KU LEUVEN

SPATIAL APPLICATIONS DIVISION

Urban Planning and Smart Cities: When is 'Smart' really Smart

Danny Vandenbroucke (SADL)

GeoSmartCities Conference – Genoa – 15/02/2017

Outline

- When is ‘Smart’ really Smart ?
- Spatial planning and the housing market
- Web technologies to enrich SDI’s
- Conclusions and ongoing work

KU LEUVEN

Outline

- When is ‘Smart’ really Smart ?
- Spatial planning and the housing market
- Web technologies to enrich SDI’s
- Conclusions and ongoing work

KU LEUVEN

When is ‘smart’ really smart

A smart city is an urban development vision
to integrate multiple information and communication technology
(ICT) and Internet of Things (IoT) solutions
in a secure fashion to manage a city's assets
– the city's assets include, but are not limited to,
local departments' information systems, schools, libraries, ...

- Is it only about ICT and IoT ?
- Is it also not about generating intelligent information from a bulk of data … ? About smart governance … ?

KU LEUVEN

Smart cities

http://europe-ul.com/makes-smart-city-smart/

KU LEUVEN

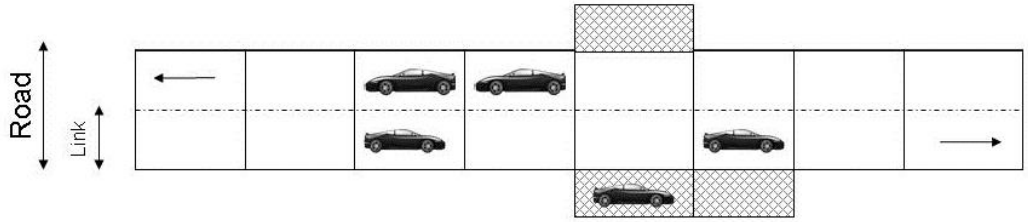
When is ‘smart’ really smart

- We need more than (open) data …
  - We need intelligence, information and insight …

Spatial Agent Based Modelling

How do children look to traffic situations ?

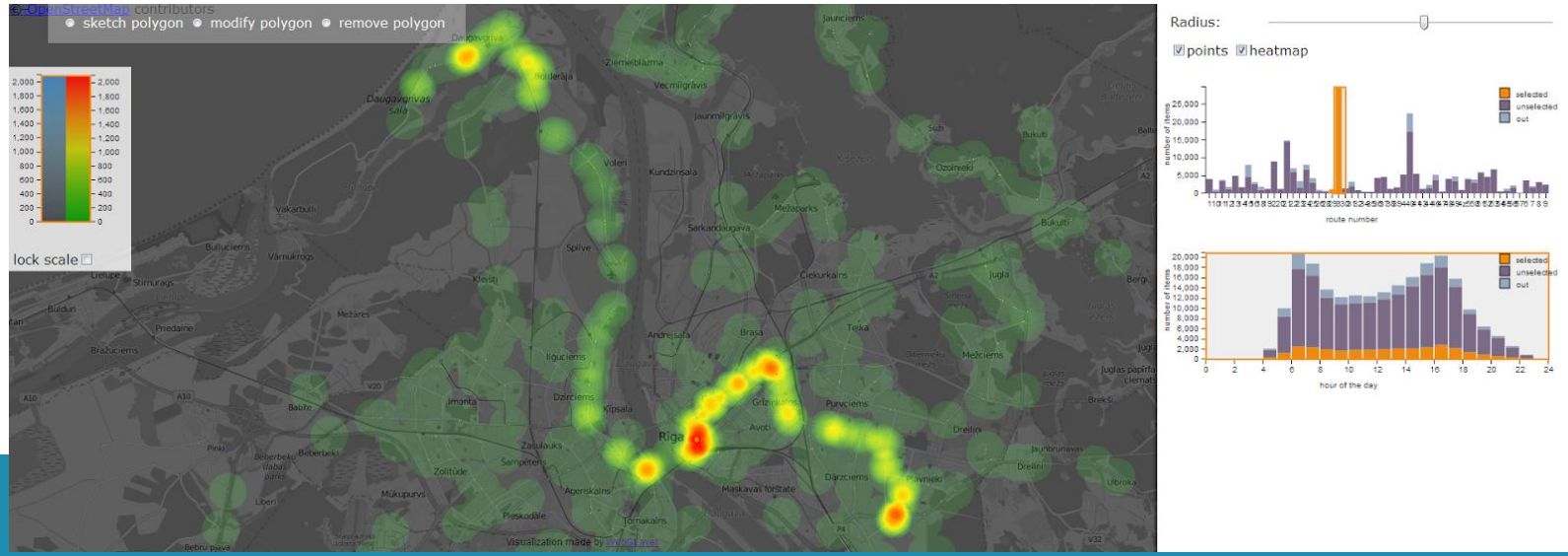
How do car drivers look for parking space?



KU LEUVEN

When is ‘smart’ really smart

- OpenTransportNet.eu hub
  - Monitoring traffic and safety in the city of Turnhout using ANPR technology
  - WebGLayer API available



Outline

- When is ‘Smart’ really Smart ?
- Spatial planning and the housing market
- Web technologies to enrich SDI’s
- Conclusions and ongoing work

KU LEUVEN

Micro-dynamics of housing market?

KU LEUVEN

Transdisciplinary research collaboration

- **Objective:** better understand the housing market in view of managing the urban sprawl (densification instead of spreading)

- **Method:** collaborative planning, fuzzy planning, adaptive co-management of space, …

- **Involved partners:** university researchers on geosciences and –technology, the spatial planning policy department of the Flemish government, and private businesses active on the real estate market

KU LEUVEN

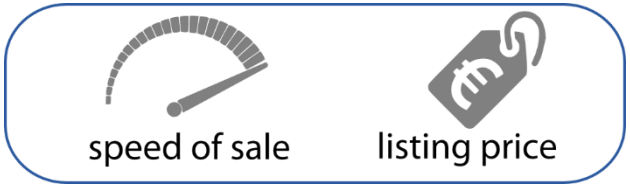
Housing market

- Housing is one of the main drivers of spatial development (EEA, 2013)
  - Together with employment and mobility

- Spatial and urban planning should play greater attention to price signals
- Information on the housing market is collected and managed by the private sector
  - Independent from any SDI development

KU LEUVEN

Indicators



- **Speed of sale:** duration that houses are listed for sale on the market (‘time-on-market’)
  - Proxy = time that a listing is published online

- **Listing price:** price of the real estate listing, this differs with the realized price

☞ Challenge: how to collect the data and enrich the base data from the existing SDI?

Outline

- When is ‘Smart’ really Smart ?
- Spatial planning and the housing market
- Web technologies to enrich SDI’s
- Conclusions and ongoing work

KU LEUVEN

Case study: greater Leuven (Flanders, Belgium)

INHABITANTS

119,410 inhabitants (2015)

58,636 households (2015)

increase pop. of 9.6% (2005-2015)

BUILT ENVIRONMENT

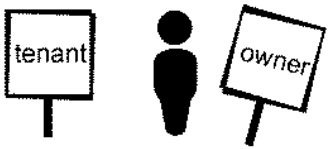
population density 13 inh/ha (2015)

av. 2.3 persons per dwelling (2011)

51,683 buildings (2011)

31% built-up space (2015)

OWNERSHIP



37% vs 63%
(weighted average, 2011)

PROPERTY PRICES

house €449,000

villa €614,131

appartment €336,027

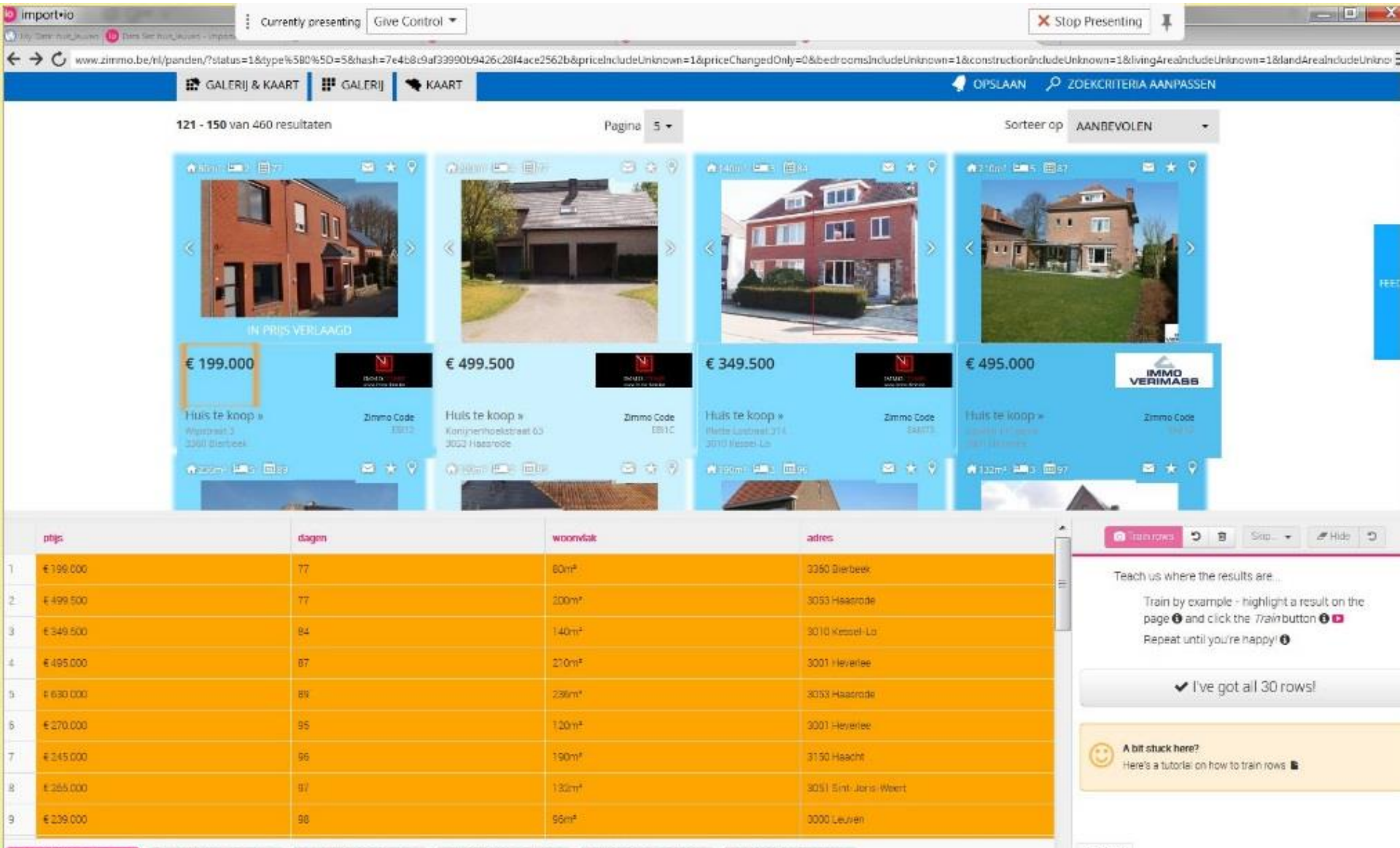
building plot €682/m²

(average, 2014)

Isabelle Loris, based on data from Statistics Belgium (beSTAT.be) and census data (Census2011.be).

KU LEUVEN

Immo (housing) websites



	prijs	dagen	woonvlak	adres
1	€ 199.000	77	80m²	3350 Dierbeek
2	€ 499.500	77	200m²	3053 Haasrode
3	€ 349.500	84	140m²	3010 Kessel-Lo
4	€ 495.000	87	270m²	3001 Heverlee
5	€ 630.000	89	286m²	3053 Haasrode
6	€ 270.000	95	120m²	3001 Heverlee
7	€ 245.000	96	190m²	3150 Haacht
8	€ 265.000	97	132m²	3051 Sint-Joris-Weert
9	€ 239.000	98	96m²	3000 Leuven

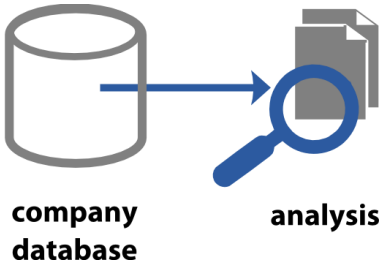
Web scraping

- **Web Data Extraction System:** extract and collect unstructured or semi-structured data that are stored or published on Web sources

  (Laender, Ribeiro-Neto et al. 2002; Sarawagi 2008; Ferrara, De Meo et al. 2014)

- Import.io allows
  - Extraction in different formats (XLS, HTML, JSON and CSV)
  - You have to ‘teach’ the tool based on at least 5 web pages
    - Extraction and **crawling** supported by the use of XPath

Micro-data real estate listings



- Scraping small(er) independent real estate agents websites across Belgium

- Method was used to collect additional information
  - Lot size, Energy Performance Certificate (EPC), value, building year

- Data cleaning using OpenRefine
  - *Selection* of relevant and sufficiently documented records
  - *Transformation* of data to usable formats (listing price, housing numbers, dates, geographic coordinates, etc.)

Indicator calculation

- ‘Speed of sale’ = difference in number of days between the first and last date of publication on the portal website
  - Variables “Pub1 start” and “Pub1 stop”

- ‘Listing price’ = variable ‘initial asking price’
  - Compared with
    - the average selling price tracked by Belgian censuses
    - the average realized price for the entire dataset (2005-2014)
    - Pricing difference (%) =
      [(realized price – listing prize) / listing prize *100].

KU LEUVEN

Results of the testing

1. Web data extraction

2. Exploration web data and testing prototype indicators

- technical & juridical barriers
- suboptimal data transfer
- collaboration is a better option

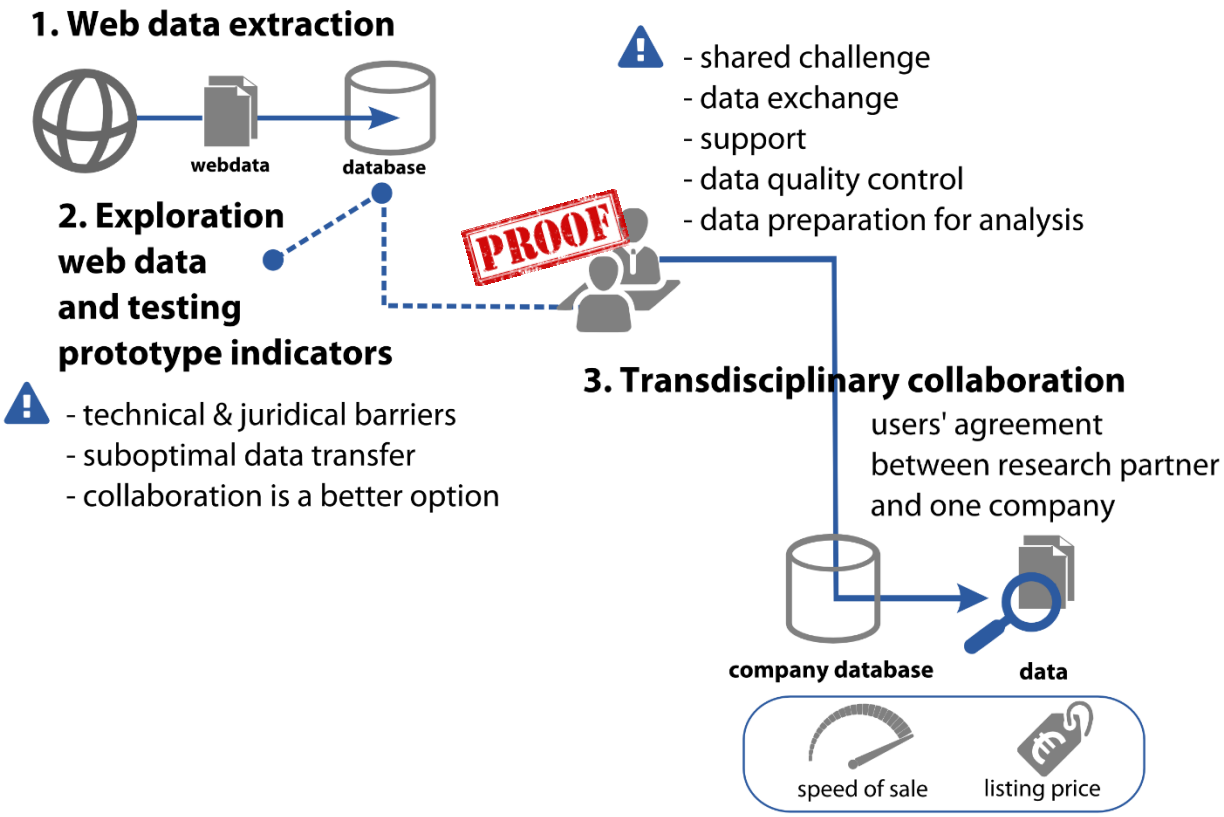
- Two major issues
  - Web scraping takes much time (44h/website)
  - Grey legal zone !

"We don't prefer it [web scraping], because it is a very suboptimal way to transfer data. We translate our data to html, made for browsers, and then you translate through html this information into data again. Many data gets lost and is very computer intensive. We have to generate all those web pages at our server side, you have to collect all the data and process it. There are just better ways to collect data." Company B

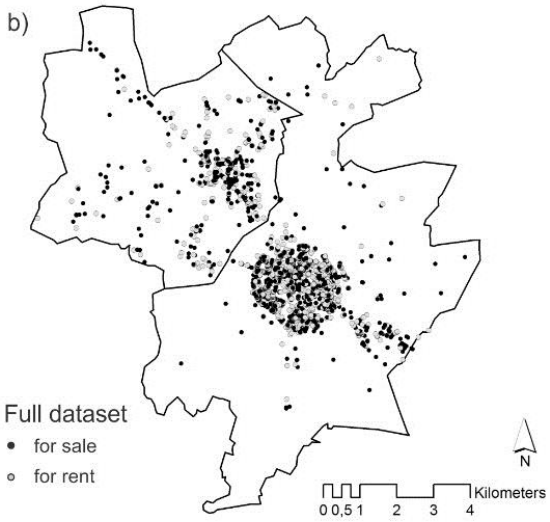
KU LEUVEN

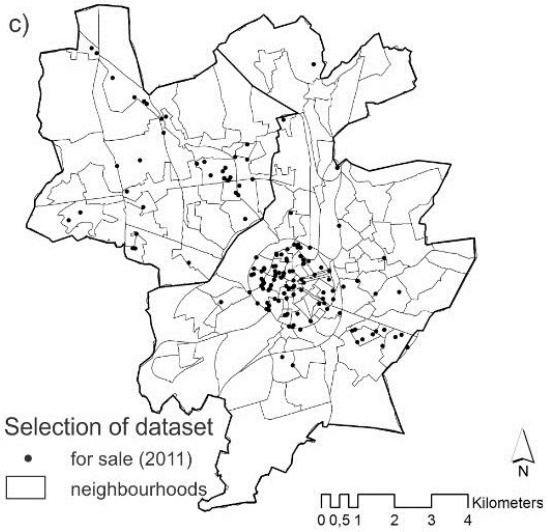
Transdisciplinary approach

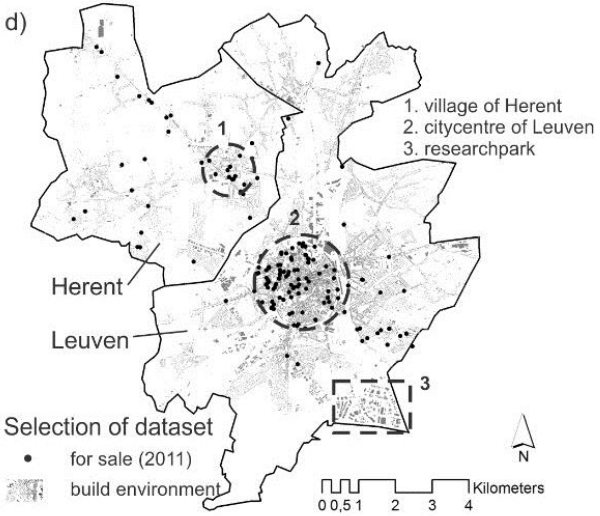
- Extending the method: collaboration with one company
  - 10 year database of listings
  - More than 110.000 listings on the Web



Micro-data real estate listings







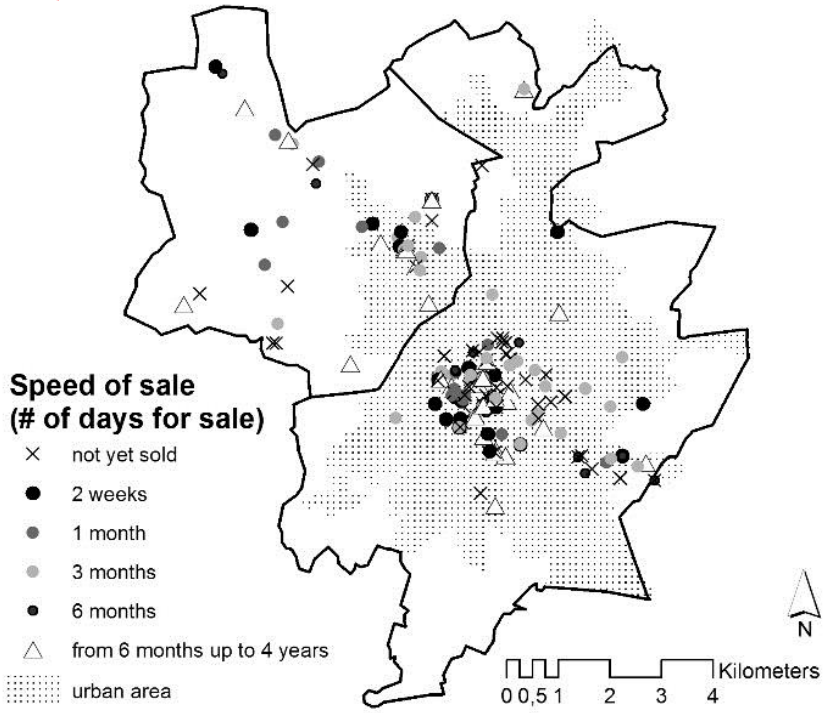
KU LEUVEN

PROOF

speed of sale

listing price

Leuven & Herent



KU LEUVEN

Outline

- When is ‘Smart’ really Smart ?
- Spatial planning and the housing market
- Web technologies to enrich SDI’s
- Conclusions and ongoing work

KU LEUVEN

Conclusions and further work

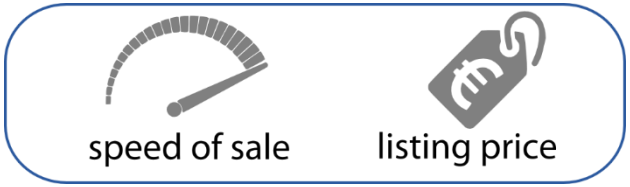
- Web scraping methods are working fine but …
  - Still slow – that can be solved
  - Legal considerations

- Complement with a collaborative appraoch
  - Although the company uses web scraping themselves (☺)

- Combine it with other techniques
  - Design an automated ETL procedure
  - Apply Linked Data techniques

☞ Geospatial data on the web (OGC & W3C)

KU LEUVEN

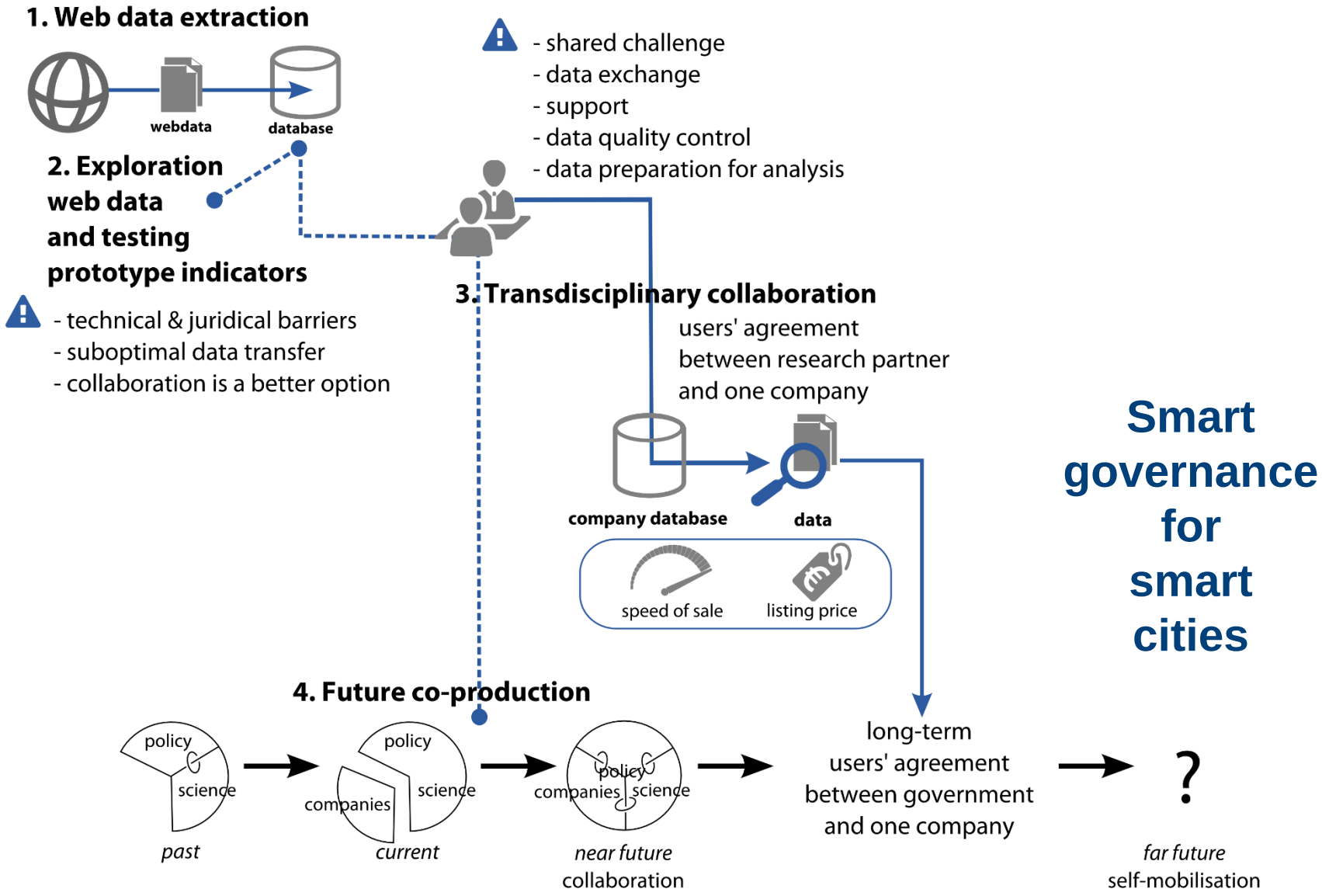


Leuven & Herent

- **Way forward**
  - map dynamics of the housing market in time and space
    - bench marks for a fast or slow speed of sale?
  - evaluate in which neighborhoods the housing market is very dynamic and where it is dull
- The importance of monitoring over longer time series: housing dynamics can change rather fast, where spatial planning is characterized by a certain level of slowness.

"Where would it be opportune to stimulate or limit the housing supply? Are we planning at the right places? What if vibrant housing market dynamics appear there where we are not looking?"

KU LEUVEN


1. Web data extraction
webdata
database
2. Exploration web data and testing prototype indicators
- technical & juridical barriers
- suboptimal data transfer
- collaboration is a better option
- shared challenge
- data exchange
- support
- data quality control
- data preparation for analysis
3. Transdisciplinary collaboration
users' agreement between research partner and one company
company database
data
speed of sale
listing price
Smart governance for smart cities
4. Future co-production
policy
science
past
policy
companies
science
current
policy
companies
science
near future
collaboration
long-term users' agreement between government and one company
?
far future
self-mobilisation

KU LEUVEN

Credits to SADL staff:

Valerie Dewaelheyns
Thérèse Steenberghe
Anuja Dangol

The Flemish Policy Support Centre on Space (2012-2015) funded this work. The views expressed in this presentation are not necessarily those of the Flemish Government

Detailed real estate data were kindly provided by Zimmo.

KU LEUVEN


Thank you !
danny.vandenbroucke@kuleuven.be