

PROJECTING 2100 URBAN GROWTH TO ASSESS URBAN CLIMATE CHANGES ON TOULOUSE URBAN AREA (FRANCE)

COMBINING SCENARIOS AND LAND CHANGE / CLIMATE MODELS



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CONTEXT AND OBJECTIVES

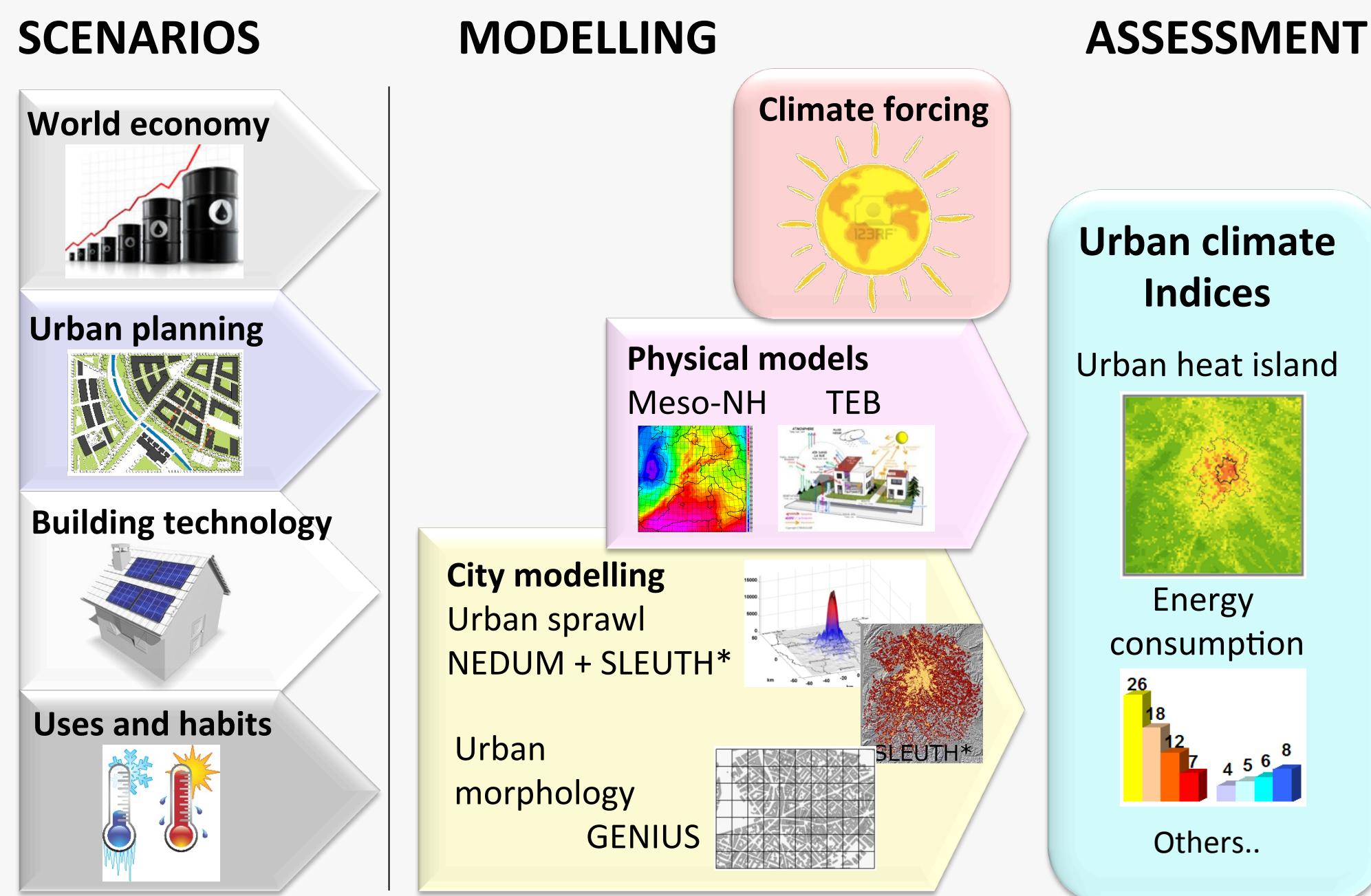
Context

- Build a multidisciplinary and integrated modeling platform to simulate urban processes over the XXIe century : the ACCLIMAT Platform.
- Propose city projections under various urban scenarios and assess their impacts depending on the climate change.
- Produce relevant indicators to evaluate these city projections and support sustainable urban planning

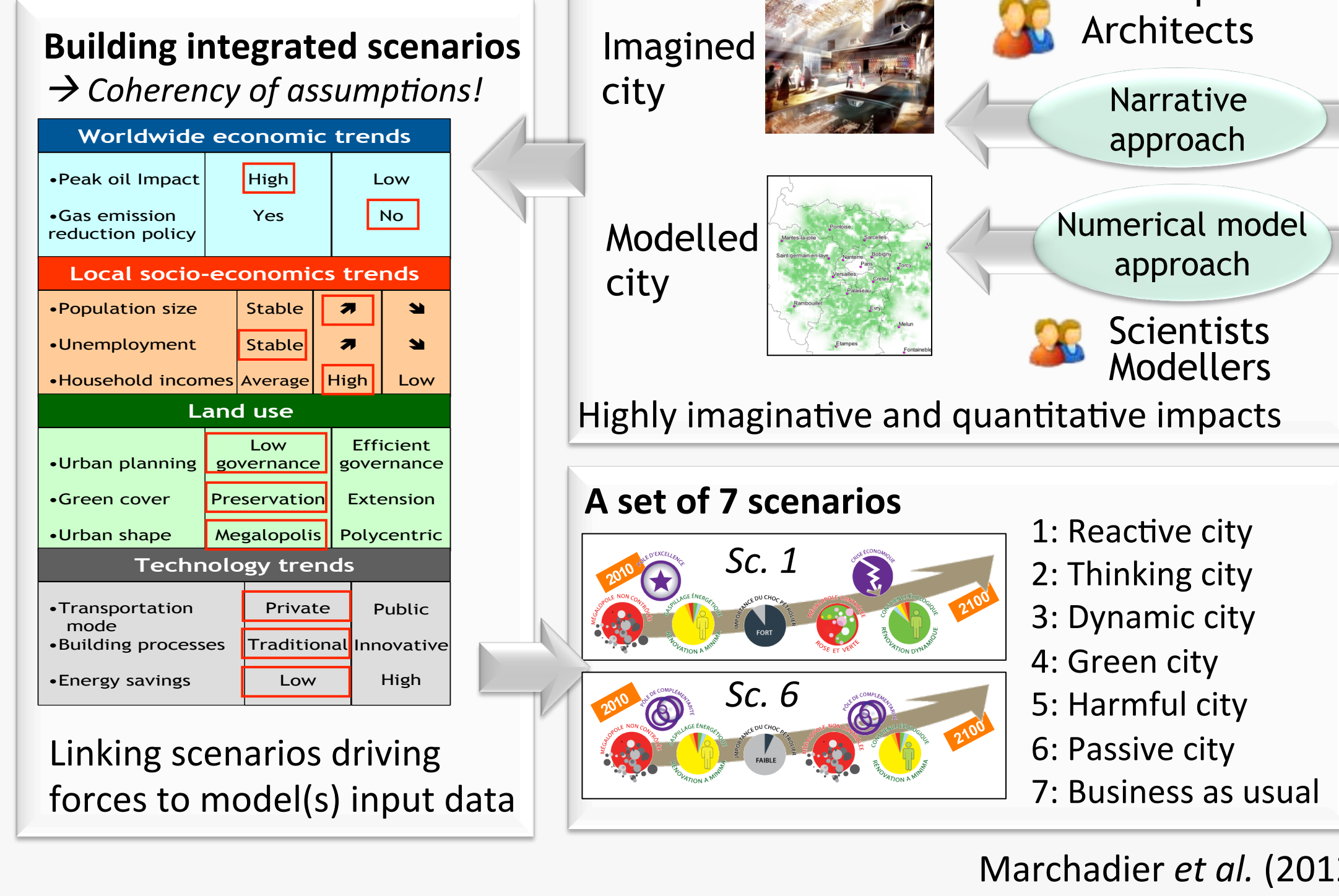
Challenges

- **Multidisciplinary** : ACCLIMAT project involves various research field areas: economy, geography, architecture, building materials, meteorology, climate, urban planning.
- **Integrated** : The Platform connects models and. This requires to overcome some gaps: scientific concepts, modeling approaches, computing languages, heterogeneous scales...
- **Scenario-projections**: Consistent scenarios are built based on worldwide economic trends, regional socio-economic context, urban planning, building regulations and technology trends. These scenarios are simulated under different climate change context.

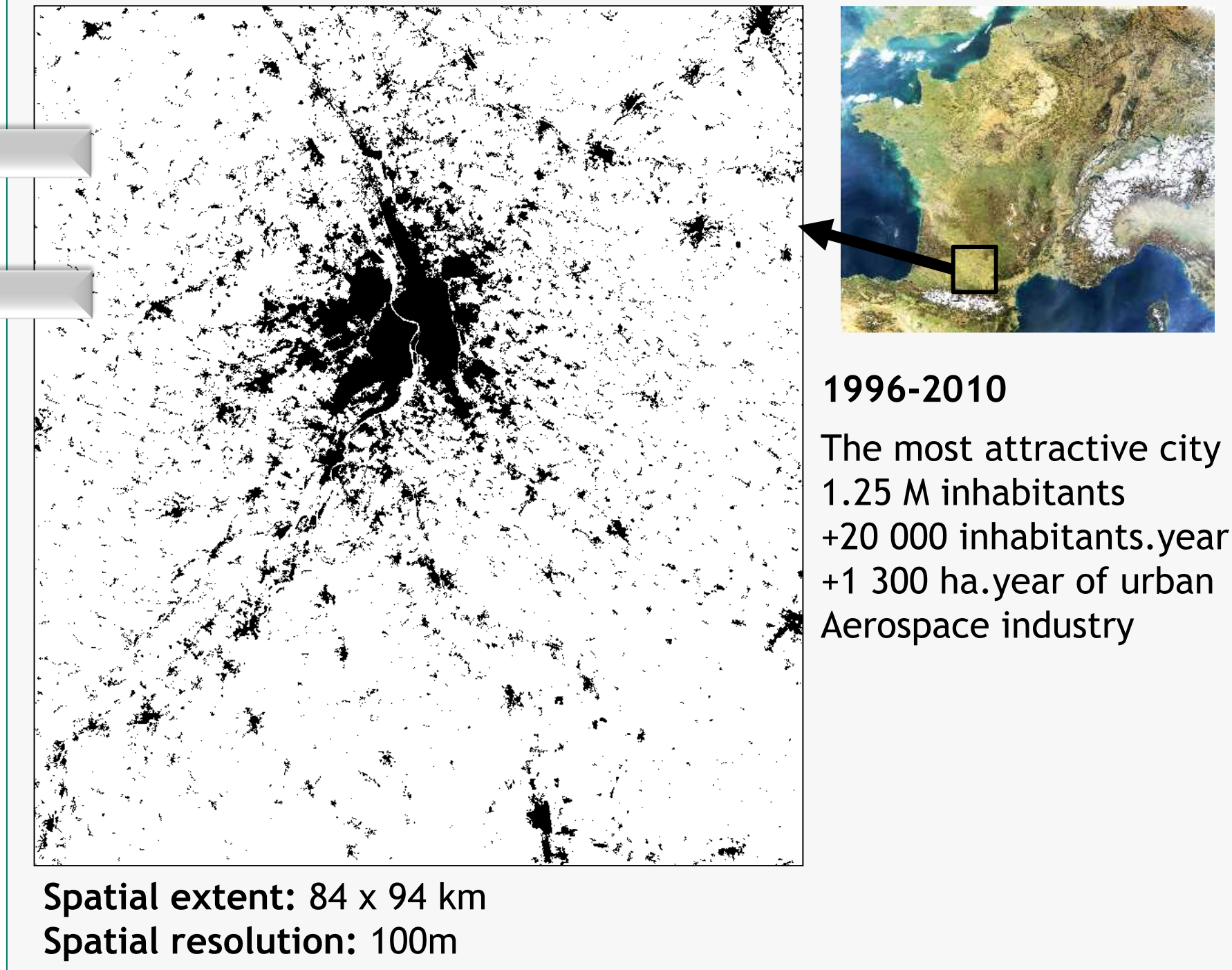
PROJECT METHODOLOGY



SCENARIOS

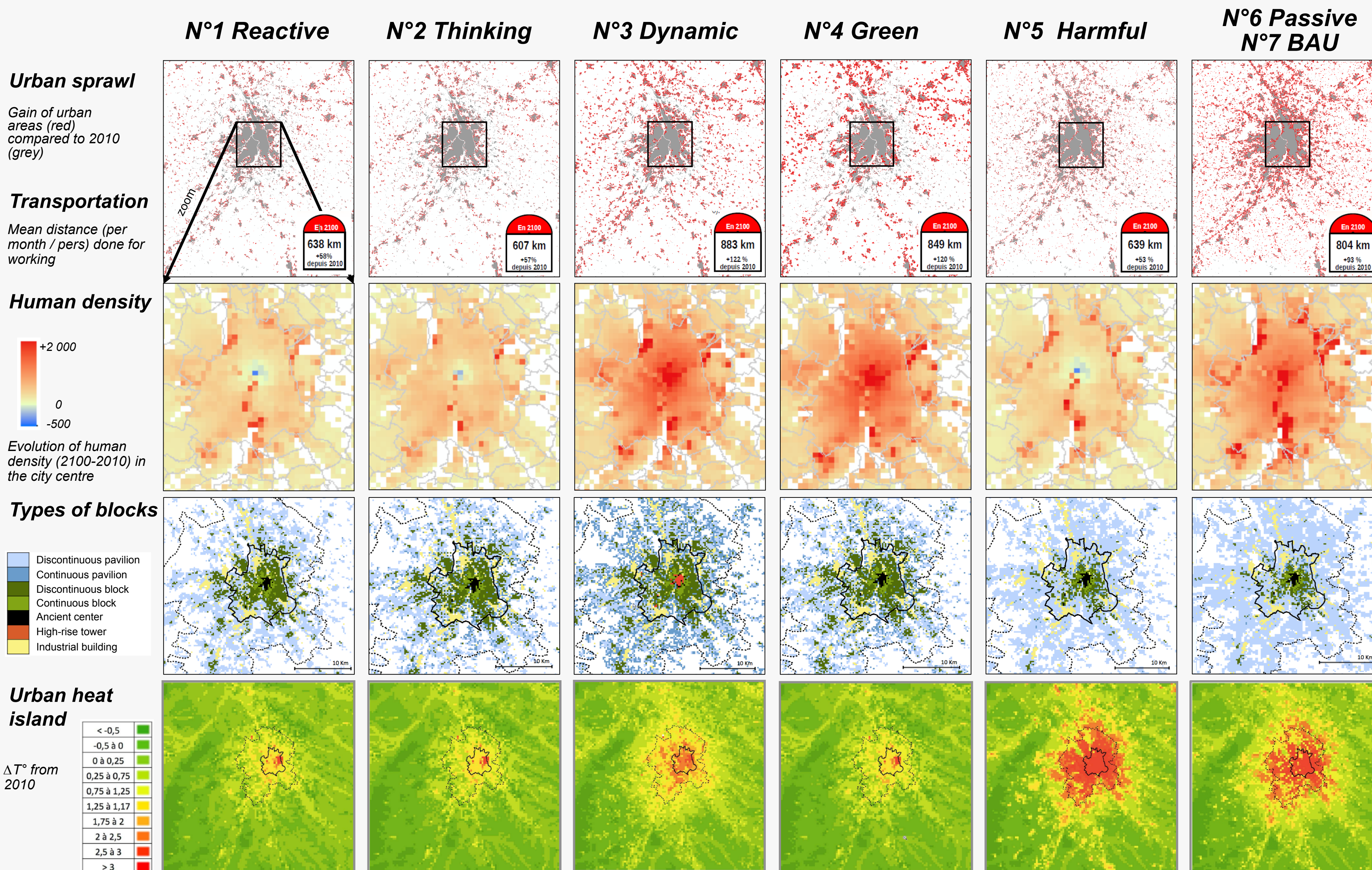


STUDY SITE: Toulouse urban area



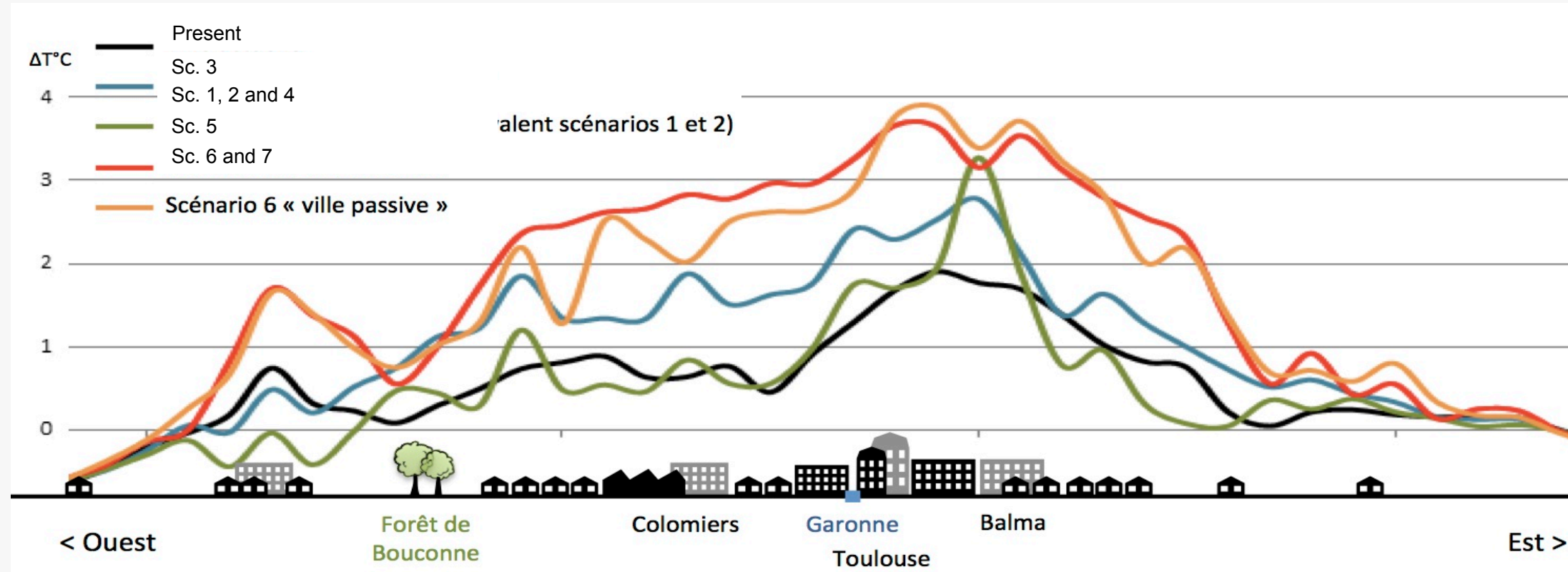
RESULTS

Comparison of the simulated scenarios

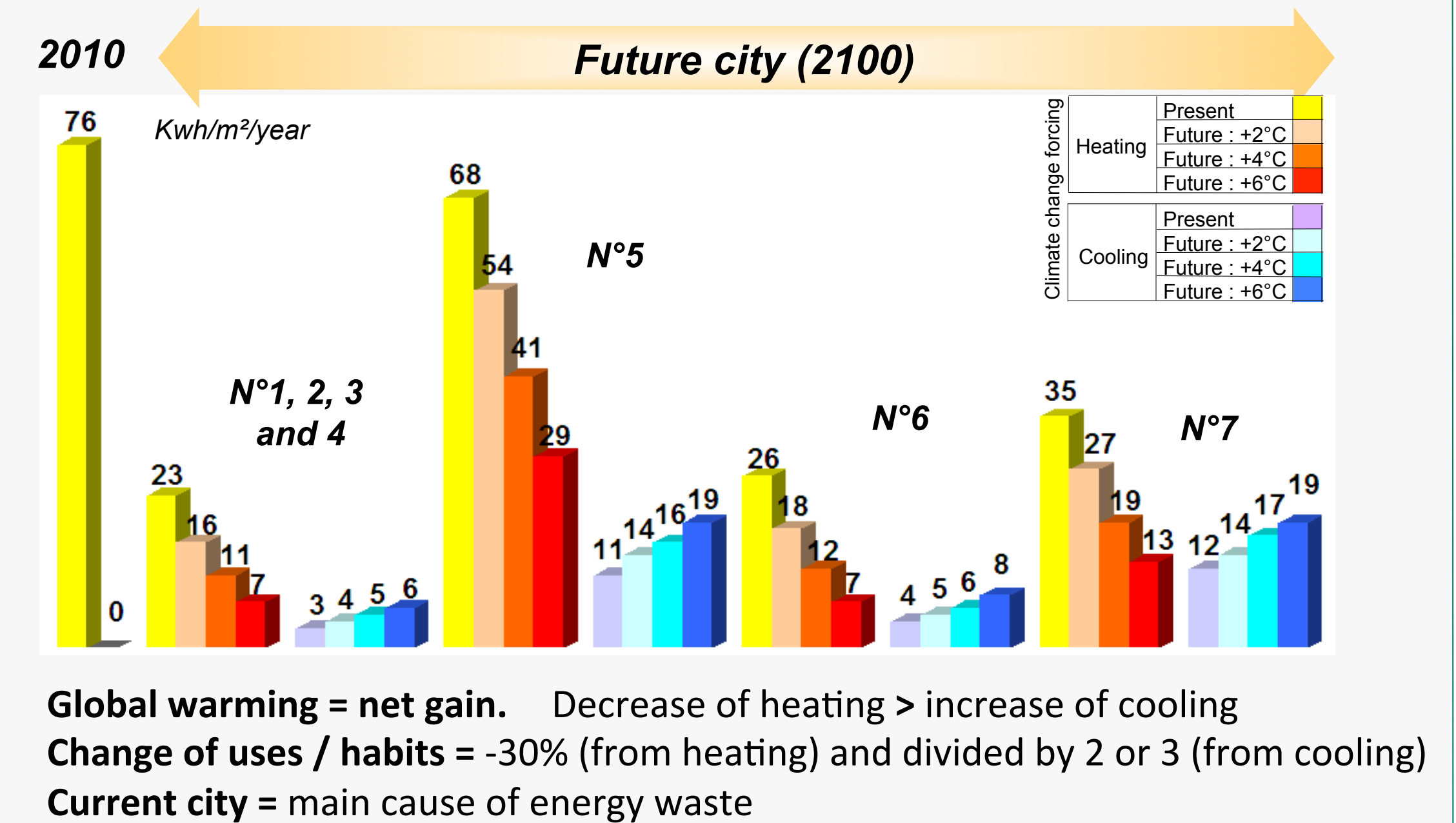


Impacts on urban climate

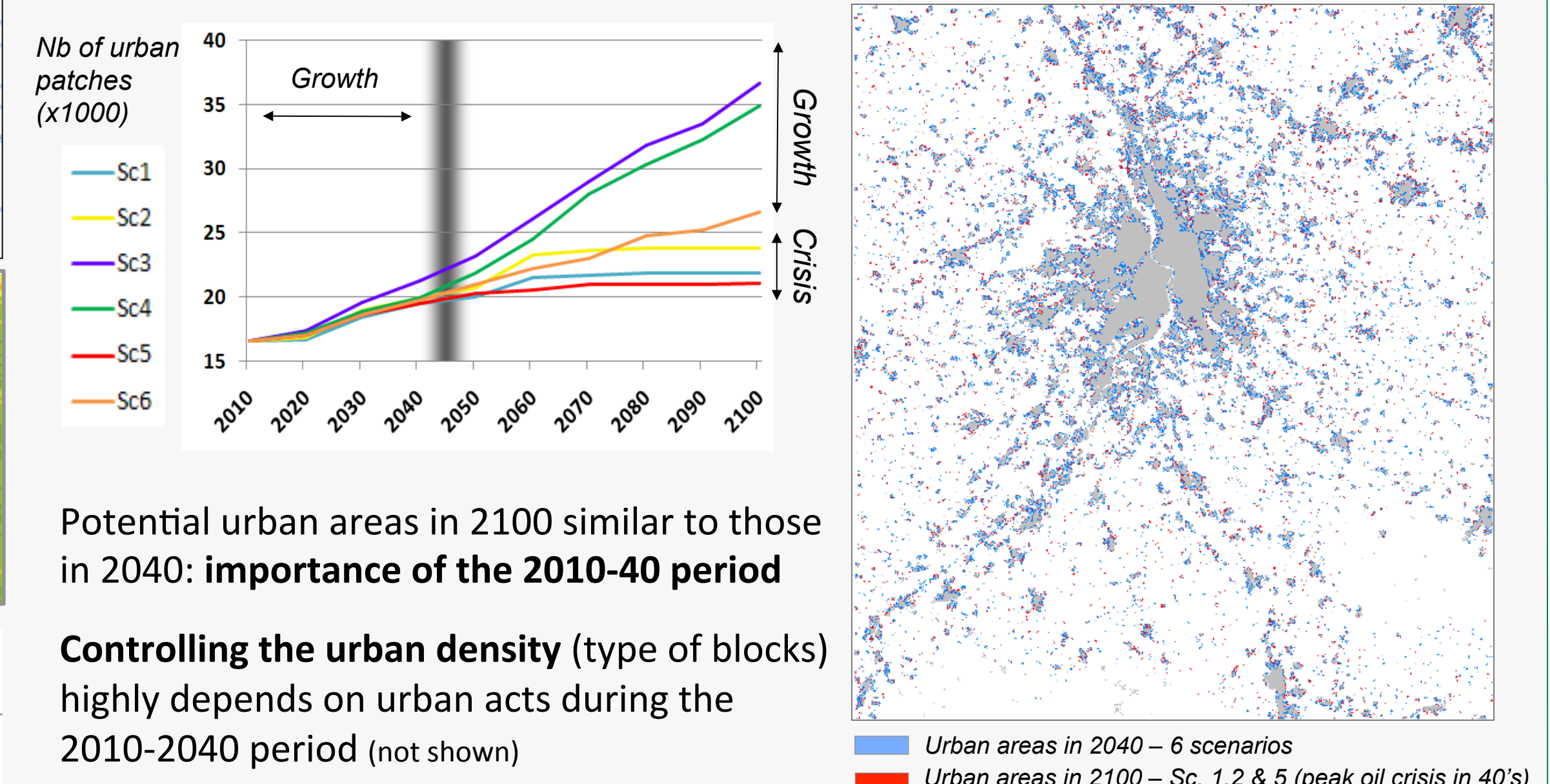
Urban sprawl = UHI from +1 to +3°C
Global warming = +2 to 6°C
Future urban climate on Toulouse = from +3°C to +9°C



Impacts on energy consumption



Do we need to act soon?



REFERENCES

- Houet T. and Pigeon G. (2011), Mapping Urban Climate Zones And Quantifying Climate Behaviors - An Application On Toulouse Urban Area (France), Environmental Pollution, Vol 159, Iss 8-9, 2180-2192
- Masson V., Marchadier C., Adolphe L., Aguejard R., Avner P., Bonhomme M., Bretagne G., Briotter X., Bueno B., de Munck C., Doukari O., Hallegate S., Hidalgo J., Houet T., Lemonsu A., Moine M.P., Morel T., Pigeon G., Salagnac J.L., Zibouche K., (Submitted). Adapting Cities to Climate change: a systemic modelling approach, *Urban Climate*.
- Moine et al. (2012) A multidisciplinary modeling platform to draw possible futures of urban climate, ICUC8 - 8th International Conference on Urban Climate – Dublin, Ireland.
- Marchadier C., Houet T., Bretagne G. (2012) How to define and assess city adaptation strategies? ICUC8 - 8th International Conference on Urban Climate – Dublin, Ireland.

WEBSITE

<http://www.cnrm.meteo.fr/acclimat/?lang=en>

CONCLUSION

A very ambitious project (multidisciplinary and integrated) :

- Combining forecasting and backcasting images of the future to wider the diversity of the scenario
- Developing a platform to couple all urban and physical models and assess quantitative impacts on urban climate
- Coupling economical, geographical and architectural models for simulating long-term futures urban growth.

Key-triggers and futures stakes

- Urban management and policies to mitigate urban climate – urban tools exist but depends on political will
- Future pressure on water supply and electricity have been highlighted
- It is essential to act soon, to change inhabitants energy habits and improve energetic performance of existing buildings.



Project founded by RTRA STAE

