

# Urban Climatopes and climatic services how to tackle climate change with local solutions

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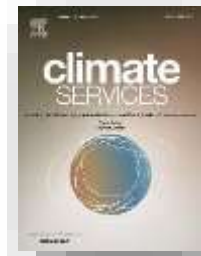
1. Climate Services Project : Urban Heat Islands and Heat Waves in Lisbon
2. Global warming need local climate adaptations
3. New guidelines for urban planning considering urban climate
4. How to get people attention to Climate Change Risks: “The Climate of my Neighborhood”

## Climate services and climate applicability

***“Climate services pioneers novel research areas that directly refer to how climate information can be applied in methodologies and tools for adaptation to climate change.”***

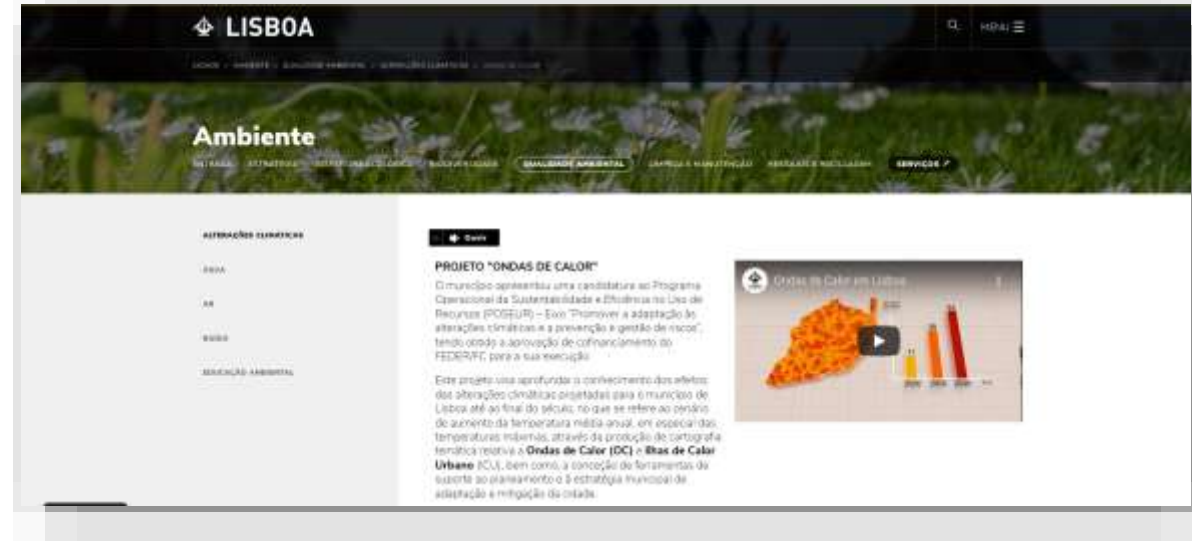
- *Information must be:*
- *Accessible*
- *easily understandable by non specialists*
- *Directed for users*
- *Decision support tools*

*...the intelligence behind the transition to a climate-resilient and low-carbon society”*



Vol.1  
(2016)

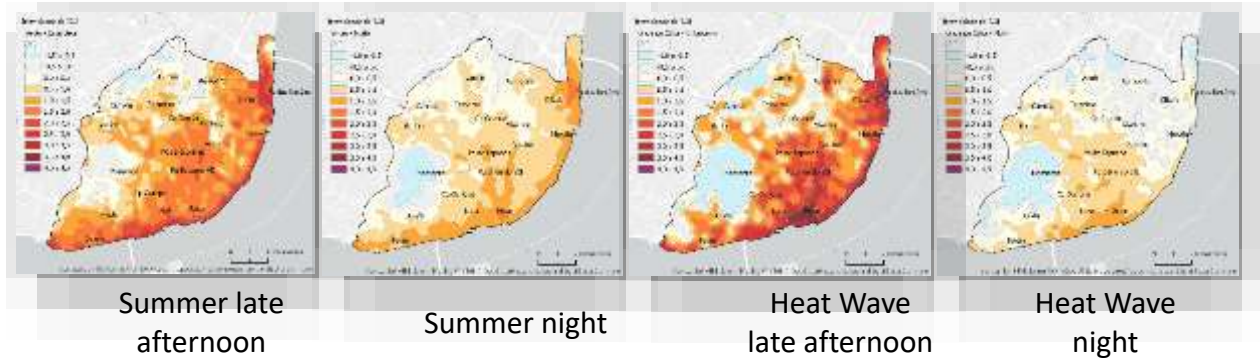




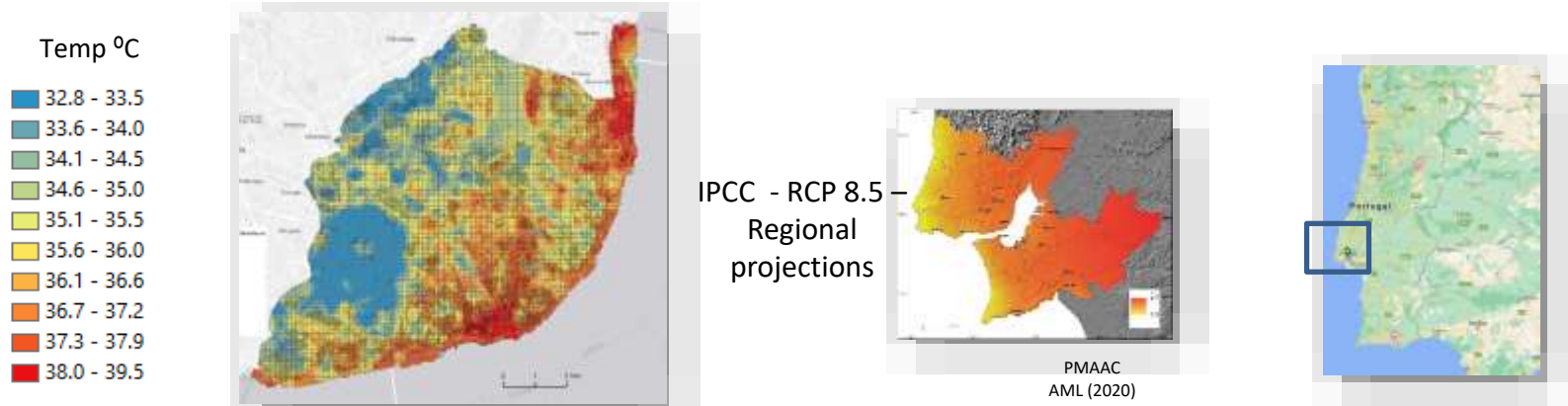
1. Updated Maps of Urban Climate-relevant Indices
2. Urban Heat Island Identification: mesoscale spatial-temporal patterns
3. Critical Areas Simulation: microscale outdoor thermal comfort

# Urban Heat Island mesoscale assessment maps: Predicting UHI spatial patterns

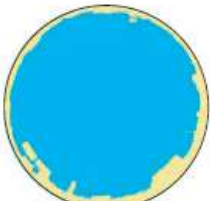
## Urban Heat island Intensity ( $\Delta T_{u-r}$ ) – present (weather types)



## IPCC worst case scenario (RCP 8.5) + UHI ( $\Delta T_{u-r}$ ) + Heat Wave (Temp °C) | 2070 - 2100



(a) Parking lot



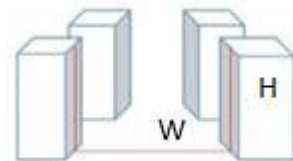
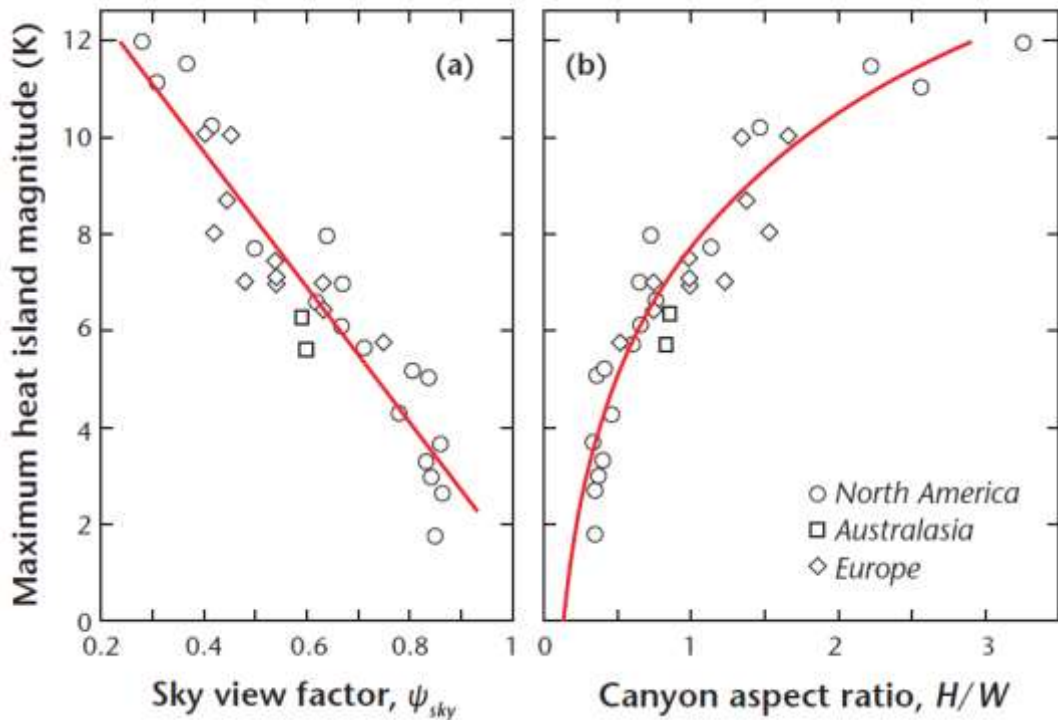
$$\psi_{sky} = 0.97$$

(d) Street canyon



$$\psi_{sky} = 0.36$$

## Urban geometry and density and UHI Intensity



# From Urban Geometry to Urban Climate-relevant Indices

Buildings Height

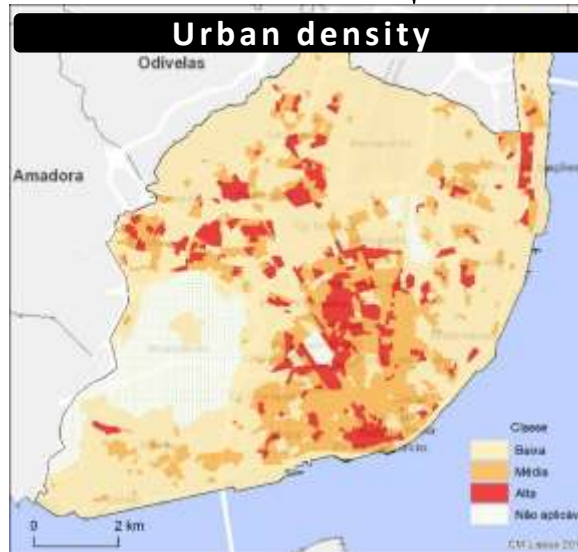
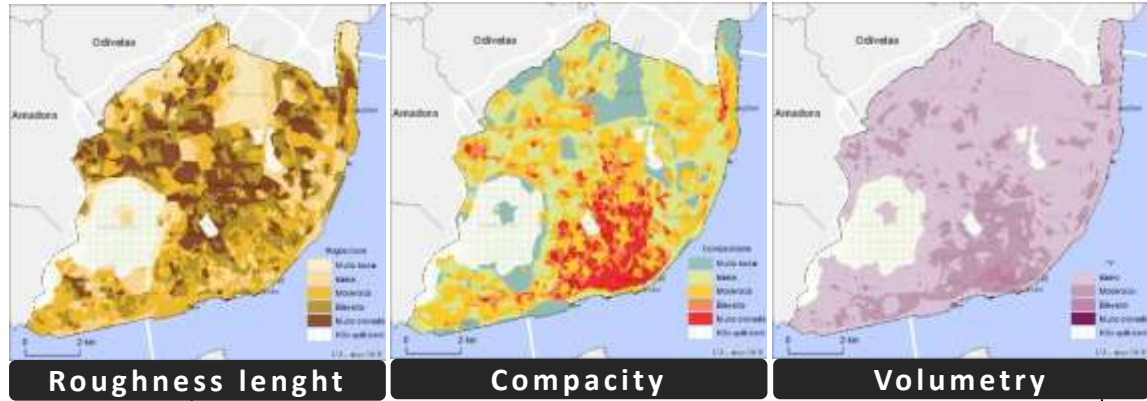
+

Building Footprints

+

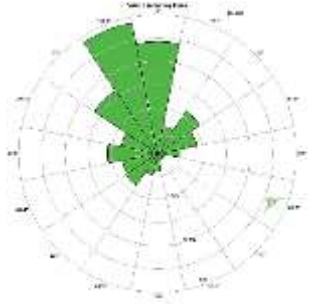
Wind Direction

urban climate algorithms



Synthesis Map of Urban Density, as a predictor for the Urban Heat Island spatial pattern

# New Guidelines for Urban Planning 2020 proposal | taking in account urban climate patterns



The area of free ventilation is very important to remove pollutants and improve thermal comfort.

2005

2020

“free” area for wind penetration is decreasing

Increasing urban density

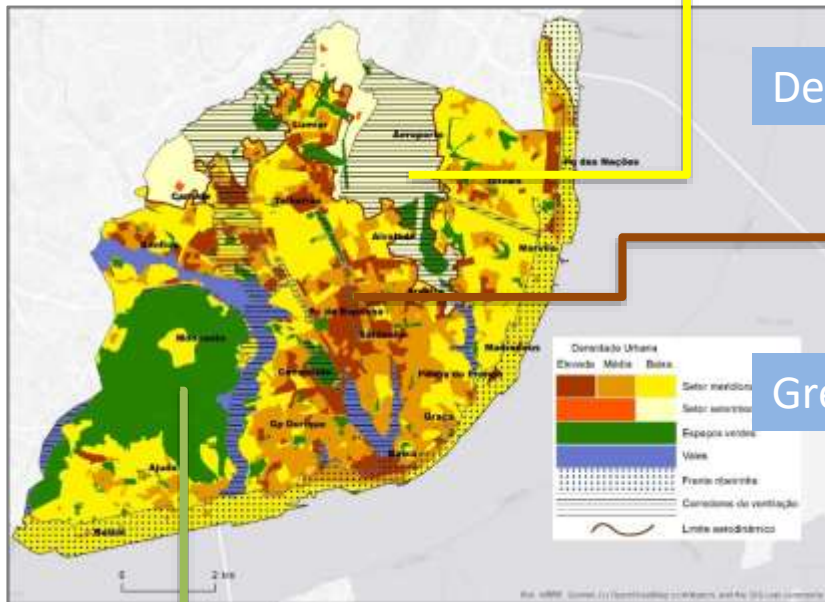


Aerodynamic limit (roughness length - 0.7 m)



# New Guidelines for Urban Planning 2020 proposal | considering urban climate

9 Climatopes | **9 areas** with climatic guidelines not necessarily the same | about **34 measures**  
3 examples

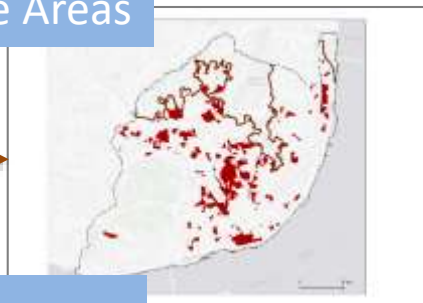


## Ventilation Paths



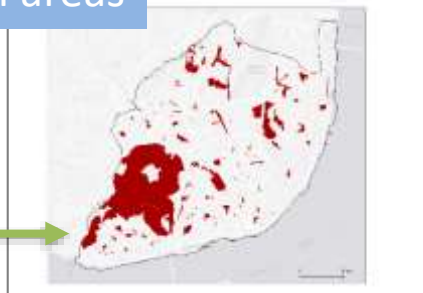
- » To maintain N/S Ventilation Paths (VP)
- » To maintain small VP interconnections
- » To reduce Z0 (roughness length) < 0.7 m
- » To maintain the disengagement of VP

## Dense Areas



- » To prevent high density ( $H/W < 1$ ) in dense built areas.
- » To prevent long alignments of buildings perpendicular to the predominant wind (N), in new neighbourhoods.
- » New materials with appropriate thermal conductivity and high albedo.
- » Green and white roofs, white previous surfaces, etc.

## Green areas



- » To increase spaces that contributes to human bioclimatic conditions
- » Cooling urban spaces (shading and evapotranspiration)
- » To promote biodiversity
- » To promote connections between green spaces and ventilation paths.

# The climate of my neighborhood: urban sustainability in times of Climate Change

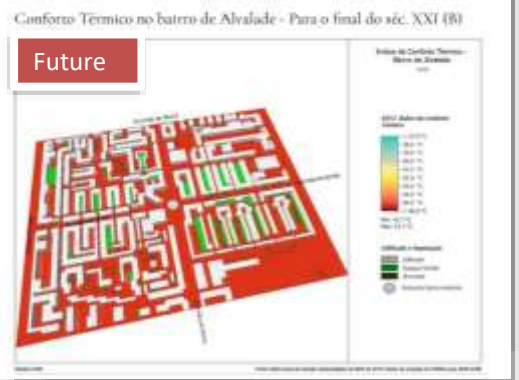
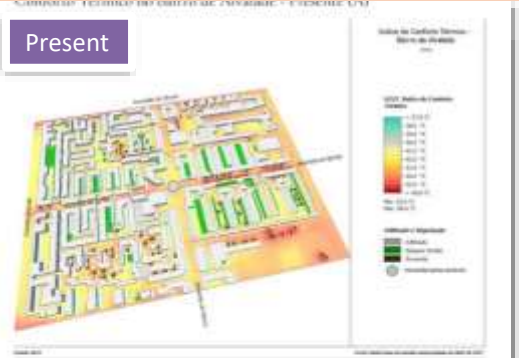
Sara Lopes (MSc thesis) – IGOT – University of Lisbon

Citizens were confronted with Thermal comfort scenarios



Figura D.2 - Modelo Tridimensional do Bairro de Alvalade

Alvalade Neighborhood Lisbon



online inquiring

Questionário à população residente no Bairro de Alvalade - Sustentabilidade urbana e Alterações Climáticas

Este questionário insere-se num projecto de investigação sobre o clima, a sustentabilidade do Bairro de Alvalade e a sua evolução para o futuro. O objectivo do estudo é conhecer o nível de conhecimento da população residente no Bairro de Alvalade sobre a sustentabilidade urbana e as alterações climáticas.

Podemos garantir:

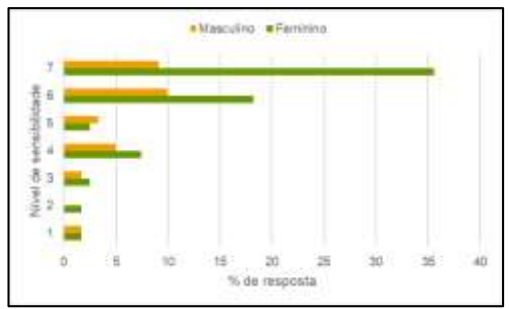
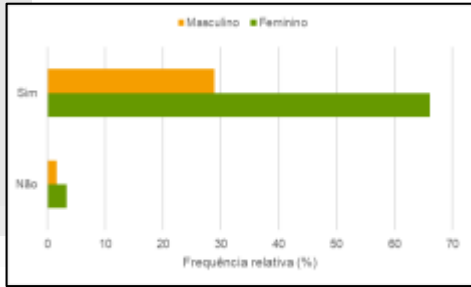
- O anonimato e a confidencialidade dos dados recolhidos.
- O tratamento dos dados recolhidos de acordo com a legislação em vigor.
- A possibilidade de contactar o investigador responsável em caso de dúvidas.

Responda às seguintes questões:

1. Conhece o Bairro de Alvalade?

Sim  Não

Are you willing to change?



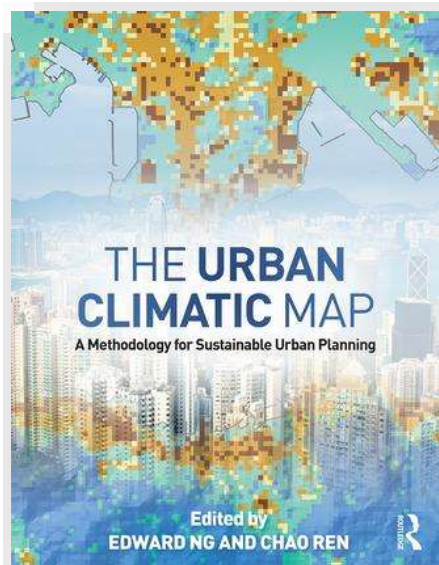
How sensitive you became to climate change in your neighborhood



## Conclusions

1. Warm season is expanding, and heat waves are more frequent and intense.
2. Urban Heat Island can increase in the future, with new compact areas.
3. Global problems need local solutions.
4. Climate Functions and Guidelines should be taken in account in urban planning to tackle Urban. Climate Change.
5. A denser network of urban meteorological stations with IoT Sensors (including noise, odors, UV, etc.) – Thermal-physiologic Urban environment observatory.
6. Scientists and o confront citizens with the reality of the “**Climatic crisis**”, without social alarm and to promote healthier live styles





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**Application of climatic guidelines to urban planning  
The example of Lisbon (Portugal)**

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**ABSTRACT**

In order to contribute to the sustainability of the urban environment, knowledge about the urban climate should be translated into climatic guidelines for planning. However, there are hardly any studies on applied urban climatology in areas with a Mediterranean type of climate. The study presented in this paper has several aims: to identify the climatic needs in a coastal city with Mediterranean climate; to describe the methodology, which can be adapted in order to be used in other cities; to discuss some of the problems that arise when applying climatic knowledge to urban planning, including the selection of the adequate scale of analysis, the required data and tools, the relevance of the planning practices, and the need to develop a shared language among planners and climatologists; and last to contribute to furthering the debate on the advantages of including climatic guidelines in Master Plans of urban municipalities in a systematic way. Lisbon's case is studied in particular. As planners need spatialized guidelines, the response of Lisbon's physical features was carried out using a Geographic Information System. Based on a Digital Elevation Model and on data of urban roughness a "ventilation map" was produced. A "building density" map was also prepared based on the analysis of a Landsat image and field work. By cross-referencing these two layers, a final map depicting Lisbon's "heterogeneous climatic response area" was prepared. Finally, a series of climatic guidelines for planning were put forth for the different units.

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**sustainability**

MDPI

Article

**Evaluating the Cooling Potential of Urban Green Spaces to Tackle Urban Climate Change in Lisbon**

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**atmosphere**

MDPI

Article

**Local Weather Types by Thermal Periods: Deepening the Knowledge about Lisbon's Urban Climate**

Claudia Reis\*, António Lopes, Ezequiel Correia and Marcelo Fragoso

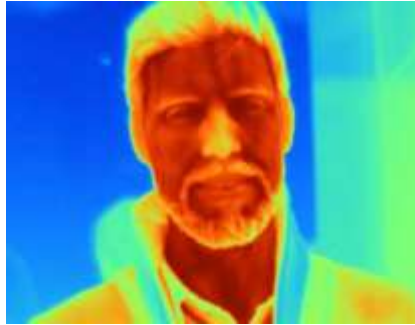
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Thank you for your attention

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Thermal Comfort assessment with Thermal Infrared camera