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ET LE DÉVELOPPEMENT



Fiscalité et limitation de l'étalement urbain : *une approche modélisée*

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14/06/2017

C.I.R.E.D.

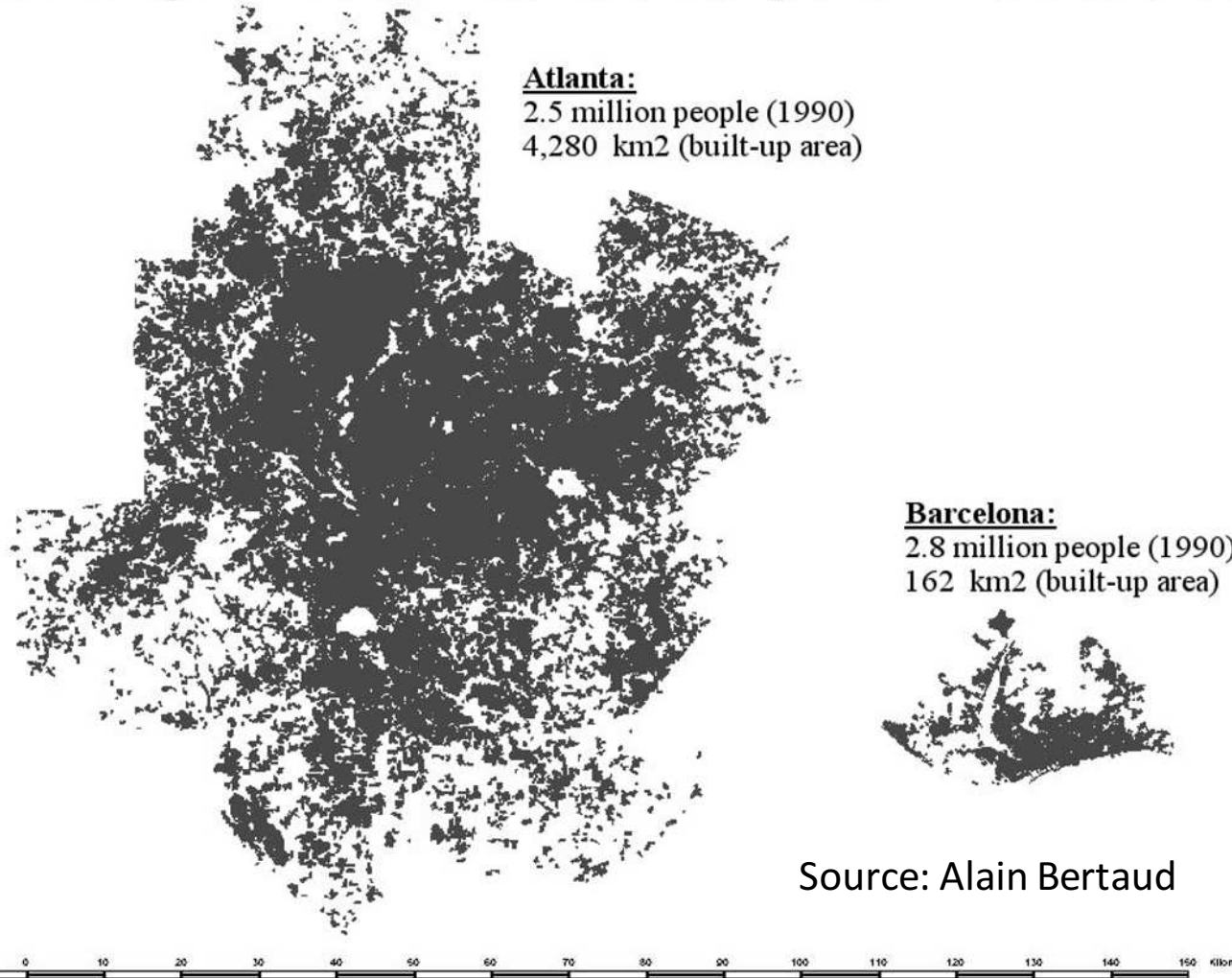
Jardin Tropical

45 bis Avenue de la Belle Gabrielle
F-94736 Nogent-sur-Marne, France

CNRS (UMR N° 8568) - ENPC
EHESS - AGROPARISTECH
CIRAD

Urban forms matter for greenhouse gas emissions...

The Built-up Area of Atlanta and Barcelona Represented at the Same Scale



Lower emissions in Barcelona because of:

1 - Shorter travel distance;

2 – Easier use of public transport:

Barcelona has 99 km of metro line.

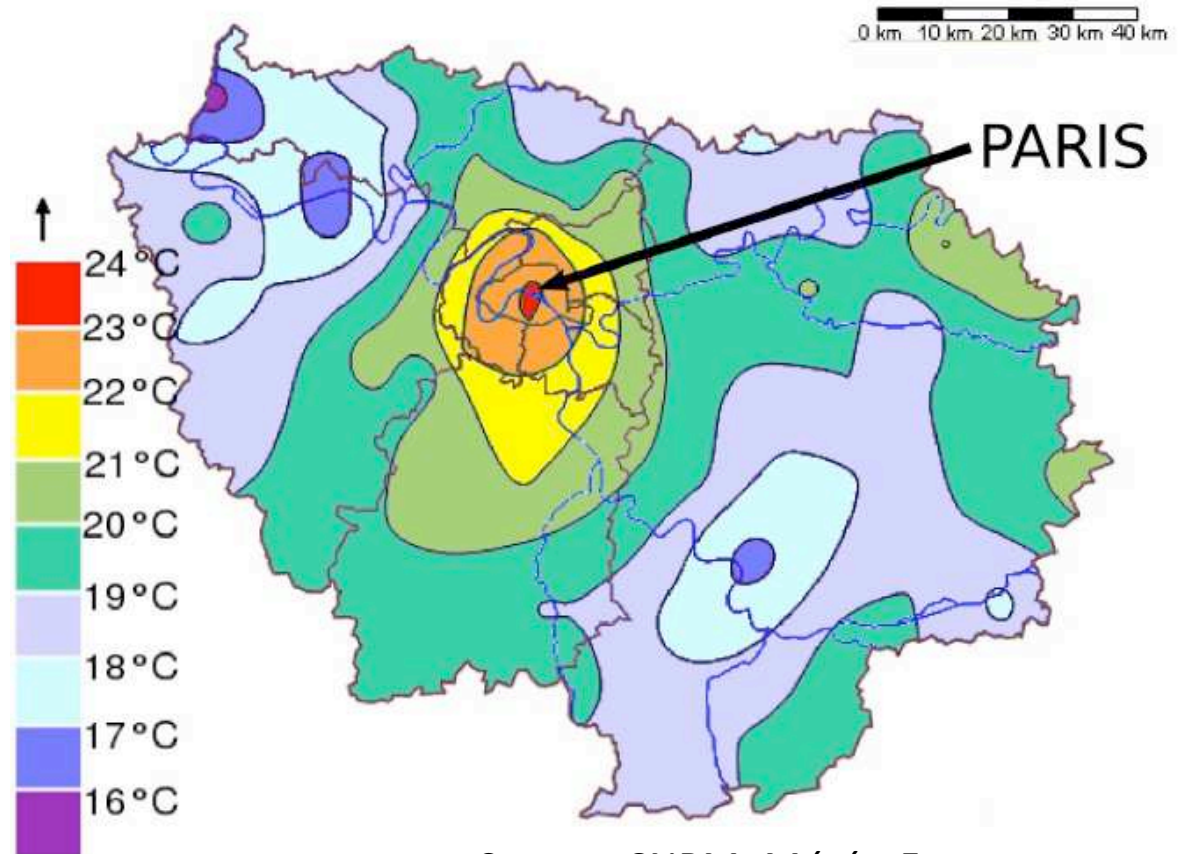
To provide the same accessibility to metro in Atlanta, 3400 km would be necessary.

Urban forms matter for climate-change vulnerability...

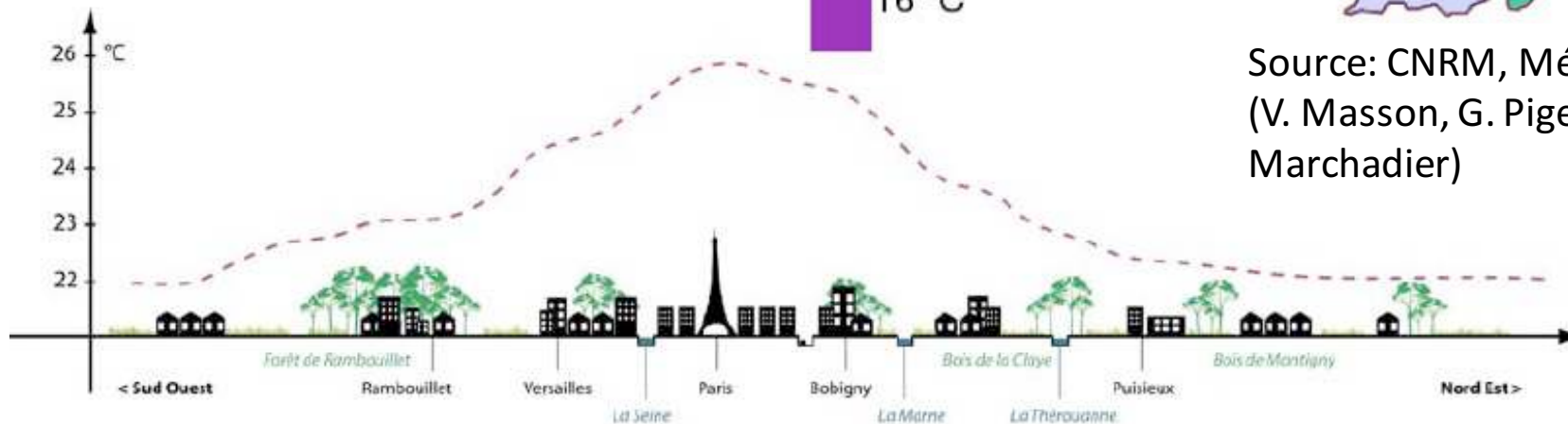
Urban Heat Island effect

Temperatures are higher in cities than in rural areas, especially at night.

Example of the 2003 heat wave.



Source: CNRM, Météo-France
(V. Masson, G. Pigeon, A. Lemonsu, C. Marchadier)



Adapting cities leads to specific issues

- **Urban forms matter for greenhouse gas emissions**
 - Transport, housing, ...
- **Urban forms matter for climate-change vulnerability**
 - Urban heat island
 - Urbanization in flooding prone areas...
- **Urban forms matter for many other policy objectives, e.g., related to social and spatial inequalities, competitiveness...**
- **Urban forms cannot change rapidly, so we already need to take into account current and future constraints**
 - Unprecedented need to anticipate future constraints and objectives and to act with no delay

Modelling urban form?

- **Standard urban economics modelling (*Alonso 1964, Mills 1967, Muth 1969*)**

- **3 mechanisms :**
 1. Households' tradeoff:
 - Lower transportation costs and shorter commuting time when living close to the city center, and
 - Larger dwellings and lower rent in remote areas

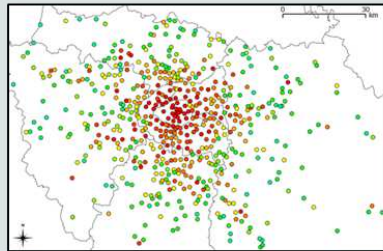
 2. Investors optimize the housing density as a function of rents and construction costs

 3. Different evolution timescales for rents, population density, buildings etc.

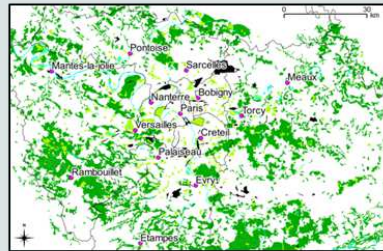
- **Simplifying hypotheses :**
 - All households have the same income.
 - One trip per day towards the city center.
 - One city center

NEDUM-2D model

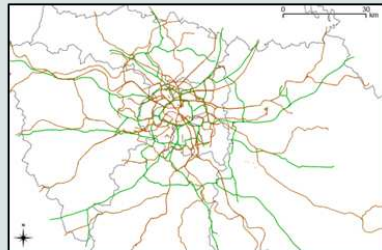
INPUTS



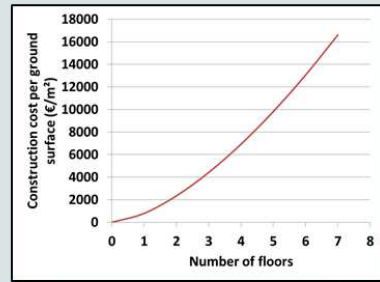
Employment centers and number of jobs and related households income



Land-use constraints

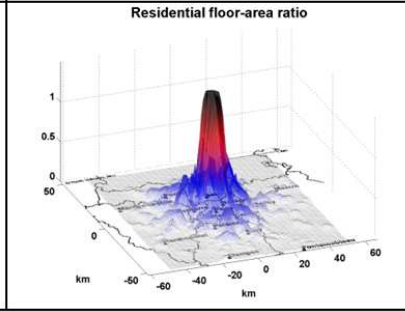
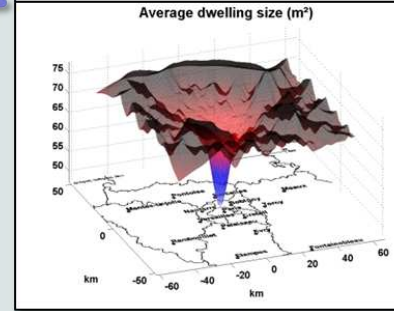
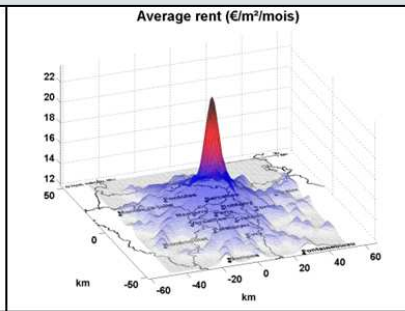
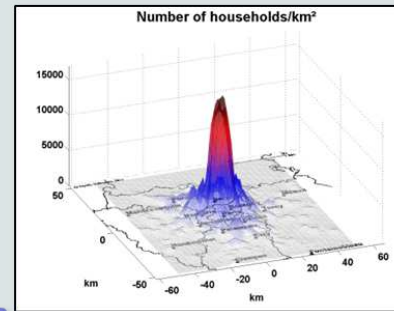


Transport times and costs



Construction costs

OUTPUTS



Rents, population density, floor-area ratio, and average dwelling size

Paris, 2006



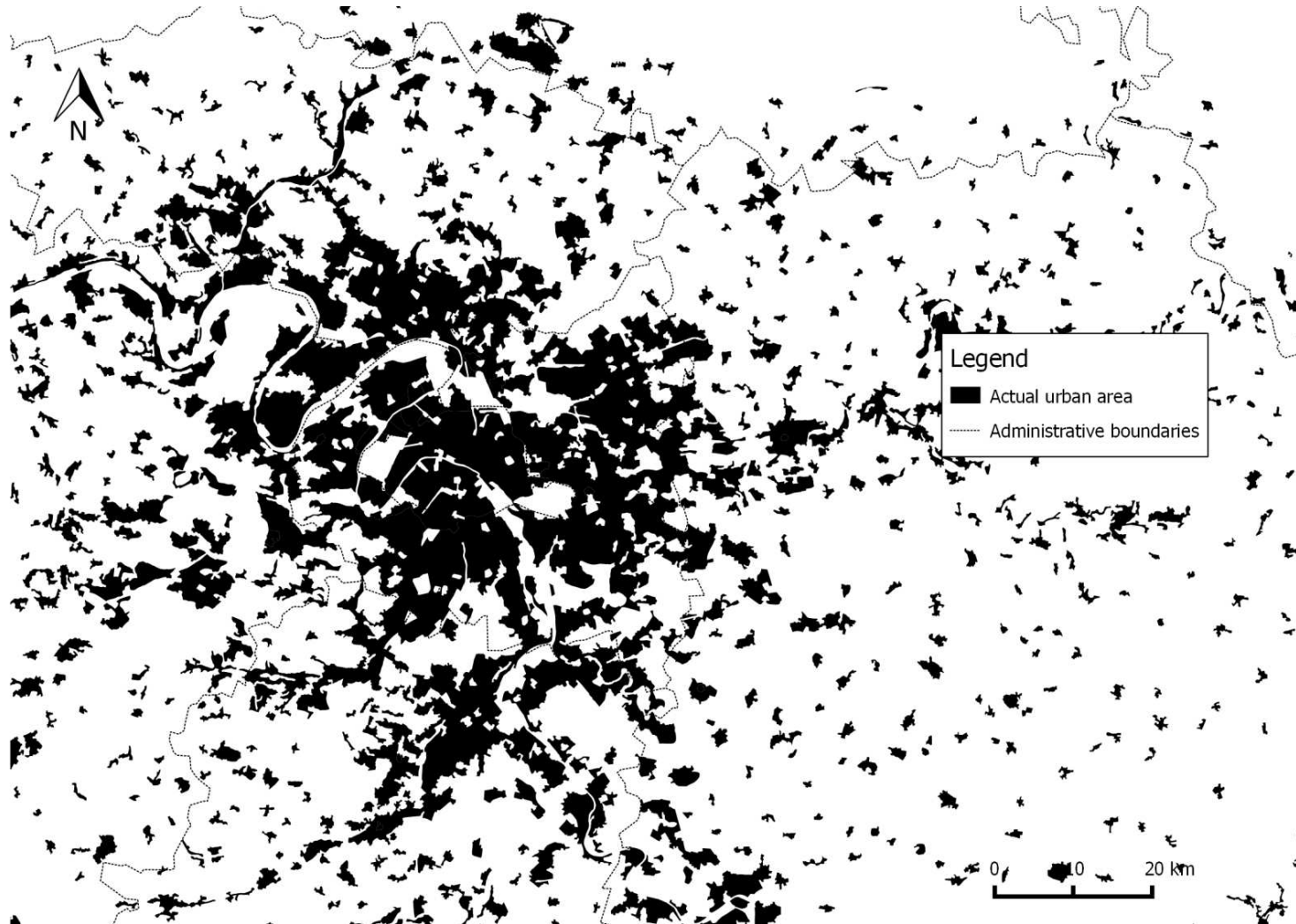
Validation process

We run the model from 1900 to 2010 using:

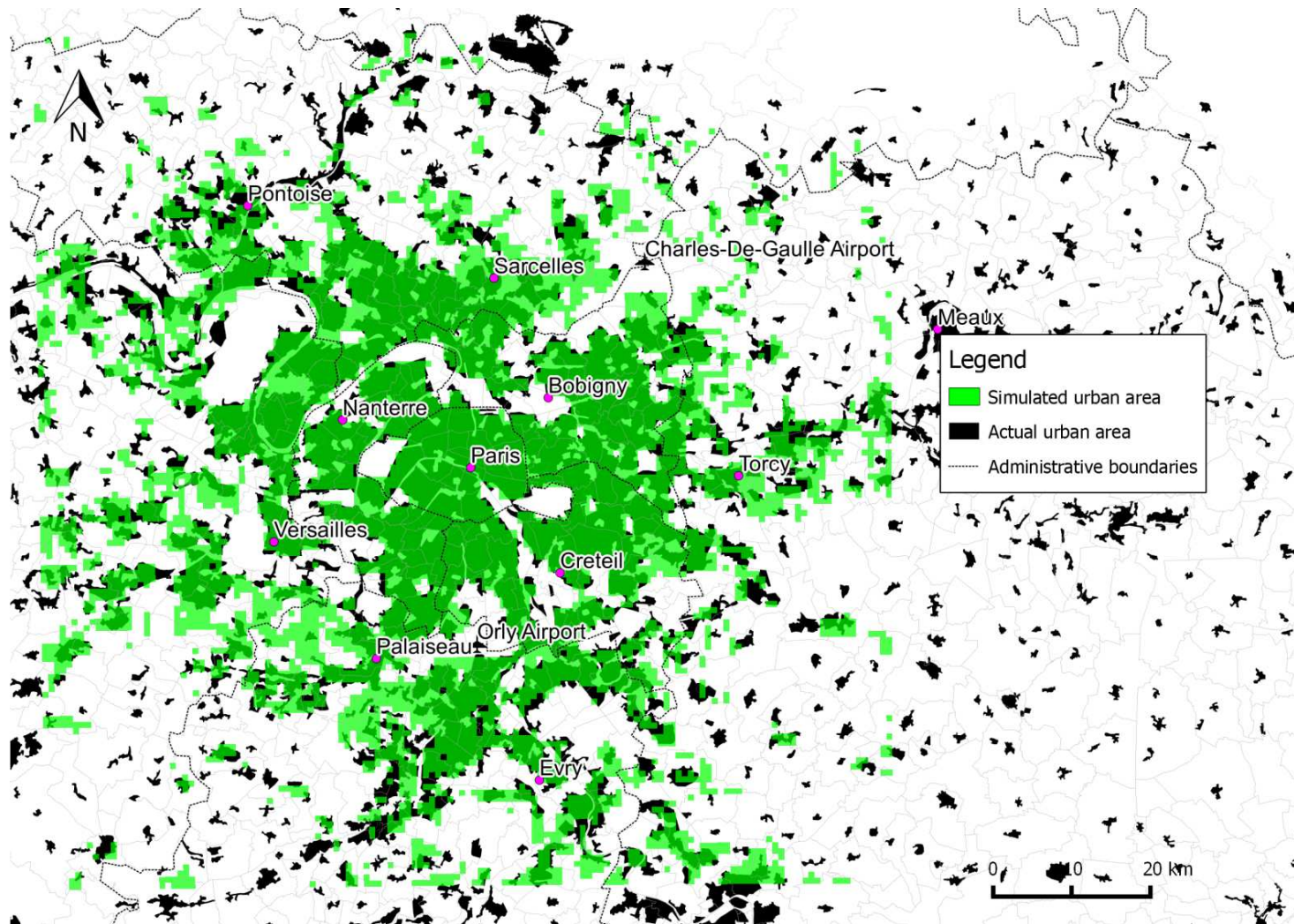
- Data on population;
- Data on average income;
- Data on transportation cost, speed, and localization;
- Construction costs change like income.



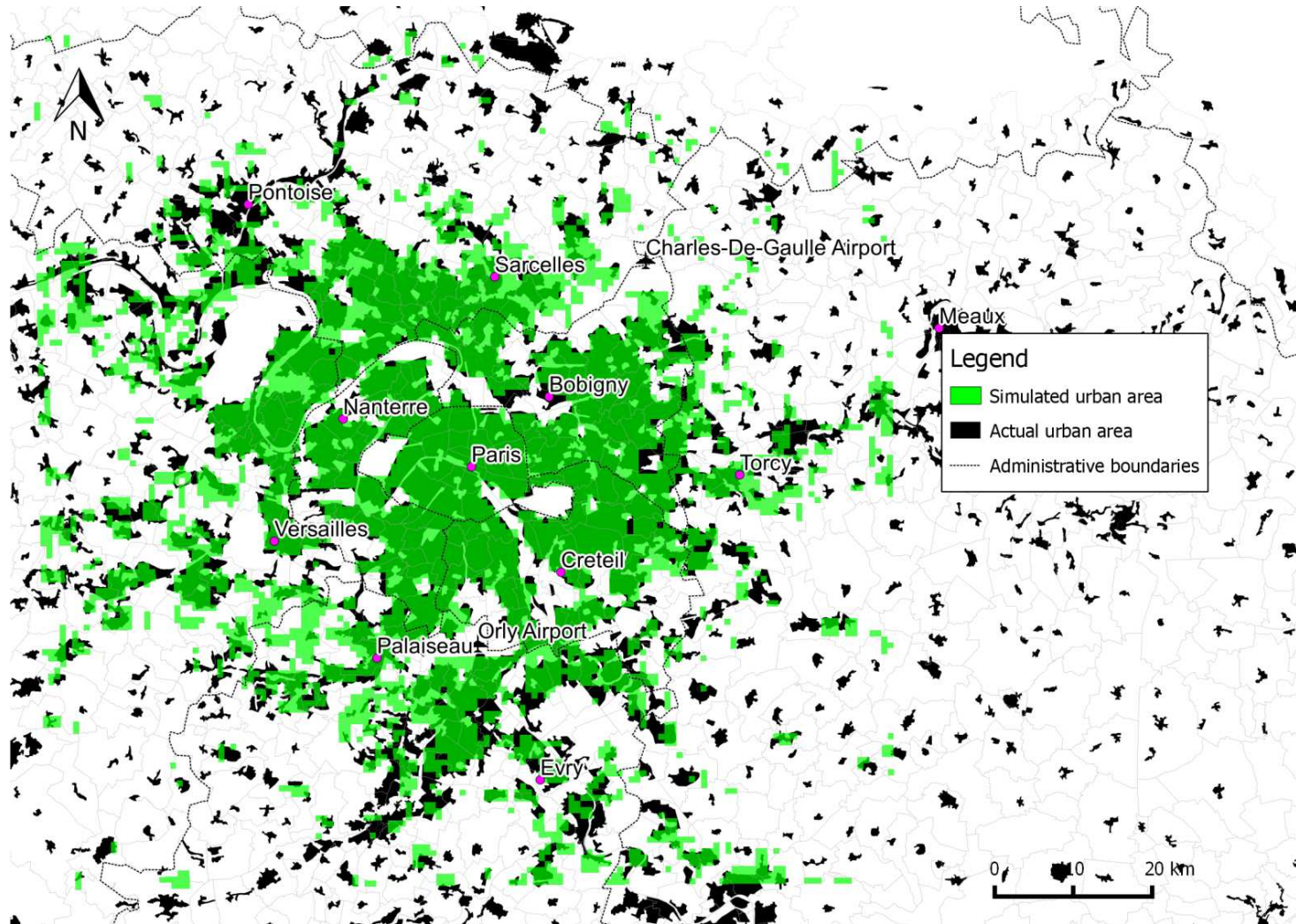
Paris, 2006



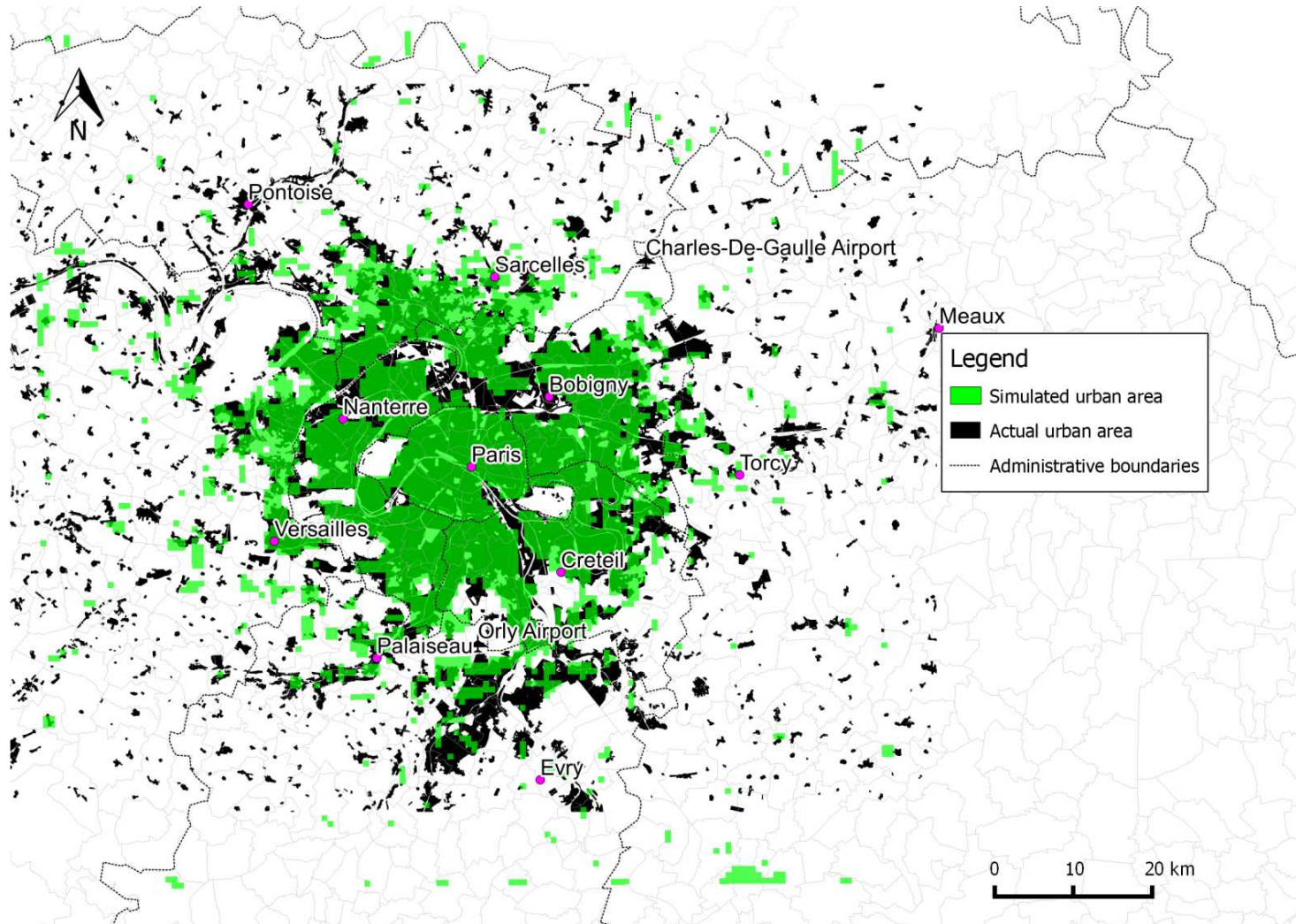
Paris, 2006



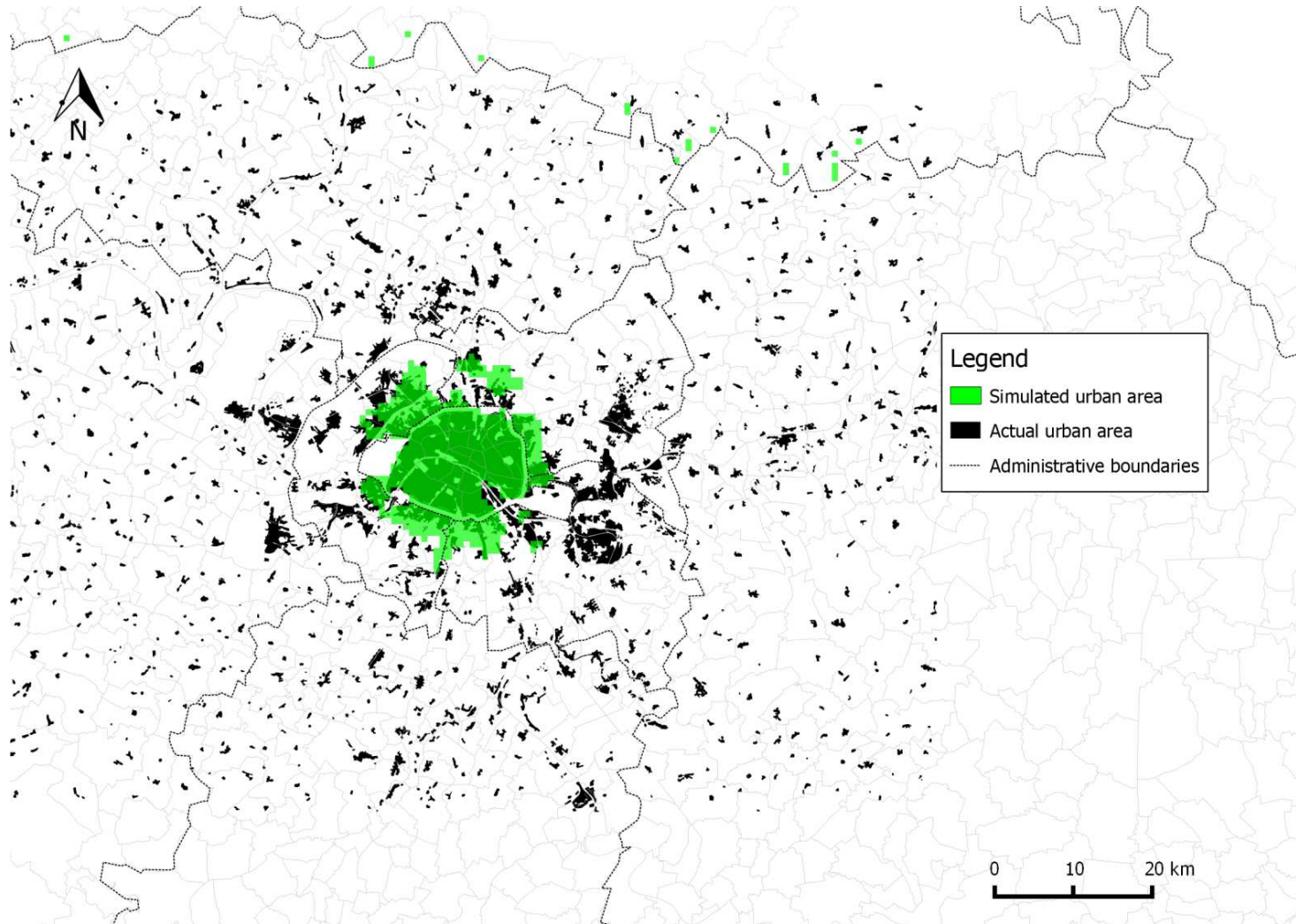
Paris, 1990



Paris, 1960

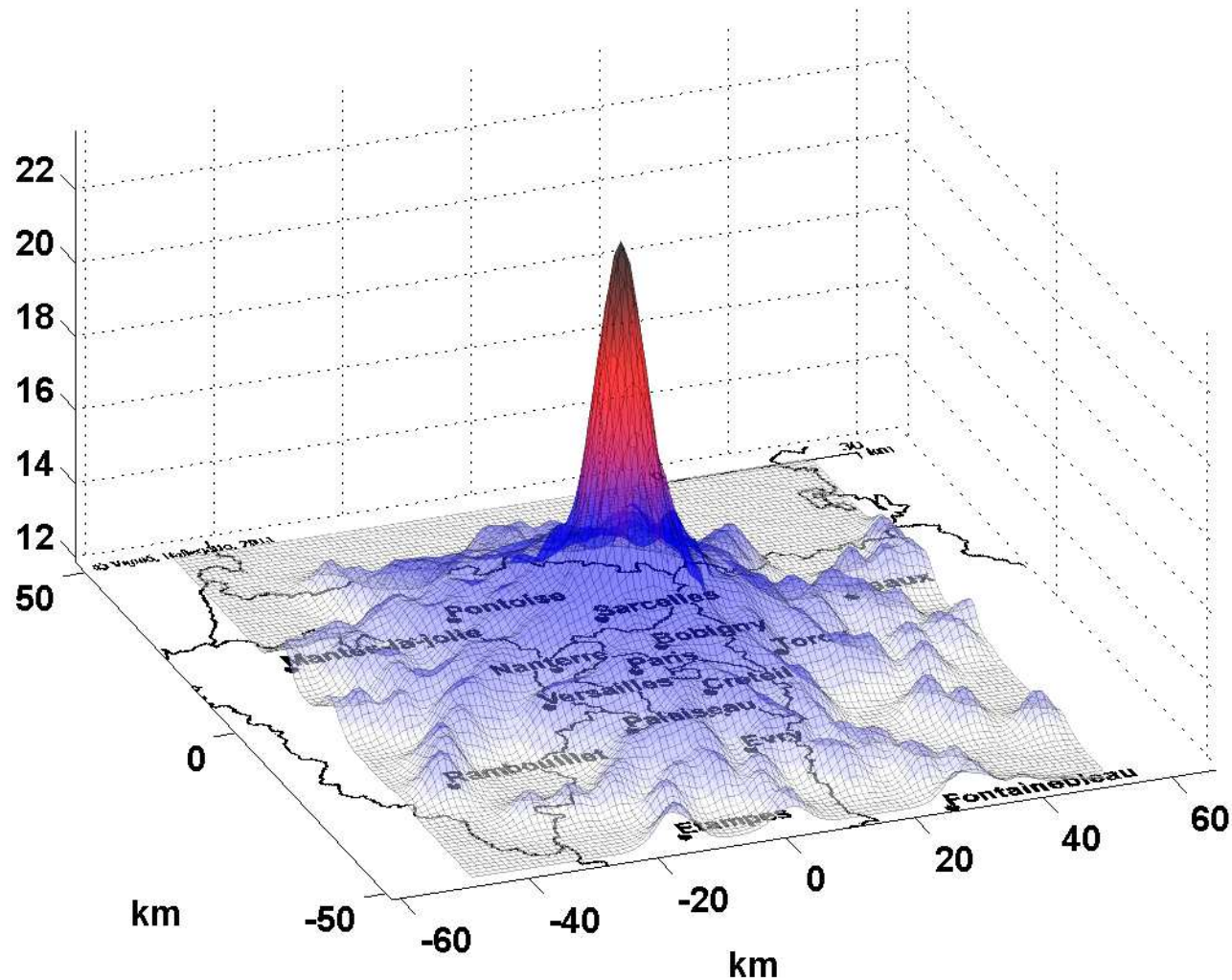


Paris, 1900

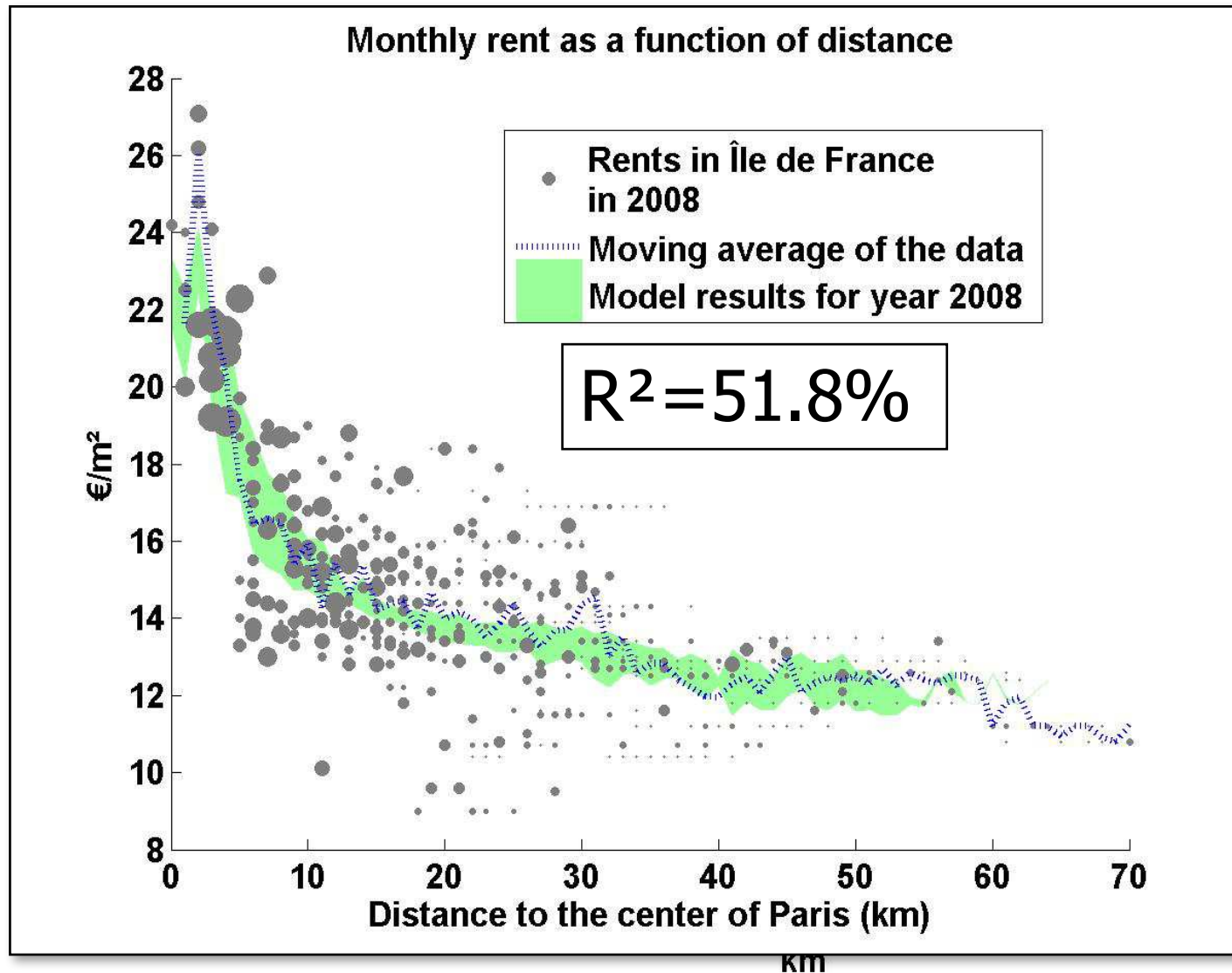


Model results: Rents (2008)

Average rent (€/m²/month)

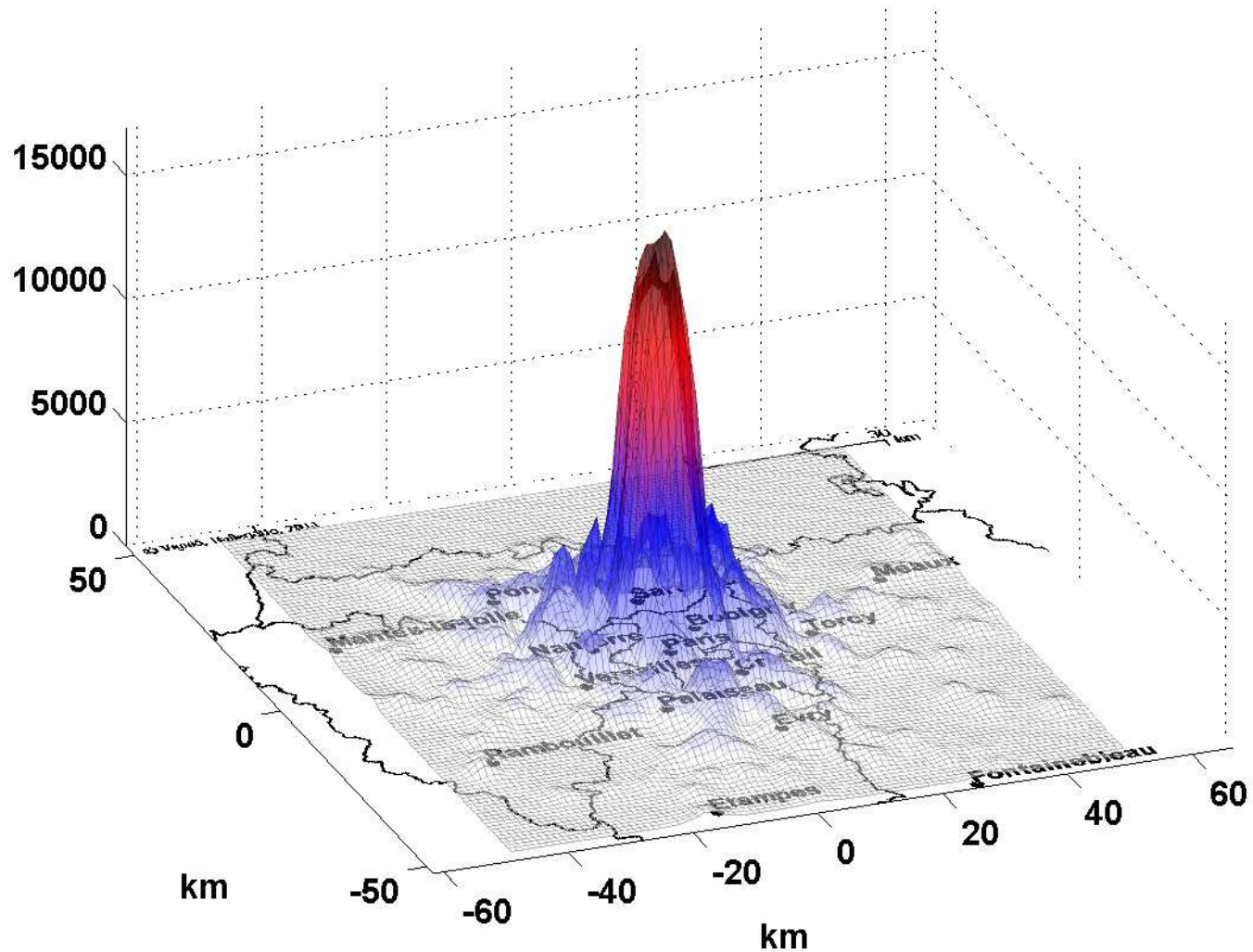


Model results: Rents (2008)

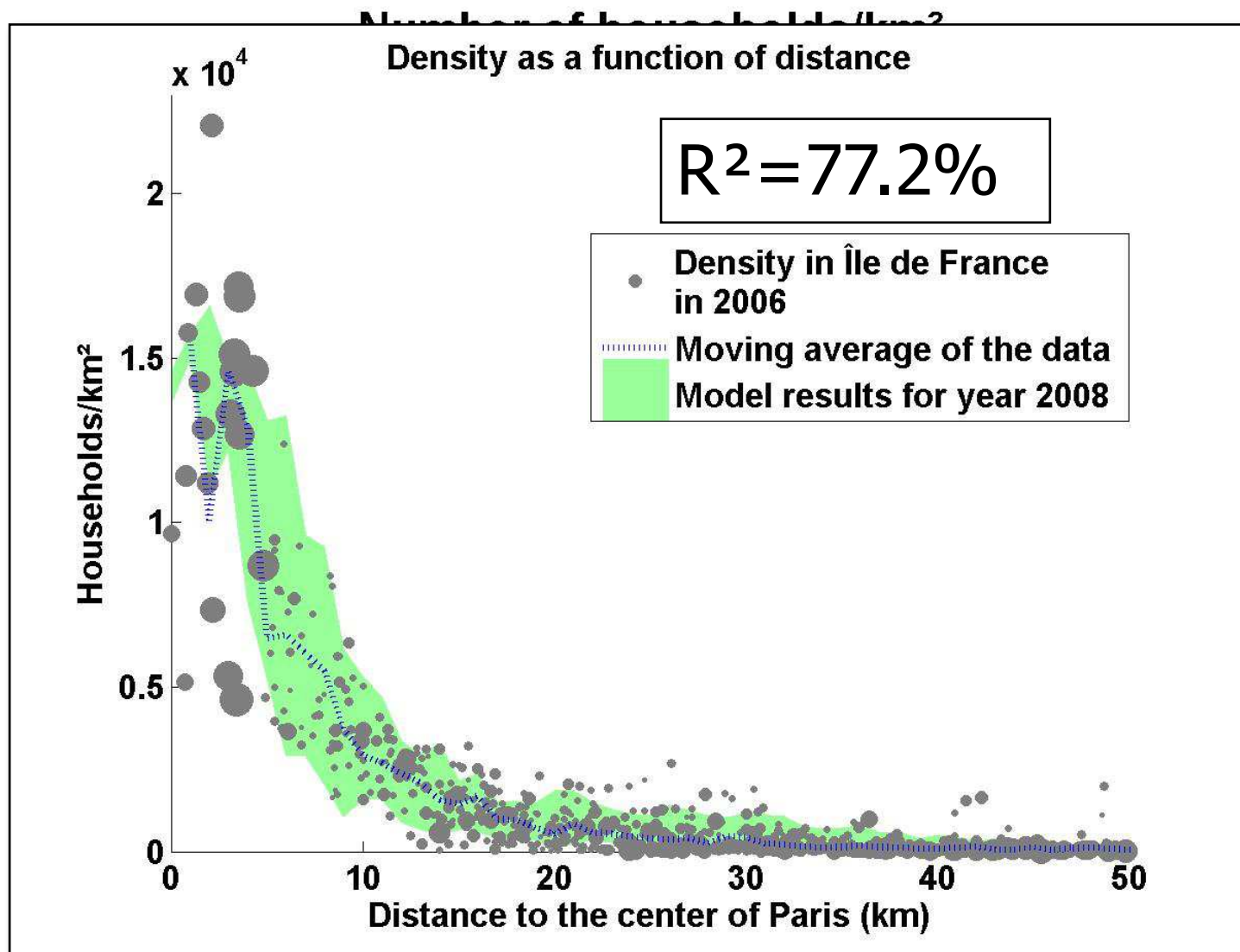


Model results: Population density (2006)

Number of households/km²



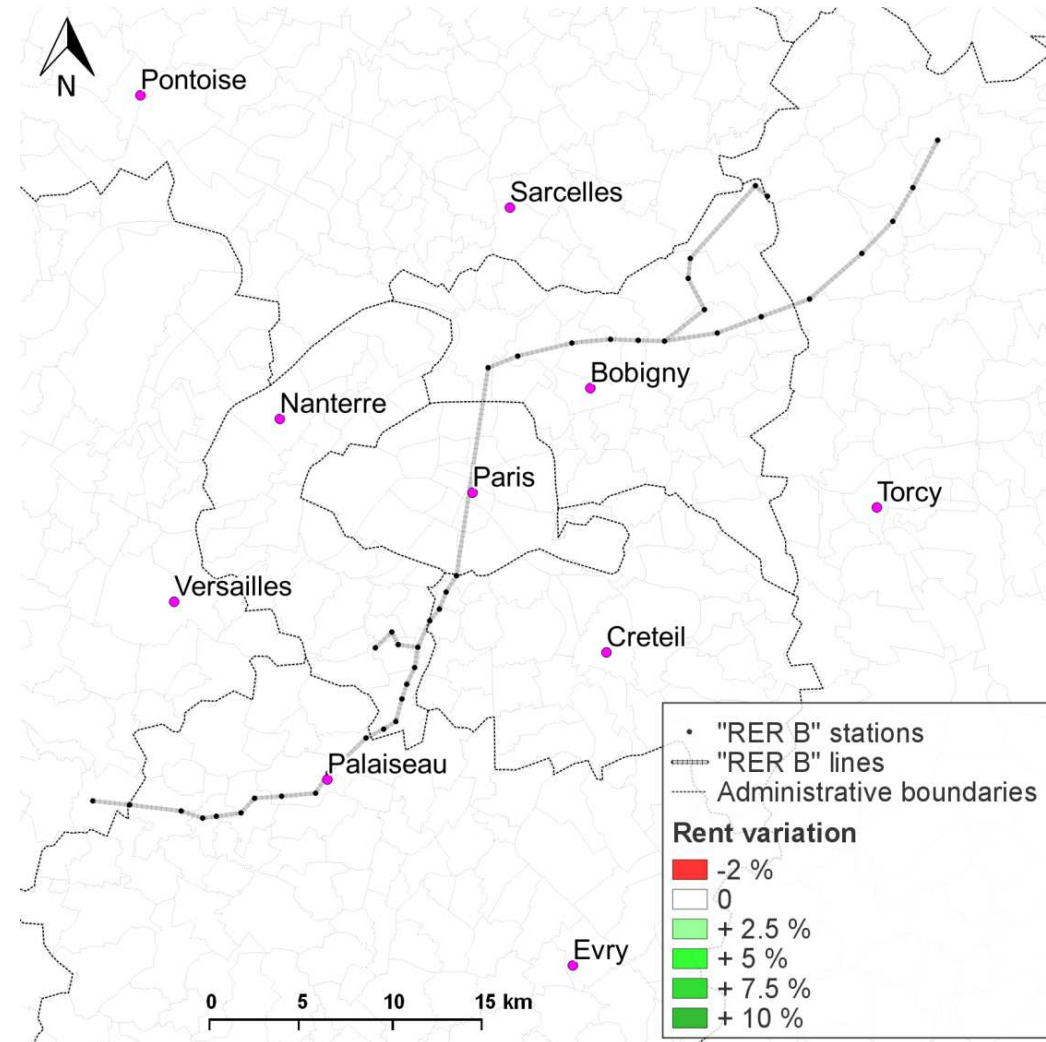
Model results: Population density (2006)



Application on Paris

We suppose a theoretical 25 % increase in local train “RER B” speed, outside Paris

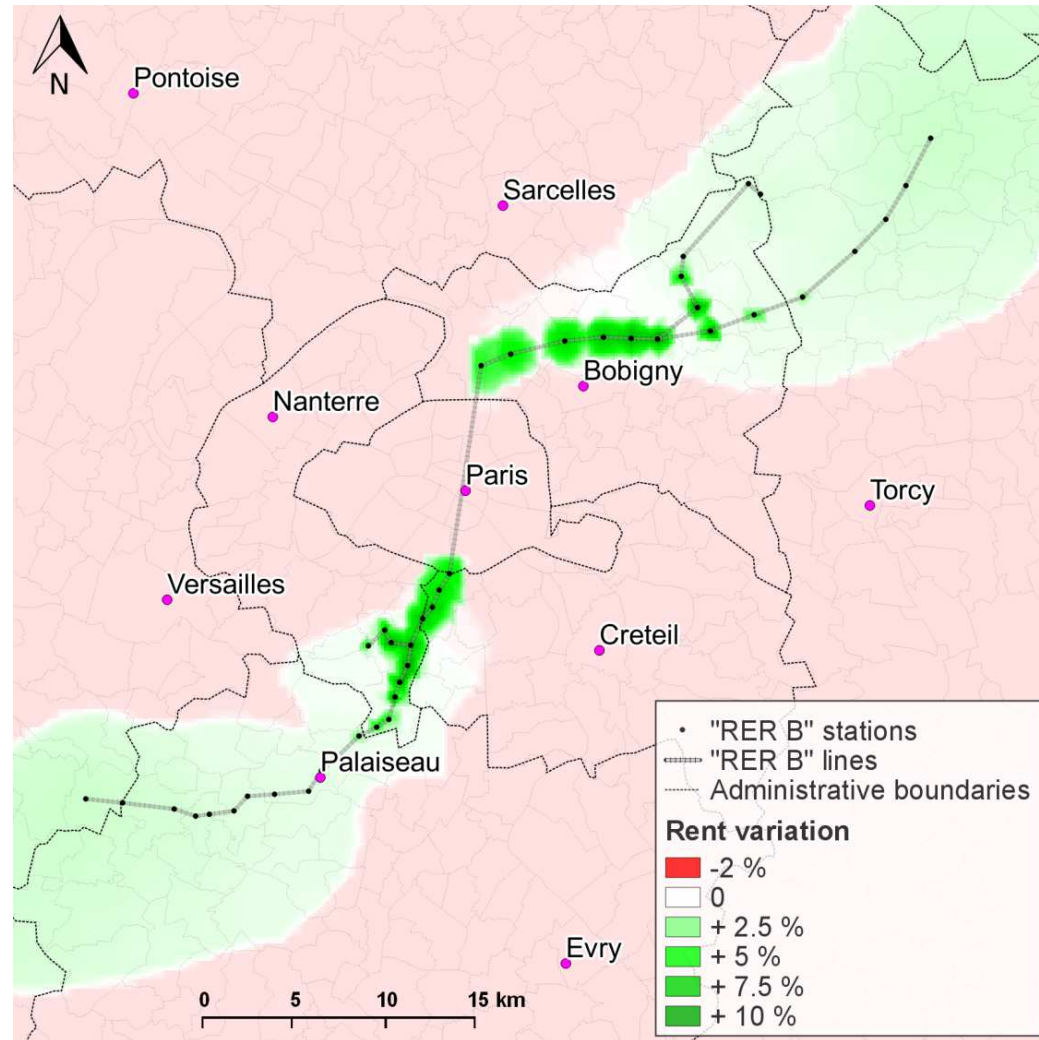
Closed city case



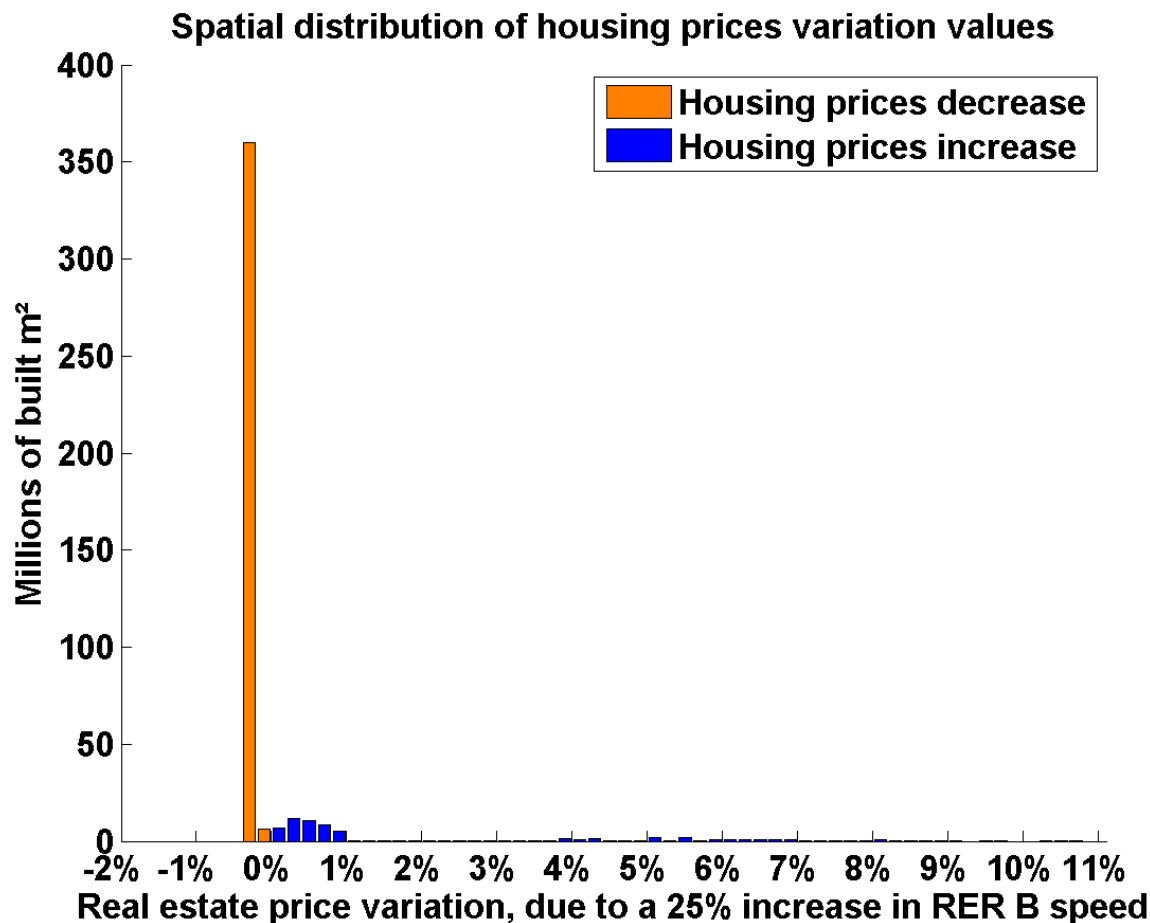
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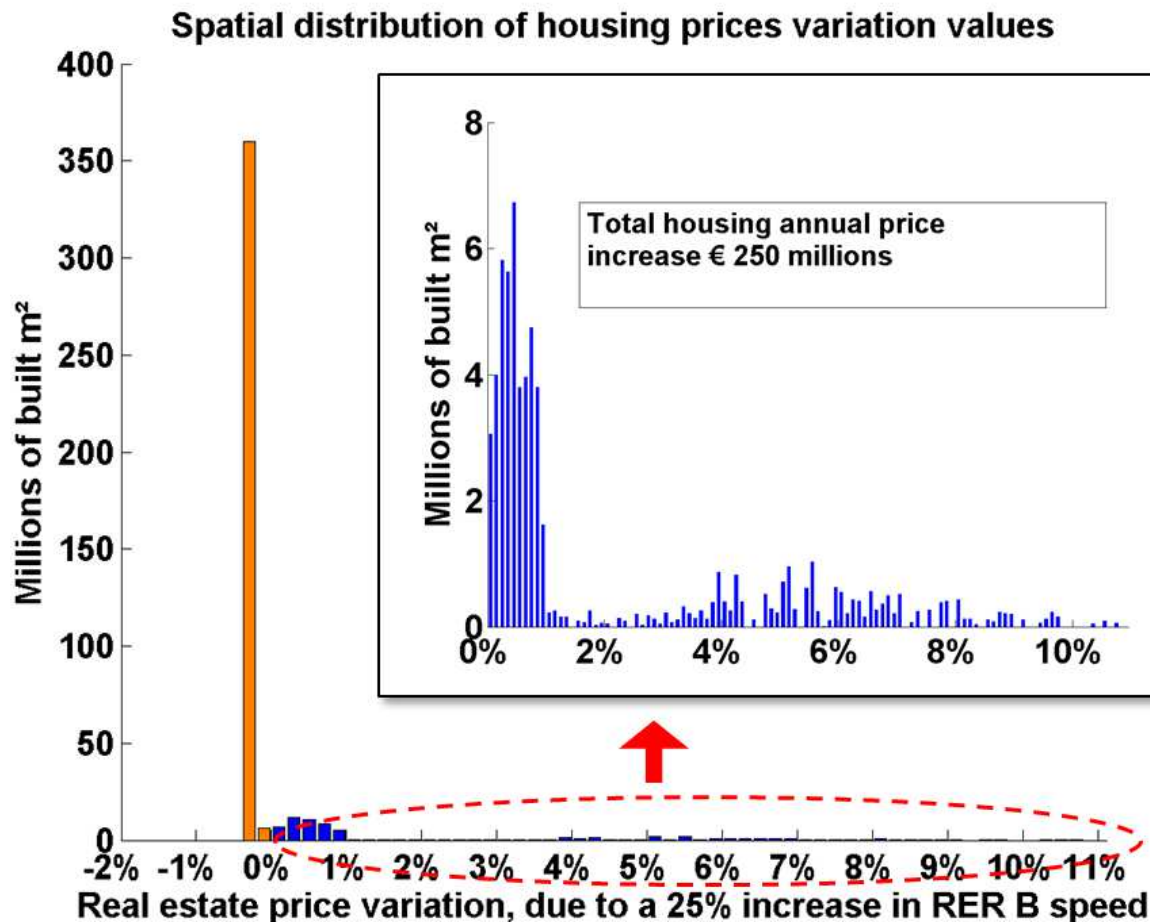


Land value capture potential: closed city case



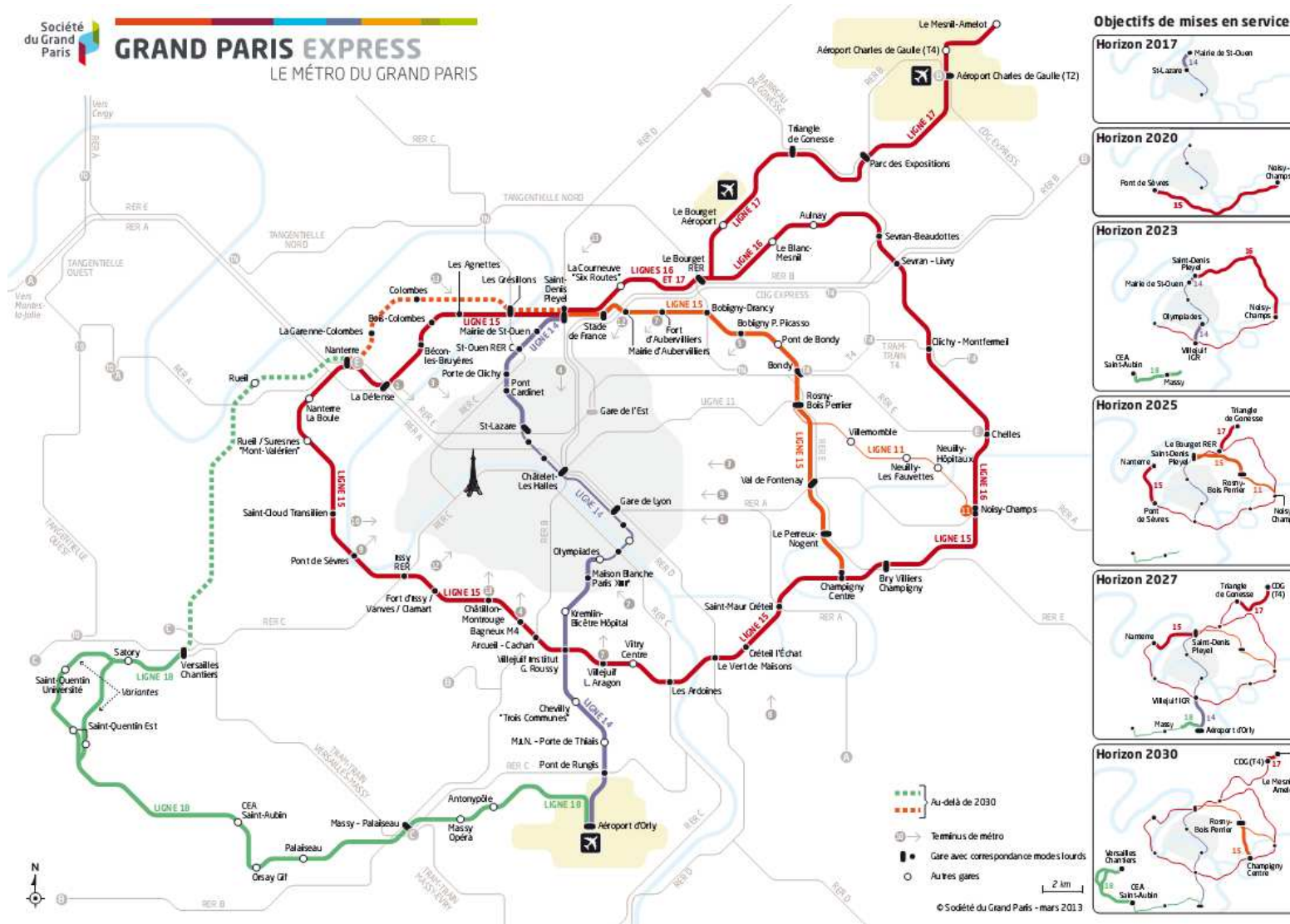
- Taking only positive rent variations lead to a € 250 millions/year maximum potential value capture
- Cost \approx a few billion euros a priori
 - 1 billion covered in 8 years, if half of land value increase is captured

Land value capture potential: closed city case

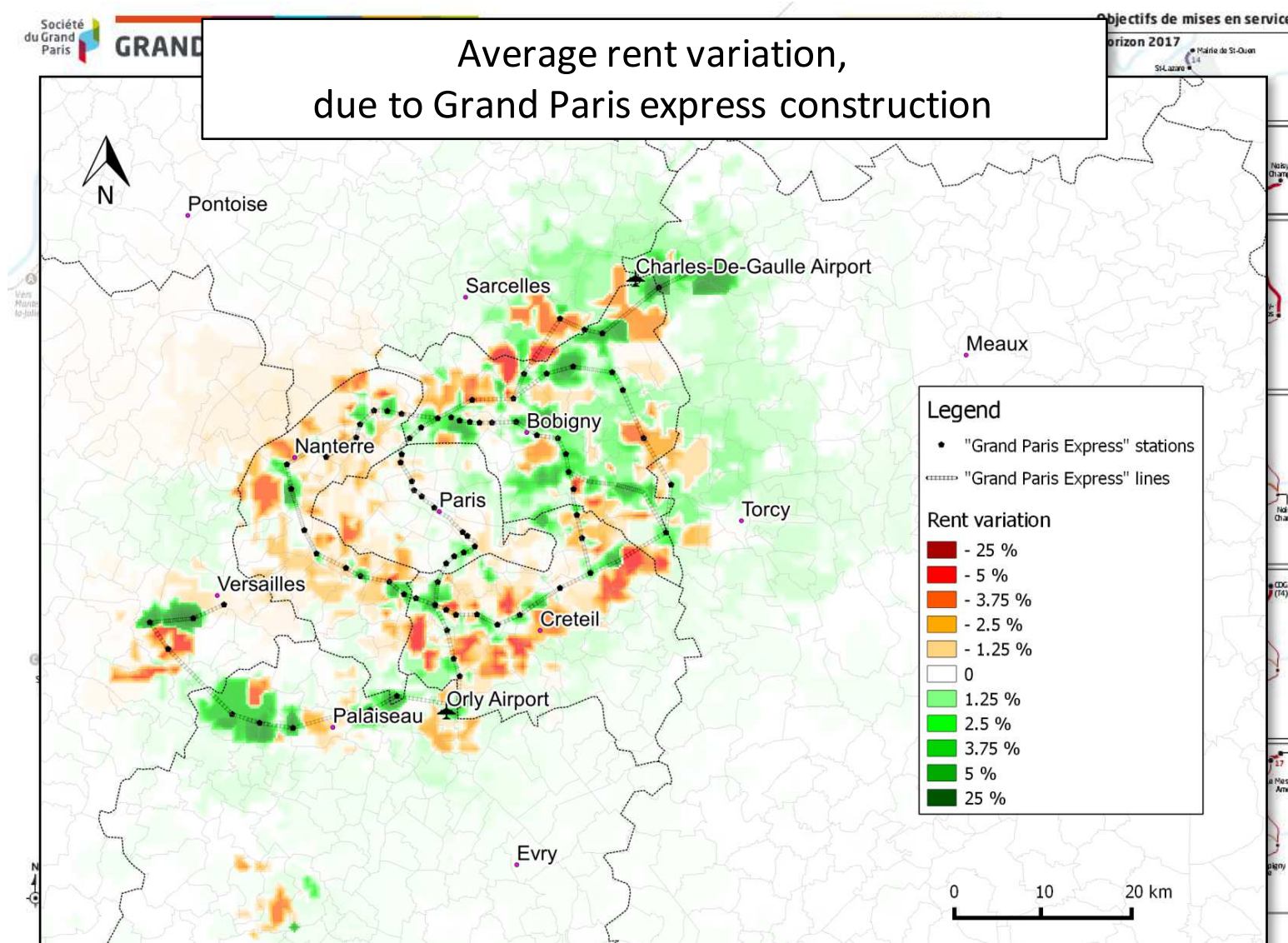


- Taking only positive rent variations lead to a € 250 millions/year maximum potential value capture
- Cost ≈ a few billion euros a priori
 - 1 billion covered in 8 years, if half of land value increase is captured

Application to the “Grand Paris express” construction (work in progress)



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Impact of taxation on construction

