



SustainCity

Brussels case study

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Outline




- ❖ The study area
- ❖ Model development
- ❖ Scenario simulations (in progress)




The study area

THE URBAN ZONES OF THE REGIONS IN THE STUDY AREA

The urban zones:

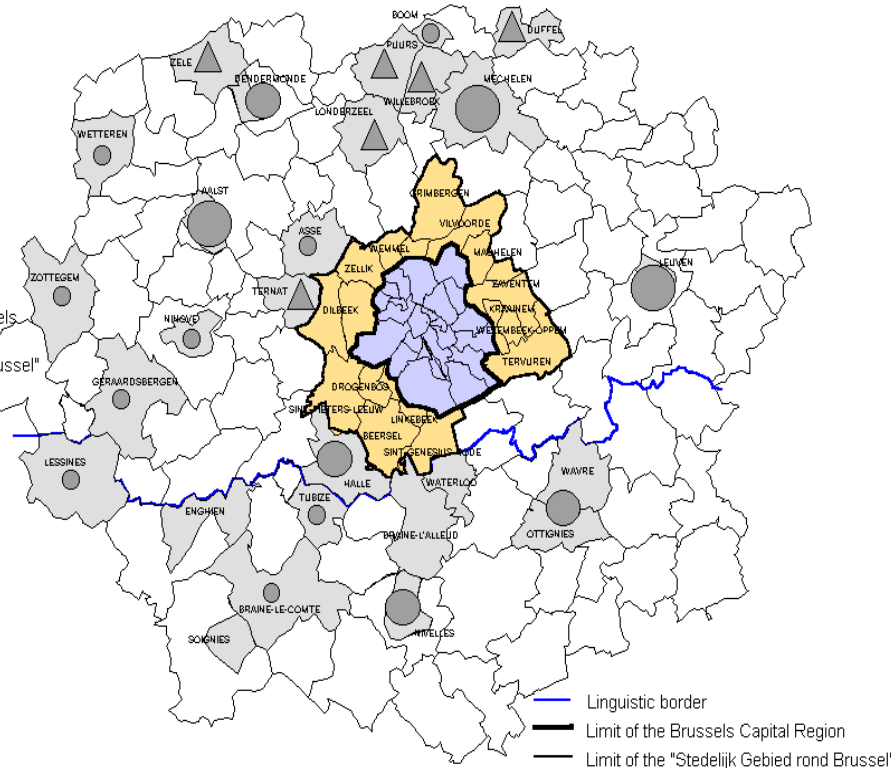
Urban hierarchy:

-  Regional city
-  Small structuring city
-  Small provincial city

-  Urban zone of the Brussels Capital Region
-  "Stedelijk gebied rond Brussel" (Flemish Region)
-  Other urban zones

Economic poles:

-  Economic node



   = urban

 = suburban or rural

The study area

- ~ Brussels Metropolitan area
- 151 communes
- ~ 4 300 km²
- ~ 3.3 millions inhab. (2010)
- ~ 1.5 million jobs (2010)

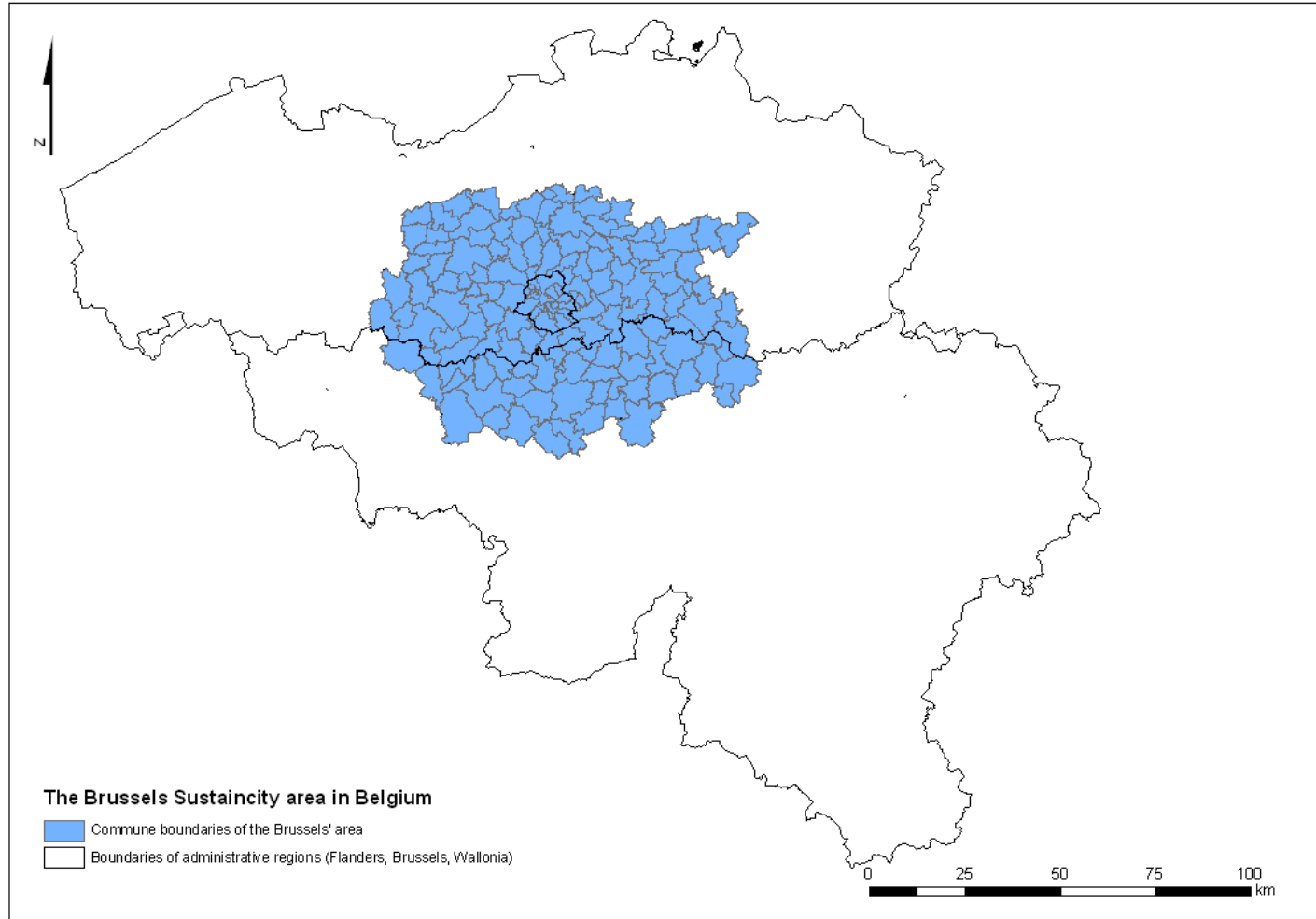
The Brussels-Capital Region

- ~ 1 million inhabitants
- ~ 650 000 jobs

Topical issues

Congestion, environmental damages, tendency to sprawl, demographic growth, PT lack of capacity and funding, ...

The study area (cont.)



MODEL DEVELOPMENT

Summary of what was done for the model development

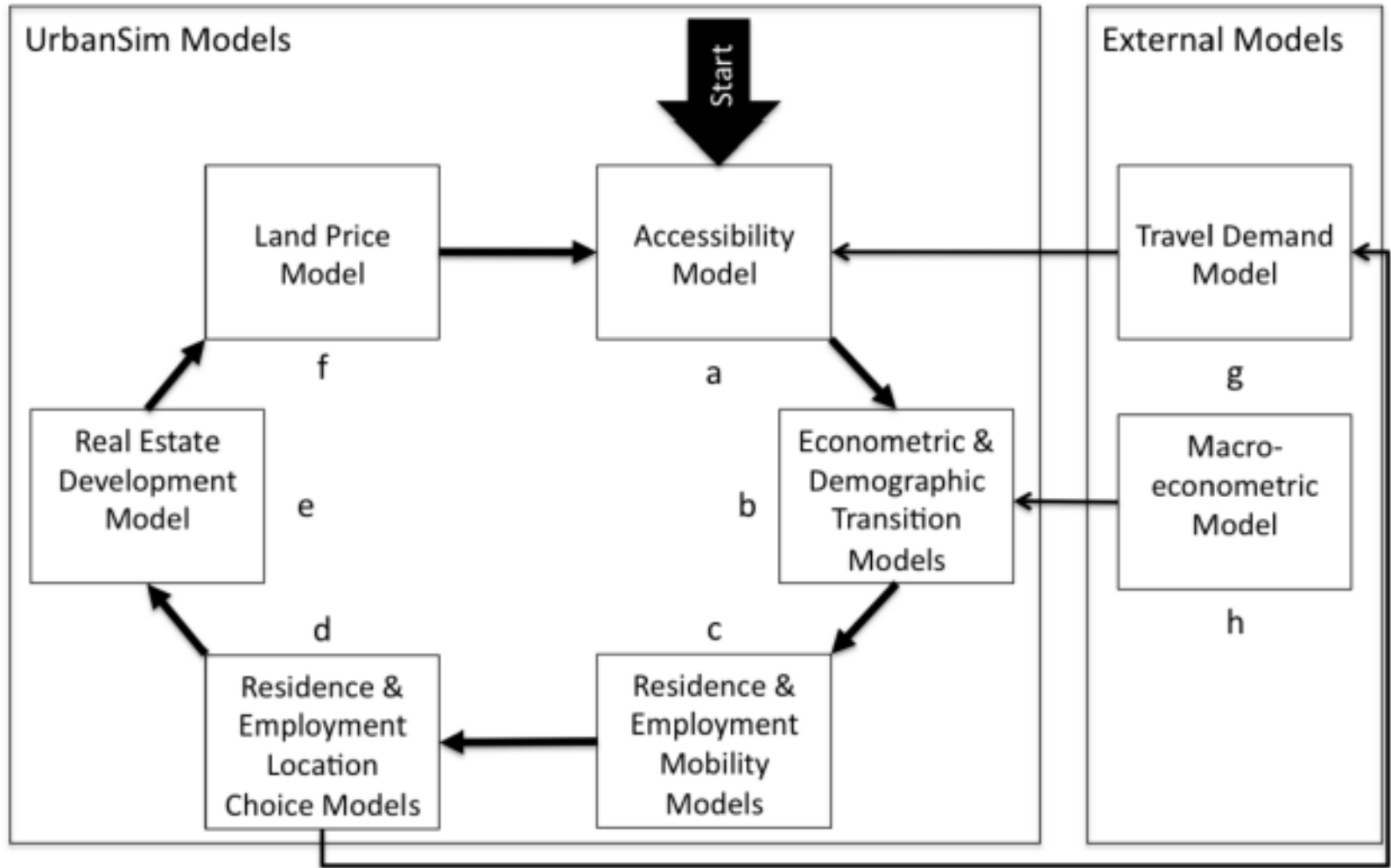
❖ Development of an Urbansim model for Brussels

- Collection of data (population, employment, buildings - 2001, 2007, and projections) (Stratec and UCL)
- Development of a synthetic population
 - (because no access to an extract of the census, to constitute the “agents”)
- Estimation of sub-models (EPFL):
 - residential real-estate price model (hedonic price model)
 - activity location choice models: household / employment (logit)
 - development project location choice models: residential/non residential (logit)
- + Development of Matsim for Brussels by TUB -> coupling UrbanSim/Matsim
- Checks on 2001 results (EPFL, Stratec)
- Test of the model on the period 2001-2007 (EPFL, Stratec)
- Implementing mode choice (TUB + parameters by Stratec) (in progress)

Tasks achieved in parallel on the Brussels case study

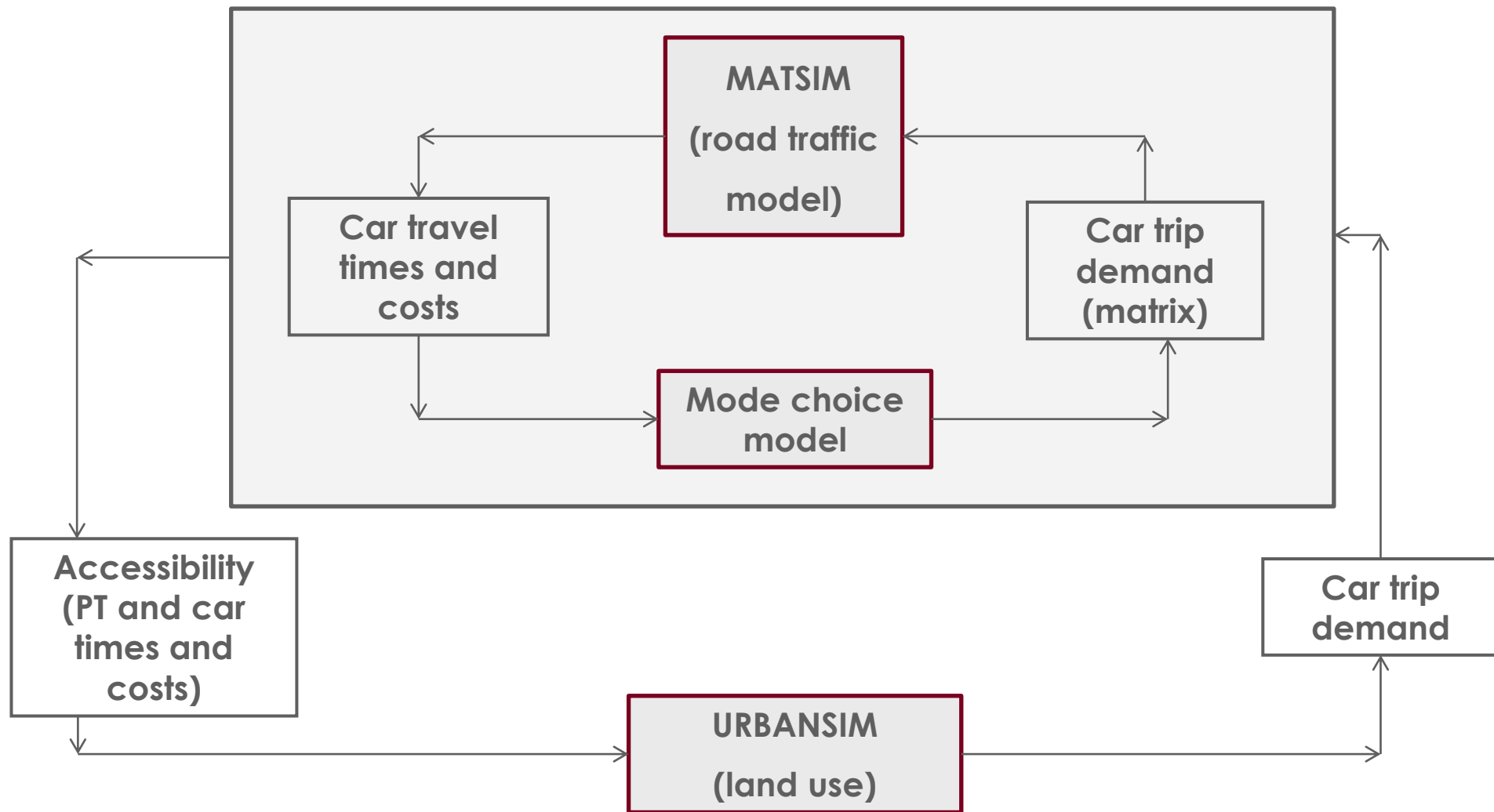
- ❖ **Spatial issues – analyses on Brussels (UCL), notably:**
 - effect of the size of the study area on the results
 - effects of the size of the basic units (zoning) on the results
- ❖ **Tests on UrbanSim with a synthetic (simplified) city (UCL)**

Main submodels in UrbanSim



UrbanSim main model after Waddell (2002) (Source : TUB, Chapter for Deliverable D7.2. : Using MATSim as a travel model plug-in to UrbanSim)

Introduction of mode choice in MatSim/UrbanSim



Remarks: PT times and costs do not change endogeneously (no PT model) ; another road traffic model than Matsim could have been used (with Matsim: harmonised modelling framework: microsimulation)

Mode choice in Matsim

❖ Features:

- Logit model combined with a learning process model
- Parameters (time and cost coefficients) taken from other studies by Stratec on Brussels
- Limit of Matsim mode choice: one single set of modal constants (car/public transport) for the whole study area
- May be difficult to calibrate

❖ Difficulty encountered with Matsim:

- Large computer memory (RAM) needed
- Yet larger memory needed with the mode choice module

SCENARIO SIMULATIONS

Simulation programme

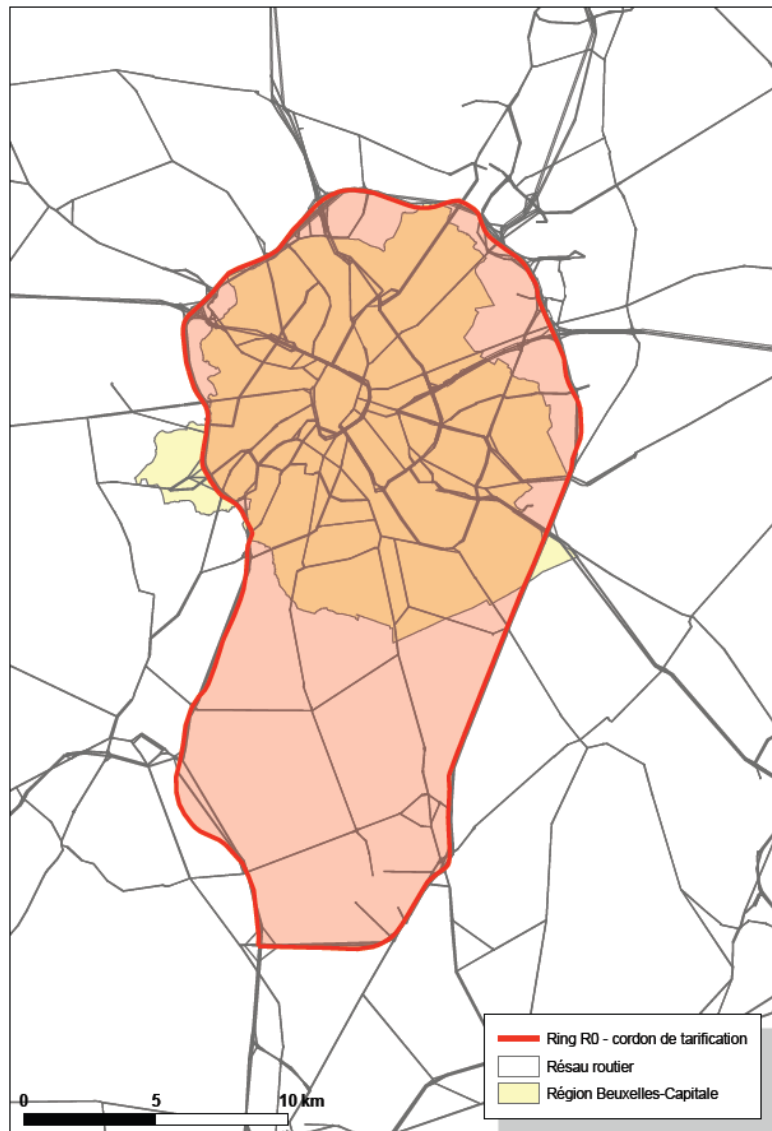
- ❖ **Simulation of a test scenario (Stratec) (in progress) :**
 - cordon pricing – common to all 3 cities
 - ❖ **Definition of 3 policy scenarios (Stratec, UCL)**
 - ❖ **Simulation of policies (Stratec) (in progress) :**
 - Urban road pricing (in progress)
 - Increase of the capacity of the orbital motorway (in progress)
 - Densification (in progress)
- ***Simulation work still in progress !***

- ❖ **Comparison of the road pricing results with other studies made by Stratec** (short term effects in Brussels road pricing study, long term effects in PROPOLIS and SCATTER)

- ❖ **Indicators and inputs for the social welfare function**

Test scenario : cordon pricing

- ❖ Cordon pricing implemented in the **city centre** in **2015**
- ❖ **City centre** defined as Brussels Capital Region (“19 communes”) and the orbital motorway (Ring)
- ❖ Additional cost of 5 euros during the morning peak (between 6 am and 10 am)



Policy scenarios

❖ Transport policies

- 1 Urban road pricing
- 2 Increase of capacity of the orbital motorway (Ring): + 2 lanes in each direction

❖ Land use policy

- 3 Densification policy

Policy scenarios

❖ Urban road pricing

- **Distance toll** applied on **Brussels Capital Region** and on the **Ring** with a flat fare = **0,43€/pcu-km**

- 0,43€/pcu-km
= mean optimal pricing that internalises the marginal external costs during morning peaks (6h-10h)

(estimation by Stratec, according to IMPACT unit values)

Coûts externes marginaux par EVP en RBC en heure de pointe du matin (8-9h)

Etude relative à l'introduction d'une tarification à l'usage en Région de Bruxelles-capitale



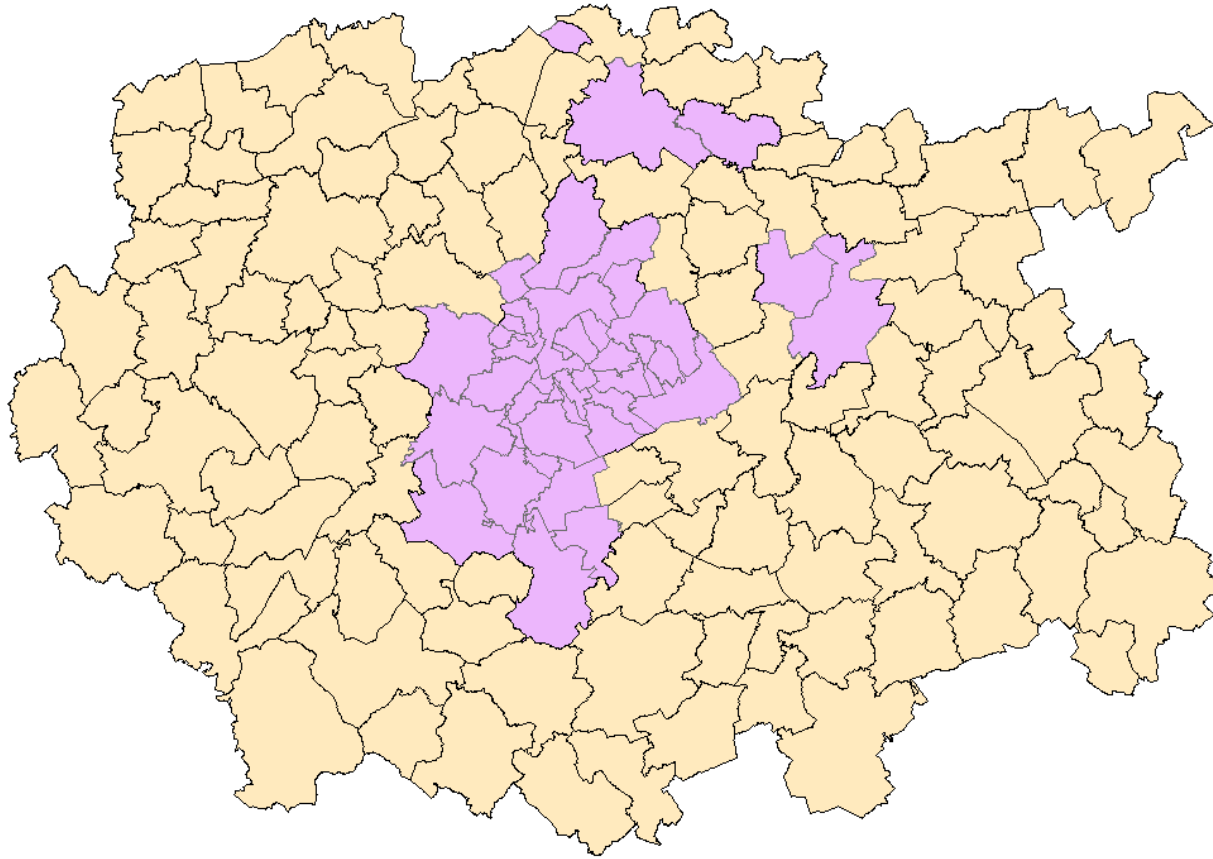
Policy scenarios

❖ Densification scenario

- **Policy goals :**
 - Population 2001-2020 increase concentrated in the “communes” classified as being part of the “agglomeration” (according to the classification by Van Heck et al., 2007)
 - ✓ (19 + 22 = 41 communes on 151)
 - Tertiary employment 2001-2020 increase concentrated in the zones with high accessibility, i.e. located at less than 1200 m from an IC/IR rail station (“ABC theory” from The Netherlands)
- **Measure :**
 - increase the residential units and the non-residential floor space in the target zones (by means of the “Scheduled development events” table)
 - measure implemented in 2015

Policy scenarios

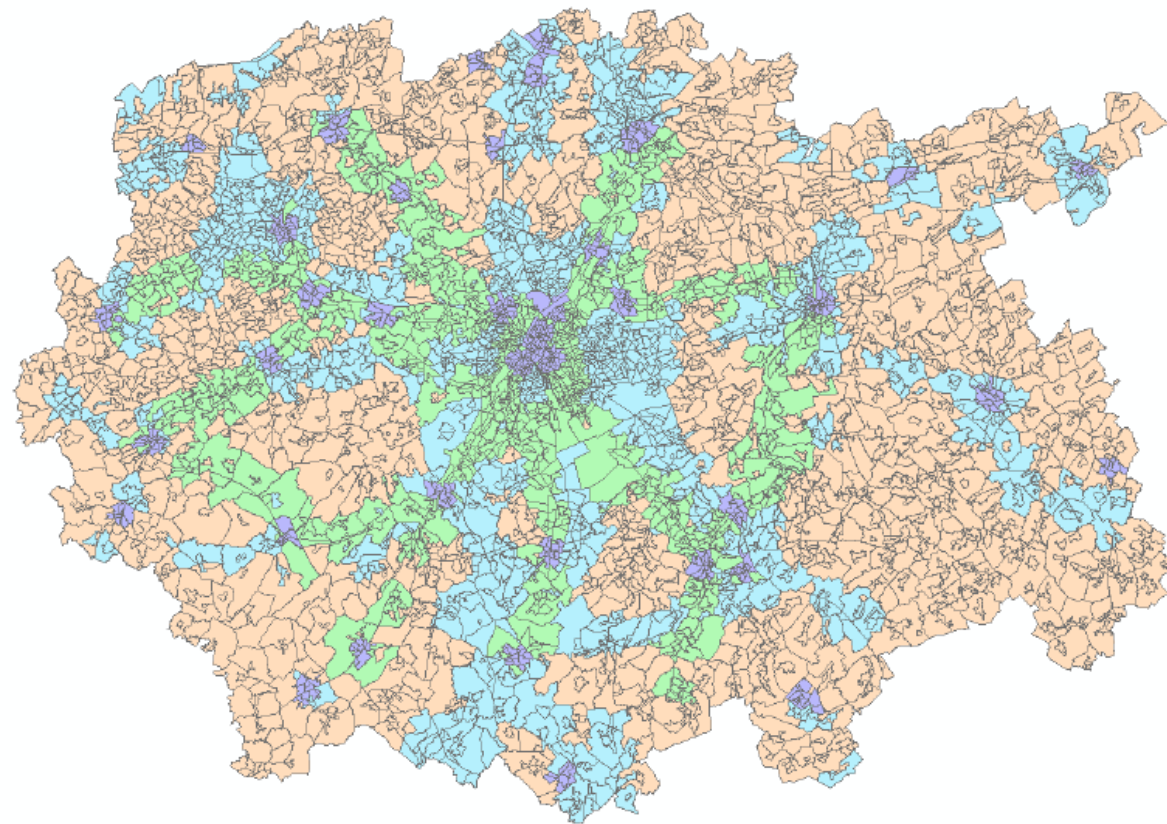
❖ Densification scenario - Population



“Communes” defined as centre and agglomeration according to Van Heck et al. (2007) are in purple.

Policy scenarios

❖ Densification scenario - Jobs



Statistical sectors classified as :

A : < 1200 m IC/IR station

B : > 1200 m IC/IR station, < 800 m RER station or < 2000 m highway

C : > 1200 m IC/IR station, > 800 m RER station, < 200 m highway

R : others

Typology "ABC" of the statistical sectors of the study area (Source : UCL)

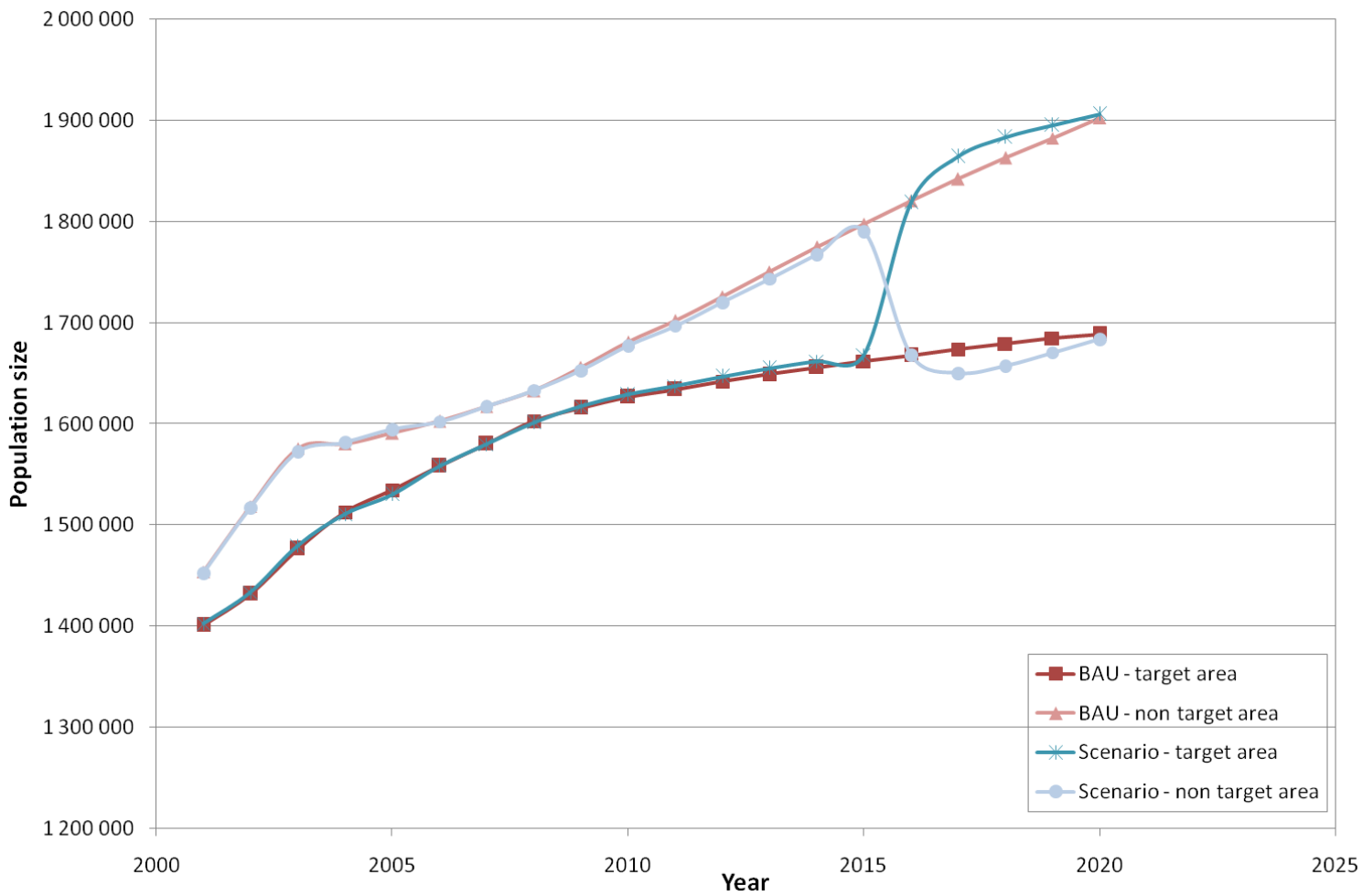
Policy scenarios

- ❖ **Densification scenario – 20 % increase in capacity in the “agglomeration” – Population preliminary results**
 - ❖ **“Agglomeration”:**
 - ❖ **2001: 1.40 Mhab**
 - ❖ **2020: 1.69 Mhab (+21 %)**
 - ❖ **2020 densification: 1.90 Mhab (+36%)**
 - ❖ **Rest of the study area:**
 - ❖ **2001: 1.45 Mhab**
 - ❖ **2020 BAU: 1.90 Mhab (+31%)**
 - ❖ **2020 densification: +1.68 Mhab (+17%)**

Policy scenarios

❖ Densification scenario - Population

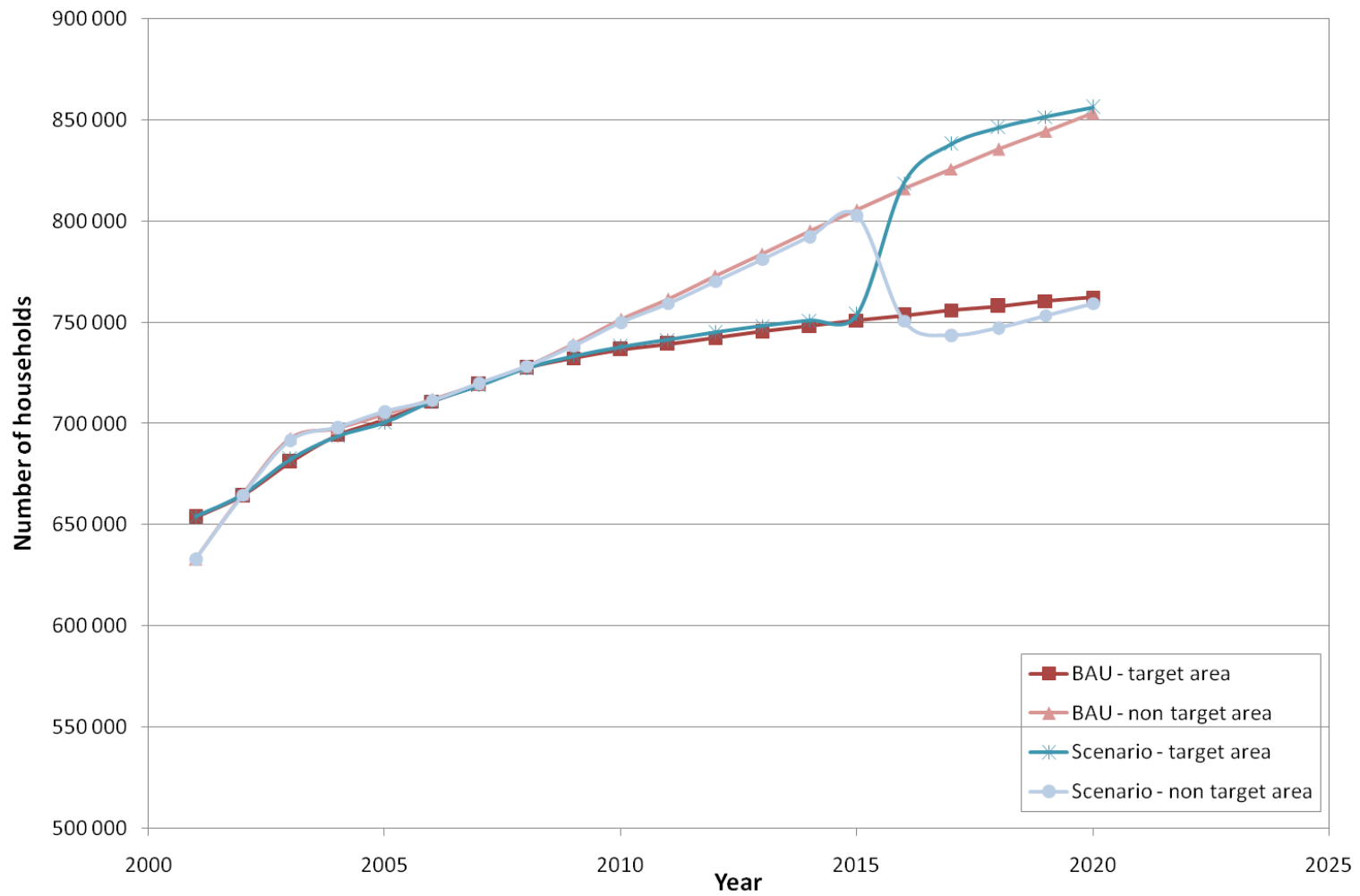
Evolution 2001 -2020	
BAU - target area	20.5%
Scenario - target area	35.9%
BAU - non target area	30.8%
Scenario - non target area	15.9%



Policy scenarios

❖ Densification scenario - Households

Evolution 2001 -2020	
BAU - target area	16.6%
Scenario - target area	34.7%
BAU - non target area	30.9%
Scenario - non target area	20.0%



Policy scenarios

❖ **Densification scenario – following tasks:**

- Checks on population results
- Add employment densification
- Check feasibility of the hypothesis (increase of capacity) and adapt if necessary
- Spread the measure on a few years
- Run with mode choice module
- Calculate transport indicator variation:
 - modal share of public transport
 - average car speed
 - car mileage
 - emissions due to transport
 - average home-work distance
 - average time spent in travel

Thank you for your attention