



LISBOA **e-nova**  
AGÊNCIA MUNICIPAL DE ENERGIA E AMBIENTE



**SOLAR THERMAL IN CLASSIFIED CITY QUARTERS**  
**LISBON HISTORICAL BAIXA POMBALINA**

Joana Fernandes

# LISBOA E-NOVA

## MISSION

To contribute to Lisbon's sustainable development through the promotion, dissemination and outset of good practices.

Aims at promoting the systematic improvement of the energy-environment performance of the city, involving the city's main stakeholders, from political actors to economic agents and the community.

**12 Employees**

**7000 Mailing list subscribers**

**50 Communication actions/year**

**25 Current projects**

## AFFILIATES



# CLASSIFIED CITY QUARTERES – THE CHALLENGES

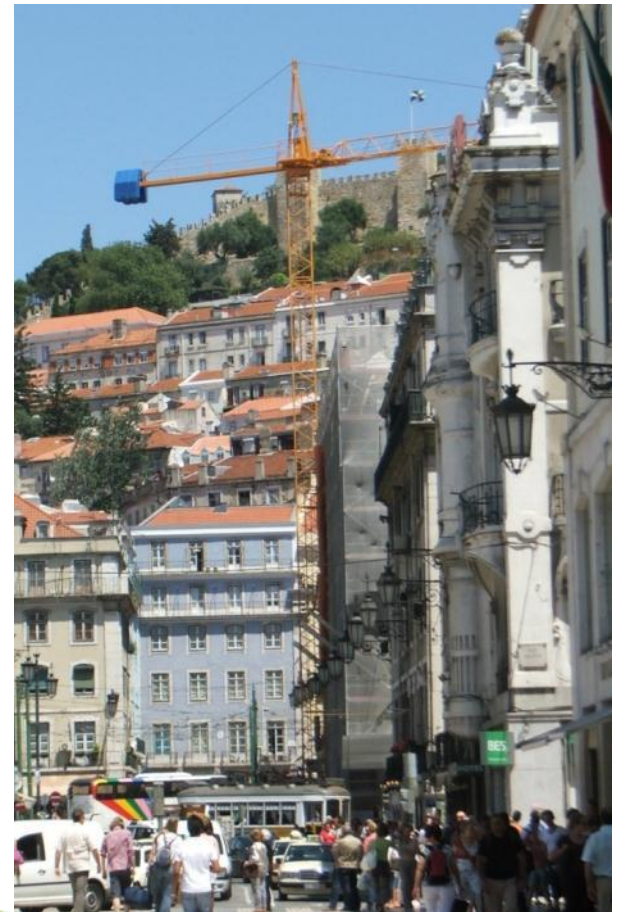
Classified buildings, both residential and services

Historical value to the city and the country;

Untouchable status – to maintain the image!

Highly abandoned areas due to:

- Old buildings that need structural reinforcement;
- Old buildings that lack actual patterns of comfort ;
- Old buildings that do not have garage;
- Old buildings that do not have lift;
- Old buildings that need to comply with strict refurbishment criteria;
- Old buildings with a low energy performance

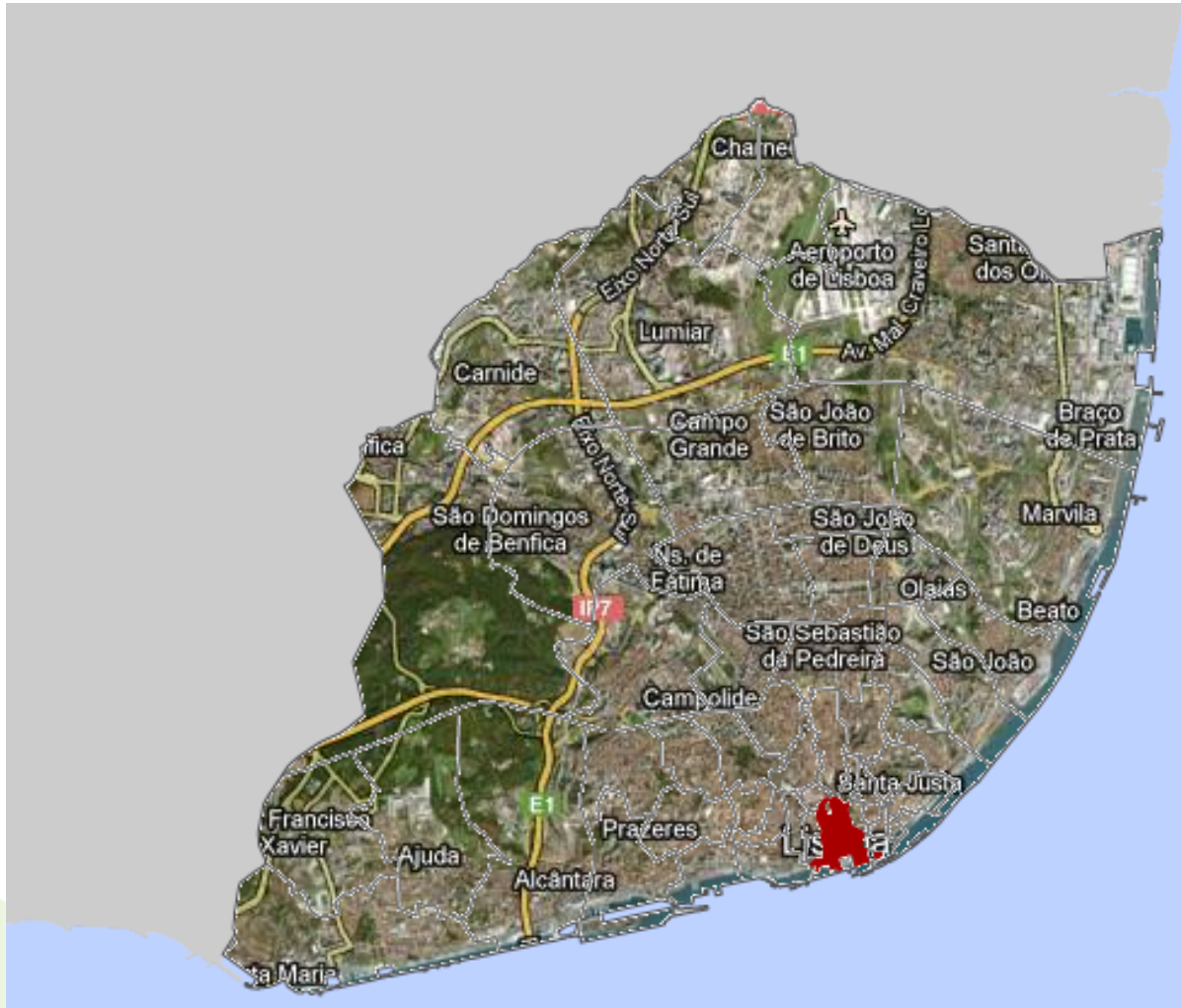


# CLASSIFIED CITY QUARTERS – REFURBISHMENT OPPORTUNITIES

- Thermal insulation of the facades;
- Thermal insulation of the roofs;
- Thermal insulation of the floor;
- Install energy efficient windows;
- Promote natural ventilation;
- Integrate renewable energy technologies
  - Solar thermal;
  - Solar photovoltaics.



# THE BAIXA POMBALINA AREA

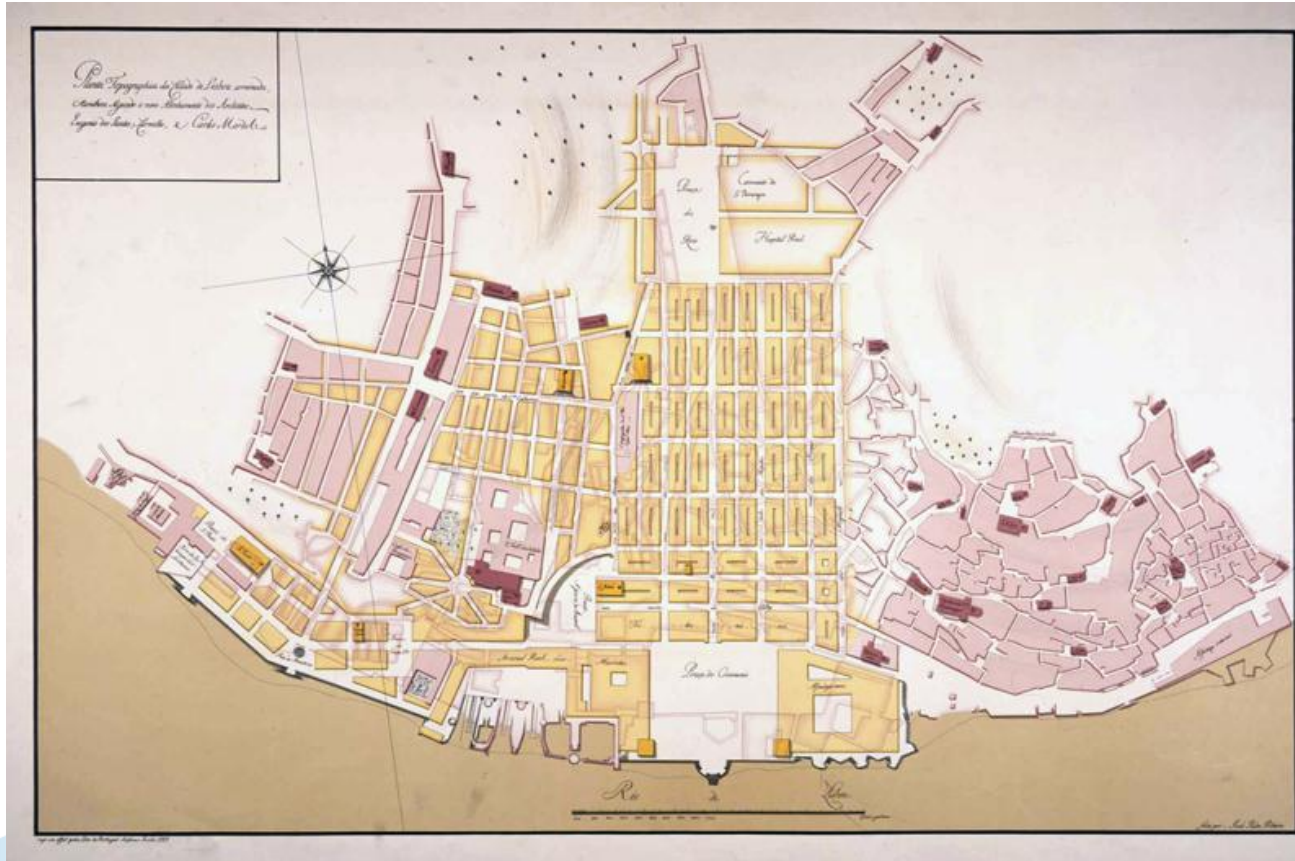


# THE BAIXA POMBALINA AREA – the 1755 earthquake



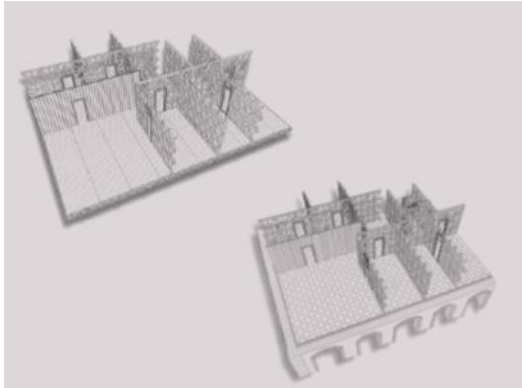
Vorstellung von Lissabon vor und in dem erbeben des 1. Novembris 1755  
[www.museudacidade.pt/](http://www.museudacidade.pt/),

# THE BAIXA POMBALINA AREA – the new urban plan in 1758



Benefactor: Marquês de Pombal  
Architects Eugénio dos Santos Carvalho e Carlos Mardel  
“Lisboa O Plano da Baixa hoje – Exposição”

# THE BAIXA POMBALINA AREA – the buildings



“A Baixa Pombalina: da inovação ao mito”



“Lisboa Plano da Baixa Hoje – Exposição”





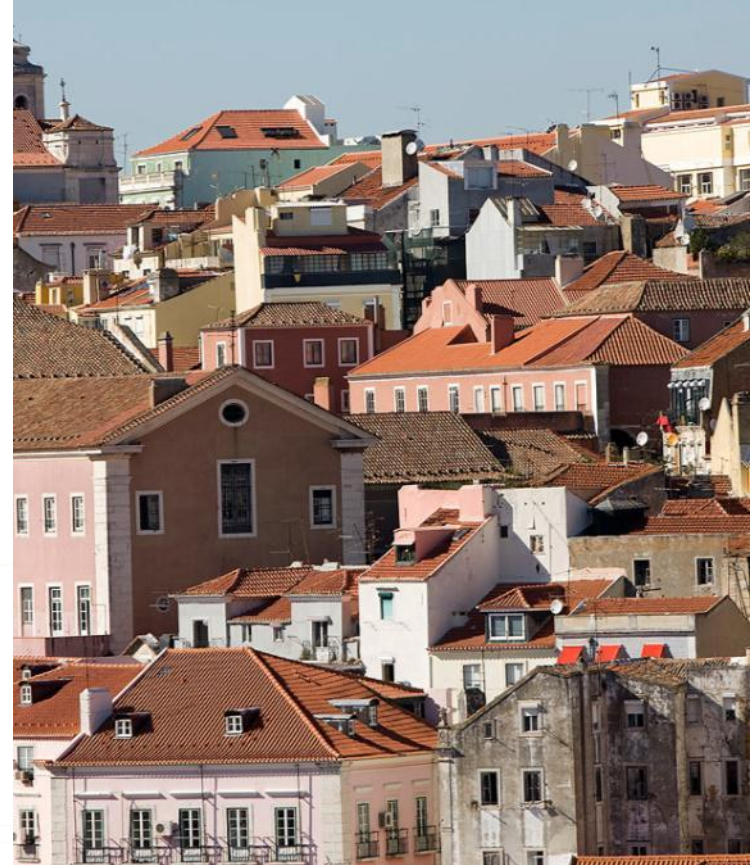
## THE BAIXA POMBALINA AREA – today

National patrimony heritage patrimony.

One of the least inhabited areas of Lisbon.

- buildings average age is 75 years old;
- 85% of the buildings do not have a lift;
- 77,6% inhabitants are over 70 years old;
- 96,4% of the inhabitants are retired;
- 87,8% lives in a rented house.

To overcome this fact and urge into the requalification of the area, the Lisbon Municipality defined the **Municipal Framework for the Baixa Pombalina Detailed Safeguard Plan.**



## THE BAIXA POMBALINA AREA – the requalification plan

Being an historical area all the buildings in this area are not required to comply to the national STO (1sqm of solar thermal collectors per inhabitant).

The Municipal Framework for the Baixa Pombalina Detailed Safeguard Plan was perceived as an opportunity to improve buildings energy performance, regarding the possibility to respond to the legal requirements, also in terms of solar thermal systems integration.



# THE BAIXA POMBALINA SOLAR INTEGRATION MAP

## STAKEHOLDERS

Lisboa E-Nova – Local Energy Agency

Lisbon Municipality  
The Urban Requalification Direction  
The Baixa Chiado Protection Unit

IGESPAR - The Institute responsible for the management and conservation of the national archaeological and architectural heritage.

Solar Thermal industry



# THE BAIXA POMBALINA SOLAR INTEGRATION MAP

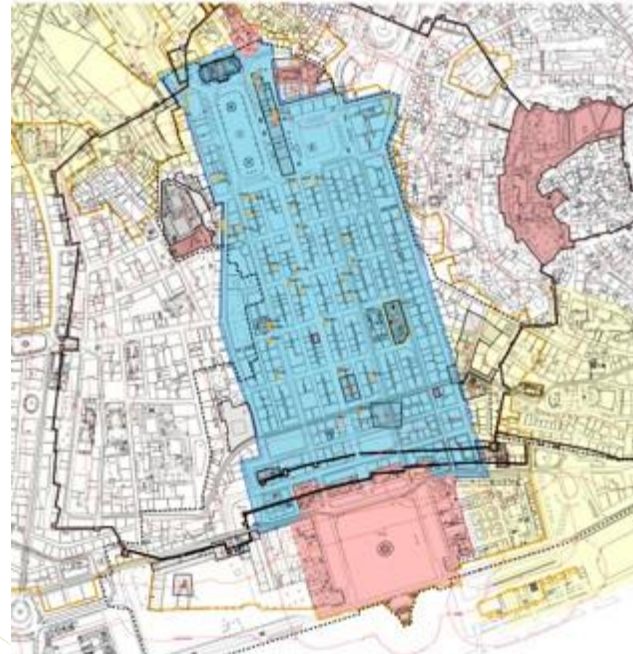
## INPUTS



Aerialphotomap, 2006



Blocks and buildings limits



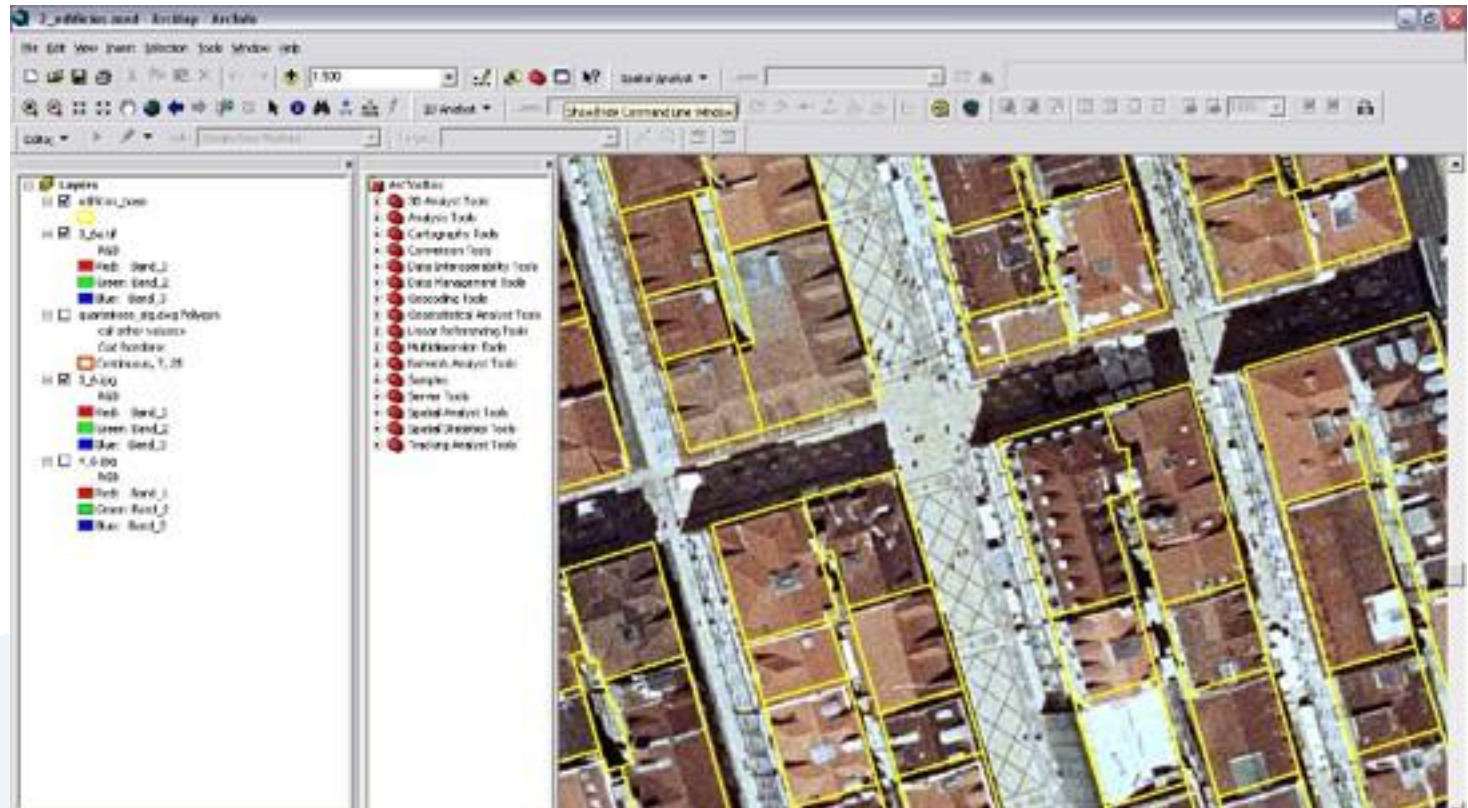
List of the classified buildings



Photographic assessment of roofs

# THE BAIXA POMBALINA SOLAR INTEGRATION MAP

## METHODOLOGY

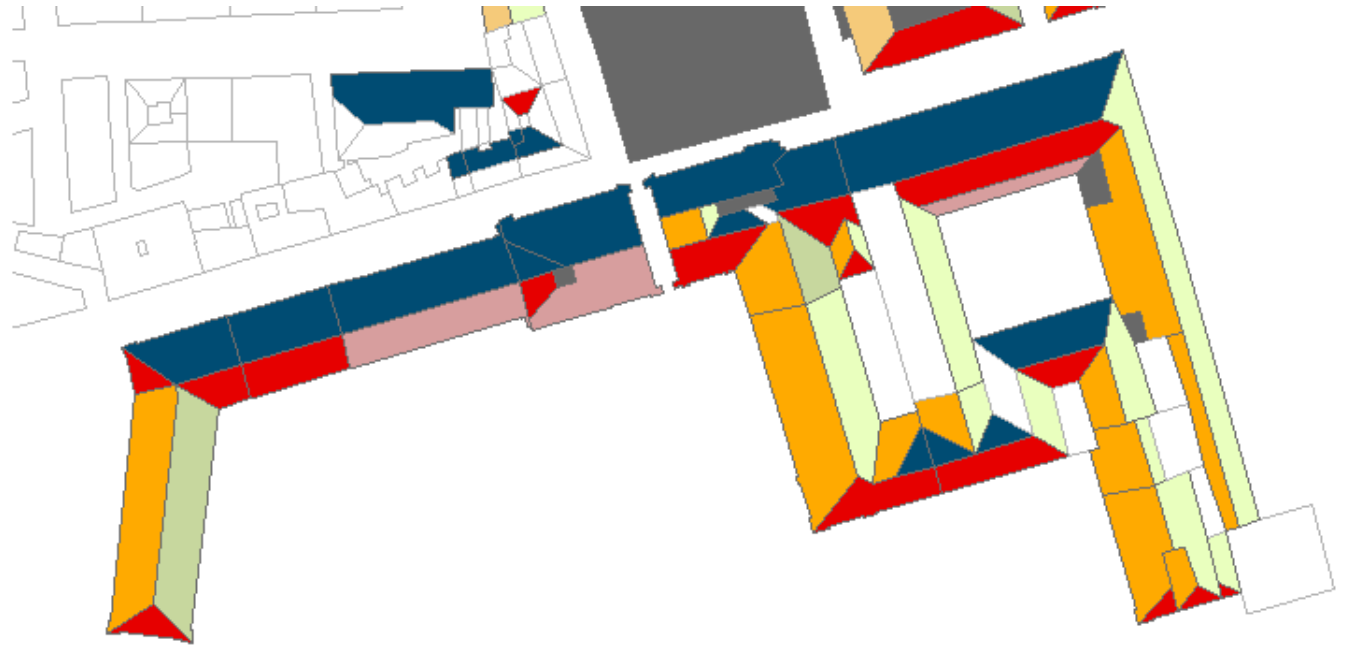


ArcGis,  
scale 1/1000

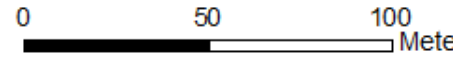
# THE BAIXA POMBALINA SOLAR INTEGRATION MAP





## METHODOLOGY

Classification of the roof covers orientation.



Escala 1/2 000



Orientation	Subtitle
East	
South	
West	
North	

# THE BAIXA POMBALINA SOLAR INTEGRATION MAP



# THE BAIXA POMBALINA SOLAR INTEGRATION MAP

## THE POTENTIAL

Orientation	Area (Average Slope 30°)		
	TOTAL	EFFECTIVE MIN. (covers without obstacles)	EFFECTIVE MAX. (covers with obstacles)
	m <sup>2</sup>	m <sup>2</sup>	m <sup>2</sup>
South	30,762	17,065	19,856
East	49,279	24,388	30,022
West	55,688	28,927	34,781
North	35,884	23,058	23,058
Horizontal	0	0	0
<b>Total</b>	<b>171,613</b>	<b>93,439</b>	<b>107,718</b>



# THE BAIXA POMBALINA SOLAR INTEGRATION MAP

## THE POTENTIAL

- 652 buildings
- 5 floors/building
- 2 apartments/floor



### Domestic hot water

- 1 bath eq. => 2.1 kW
- (40 l/day.apartment of DHW at 60°C,  $T_{\text{tap water}}=15\text{ °C}$ )
- 3 baths/day.appart.  $\Rightarrow$  **14.9 GWh/year**

6500 dwellings

**Solar Fraction 70%**

**17% of the total  
available area**

Without obstacles

**$E_{\text{solar}} = 10.4 \text{ GWh/year}$**

# THE BAIXA POMBALINA SOLAR THERMAL OBLIGATION

Municipal Framework for the Baixa Pombalina Detailed Safeguard Plan,

## Article 22º

### Roof Covers

**2** Intervention in the roof covers are only allowed for the following works:

...

f) integrating solar energy technologies;

**3.** Intervention works for changes in roof covers are allowed to:

...

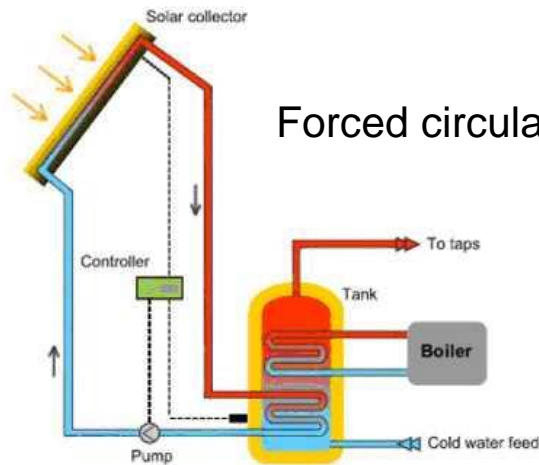
h) Installing solar energy technologies in the locations not excluded in the Solar Systems Integration Potential Map for the Lisbon Baixa Pombalina Area.

**4.** The installation of STS should be done according to the Manual for integration of Solar Systems in Lisbon's Baixa Pombalina.

# THE BAIXA POMBALINA SOLAR THERMAL INTEGRATION



Integration STS in the roof cover



Forced circulation system



# BAIXA POMBALINA SOLAR INTEGRATION POTENTIAL

## The goal:

Evaluate the best areas to select good value projects;

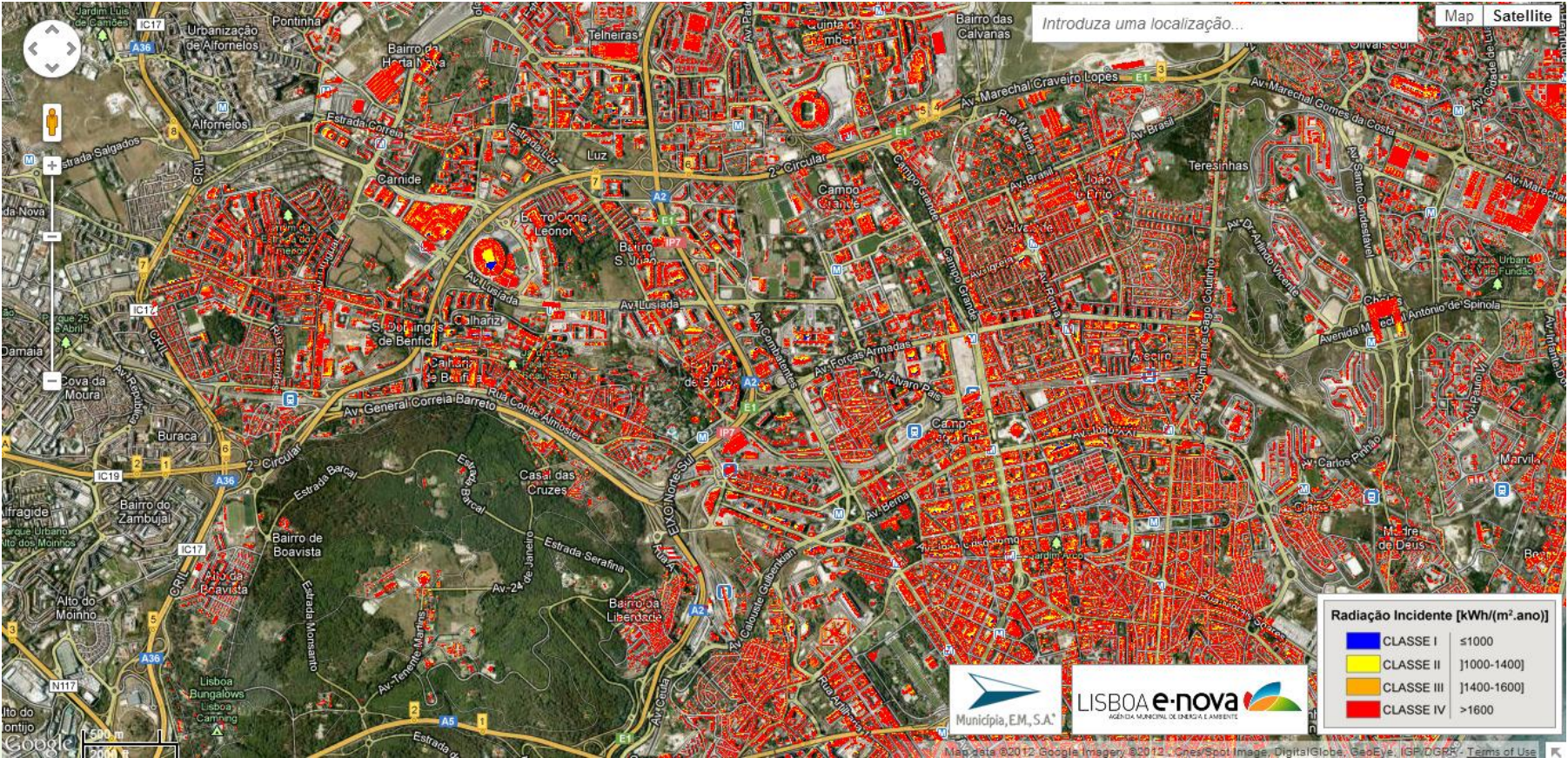
To highlight that it's possible to combine solar technologies with historical patrimony and enhance the historical value of this area, responding to buildings energy performance demanding's and comfort criteria that todays inhabitants require;

Attract new inhabitants to the Baixa Pombalina area.



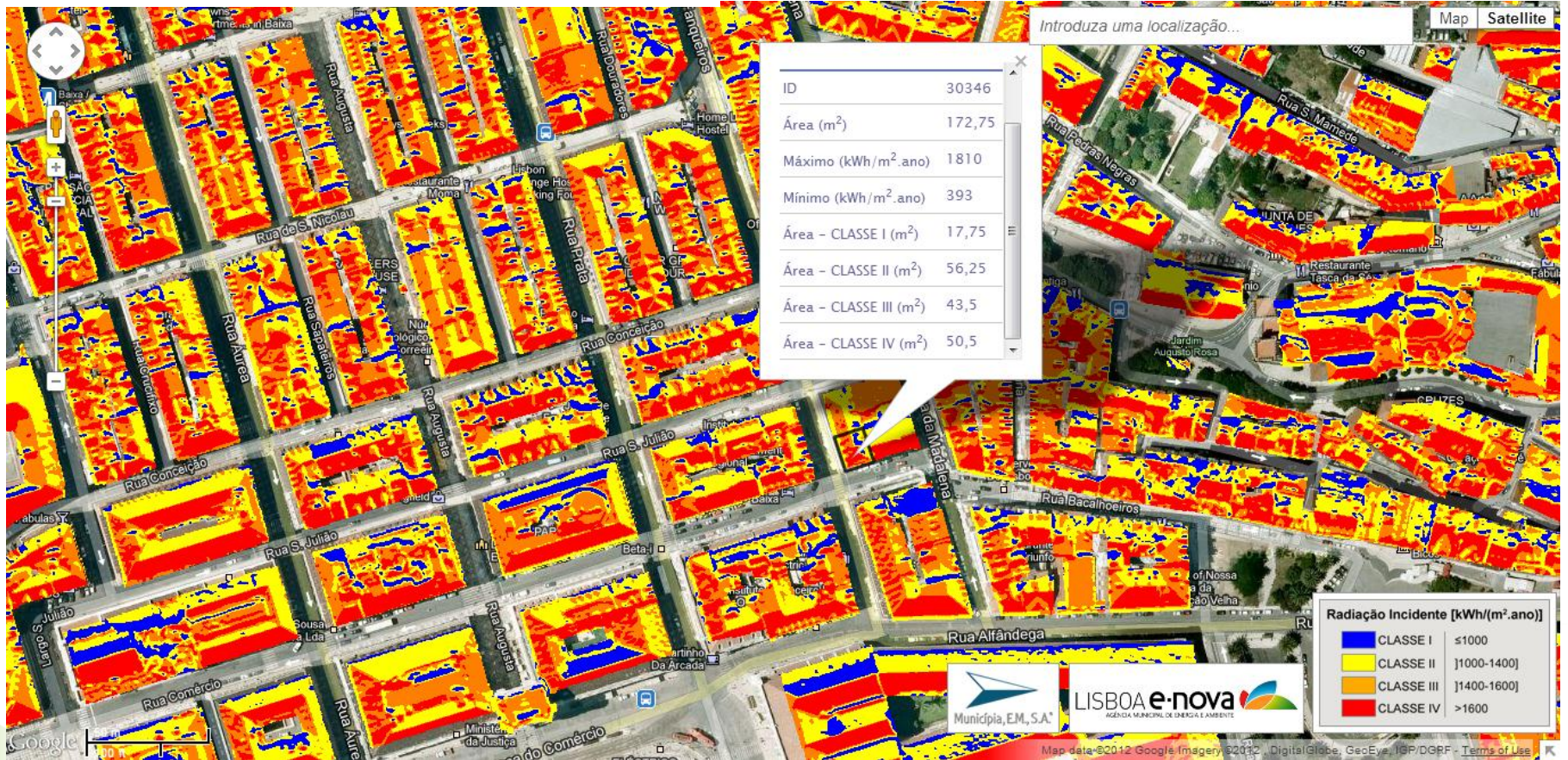
# LISBON'S SOLAR POTENTIAL

[www.lisboaenova.org/cartasolar](http://www.lisboaenova.org/cartasolar)



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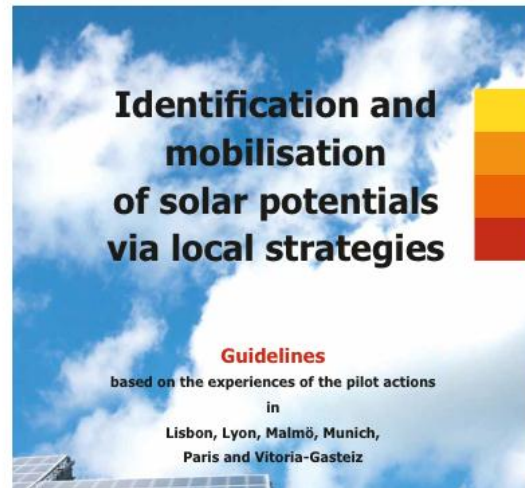
- NEWS AND EVENTS
- CURRENT PRACTICE IN EUROPE
- SOLAR URBAN PLANNING IN POLIS CITIES
- POLIS NATIONAL ACTIVITIES
- PLANNING INSTRUMENTS
- PUBLICATIONS**
- E-ROOM
- PARTNERSHIP AND CONTACTS
- LINKS

## Publications

- POLIS publications**
- Other publications

## POLIS publications

*POLIS Guidelines, based on the experiences of the pilot actions in Lisbon, Lyon, Malmö, Munich, Paris and Vitoria-Gasteiz*



Based on experience gathered during the pilot actions in the cities of Lisbon, Lyon, Malmö, Munich, Paris and Vitoria-Gasteiz, guidelines were developed to support the adaptation of urban planning procedures with the aim of boosting solar energy in other cities and towns. The POLIS partners have identified a total of ten guidelines necessary to implement a coherent planning policy in favour of solar energy. They address how to identify and mobilise the solar potential, optimise solar urban planning processes, and adapt local policies and legislation. Each of the ten guidelines (covering the entire process from data collection to policy development and legislation) will help replicate these successful experiences in other cities, benefiting from the lessons learned in practice.

The document is available in the following languages :  
[English version](#)  
[French version](#)  
[German version](#)

[www.polis-solar.eu](http://www.polis-solar.eu)

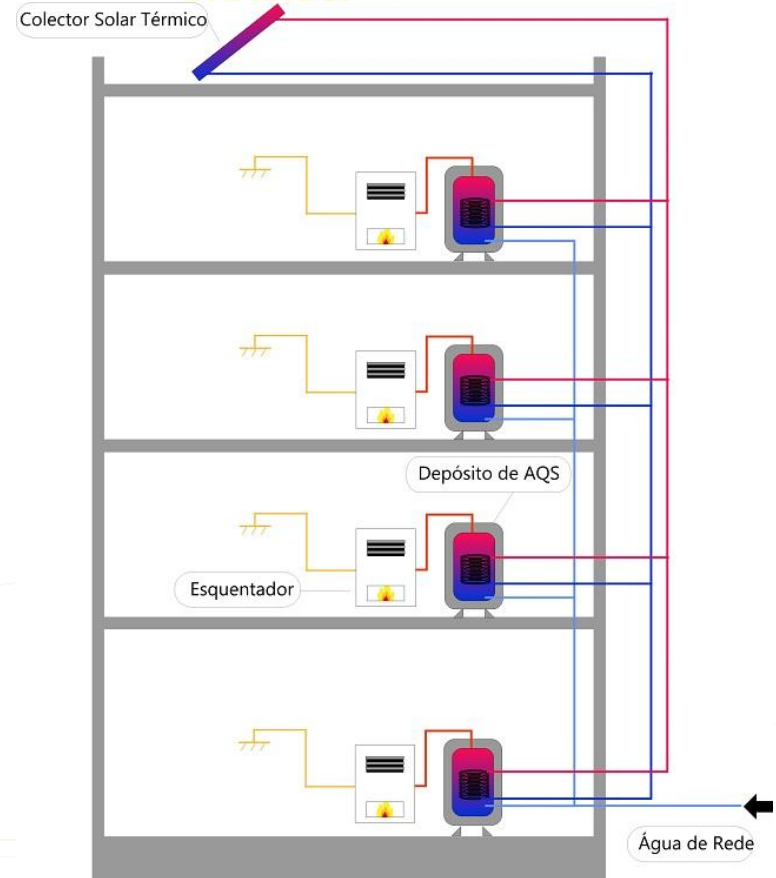
# LISBON'S SOLAR POTENTIAL – PROJECTS



## URBAN SOL PLUS [www.urbansolplus.eu](http://www.urbansolplus.eu)

Support and promote the usage of solar thermal systems in multi-family buildings undergoing major renovation works and in protected urban areas and classified buildings.

Documents:  
Transfer guidelines on protected buildings;  
Transfer guidelines on architectural integration





***Thank you for your attention***

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