



# Trade-offs and synergies in urban climate policies

## The case of Paris

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# Trade-Offs and Synergies in Urban Climate Policies

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- **Urban climate policies are not developed or implemented in a vacuum**
  - Environmental policies can result in positive feedback with respect to economic and social issues
  - Conflicts among different policy goals can also take place leading to trade-offs and implementation obstacles
  
- **How, and to what extent, can we make mitigation, adaptation, economic, and social policies synergetic ?**
  - How can we assess these negative and positive feedbacks?

# A multicriteria analysis

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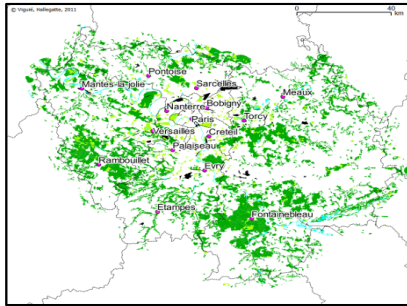
- **We carry out a multicriteria analysis of three urban policies**
  - Each policy is analyzed with respect to several policy goals
- **We use a simple integrated city model, NEDUM-2D**
  - Land-use transport interaction model
  - Calibrated on Paris urban area
  - Simulates rents level, population density and transport demand across the city
  - Validation of the model over the 1900–2010 period
- **Modelling Assumptions**
  - NEDUM-2D model used to simulate the evolution of the Paris urban area between 2010 and 2030

# NEDUM-2D model

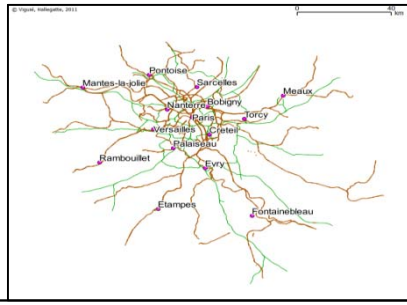
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- **Standard urban economics modelling (*Alonso 1964, Mills 1967, Muth 1969*)**
  
- **3 mechanisms :**
  1. Households' tradeoff:
    - Lower transportation costs and shorter commuting time when living close to the city center, and
    - Larger dwellings 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

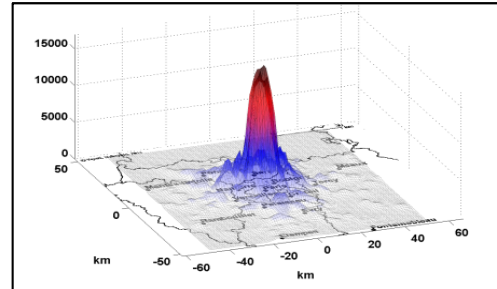


Land-use constraints

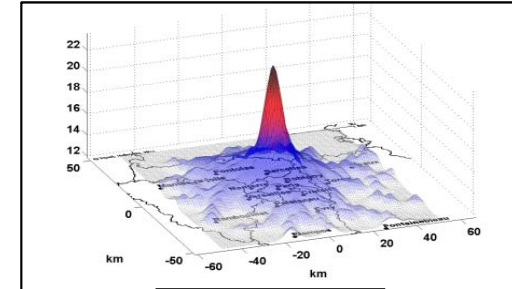


Transport times and costs

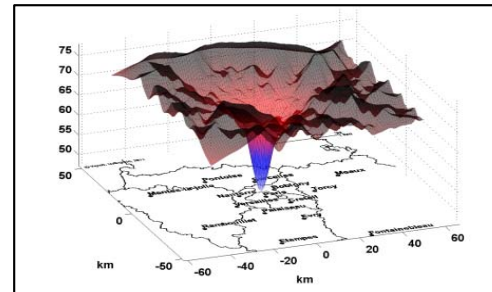
- Total population
- Construction costs
- Average households income



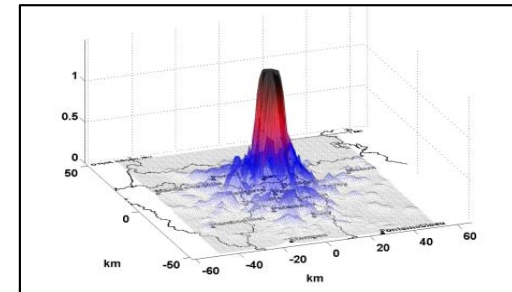
population density



Rents



average dwelling size



floor-area ratio

# Paris, 2006

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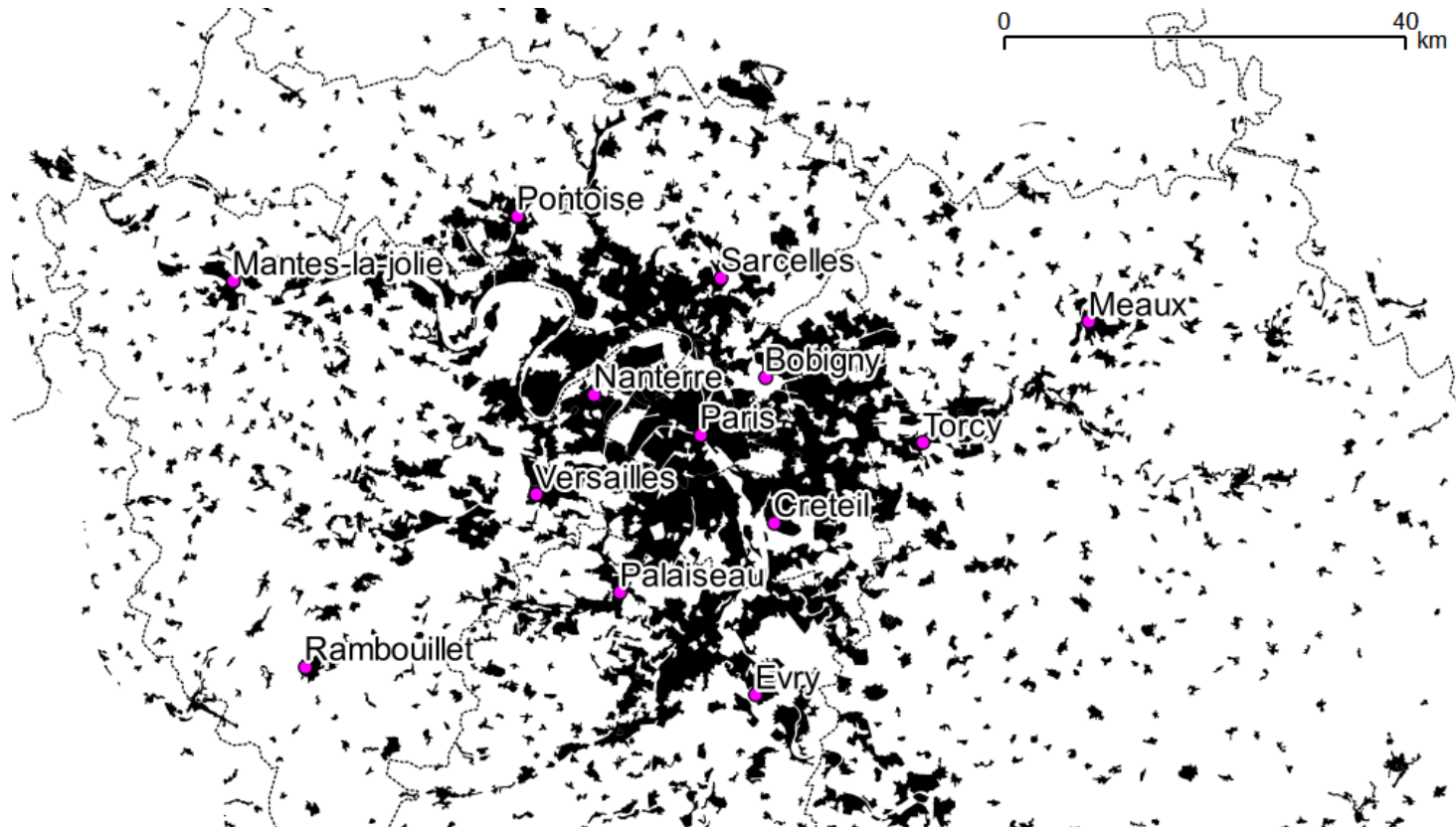
## Validation process

We run the model from 1900 to 2010 using:

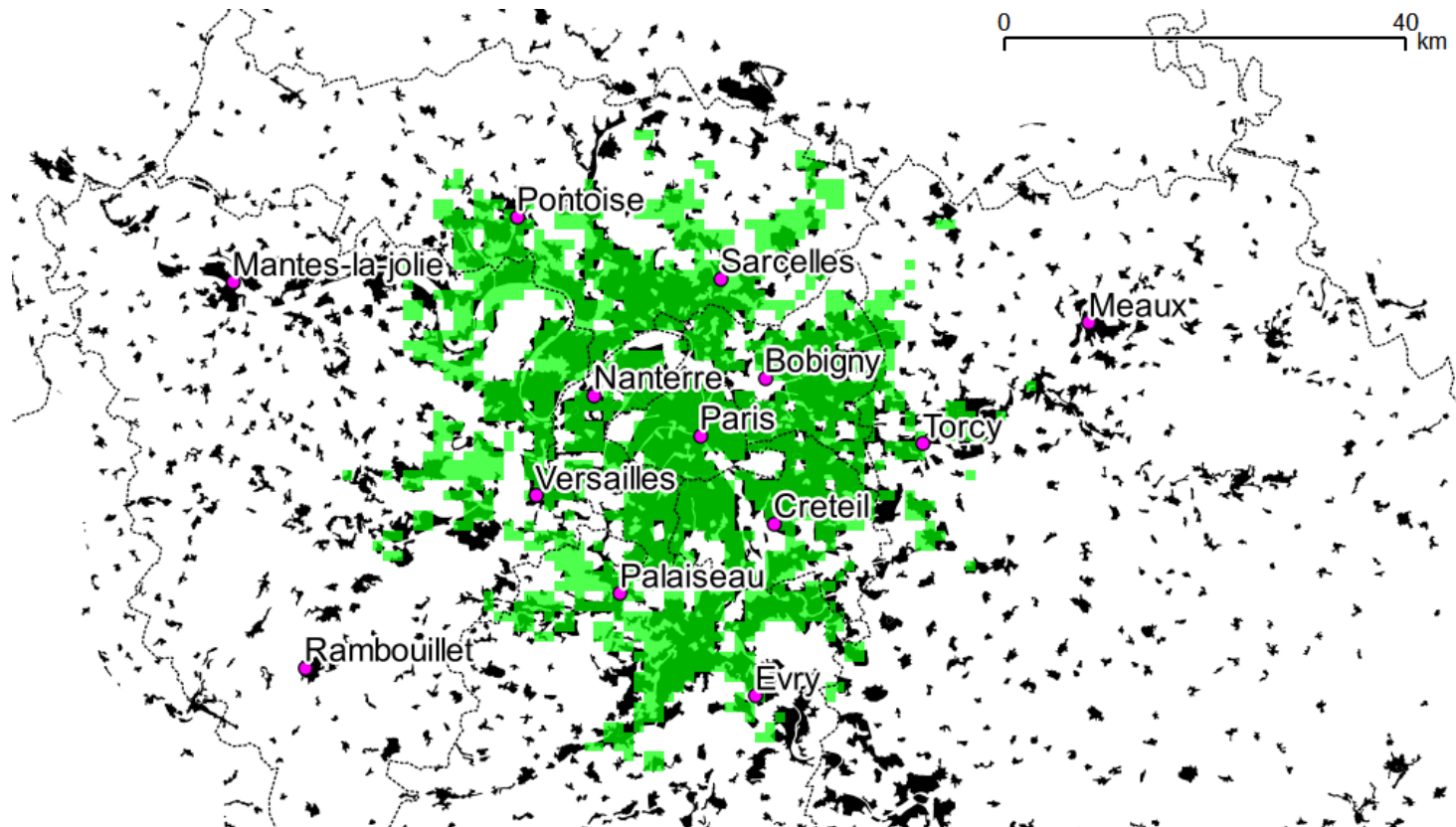
- Data on population;
- Data on average income;
- Data on transportation cost, speed, and localization;
- Construction costs change like income.

# Paris, 2006

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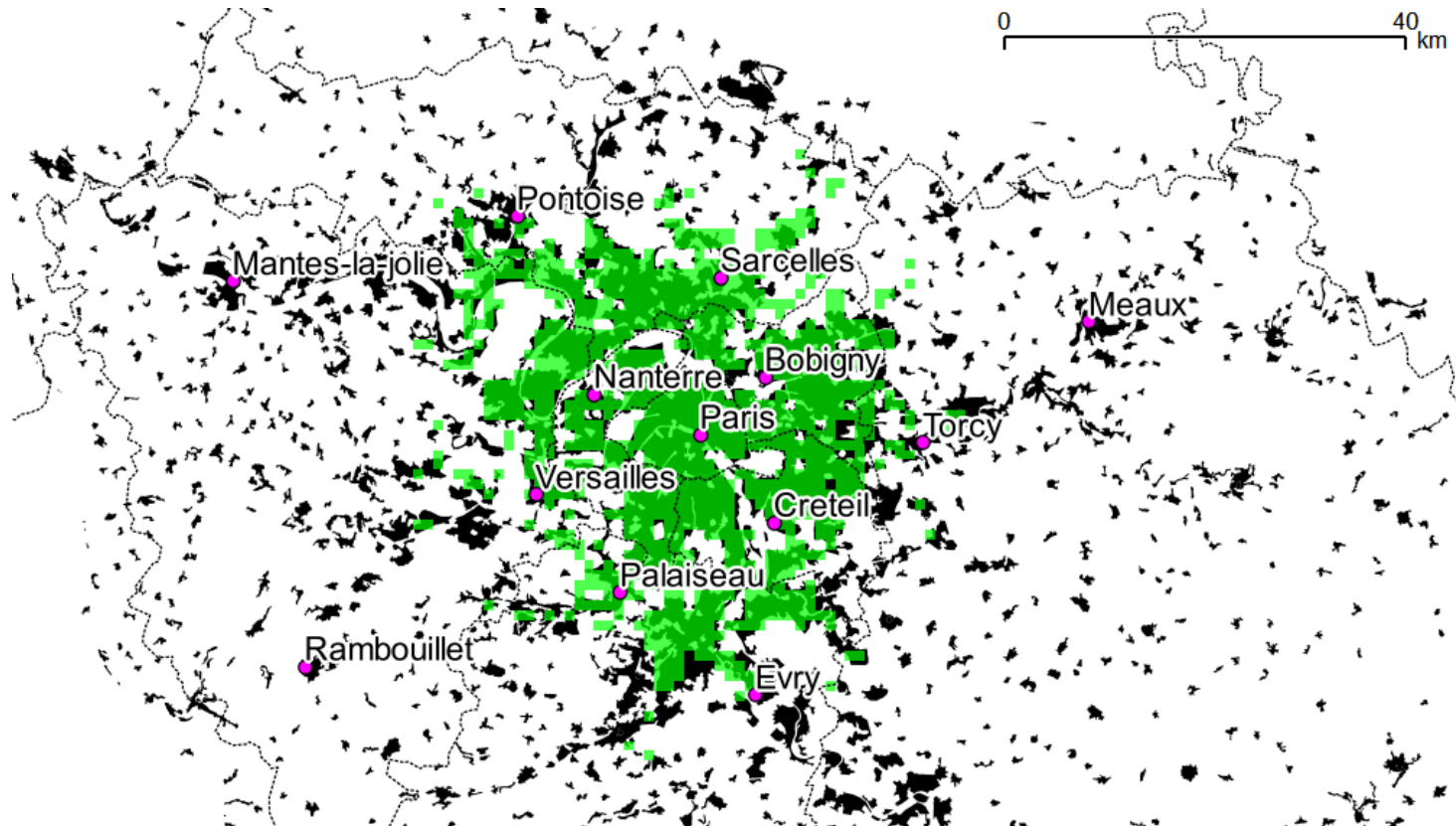
# Paris, 2006





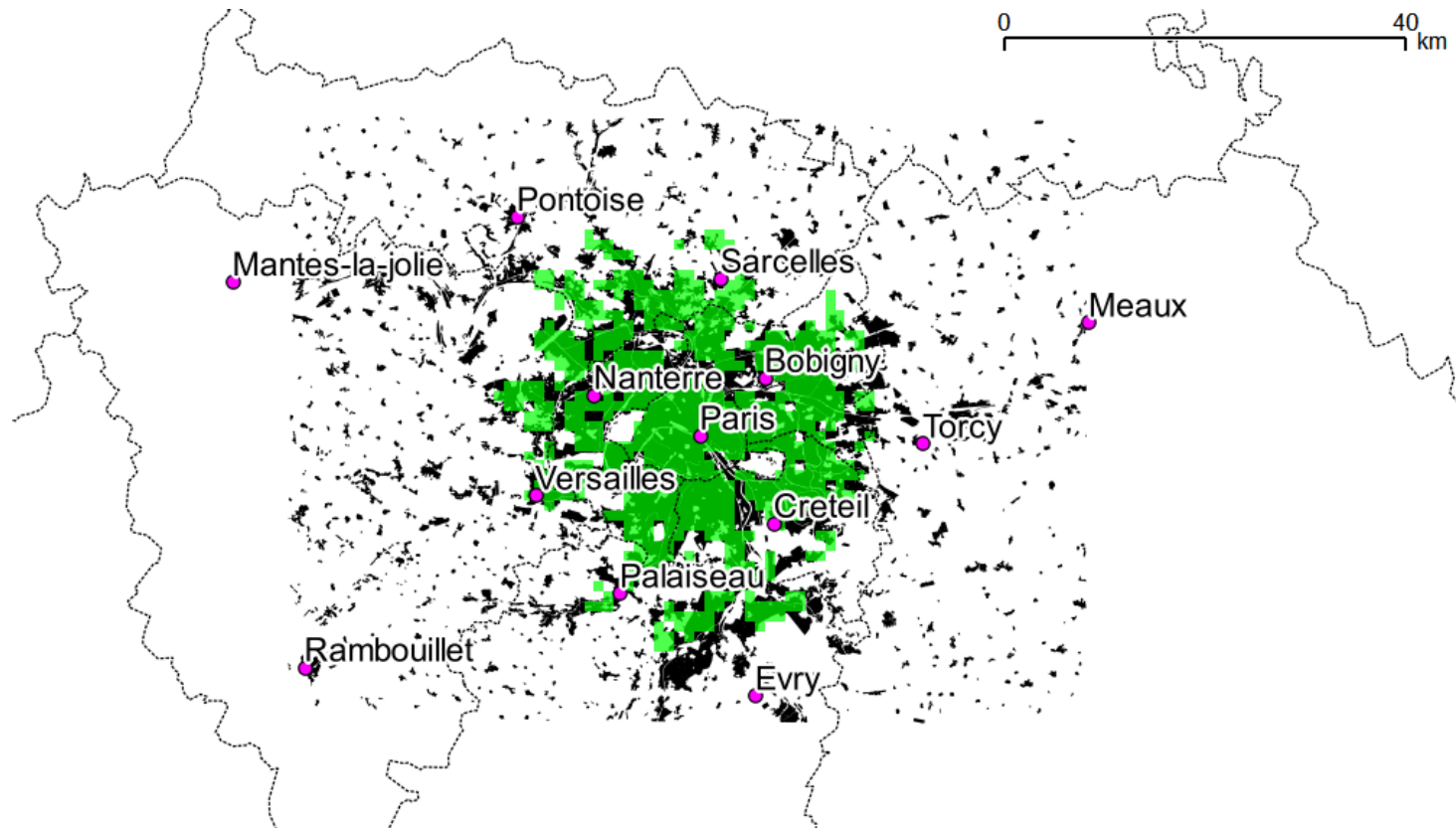
# Paris, 1990

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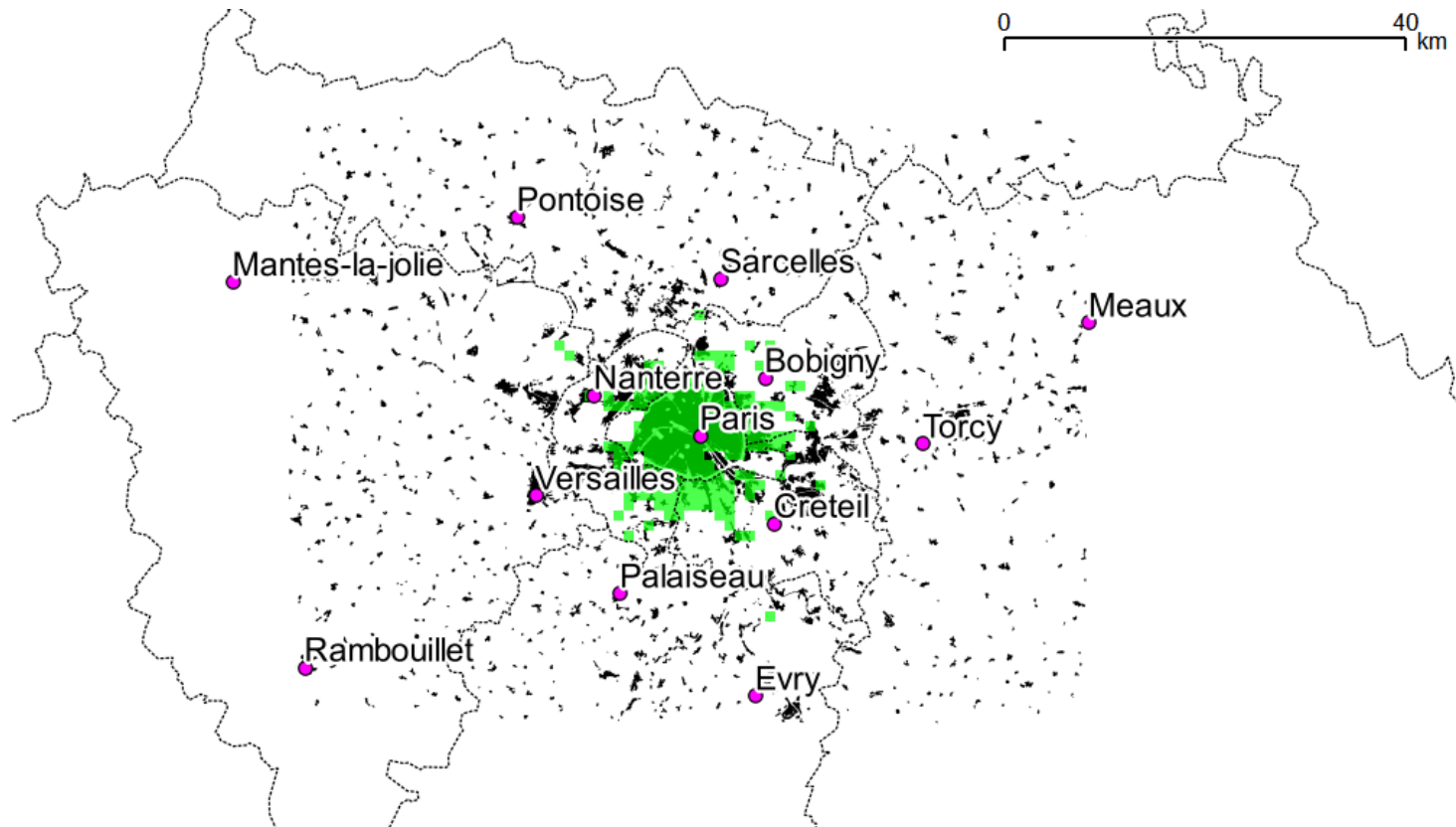
# Paris, 1960

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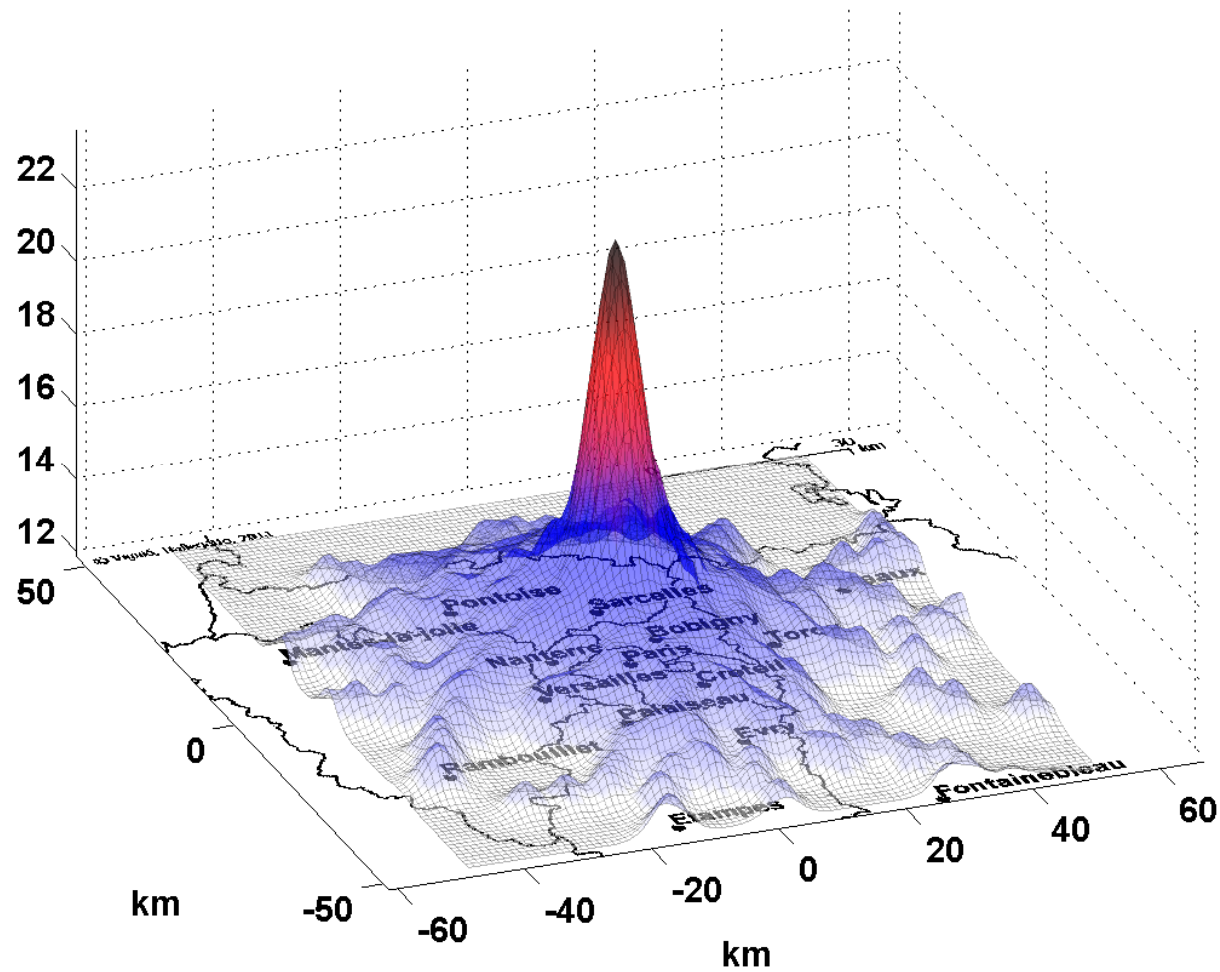
# Paris, 1900

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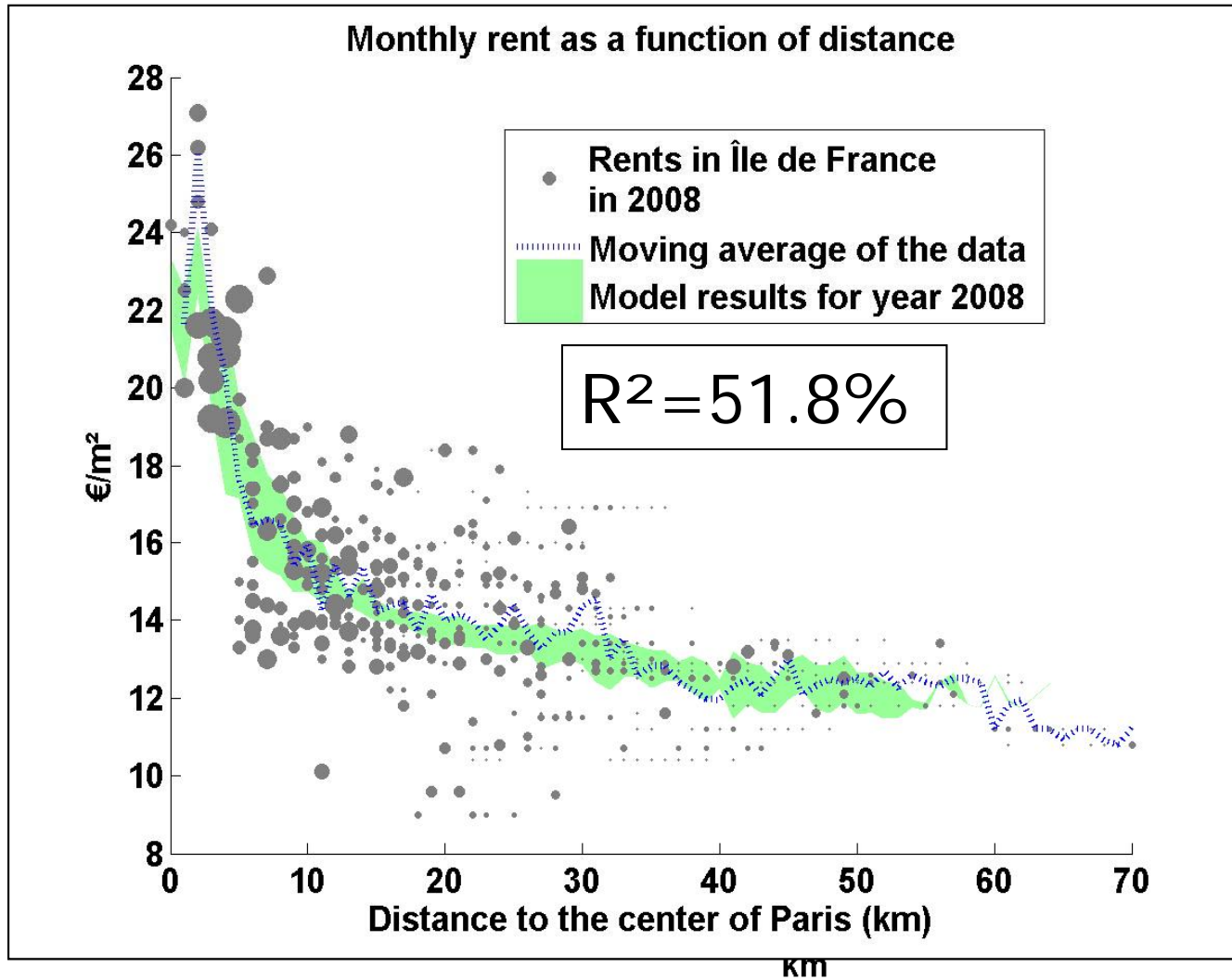


# Model results: Rents (2008)

Average rent (€/m<sup>2</sup>/month)

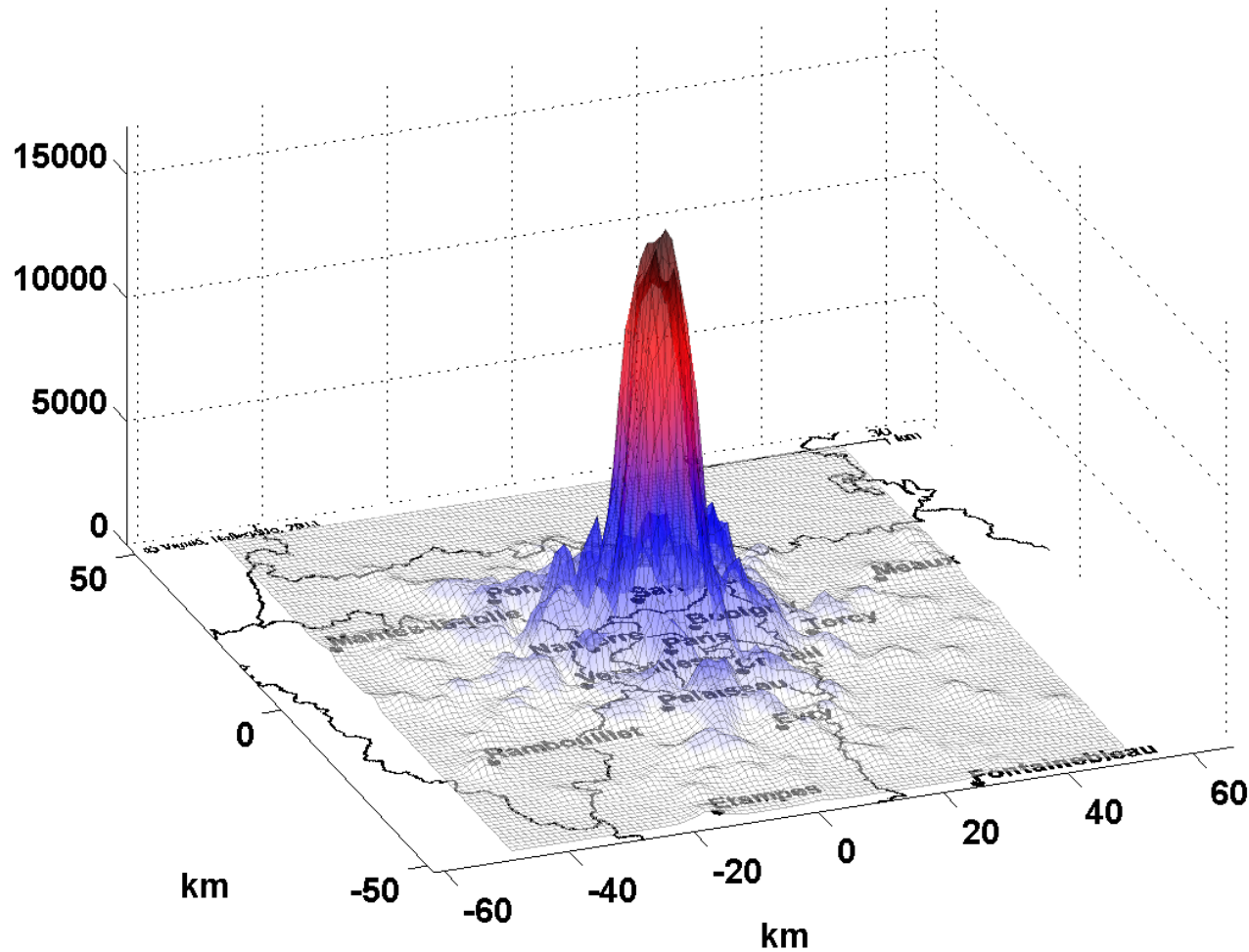


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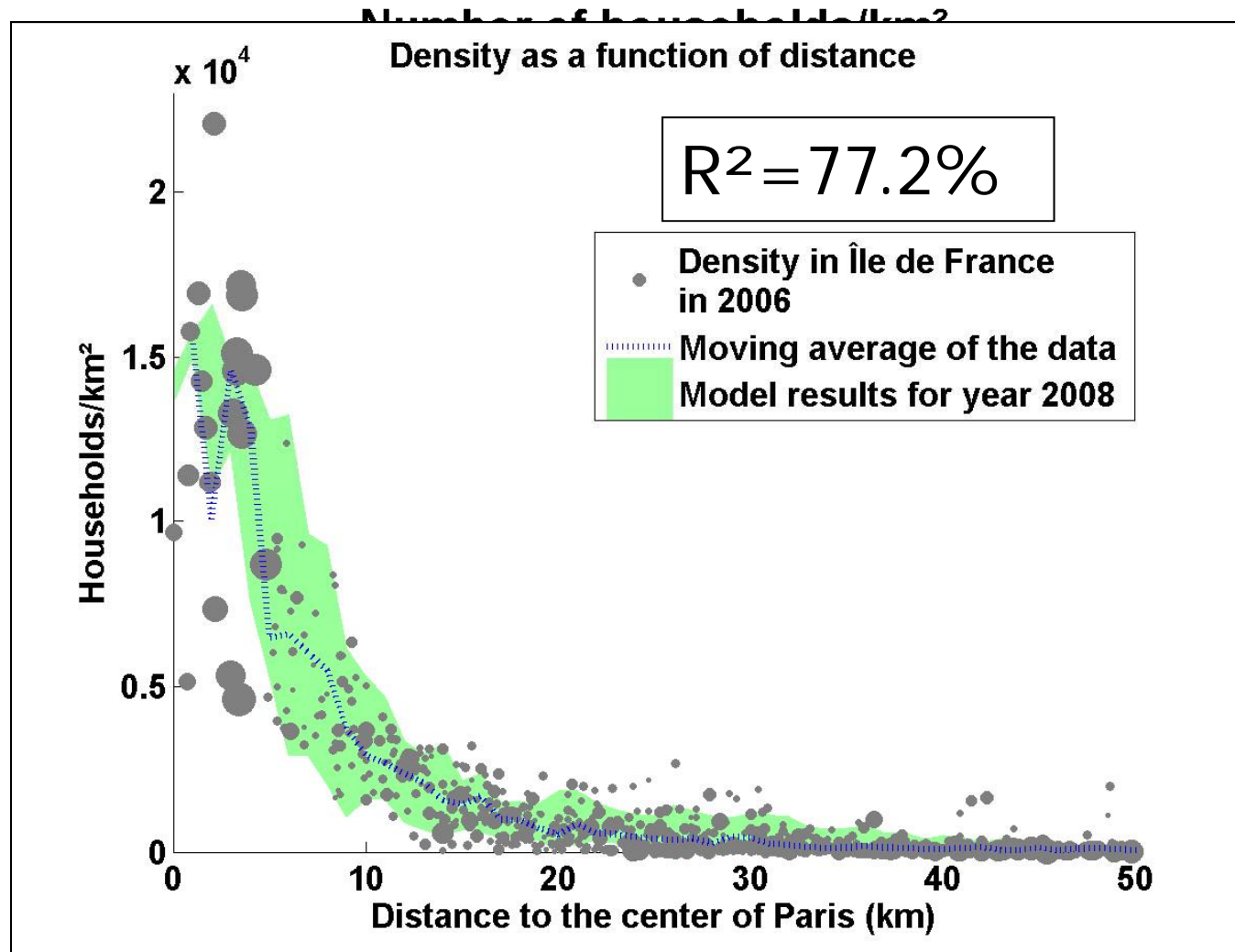


# Model results: Population density (2006)

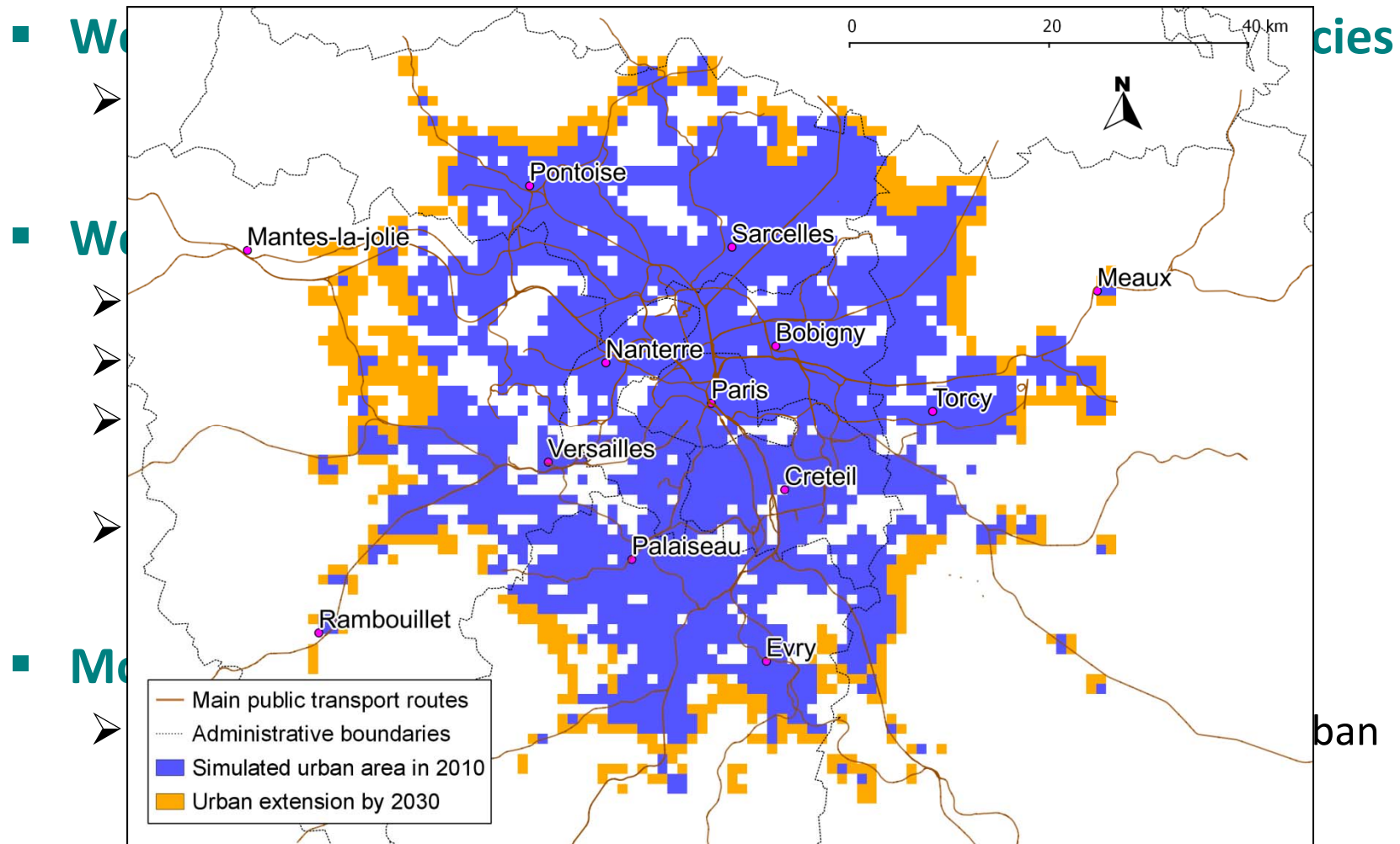
Number of households/km<sup>2</sup>



# Model results: Population density (2006)



# A multicriteria analysis





# Urban Policies

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## Greenbelt policy

- Land use regulations which prohibit building in areas that are not already densely inhabited in 2010

# Urban Policies

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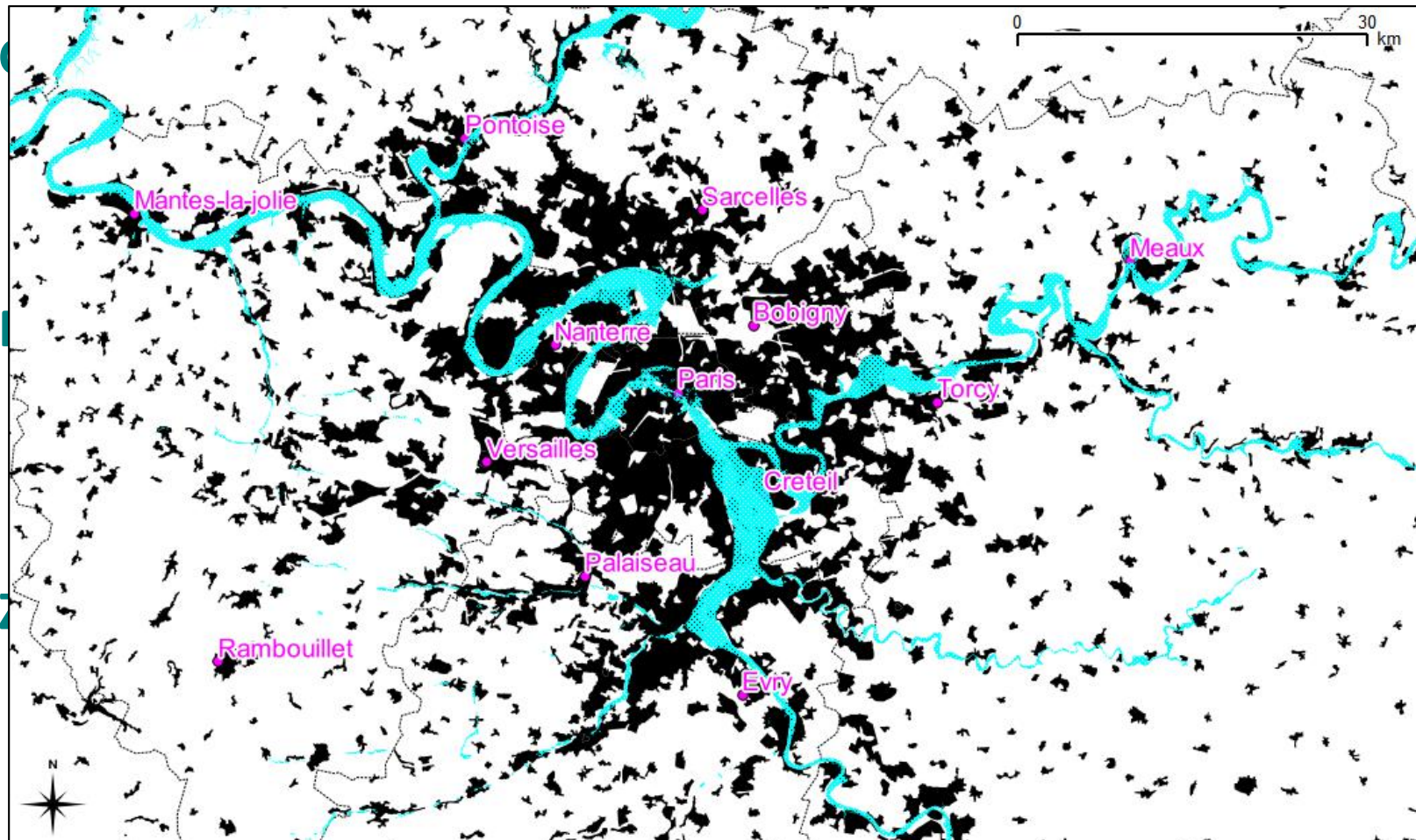
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## Public transport subsidy

- Single tariff for all destinations in the Paris urban area
- Financed by a lump sum tax

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## Zoning policy to reduce the risk of flooding

- Prohibits new buildings in flood-prone areas

## ➔ Compared to a “do-nothing” scenario

# Policy Goals and Indicators

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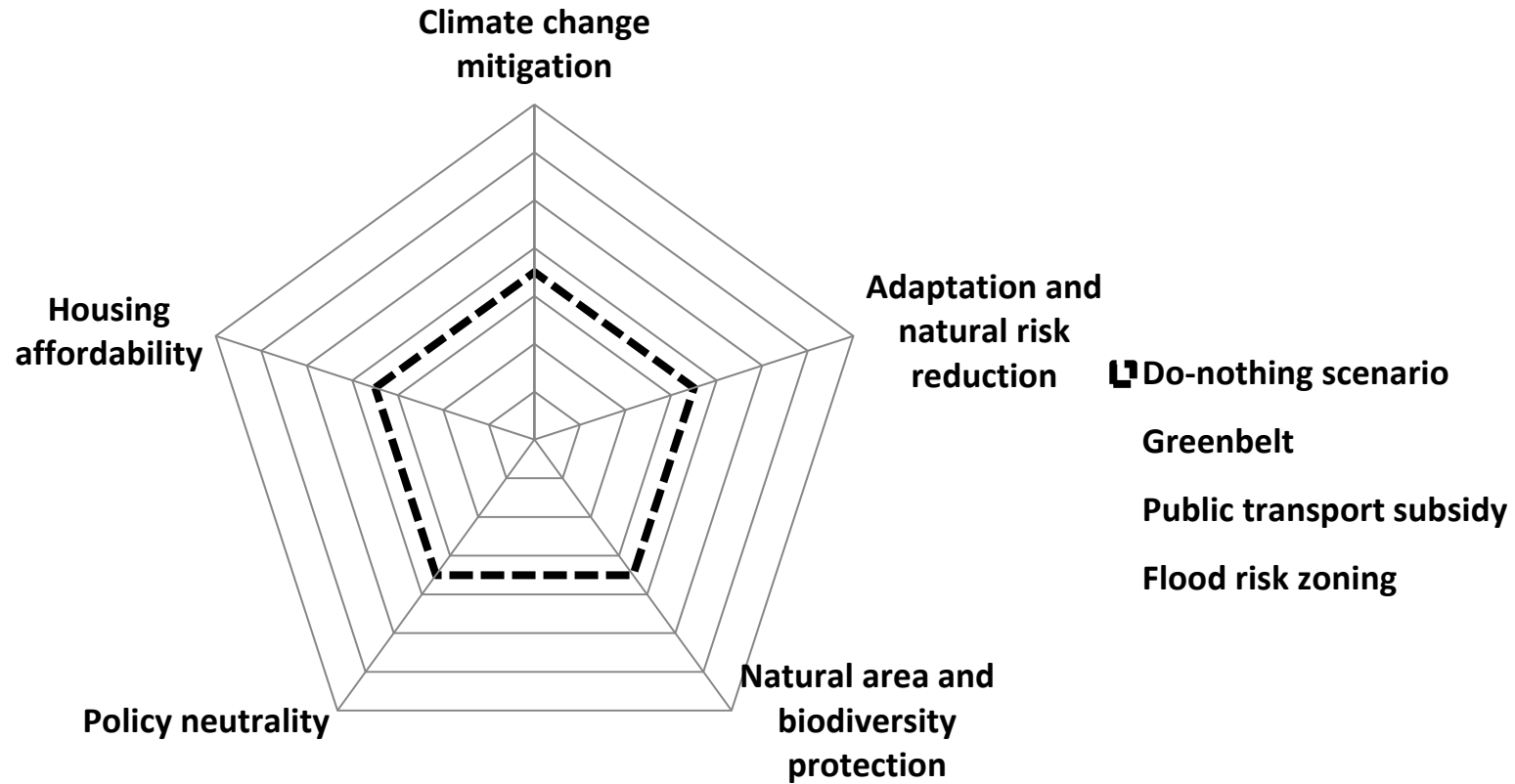
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Natural area and biodiversity protection	Total urbanized area
Housing affordability	Rents in the center of the urban area divided by available income
Policy neutrality	Gini index of the profitability of real estate investments

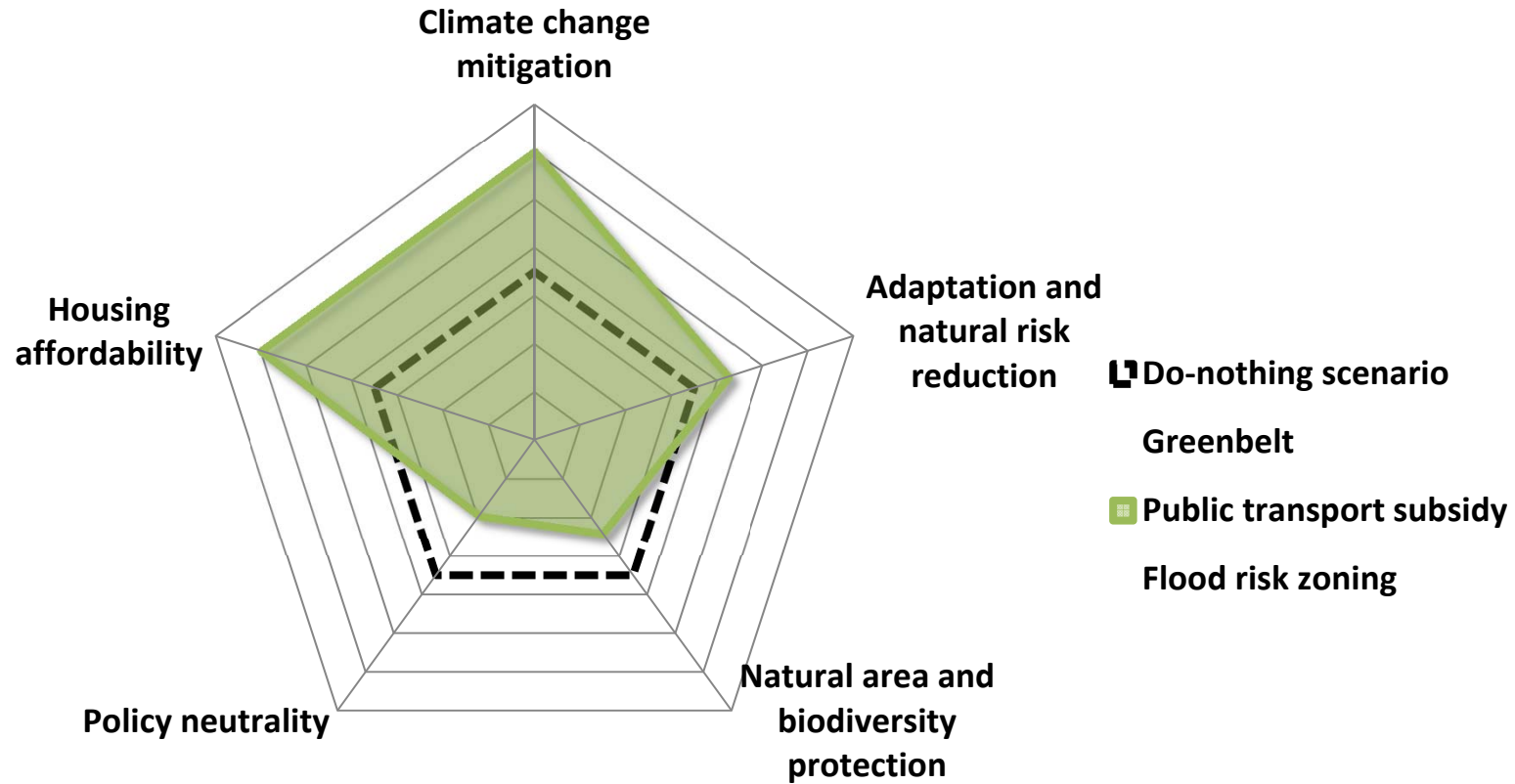
# Simulation results

Indicators	Greenbelt	Public transport subsidy	Flood risk zoning	Policy mix	Do-nothing scenario
Change in average daily distance driven in car (m)	+ 1,570	-440	+ 2,550	-880	+ 2,560
change in population in flood-prone areas (thousands of households)	+39,000	-4,000	-6,000	-8,000	+ 6,000
Change in total urbanized area (km <sup>2</sup> )	0	+ 690	+ 470	0	+ 480
Redistributive impacts (Gini index)	+ 0.093	+ 0.271	+ 0.201	+ 0.146	+ 0.203
Change in dwelling size in the center of Paris (m <sup>2</sup> )	+ 0.17	+ 1.73	+ 0.79	+ 0.95	+ 0.82

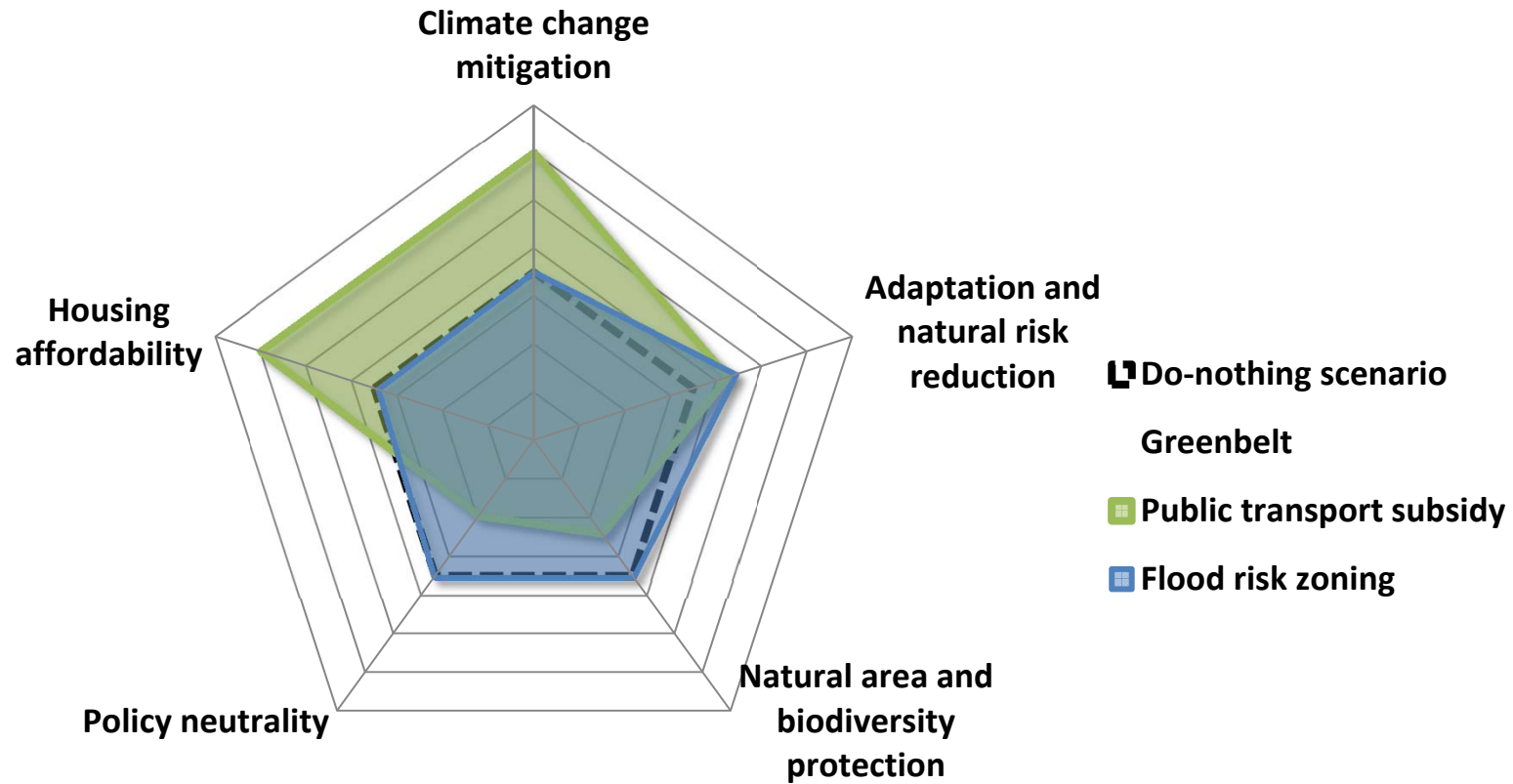
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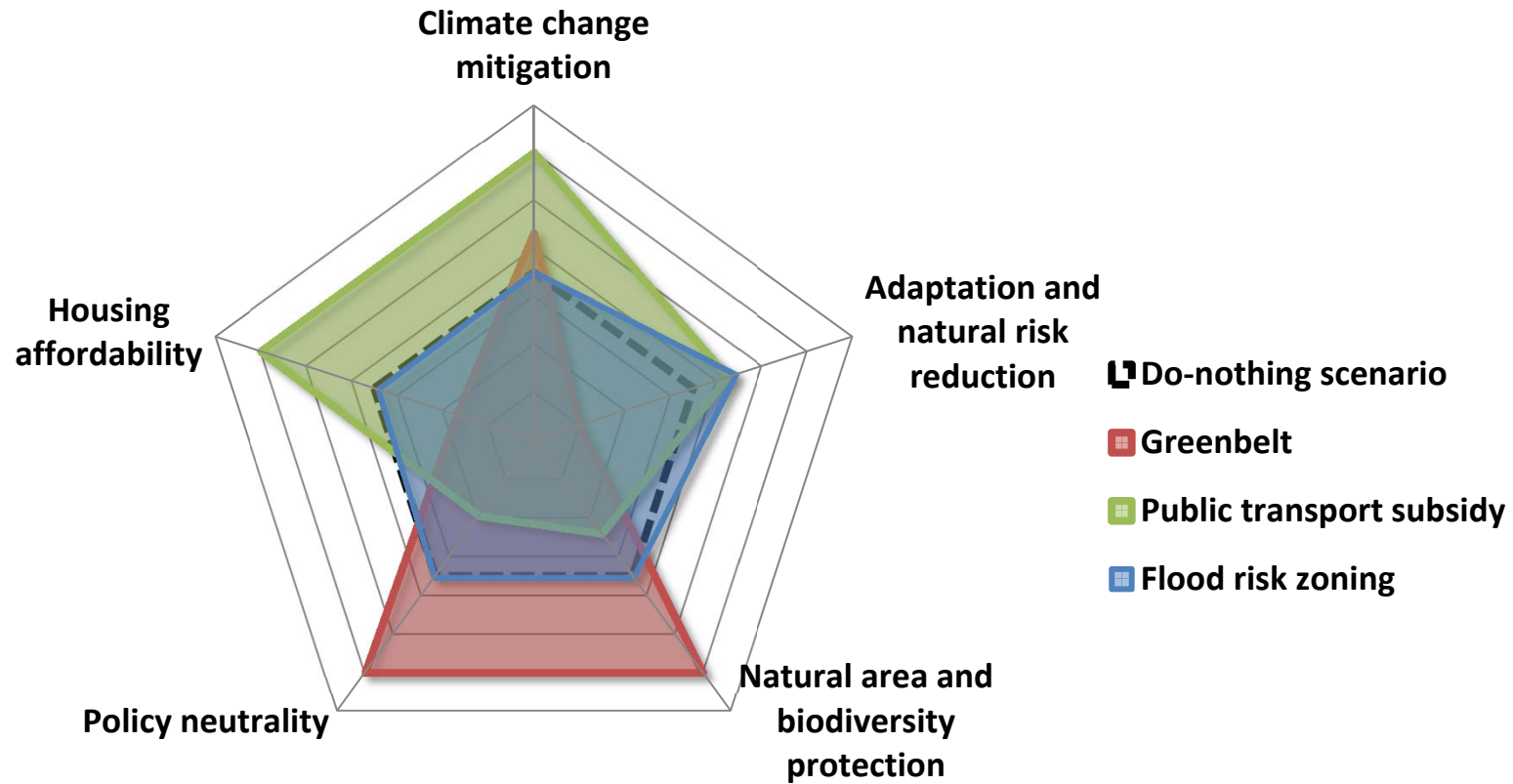
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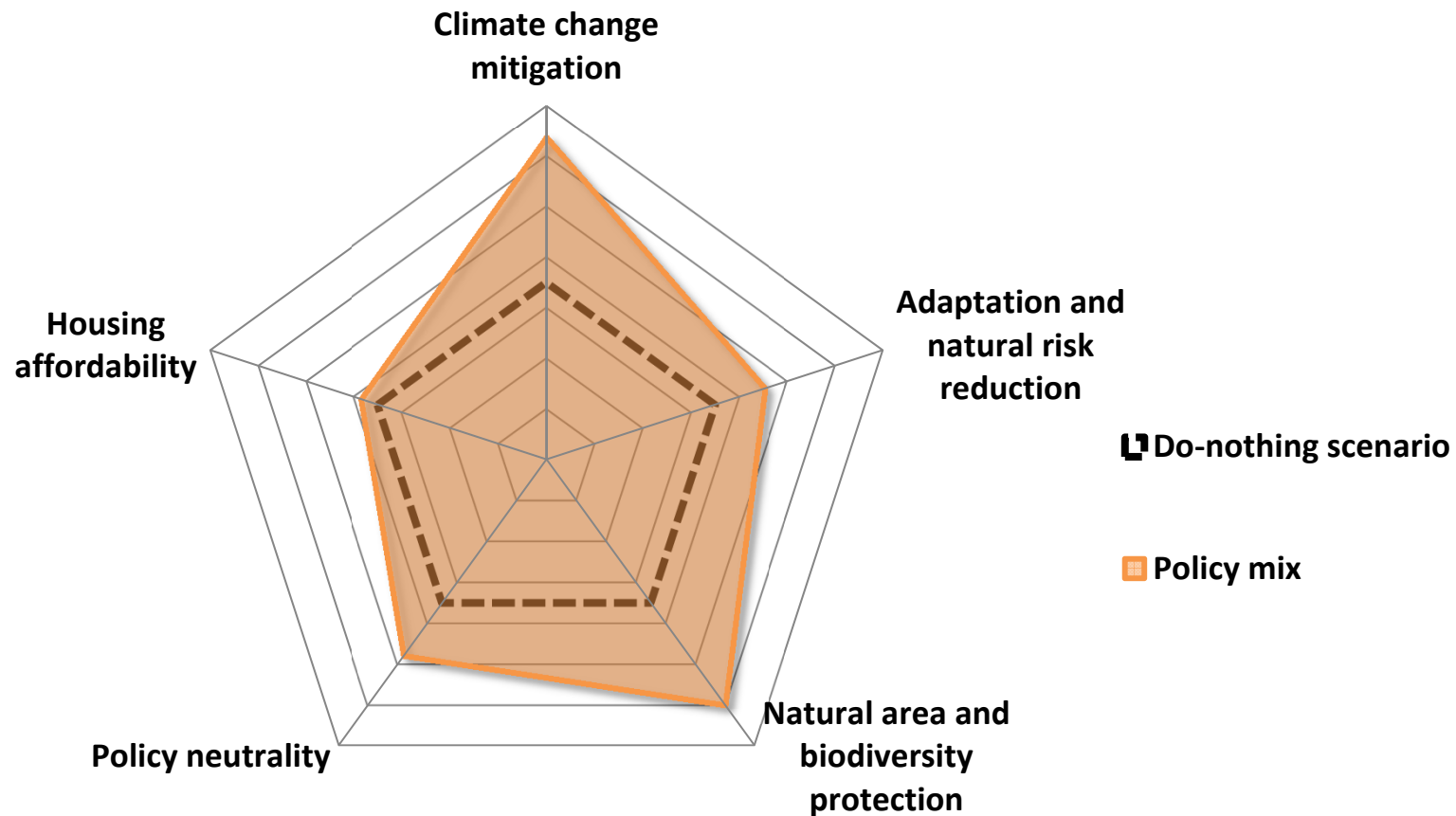
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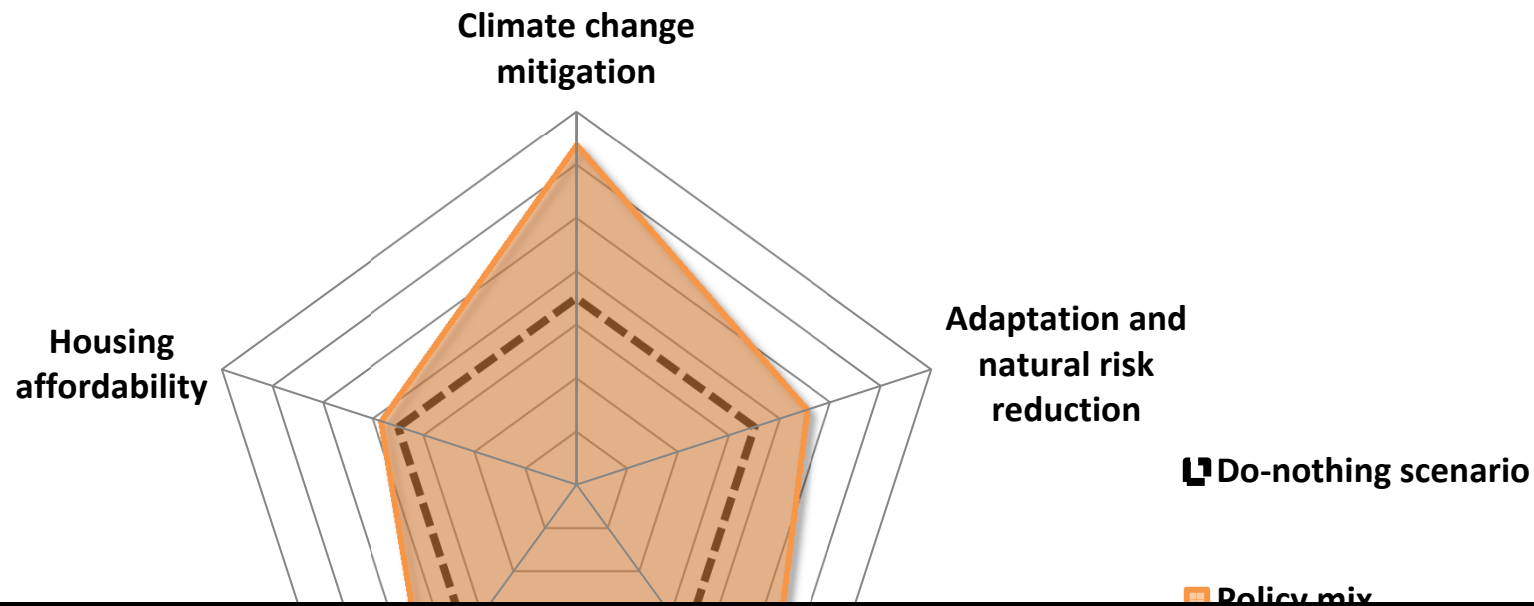
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When all three policies are applied together, the situation is improved as measured along all policy goals, compared with the do nothing scenario

**Mainstreaming of climate objectives with other policy goals can help design better policies**

## A few insights...

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- **Appropriate integrated city modelling can enable to provide quantification of interactions between urban policies**
- **In a policy mix, the consequences of each policy are not simply additive.**
  - This nonlinearity permits building policy combinations that are win-win strategies.
  - Feasibility in practice ?...
- **Stand-alone adaptation and mitigation policies are unlikely to be politically acceptable**
  - Need to mainstream climate policy within urban planning
- **Urban economic models and urban-scale long term scenarios provide useful insights into mitigation and adaptation policies.**