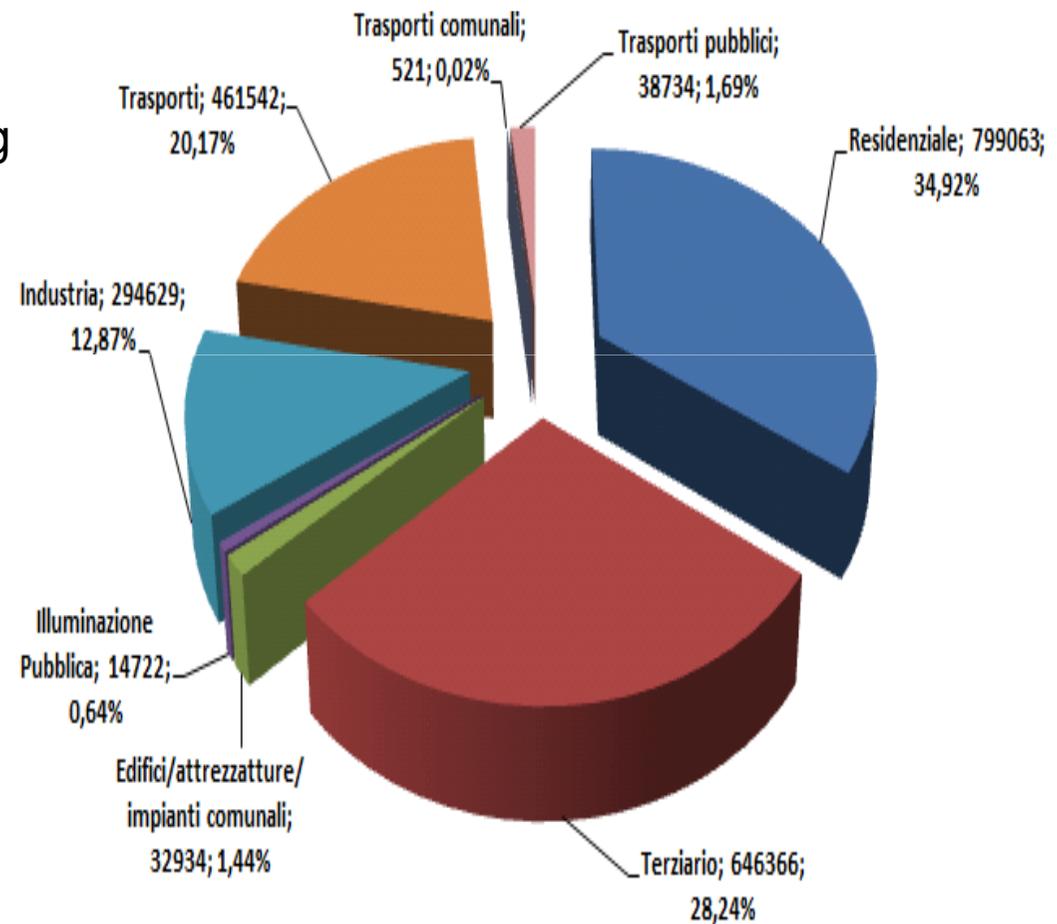
The 2012 SEAP

- Bologna subscribes the **Covenant of Mayors** in december 2008
- 3780 cities have signed the covenant to now (1856 in Italy). 1221 have submitted their **Sustainable Energy Action Plan** (343 in Italy)
- The 2007 Energy Plan (PEC) taken as a guide for the SEAP preparation.
- December 2011: first SEAP version provided for the **phase of consultation** and for the definition of **public/private agreements** in order to give a concrete framework of rules, resources and timing for SEAP implementation
- May 2012: **SEAP approval**



Baseline emission inventory

- The Baseline Emission Inventory is the **inventory of annual CO2 emissions** relating to energy end-uses in city territory.
- Base year chosen: **2005**
- Energy Data collected from **1990 to 2009**
- **Emissions breakdown** substantially the same today



Emissions in residences

- Residential sector is responsible for the **highest percentage of emissions** (34,9%)
- Average year consumption for heating: **170 Kwh/sq** (minimum standard for new buldings 90 Kwh/sq)
- Half dwellings heated with **autonomous heating**
- **20.500 buildings**: 22,4 % built before 1919, 68 % built between 1919 and 1971.
- 65 % of dwellings **owned by occupants**.
- **10.000** public dwellings
- **Rate of intervention** on buildings: approximately 5% / year



Emission in services

- Services responsible for **28,24 %** of emissions
- International Trade Fair: more than **1.000.000 professional visitors** per year
- Railway station: more than **1.000** trains/day
- Airport: **5.9 milion passengers** in 2011
- **23** big commercial structures
- Agroindustrial centre: about **300.000 tons of fruit and vegetables** handled yearly
- Hospitals: over **1.800** beds, more than **14.000** employees
- University: about **100.000 students** (80.000 in Bologna) and more than 3.000 professors
- Cultural system: **47 museums** and 30 libraries



Emissions in mobility

- Mobility responsible for **20.17% of CO2 emissions**
- **35.6% of trips by car**, 25.6% by public transport .
- Motorization rate: **53 vehicles per 100 inhabitants** (European average 46, Italian average 61).
- Public transport based on **bus network**. Ongoing development of metropolitan rail network.
- Widespread use of **motorcycles**.



Emissions in industry

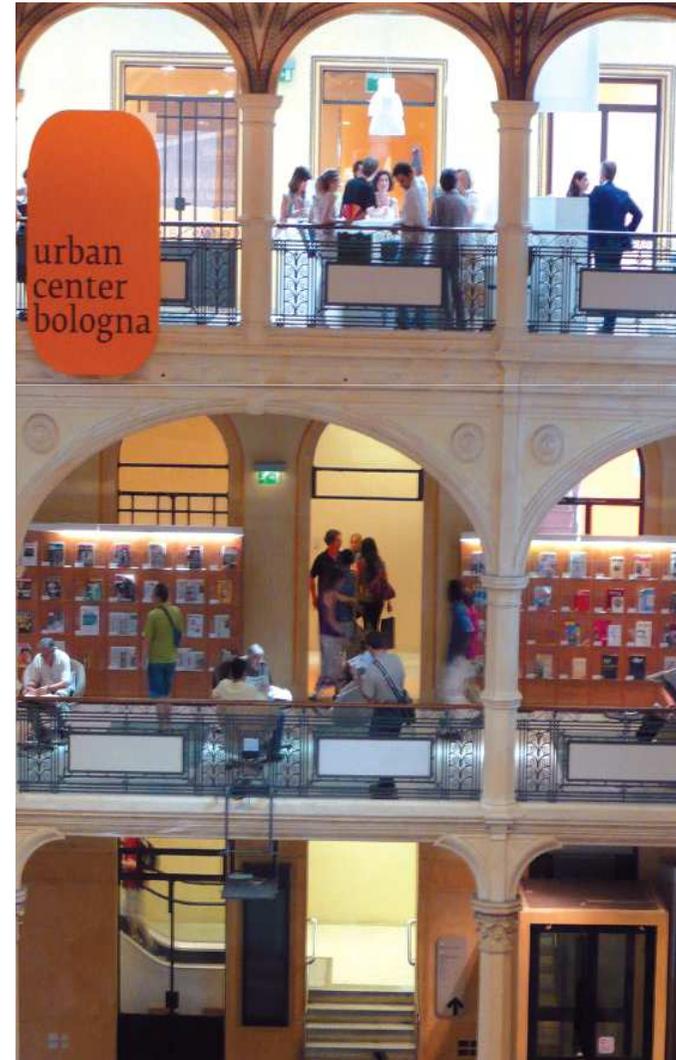
- Industry covers **12,87 %** of emissions in the city.
- Relatively small percentage if compared with metropolitan area (**26 %**).
- About **6.500 manufacturing firms** and 900 agricultural
- **Declining number** of manufacturing and agriculture firms
- Predominance of **small enterprises** with limited investing capability



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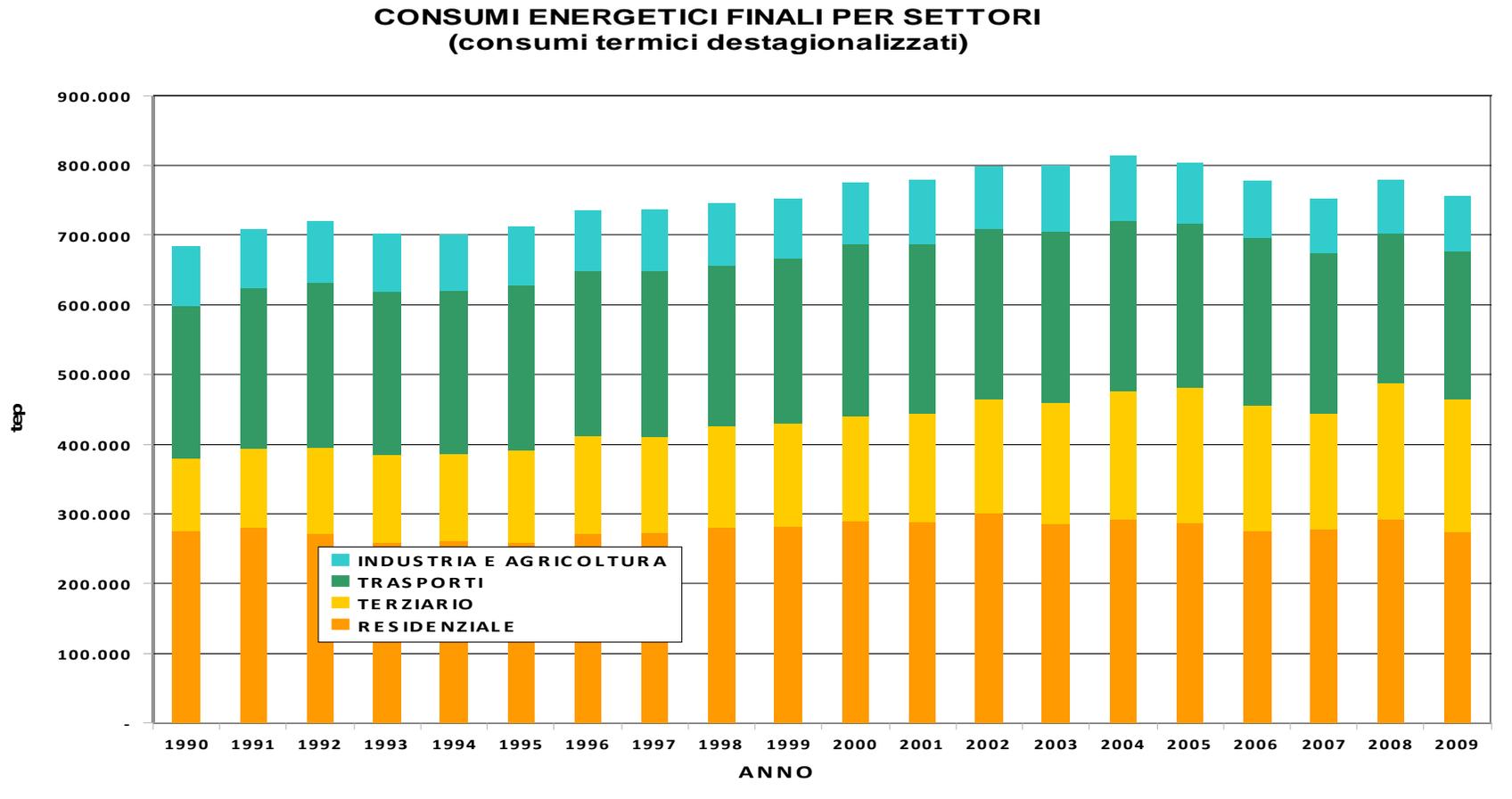
Emissions by City administration

- City administration is directly responsible of **2,1 %** of overall emissions
- **300** buildings owned by the City including schools, sports facilities, cultural and recreational centers
- **Poor energy performance** of many public buildings
- Public lighting: **45.000 lights**
- **340 cars** used by employees and municipal police



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Current trends



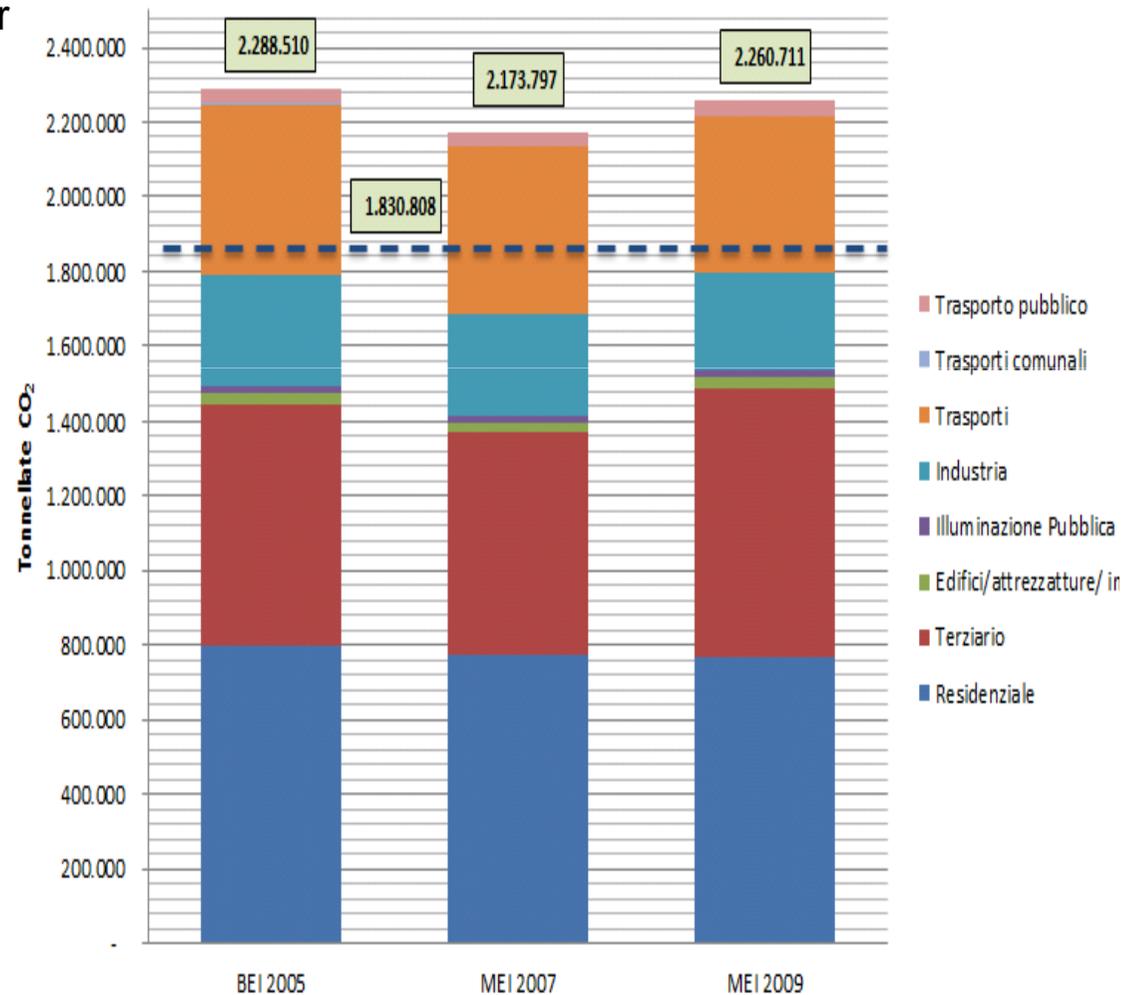
Since 2004 energy consumption **have started to decline gradually**, reversing a long standing trend of growth.

Definition of 2020 objective

Achieving the European target fixed for 2020 will be a **challenging task** because:

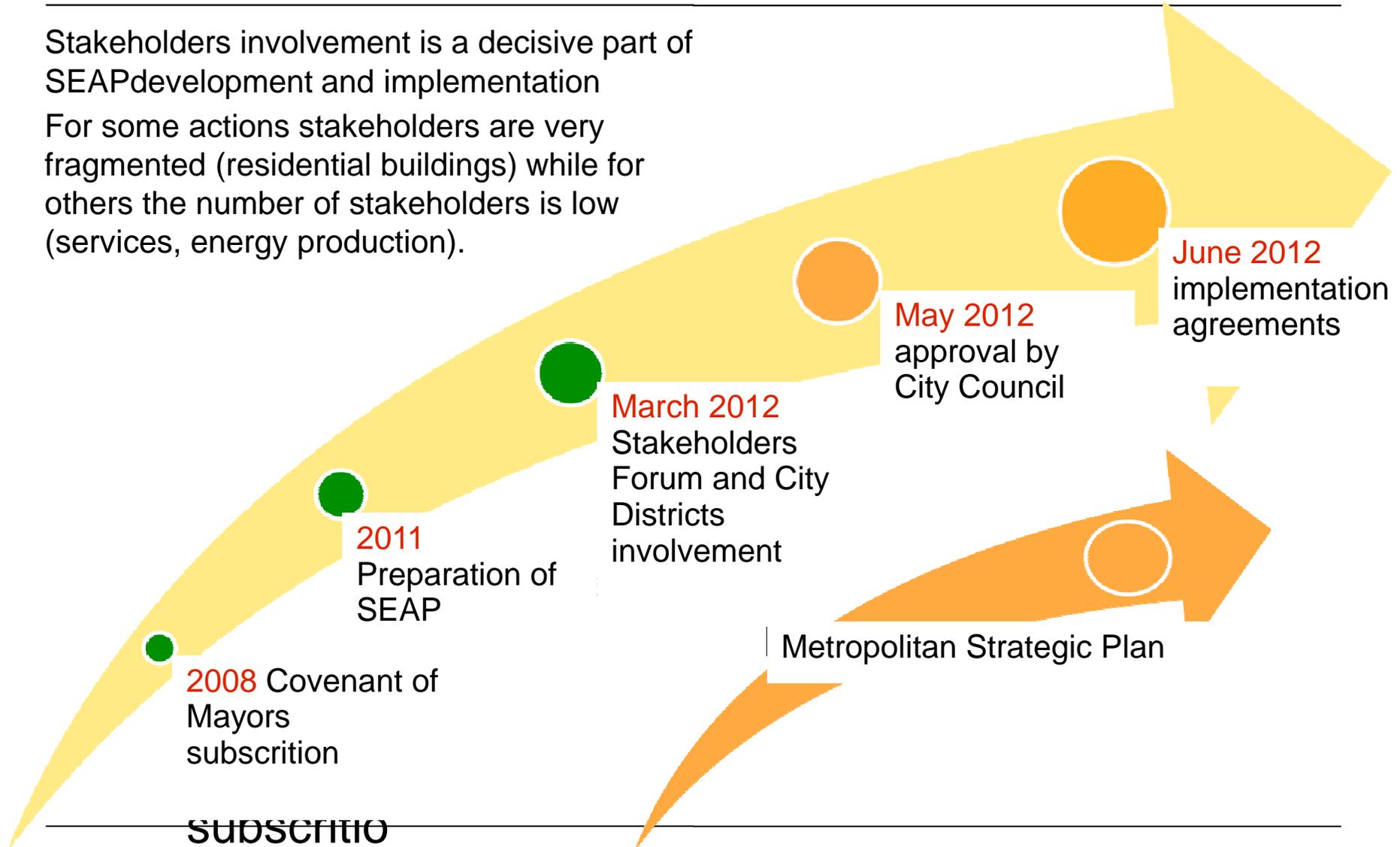
- Municipality controls directly only **2,1 % of emissions**;
- The possibility to reduce emissions by use of local regulatory tools is **limited by national legislation**;
- Consequently, most action will be implemented in **partnership with stakeholders** on the basis of an assumption of shared objectives and interests.

For these reasons, Bologna confirmed locally the **-20% European target**.



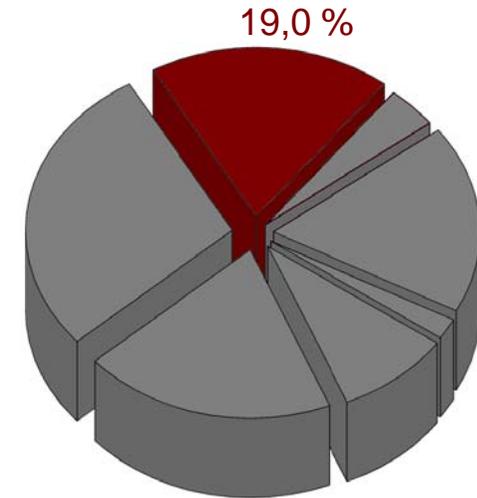
Stakeholders involvement

Stakeholders involvement is a decisive part of SEAP development and implementation
For some actions stakeholders are very fragmented (residential buildings) while for others the number of stakeholders is low (services, energy production).



Actions

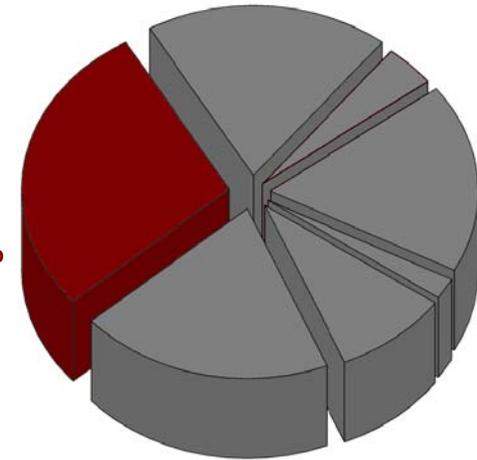
- The emissions reduction target means a reduction in City emissions of about **500.000 CO2 tons/year**
- **19 %** of this target has already been achieved
- **Many actions are to be intensely undertaken in the next few years in order to meet this target**
- Estimated overall investment is over **4.000 millions Euro**. City energy bill (now 900.000 Euros/year) will decrease by 25 %
- Most actions are **diffuse** and involve a great number of subjects
- Six action areas: **residences, services, industry, local energy production, mobility, City administration**



Residences

- Actions on this sector are by far the **main challenge** of the SEAP
- **Highest potential** for emissions reduction
- Obstacles: **Fractioned property** and **difficulty in investing**
- Need for a strong and diffuse **public information** activity resulted from public discussion
- **Agreement** among stakeholders for the definition of standard intervention package and financing instruments
- Constitution of a local **Energy Agency** supporting these actions and organizing demand and offer for energy services
- **Public call issued in march** for the definition of a qualification plan of existing City

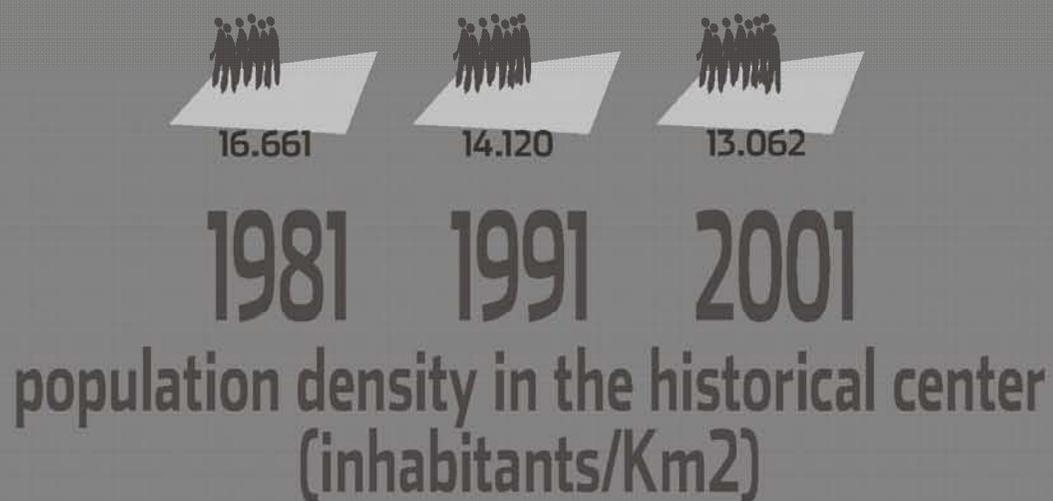
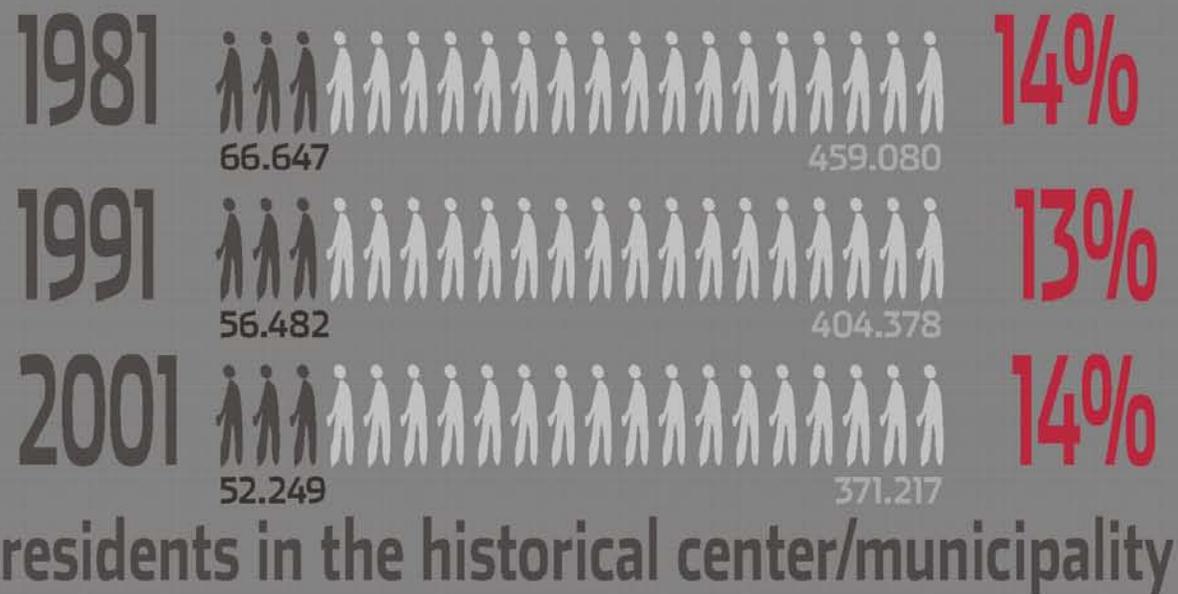
26,9 %

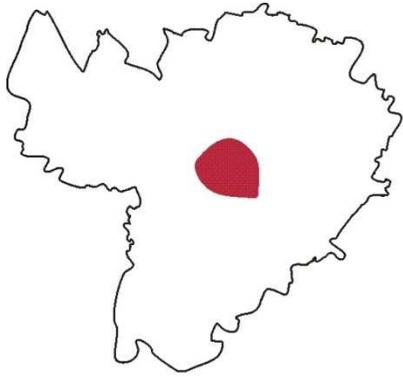


Historical buildings

- A vibrant City Centre with many residents, students and temporary population
- 22,4 % of existing buildings have been built before 1919
- City historical centre among biggest in Europe (approximately 400 hectares)
- New building code (RUE) updates criteria for intervention on existing buildings



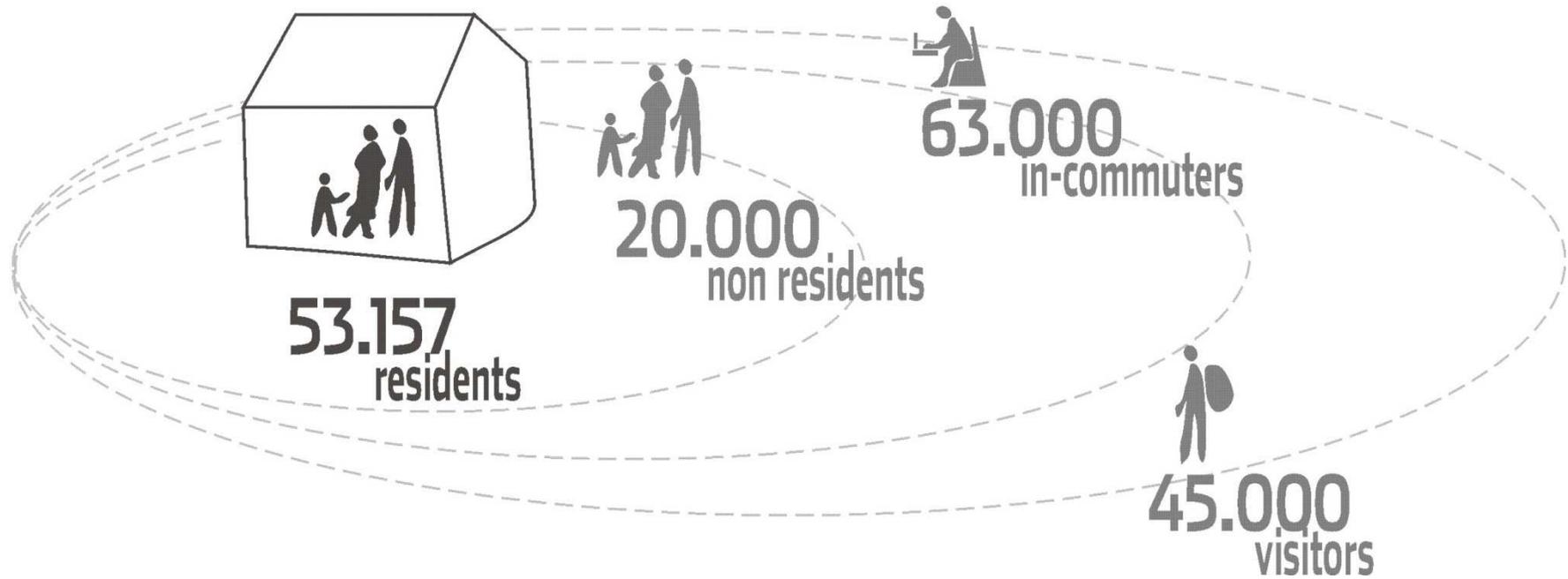




residents
377.000
53.157

estimated daily population
550.000
181.157

historical center





Bologna: about 400 ha



Barcelona: about 200 ha



Vienna: about 250 ha



1 **Idoneità città che cambia**

Adozione D.C.C. n. 27 del 20/02/2009
 D.C.C. n. 137 del 20/09/2008
 Versione n.1 - Aprile 2009

Sindaci
 Virginia Casanova, Calisto Tanzi

Assessorato Urbanistico e Pianificazione territoriale, Casa
 Virginia Casanova, Calisto Tanzi

Direttore Settore Tecnico e Urbanistico
 Giacomo Casanova

Responsabile gruppo di progettazione
 e servizio Urbanistico

Consulente generale
 Patricia Calabro

Strade carriatale e passerelle
 edifici monumentali

Strade pedonabilmente dedicate al trasporto pubblico
 edifici preesistenti

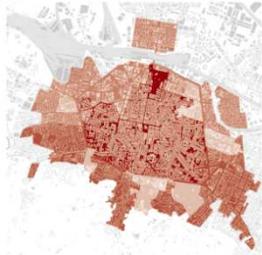
Fontane
 Muri perimetrali, mura e caseari
 Architetture e edifici
 Piazze e saggi
 Elementi decorativi

Parchi e giardini di interesse storico
 Corti, cortili, giardini ed orti



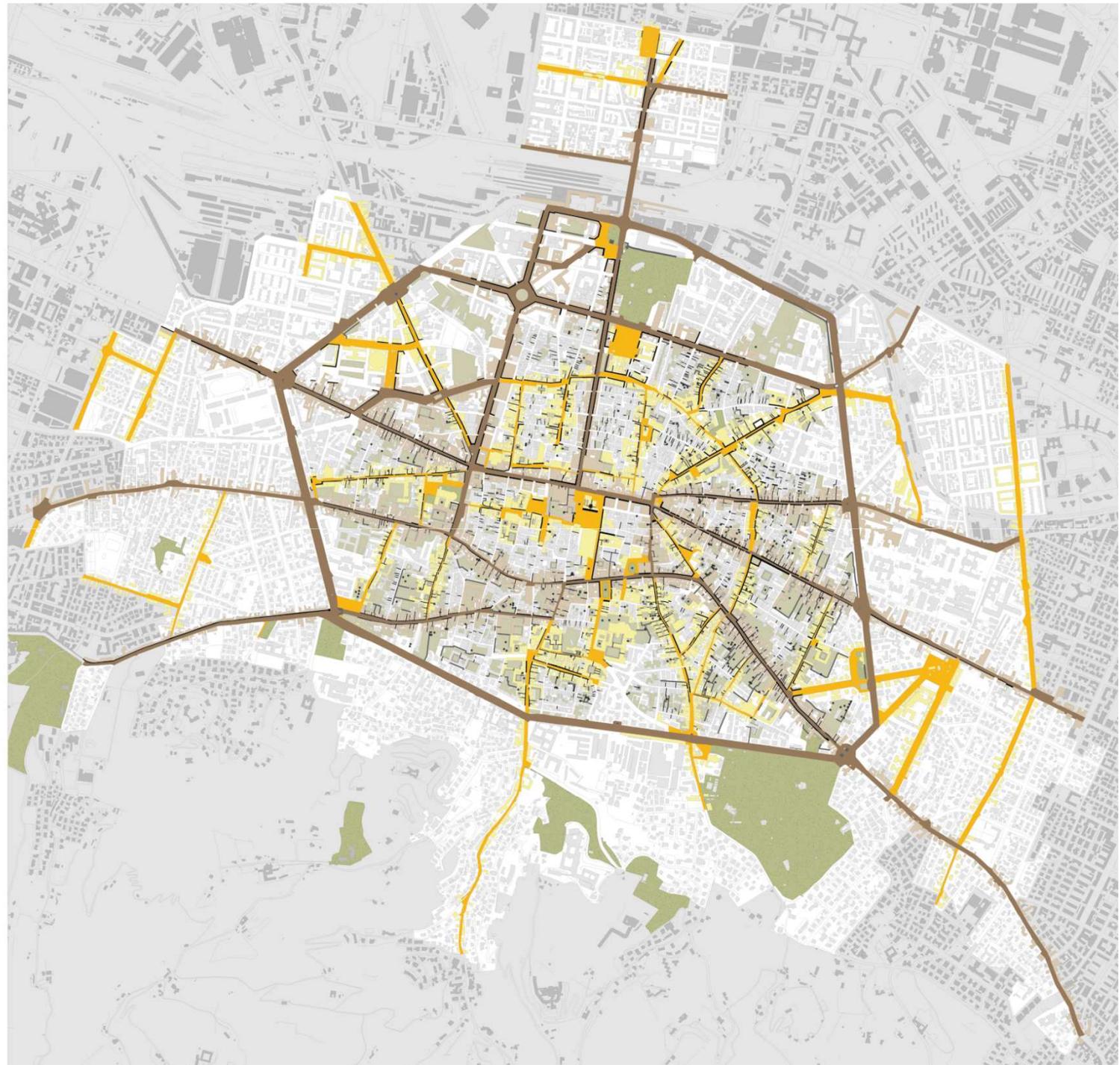
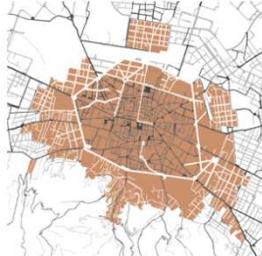
Ambiti storici

ambiti di interesse storico
 quartieri periferici
 tessuti preesistenti
 tessuti storici



Visibilità storica

strade storico
 strade storico di collegamento negli ambiti storici





Ancient shaped nucleus



Monumental buildings



- **Compatible solutions** are to be adopted for intervention in monumental buildings
- **Pilot actions** on City Palace (within GovernEE Central Eupe Project) and definition of a toolkit.

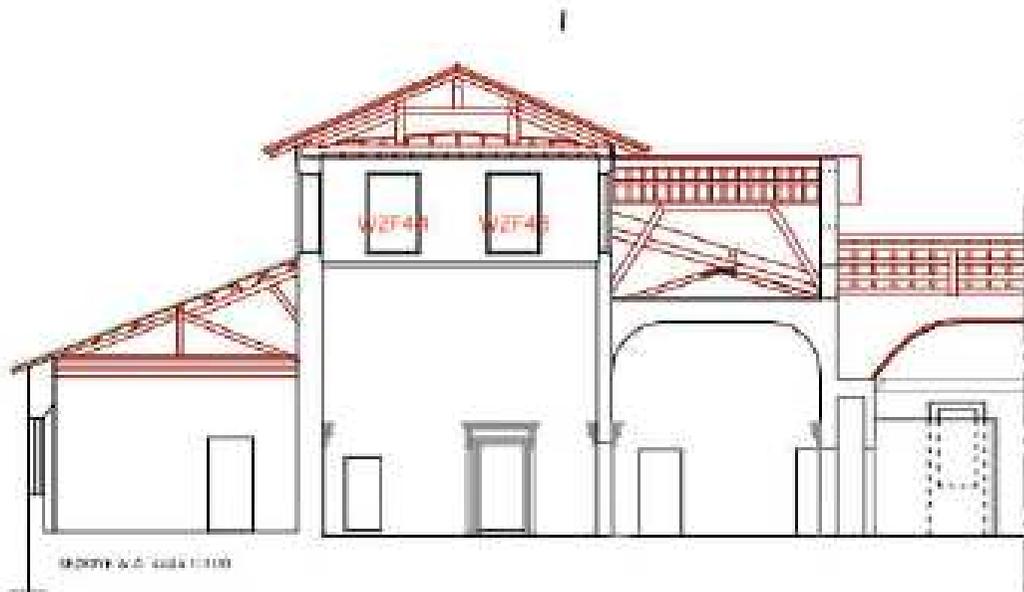


Image parameters:
Degree of emission: 0.95
Reflected temperature: 20.0

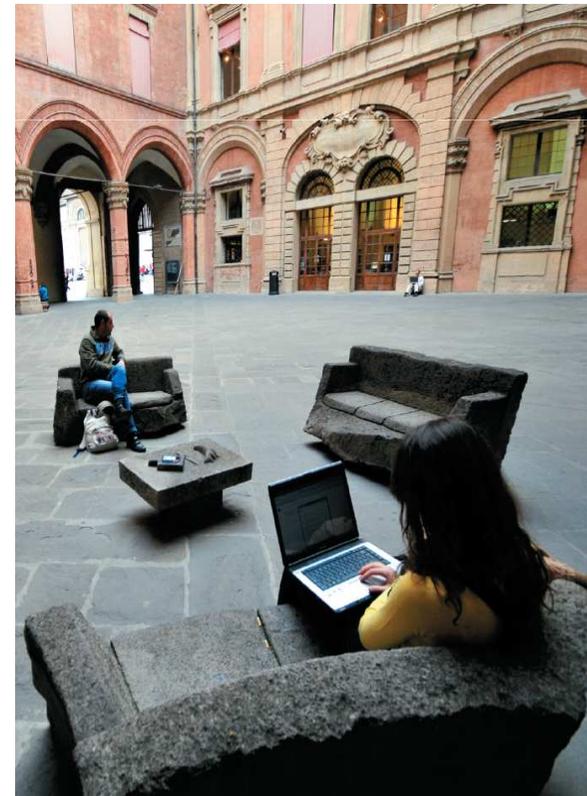
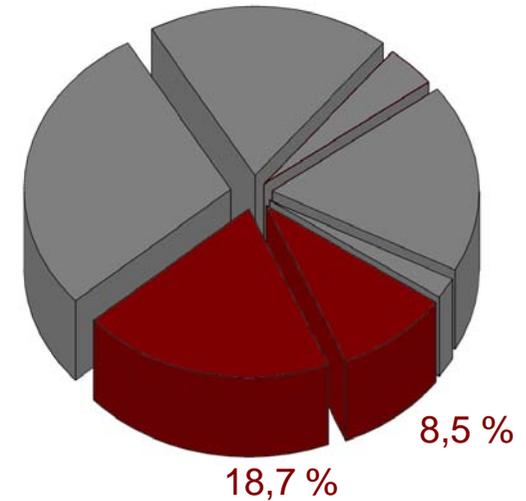
Public Housing

- 8 % of residential buildings owned by the city (average scarce energy performances)
- Intervention on public housing allow the substitution of entire built lots
- The example shows an area in San Donato District where the intervention of substitution allowed a general increase of quality included green spaces and social inclusion



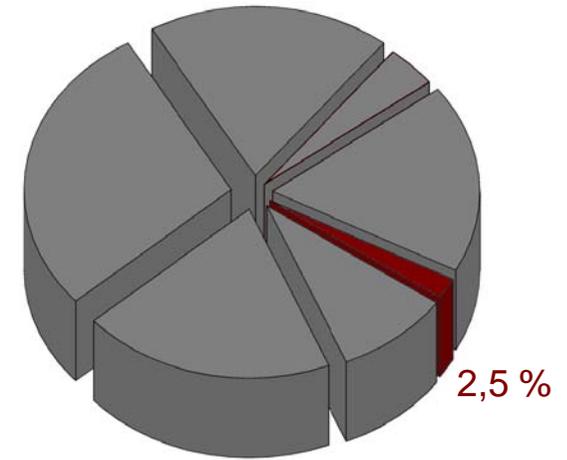
Services + industry

- Opportunity of **huge reductions** in energy consumptions for buildings (heating, electricity).
- **Many interventions** already underway (energy efficiency in large food stores, energy management of hospitals, airport, ...)
- No energy intense industrial processes
- Role of **energy managers** in the development of energy strategies for firms and companies
- **Smart ICT** as an opportunity
- Actions on services and industry are **more likely to be undertaken**: smaller number of stakeholders
- **Most promising** sector of SEAP



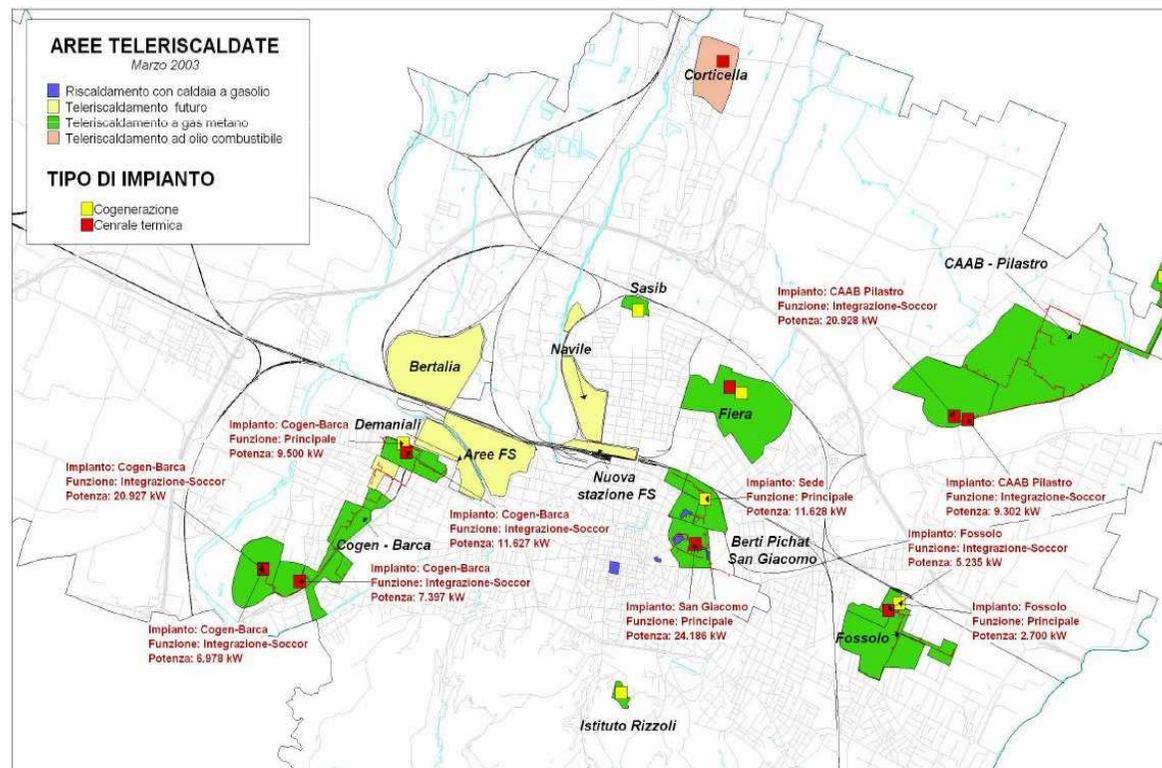
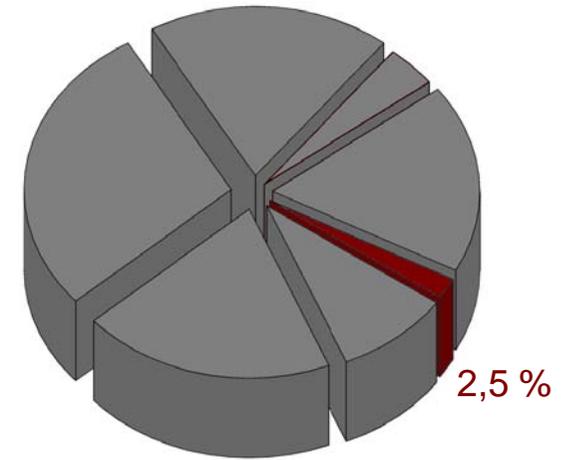
Energy production

- Since 2007 strong diffusion of photovoltaic on city roofs
- 1MWp plant in former quarry (2011)
- 2,4 Mwp plant on public housing roofs (2009)
- Installation on public schools donated by parents associations
- Opportunity from the dismissal of asbestos roofs in industrial areas



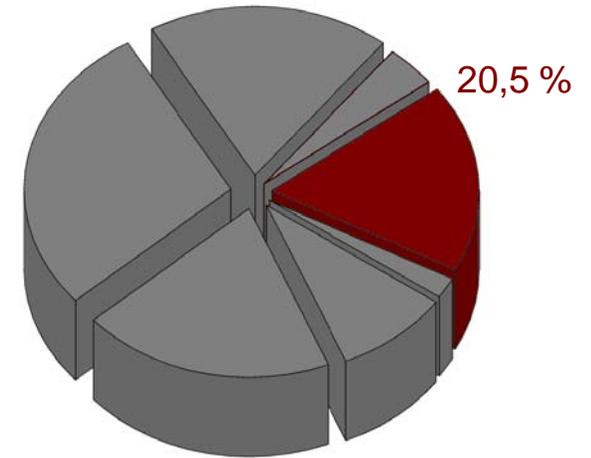
Energy production

- District heated areas mostly managed by local multiutility company Hera
- Requalification of existing district heating plants and pipes
- Diffusion of micro cogeneration for buildings



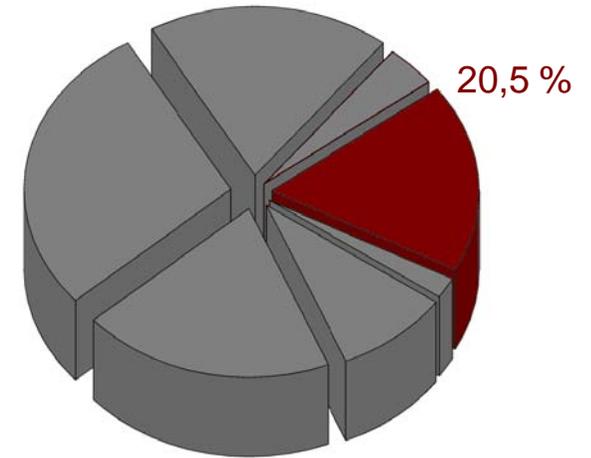
Mobility

- Support a **no car mobility**
- Infrastructural interventions for more efficient **bus lanes**
- Promotion **widespread ciclability and pedonability of the city** (increase of reduced speed areas, integration of bike lanes, specific rules for city centre)
- Completion of **Metropolitan Railway Service (SFM)**
- Main obstacle: **absence of dedicated local public transport infrastructures**



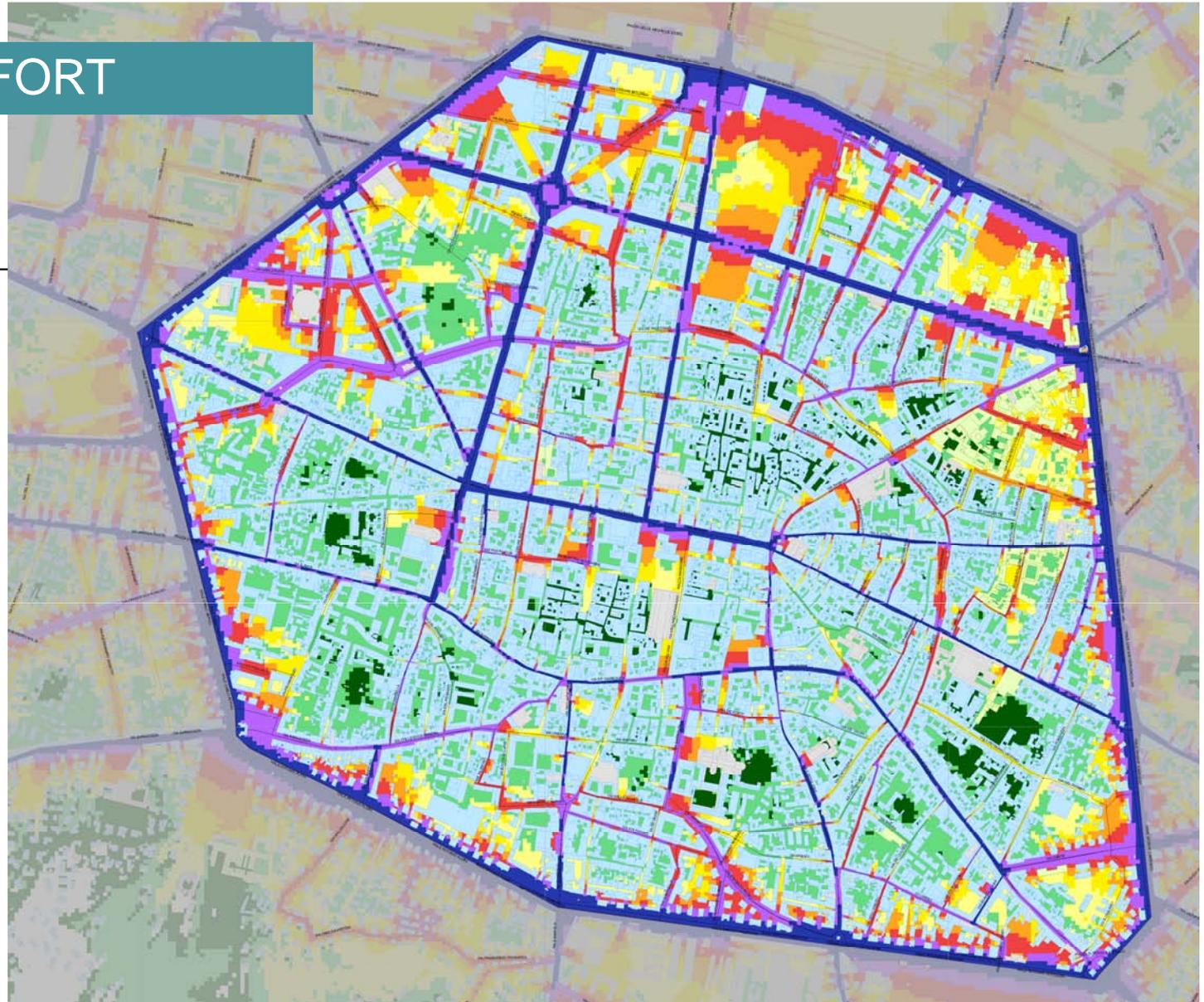
Mobility

- Comprehensive plan for the qualification of City Centre presented on dec 3rd 2011 “Di nuovo in centro”
- Extension of pedestrian areas and definition of areas with very restricted access (city centre already traffic limited zone)
- Increase of pedestrian and bike accessibility
- Intervention on public spaces and valorization of selected districts



NOISE DISCOMFORT

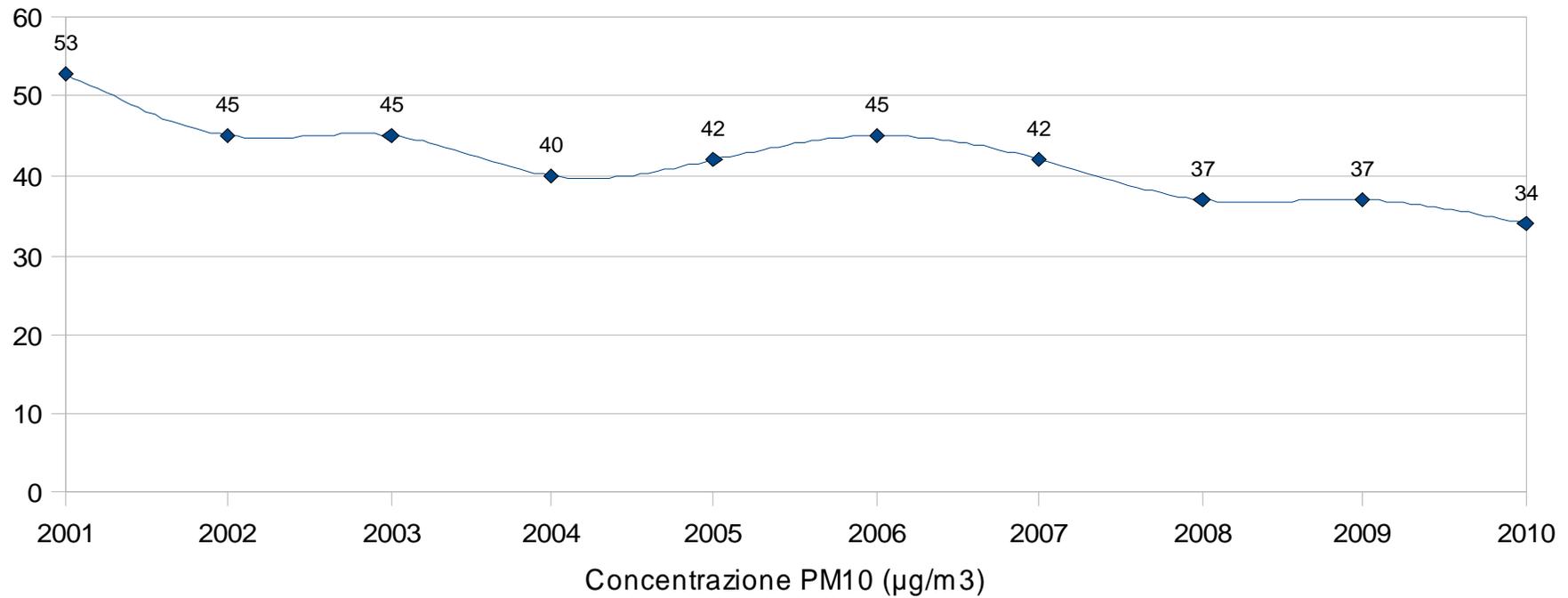
Livelli di rumore in dB(A)	Popolazione esposta
< 40	17.746
40 - 45	
45 - 50	
50 - 55	
55 - 60	4.003
60 - 65	4.549
65 - 70	9.506
70 - 75	13.144
>75	2.743



Half residents

Exposed to more than 65 dB

ENVIRONMENTAL DISCOMFORT

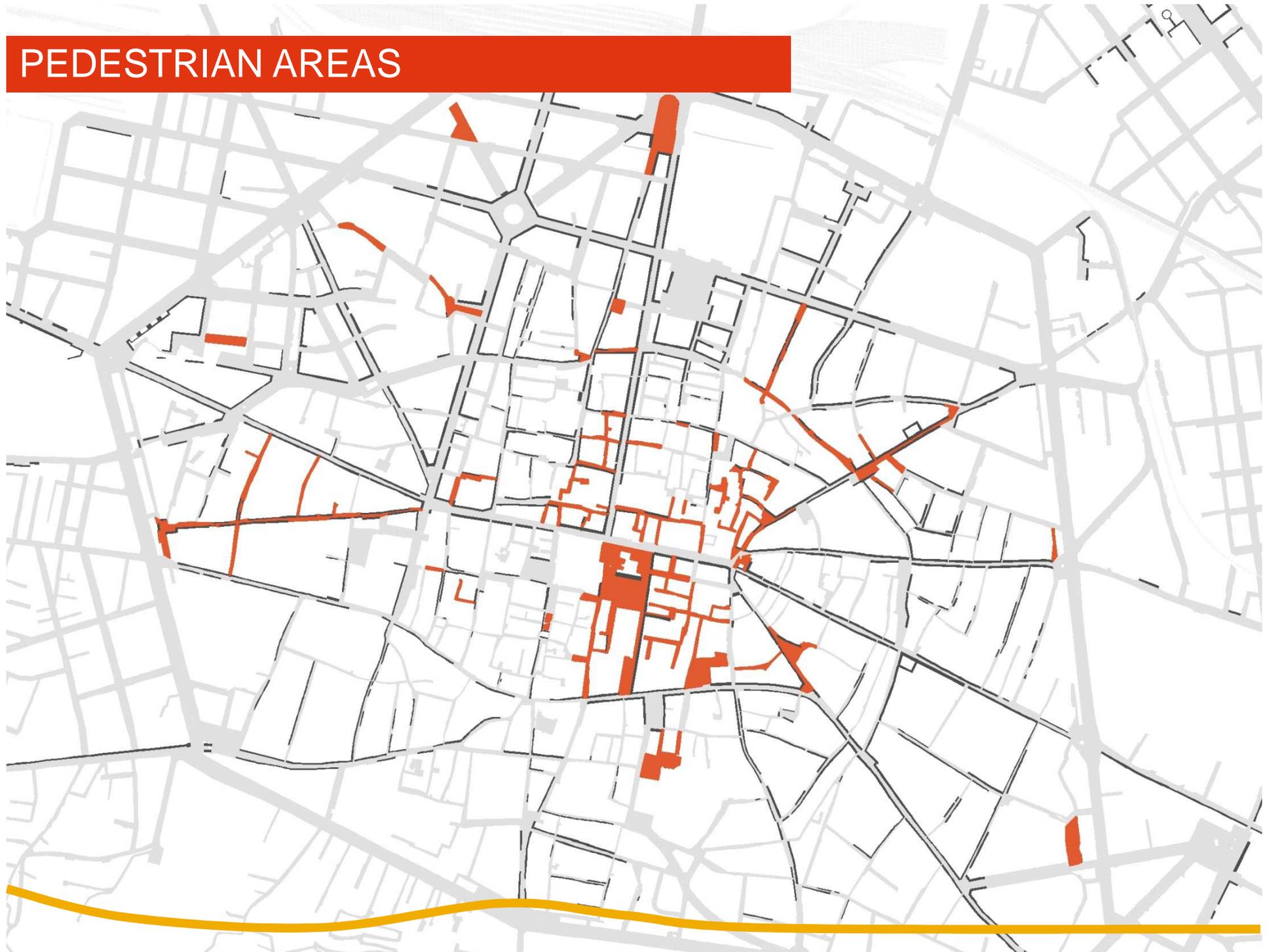


High number of days in which PM10 limit is exceeded ($50 \mu\text{g}/\text{m}^3$)

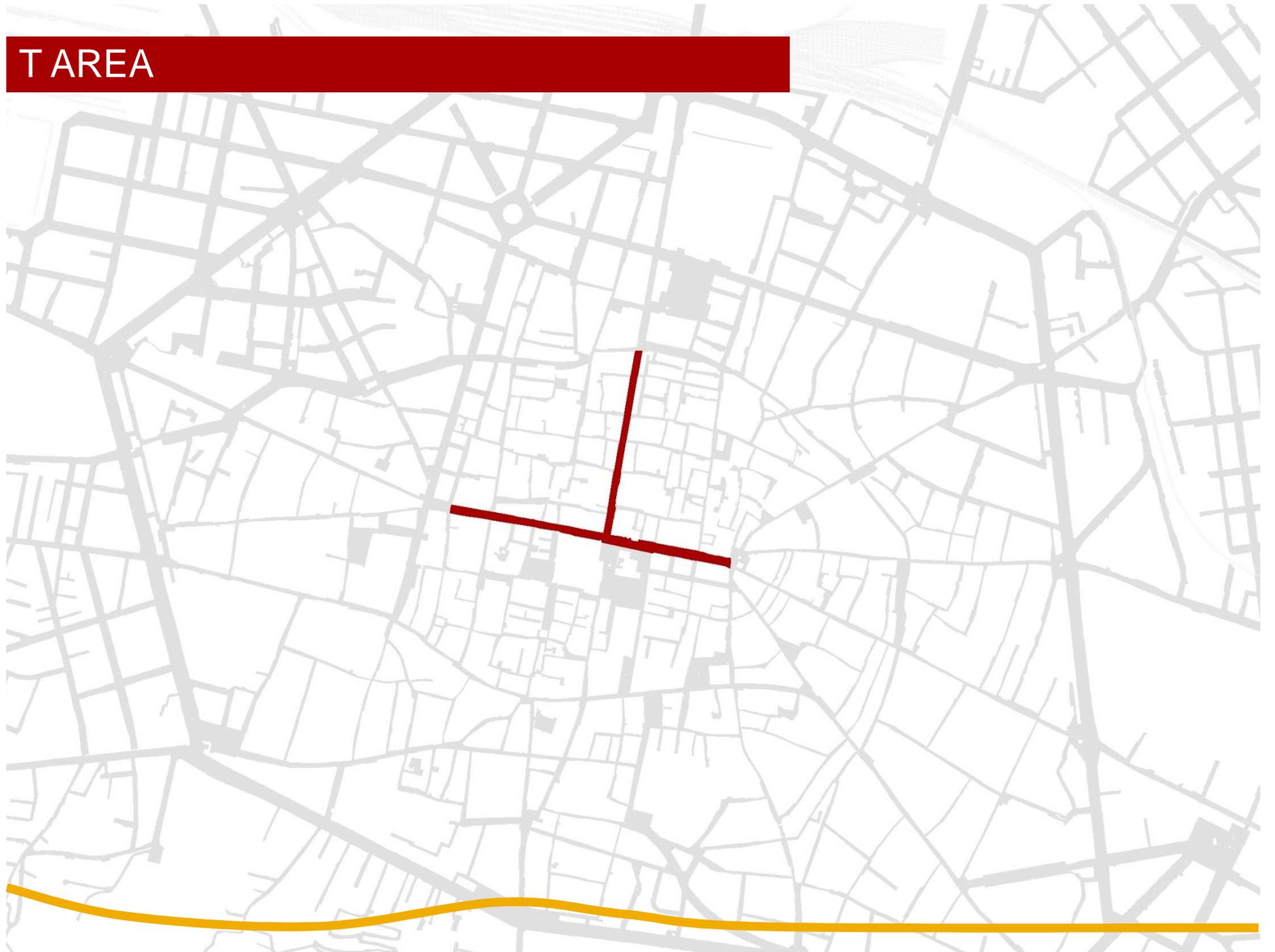
ONLY FOR RESIDENTS



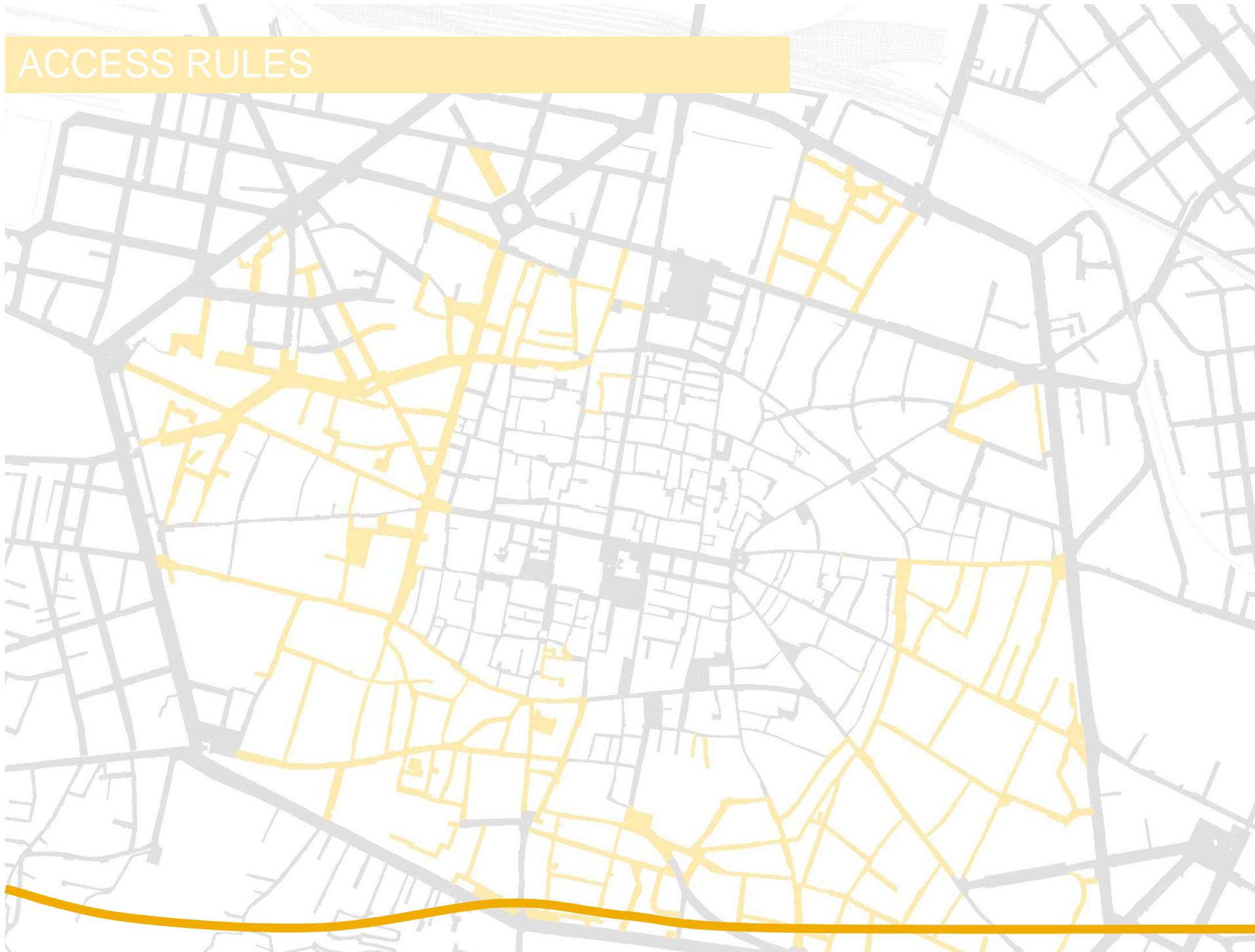
PEDESTRIAN AREAS



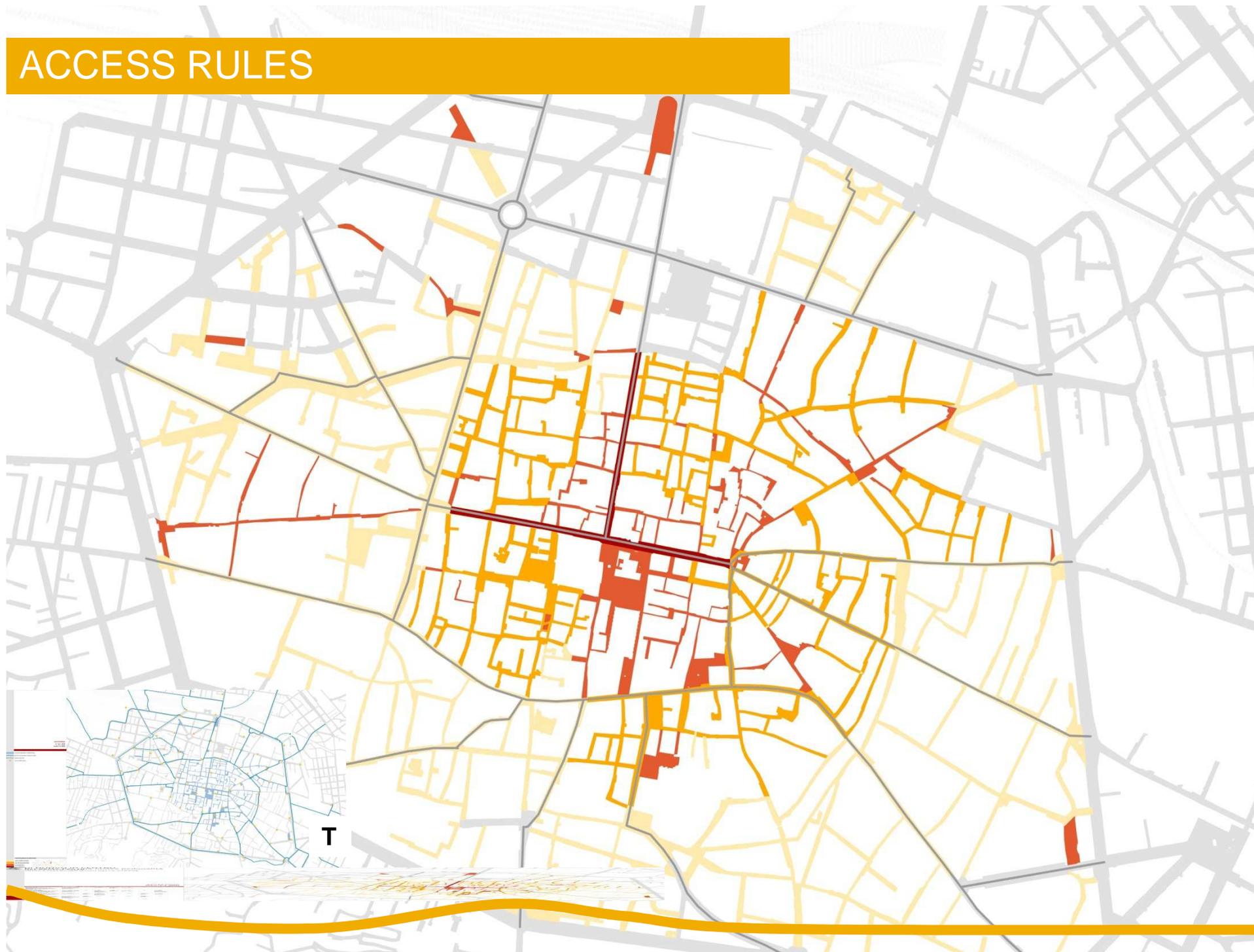
T AREA



ACCESS RULES

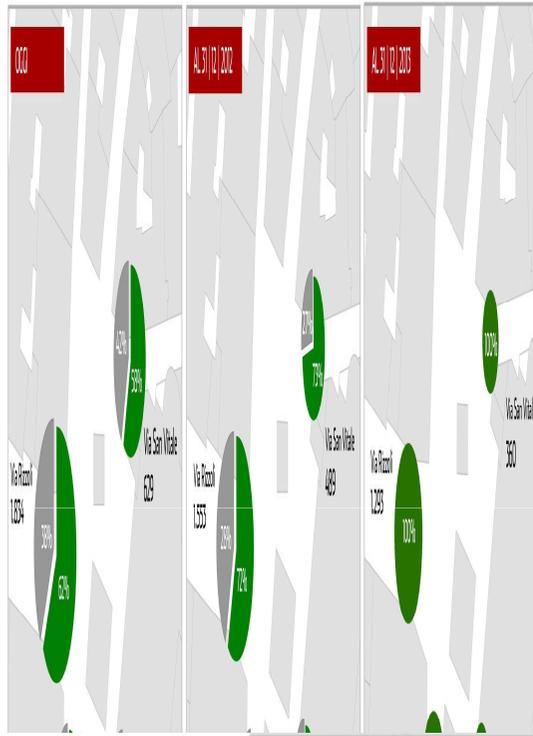


ACCESS RULES



INTERVENTI MOBILITA'

MODIFICA ALLE LINEE DEL TRASPORTO PUBBLICO E AI MEZZI CIRCOLANTI

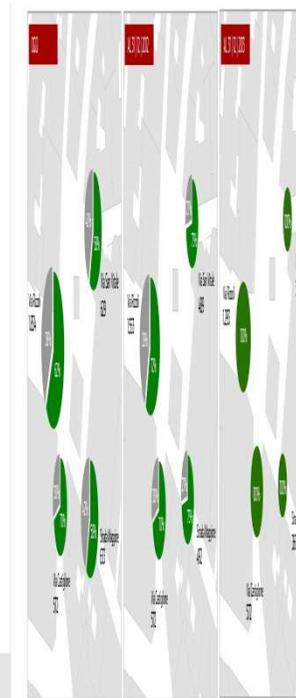


Tragitto linea 27 - oggi



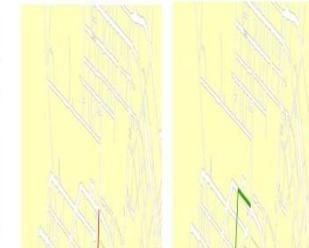
Tragitto linea 27 - al 2013

nona discesa di via delle Scale



Tragitto linea 27 - oggi

Tragitto linea 27 - al 2013



PROPOSTA

SERVICES FOR SUSTAINABLE MOBILITY

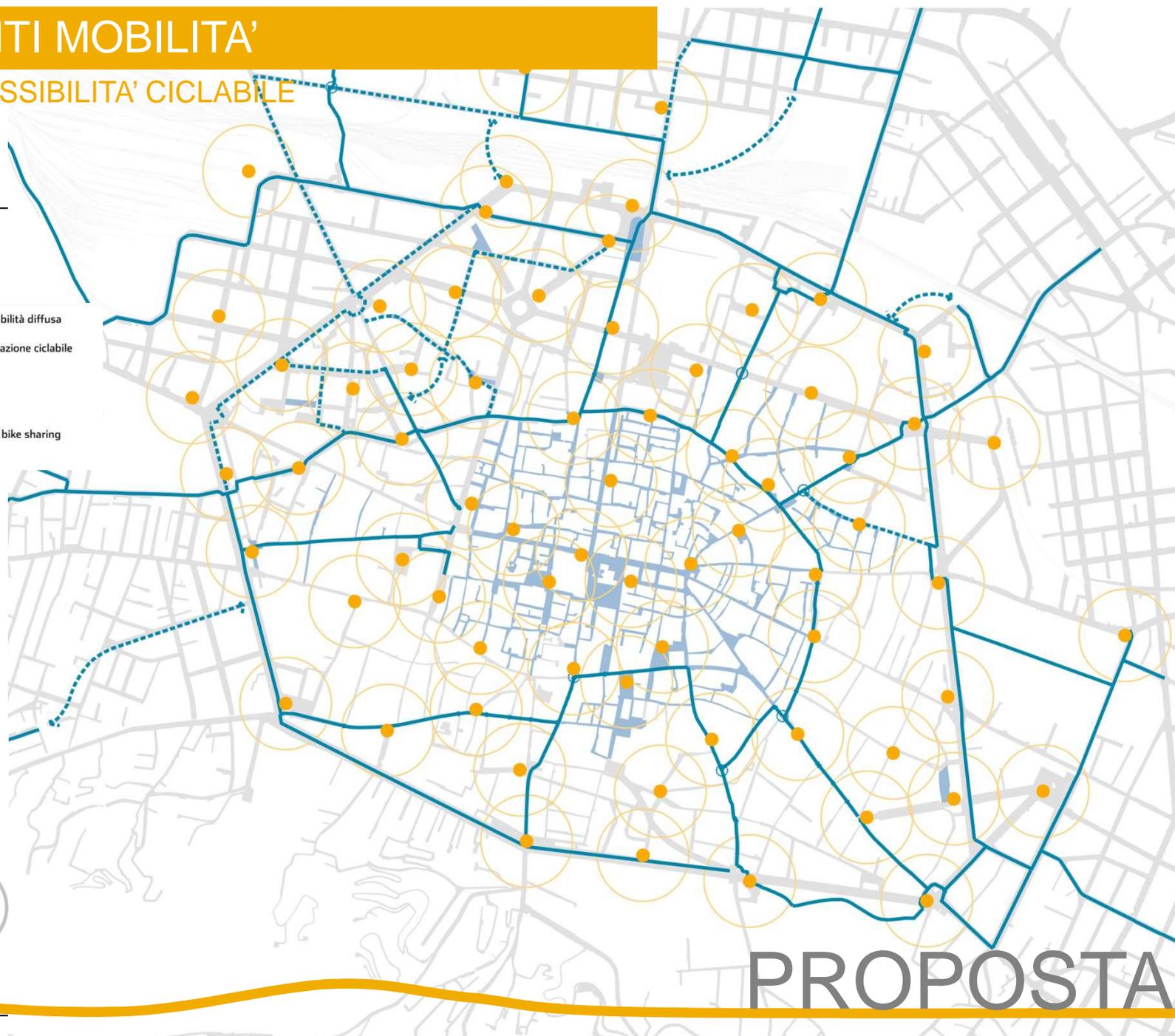
Bike sharing, car sharing, promotion of electric obility, ..



PROPOSTA

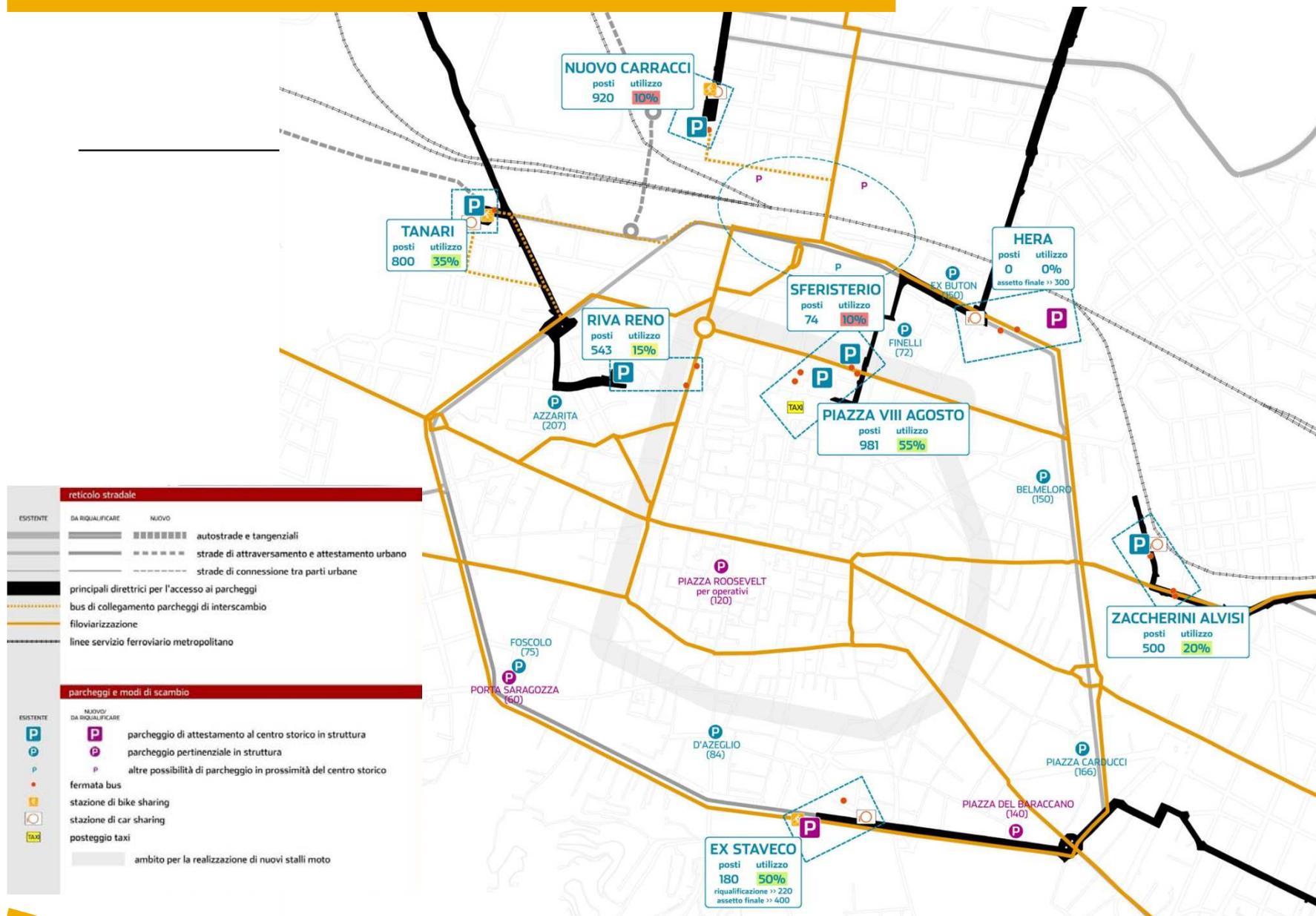
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PROPOSTA

PARKINGS



Urban Forestry



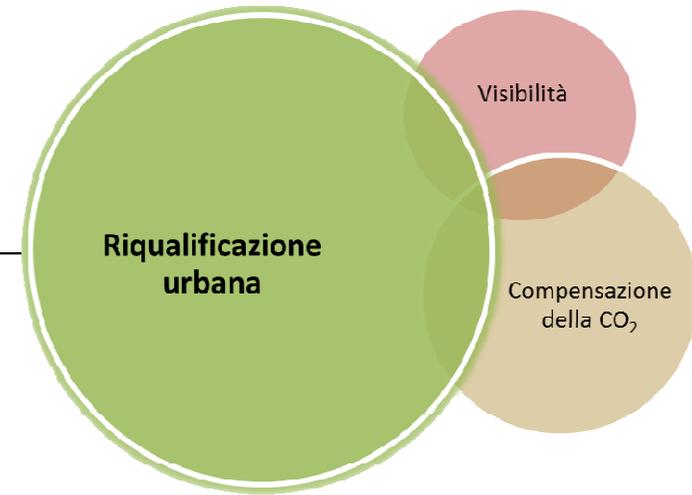
- Public/private partnership for interventions of urban forestry within **LIFE EU Project Gaia**.
- **Project objectives**: CO2 absorption, better air quality, improve microclimate locally.
- Local companies finance forestry intervention thus reducing their **carbon footprint**
- Results achieved by companies are certified through a transparent accountability process.
- National Research Institute CNR evaluate results on **air quality**

3000 trees will be planted by the end of Gaia project (april 2013)

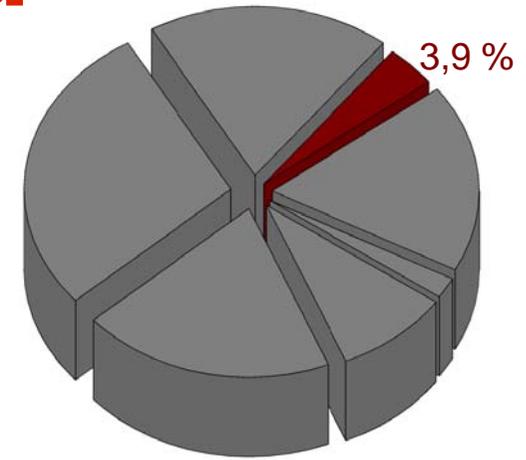


Urban Forestry

First intervention in the big industrial area “Roveri” where ecological values will be integrated by the regeneration effect of abandoned areas.



Public buildings and lighting



- Difficulty in investing
- New contract for the **management of public buildings** from 2013
- **Public/private partnership** (Longo Swimming Pool: new cogeneration plant and solar panels)
- Specificity of **historical and monumental buildings**
- New contract for **public light** in next years
- Some **results achieved** (300 street lamps substitute with high efficiency led)





Thank you for attention !

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