

A MULTIDISCIPLINARY OBSERVATORY
TO ASSIST THE CLIMATE CHANGE
ADAPTATION POLICY :
THE EXAMPLE OF THE GREATER LYON

LUCE PONSAR

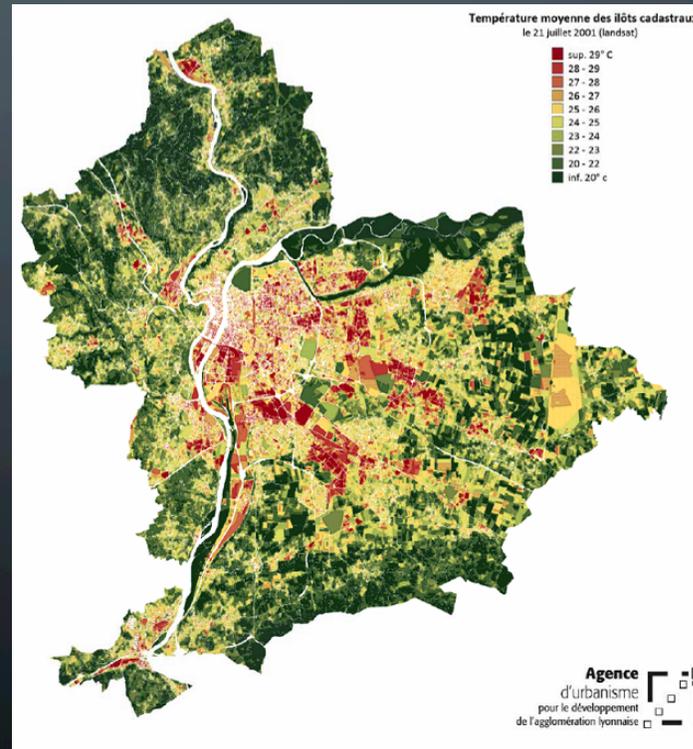
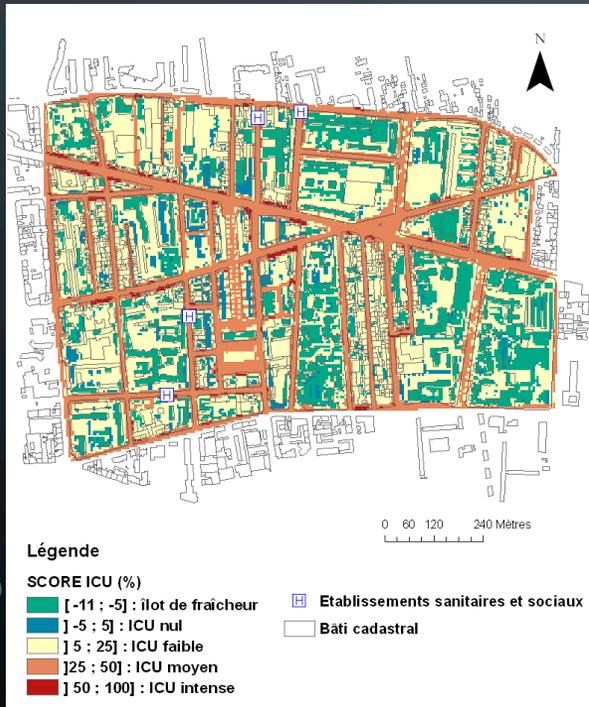
DIDIER SOTO

GRAND LYON
la métropole



2005-2010 : launching of the first projects

- EU Amica project : **heatwaves** identified as the main local climate change issue
- First maps of the **Urban Heat Island (UHI)** local variations



Geo-statistical approach
(Champiat, 2008)

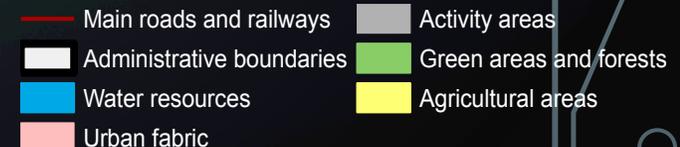
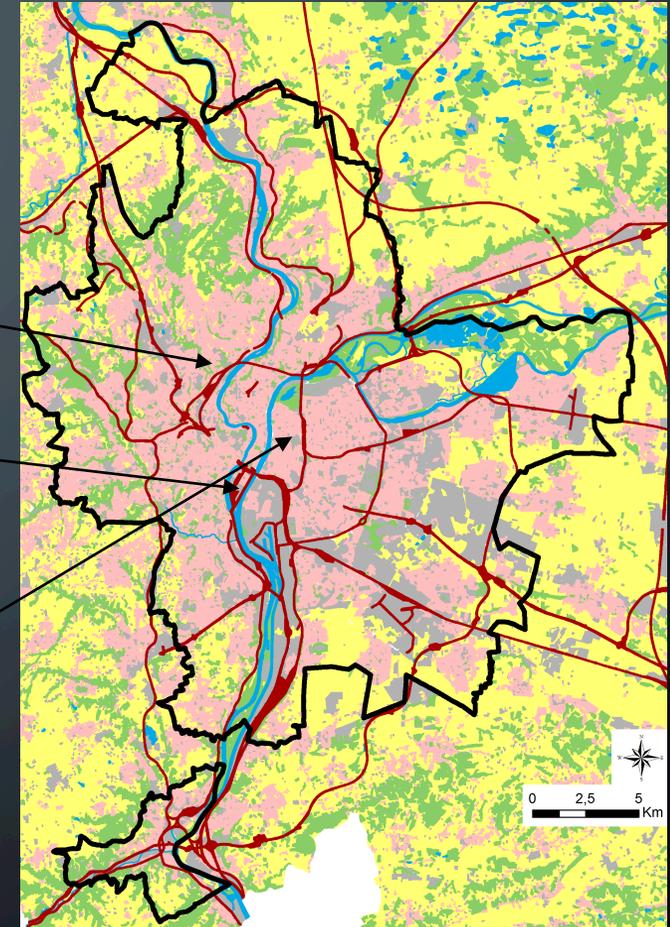
Remote-sensing
identification
(UrbaLyon, 2010)

2010-2015 : public and private research initiatives

- PhD thesis to improve the knowledge of UHI spatialisation in three different cities
- Environmental analysis in “La Duchère” district by a design office
- First thermal model in the “Confluence” district by researchers on urban sciences and techniques
- Temperature measurements in the “Part-Dieu” district during summer 2011
- Road dampening project in the “Part-Dieu” district between 2012 et 2014
- EVA project : impacts of water, vegetation and albedo on microclimate

Many questions still remain :

- How to model local urban microclimates ? Which districts ? Which interactions with climate change ?
- Where are located the most heat-related vulnerable assets ?
- How to evaluate local adaptive capacities ?
- Which are the best practices to refresh hot urban areas ?
- Which are the best-climate adapted materials ?
- How to deal with citizens for a better sharing of good practises ?



THE CLIMATE CHANGE EFFECTS TO COME AT THE LOCAL SCALE

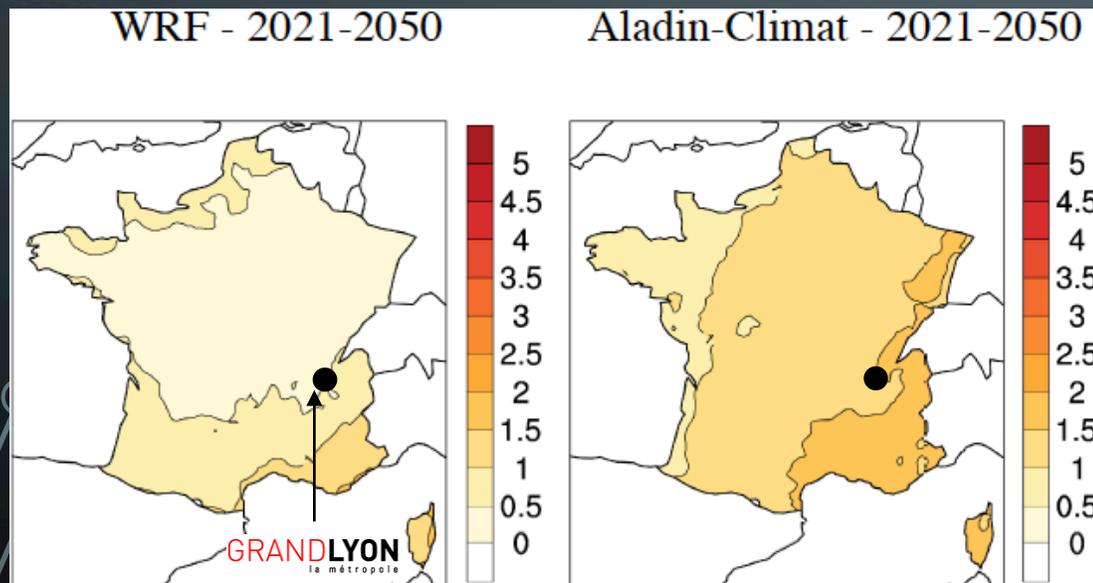
Statistical trends concerning mean temperatures and heatwaves

At the Lyon-Bron station, between 1959-2013 (reference period 1981-2010), there have been :

- An increase of the mean annual temperature of **1,7°C**.
- An increase of the mean summer temperature of **2,4°C**
- Three main heat waves : **1976, 2003 and 2015**

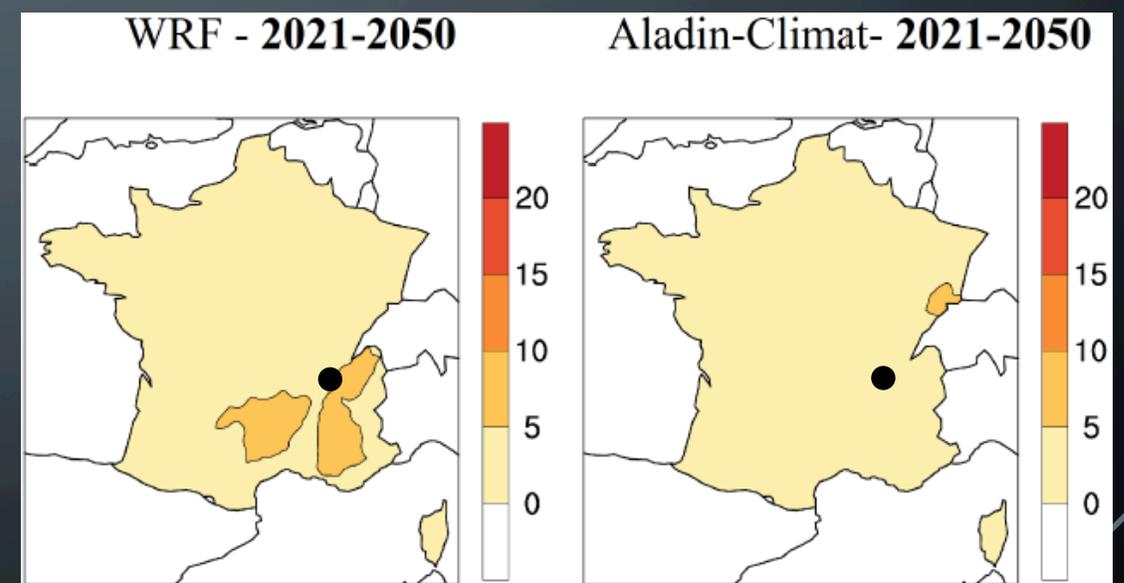
Future climate change projections according to European models

Jouzel et al, (2014)



Summer temperature differences (°C) relative to the 1976-2005 period according to RCP 8.5

An increase between 0,5 and 1,5°C



Number of heat wave days differences relative to the 1976-2005 period according to RCP 8.5

An increase between 0 and 10 days

THE HEAT-RELATED RISK, A COMBINATION BETWEEN HAZARD AND VULNERABILITIES

Excess mortality risk :

- **1976** : excess mortality of **6 000** people in France
- **2003** : excess mortality of **15 000** people in France
- **2015** : excess mortality of **3 000** people in France

Many determinants of heat exposure :

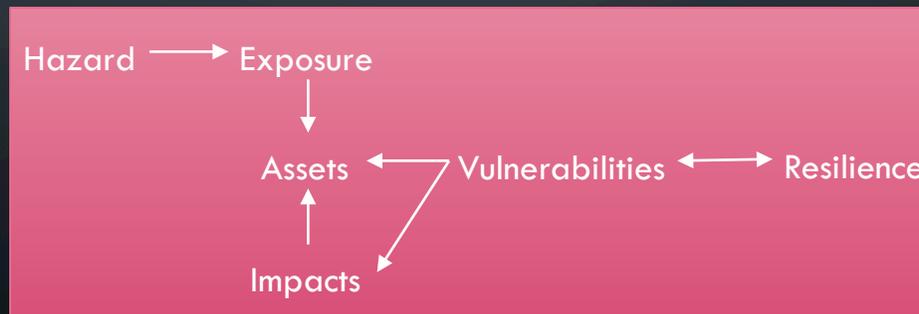
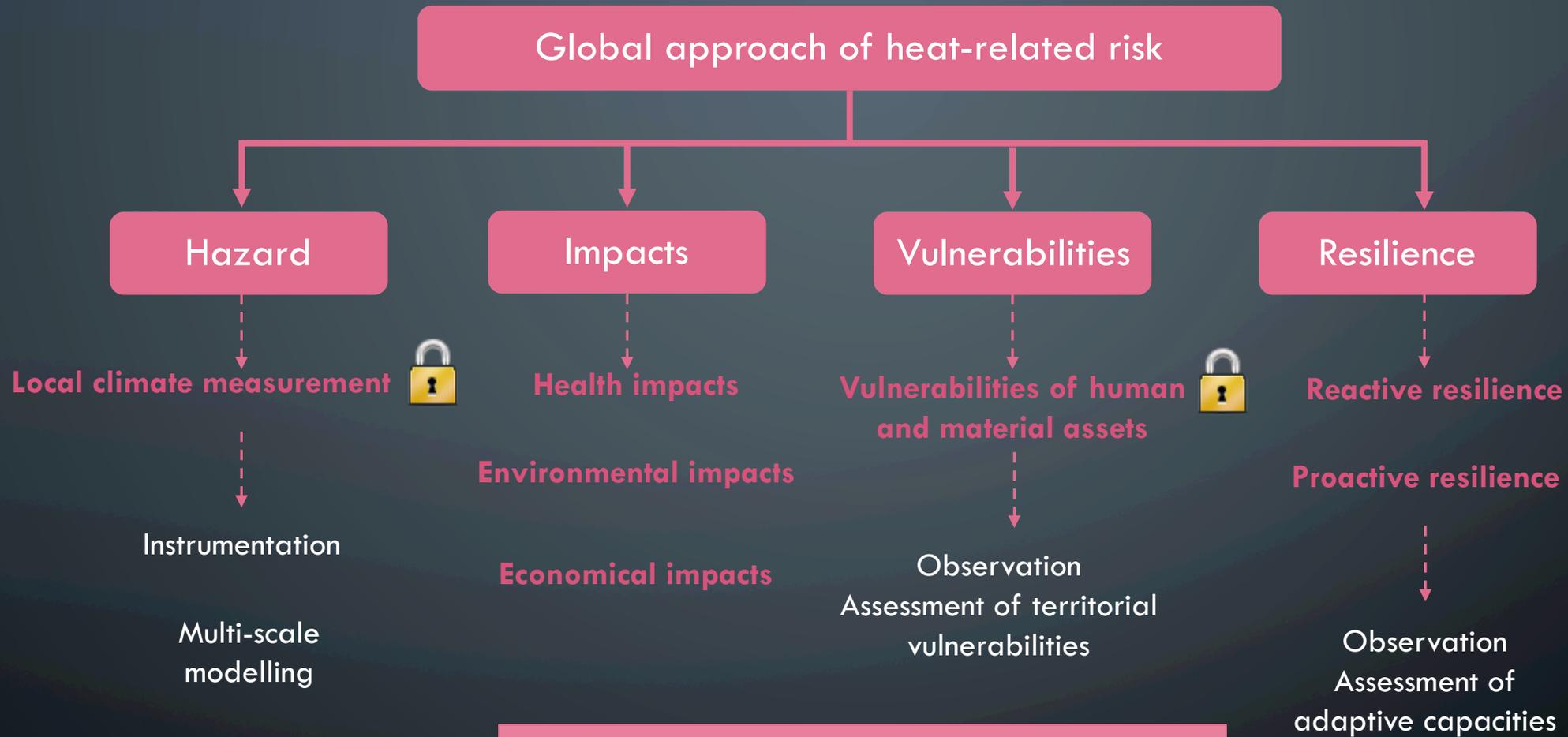
- **Urban determinants** : highly mineral environments ; anthropogenic additive heat ; pollutant emissions...
- **Climatic determinants** : precocity and length of the heatwave; very high minimal temperatures...

Many determinants of heat-related urban vulnerability :

- **Physiological determinants** : elderly, children, people with pre-existing health impairments...
- **Socio-economic determinants** : education, income, poverty, home amenity, housing quality, healthcare access, social isolation...
- **Institutional determinants**: ability to deliver services, willingness to invest in adaptation, barriers to adaptation, participatory decision making...



A SCIENTIFIC APPROACH THAT SHOULD BE EXTENDED



EPOC AN OBSERVATORY TO BRING MULTIDISCIPLINARY AND OPERATIONAL ANSWERS



EPOC project :
Foreshadowing study of a local climate observatory
Length : 2 years (2014-2016)
Multidisciplinary researches
Researchers-practitioners rapprochement

...through an observatory, considered as an interface between :

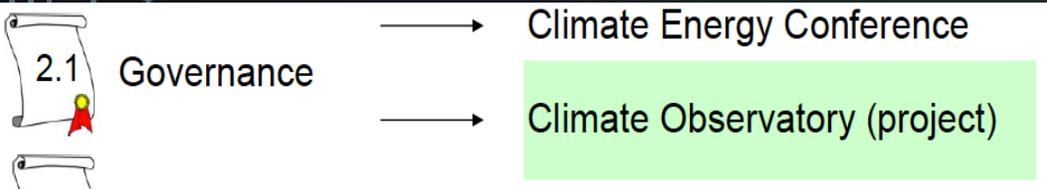
- researchers
- technicians from local authorities
- consultants
- managing directors
- professional association networks
- citizen associations

An adaptation strategy with a partnership approach...

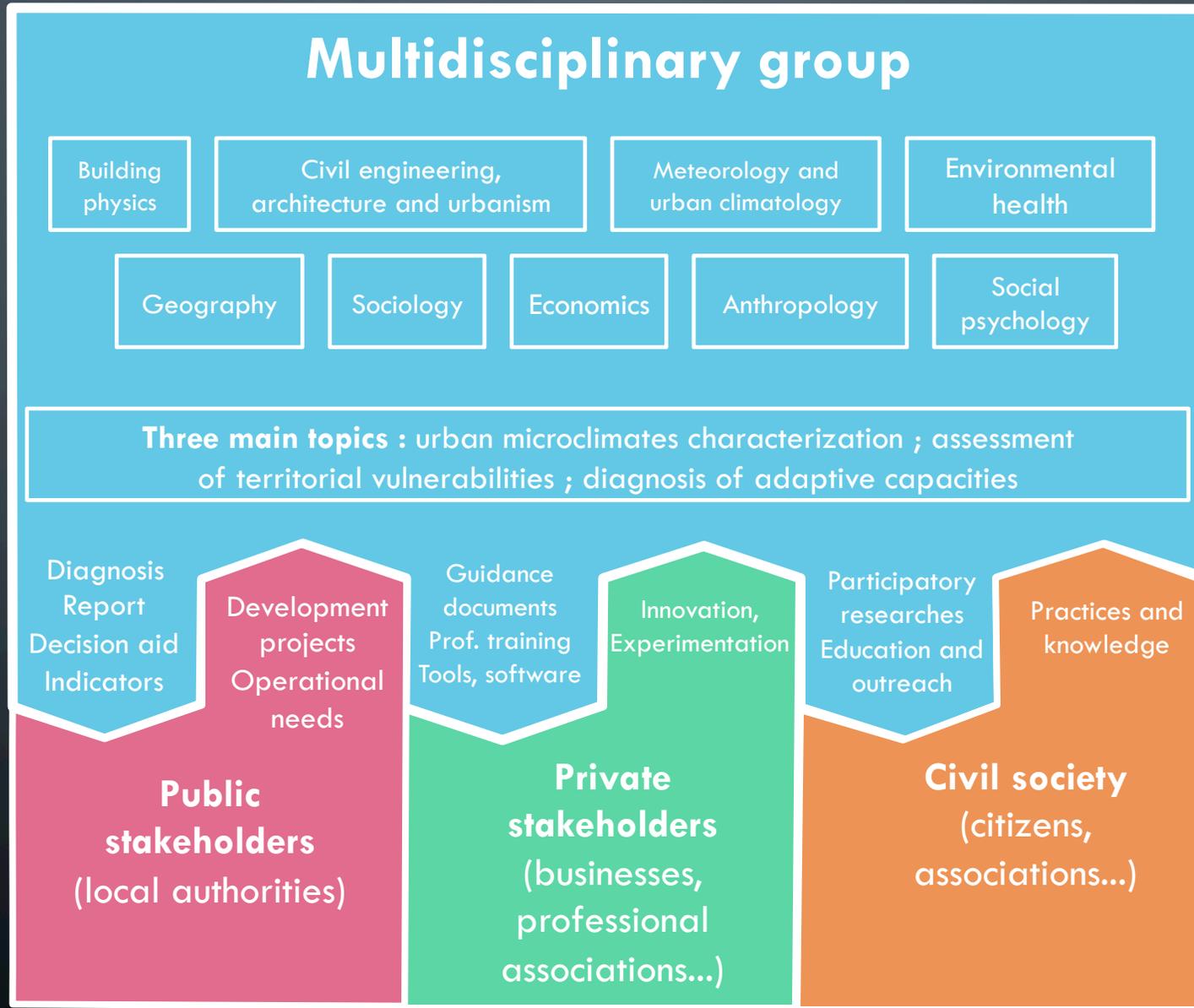


Many objectives :

- Sharing scientific knowledge
- Overviewing local scientific, technic and socio-economic abilities
- Foreshadowing the structure, its governance and its funding
- Experimenting some expected deliverables



AN OBSERVATORY TO BRING MULTIDISCIPLINARY AND OPERATIONAL ANSWERS





EPOC 1ST PROJECT : ASSESSMENT OF TERRITORIAL VULNERABILITIES

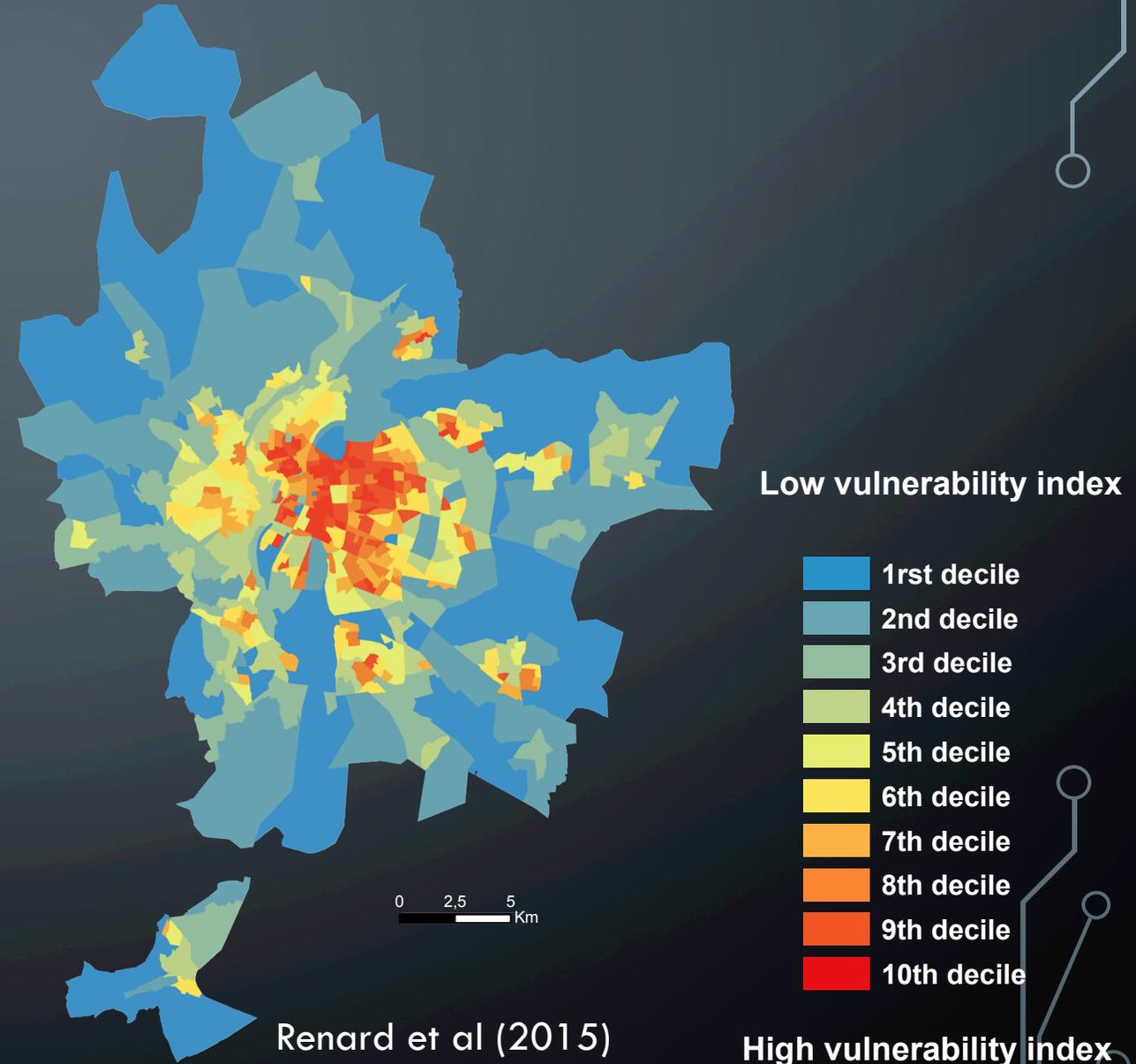
Building of a heat-related vulnerability index :

- Quantification of the socio-economic assets



- Assessment of the vulnerability based on expert judgments (doctors, nurses, epidemiologists)
- Weighting of the assets with a multicriteria decision analysis method

Three main vulnerable assets : elderly, children, people with pre-existing health impairments



EPOC 2ND PROJECT : CHARACTERISATION OF LOCAL URBAN MICROCLIMATES

Modelling :

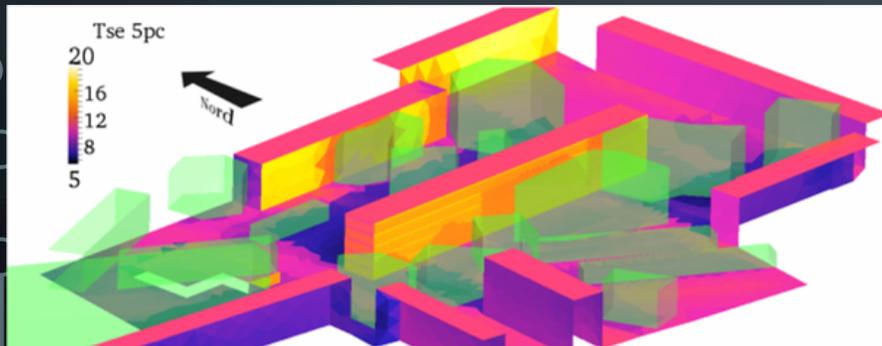
3 different districts :

- Lyon-Terreaux (old buildings)
- Lyon-Perrache (ancient suburb in full renovation)
- Rillieux-Semailles (residential suburbs)

Selection criteria:

- High values of vulnerability index (top decile)
- Various shapes and ages of buildings

Surface temperature modelled by software processes :
Solene microclimate (Malys, 2012)

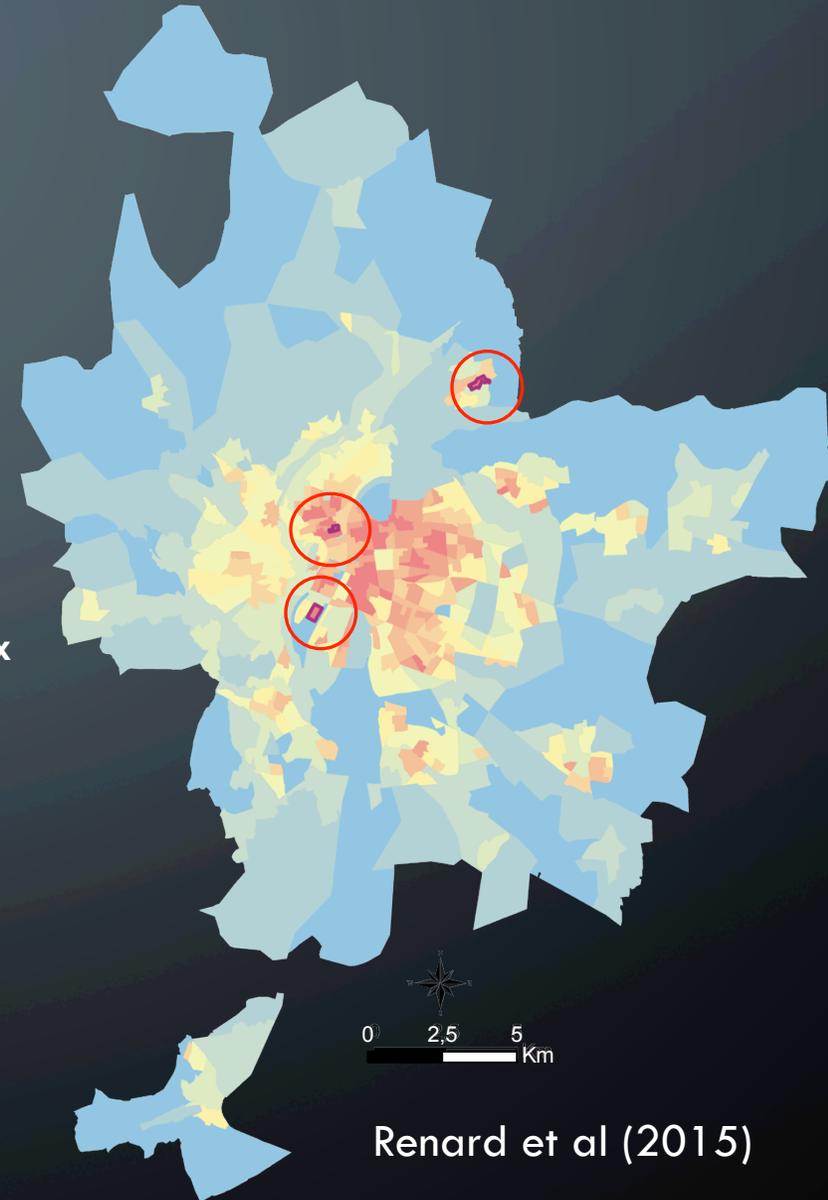


Study areas

Low vulnerability index



High vulnerability index



Renard et al (2015)

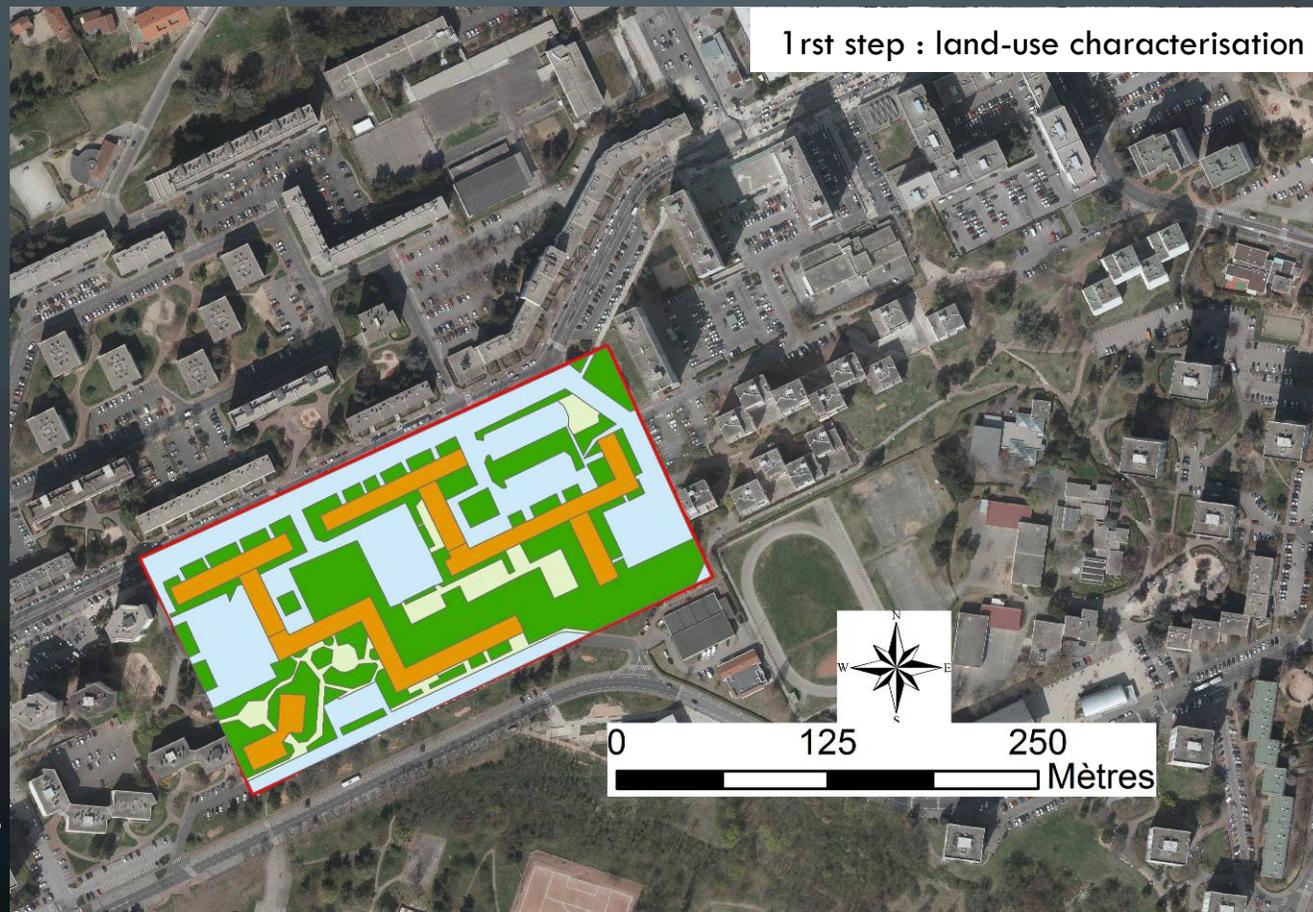
EPOC 2ND PROJECT : CHARACTERISATION OF LOCAL URBAN MICROCLIMATES

“Solene microclimate” process (in brief) : land-use characterisation ; 3-D shaping ; attribution of thermodynamic properties ; computational fluid dynamics

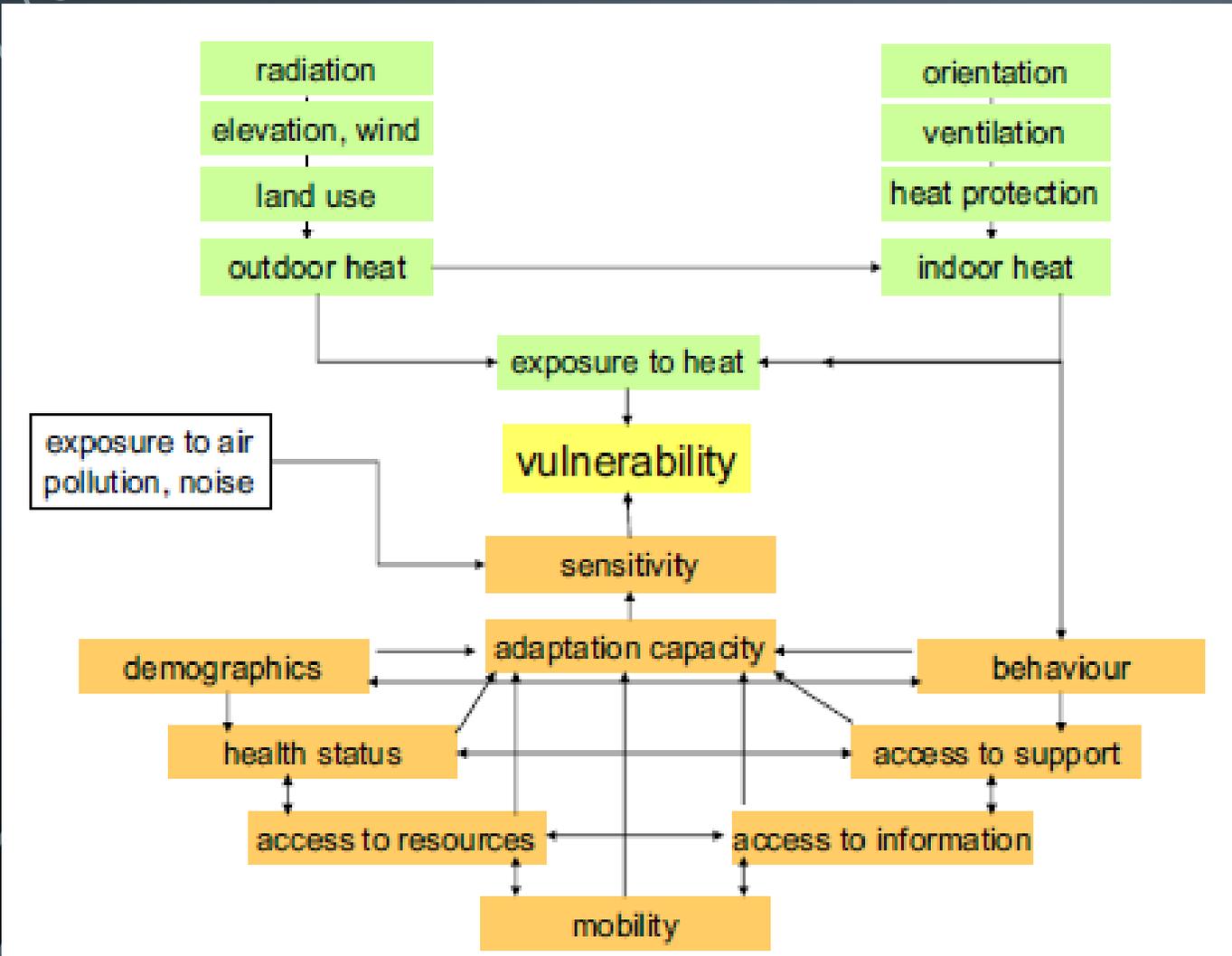
➔ **surface temperature ; air temperature ; velocity**

Rillieux-Semailles,
a residential suburb district
with one of the higher
values of vulnerability index

- Study area
- Mineral roads
- Built-up surfaces
- Vegetated surfaces
- Paths



EPOC 3RD PROJECT : DIAGNOSIS OF LOCAL ADAPTIVE CAPACITIES



Wolf and McGregor (2013)

Quantitative socio-economic indicators :
demographics, health status ; access to resources, mobility

Qualitative indicators :
behaviour, access to support, access to information

➡ scientific barrier : how to assess ?

Multidisciplinary researches with geographers, social psychologists, sociologists and anthropologists

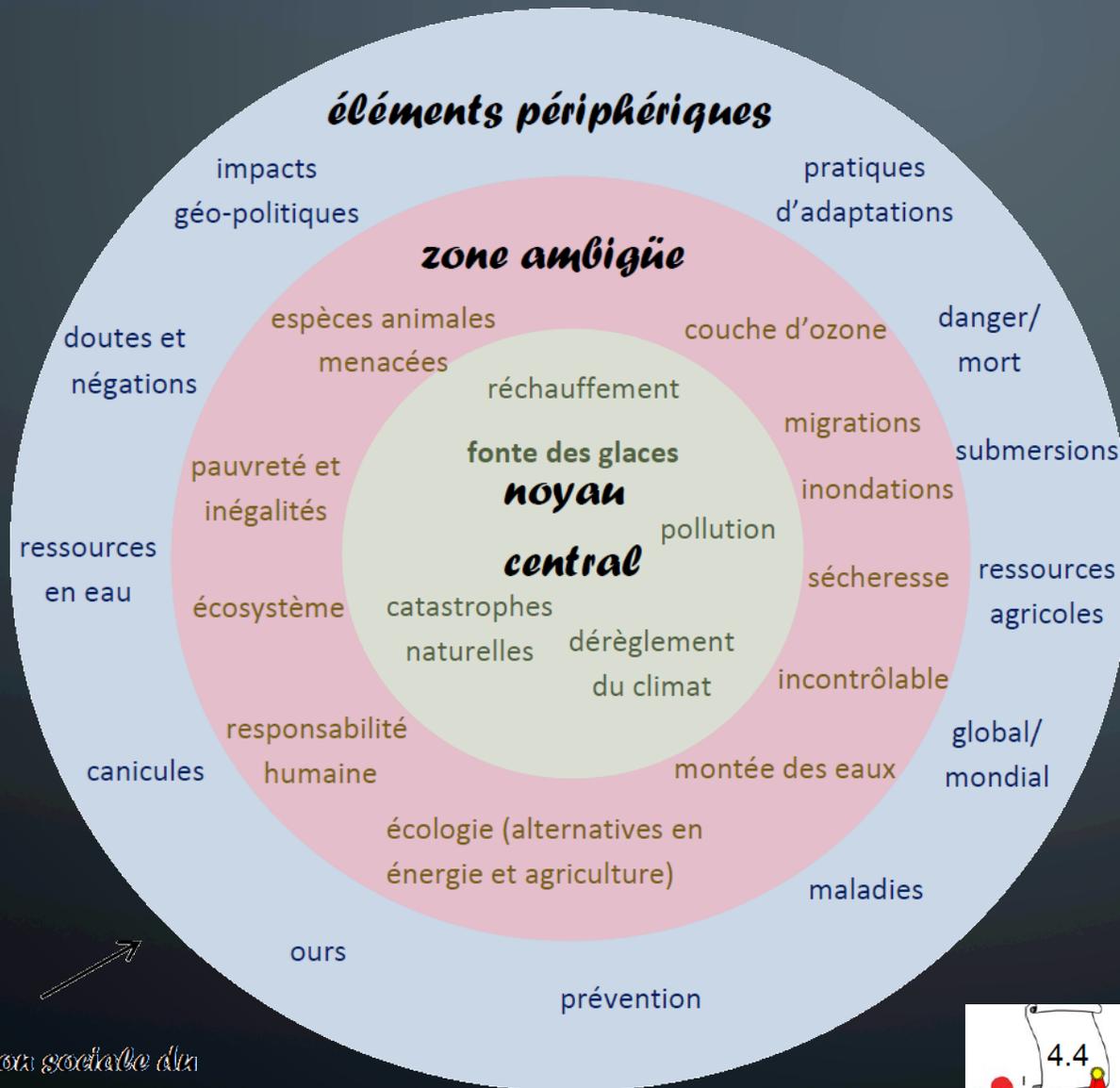
First diagnosis : citizen consultation

EPOC 3RD PROJECT : DIAGNOSIS OF LOCAL ADAPTIVE CAPACITIES

- **First step** : “street interviews” : individuals motivations to be part to a participatory research
- **Second step** : creation of a **multidisciplinary group** to elaborate participatory methods and tools
- **Third step** : “focus-groups” : experimentation of participatory methods on individuals from civic and environmental associations (neighbourhoods councils...)
- **Fourth step** : “market stall” : experimentation on participatory methods on individuals in a familiar environment with a focus on “emotions and feelings” about climate change
- **Fifth step** : multidisciplinary analysis by the previously established group



EPOC 3RD PROJECT : DIAGNOSIS OF LOCAL ADAPTIVE CAPACITIES



Semantic repartition of the social representations according three levels :

- **Central core** : most established representations
- **Surroundings elements** : representations which are the most able to change
- **Ambiguous zone** : transition zone between consolidated ideas and movable representations



First knowledge to determine citizens behaviour and practices

For social data

CONCLUSIONS

An ongoing local adaptation policy, which is currently facing several scientific and technical barriers



A local community of researchers working on urban climates and climate change



The solution to all problems !

A structure interface is needed to ensure **the mediation and the translation** of, in one hand, the operational needs and, on the other hand, the scientific data, concepts and methods.

EPIC is one possible solution to address the climate change adaptation and many projects have been launched to consolidate relations between researchers, practitioners and citizens.

Now, we need to sustain this structure with **consolidated scientific and technical deliverables**, an **established budget** (scientific programs from European or national funding, public and private contributions) **and a staff to animate the network**.

Thank you for your attention !