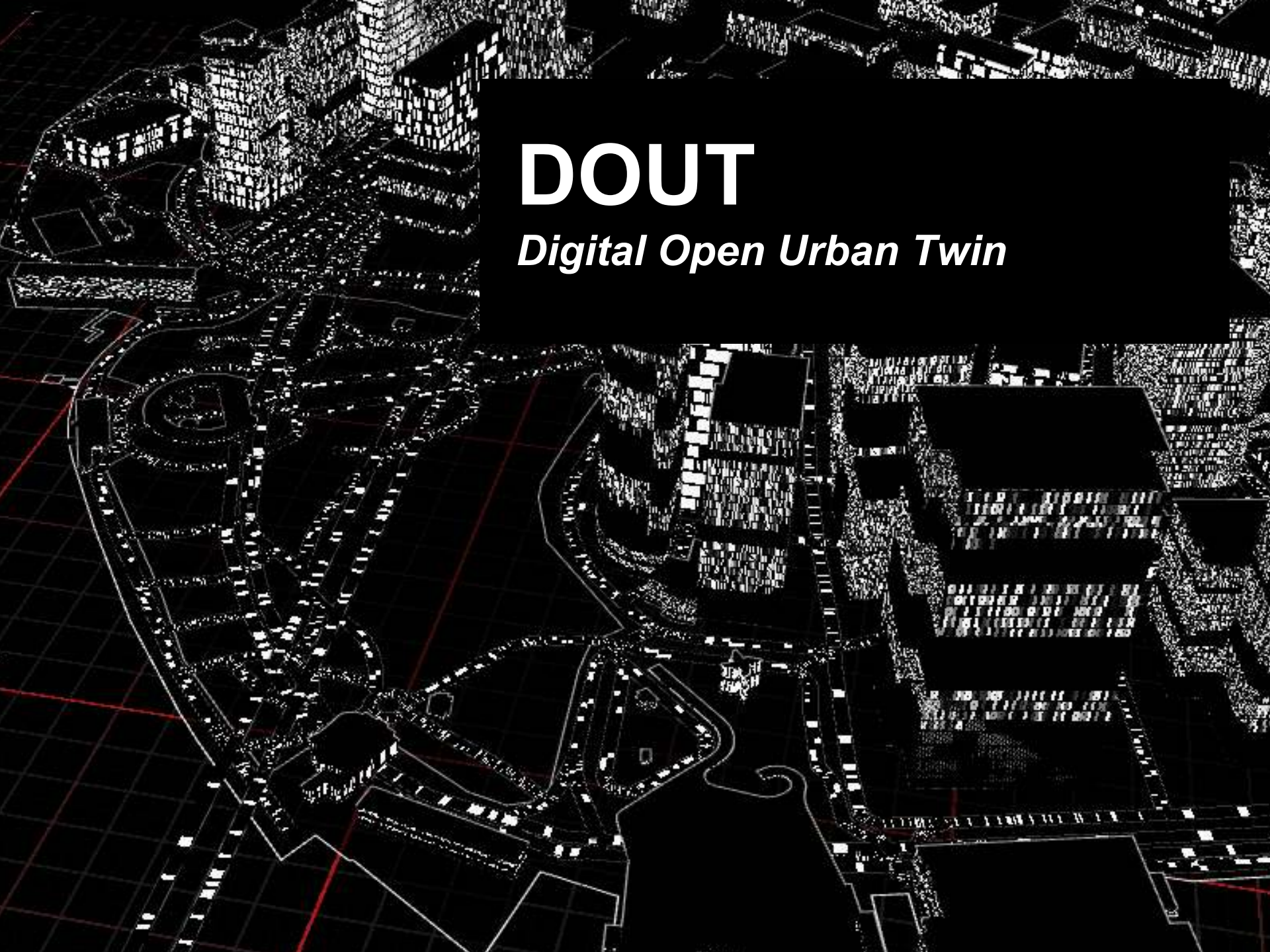
Centro Nexa su Internet & Società

Politecnico di Torino

Future
Urban Legacy
Lab

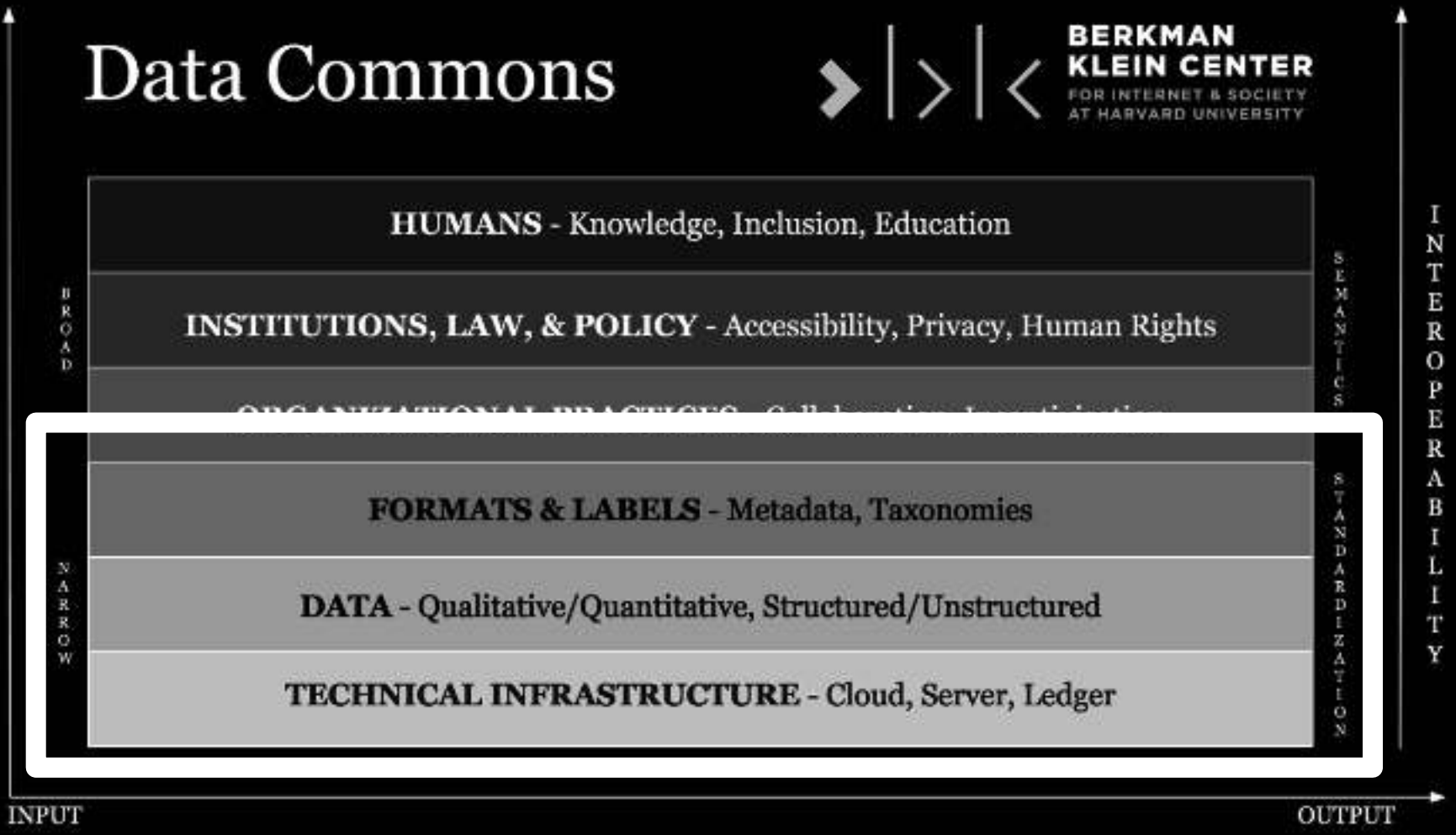

DOUT
Digital Open Urban Twin

OUTLINE

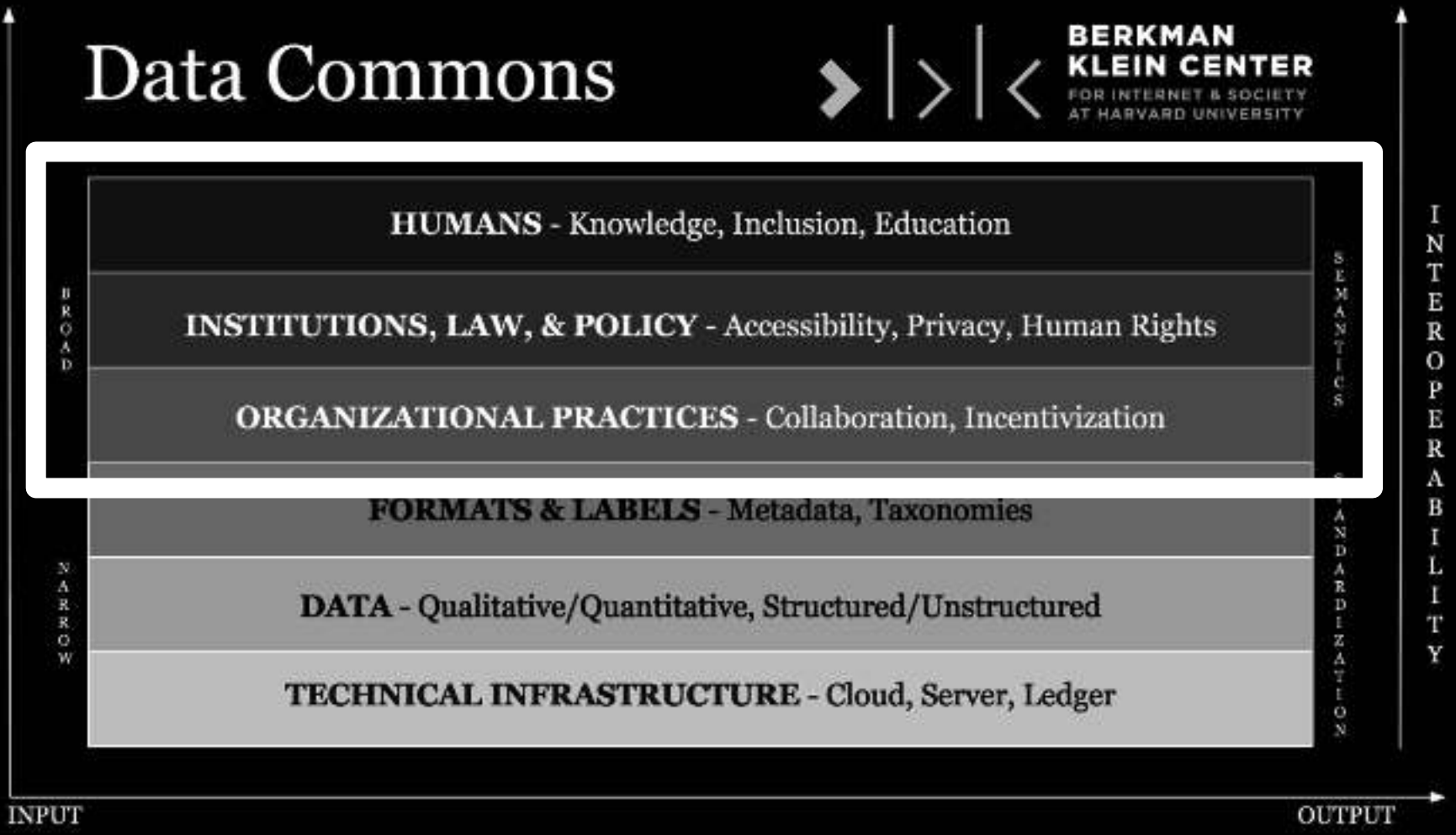
- Context
- Digital infrastructure
- Representations
- Experiments

Context

Fonte: Data Commons Version 1.0: A Framework to Build Toward AI for Good
A roadmap for data from the 2018 AI for Good Summit
Elena Goldstein, Urs Gasser and Ryan Budish - https://bit.ly/2P3J61R

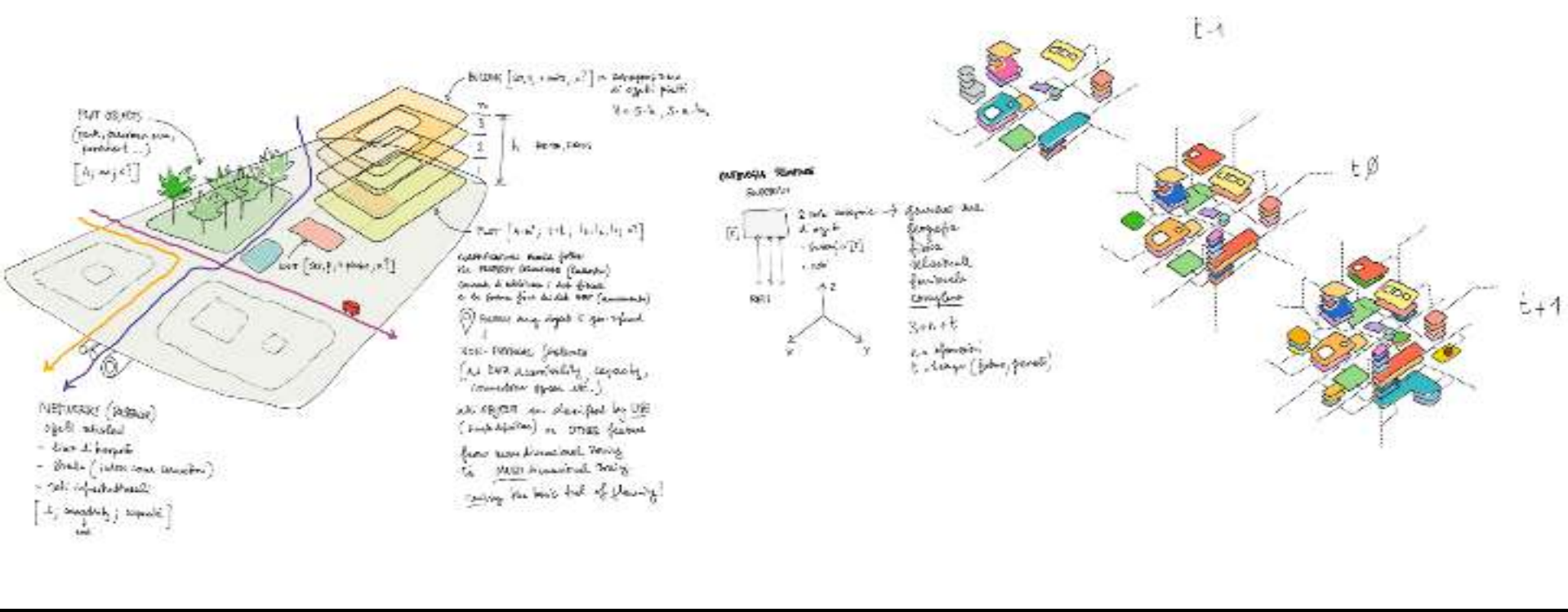


Focus on: digital infrastructure



Focus on: representations

Digital infrastructure



DIGITAL OPEN **URBAN TWIN**

3-D Skeletal representation: volumes and areas

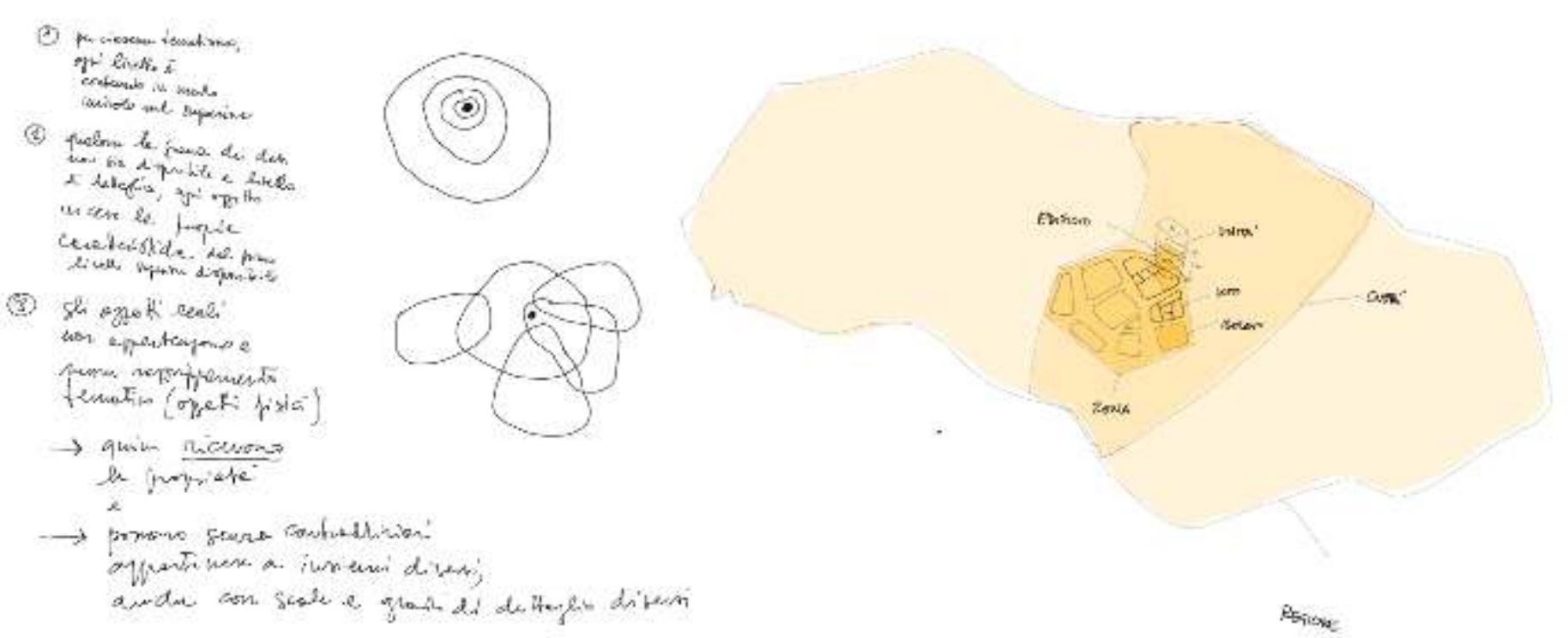
4-D: temporal dimension

Multiple overlapping layers of data, with different consistent granularity levels

Inheritance of attributes: lower level elements inherit attributes from higher levels

Possibility of modelling what-if scenarios

Extensible platform



DIGITAL **OPEN** URBAN TWIN

Interoperability and standards (CityGML, OGC, ISO TC211, Inspire)

Some data necessarily located in the servers of Politecnico

Data retrievable from external services

Accessibility from web interface

Data usage licence

Security

Comparative analysis: data models and tools

ArcGIS Online

CityEngine

three.js

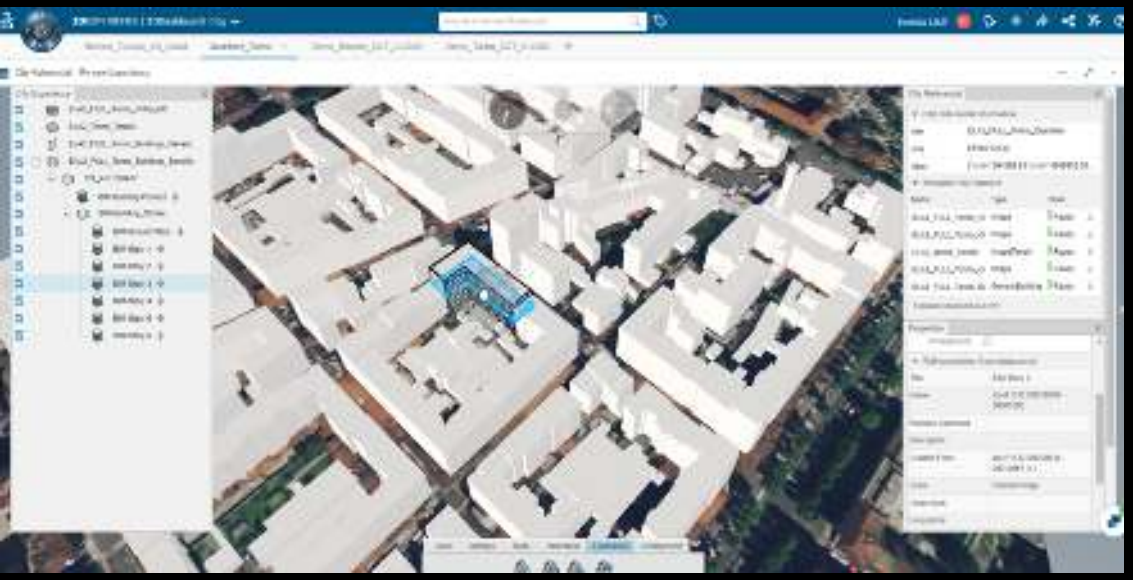
CityEngine
Web Viewer

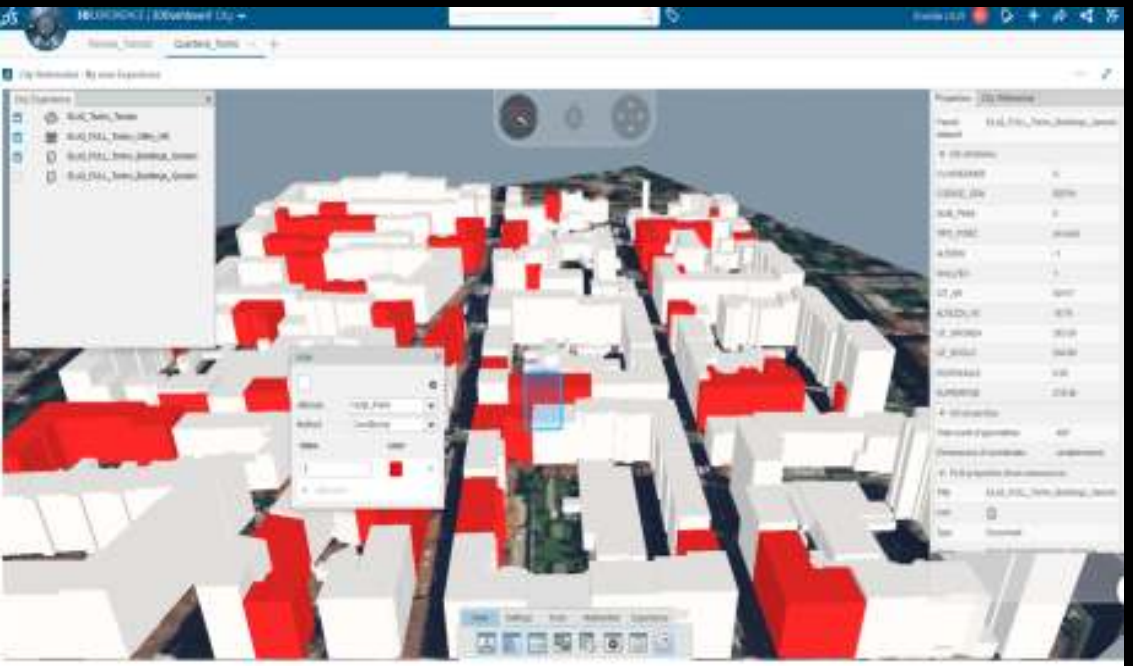
AUTODESK®
INFRAWORKS™ 360

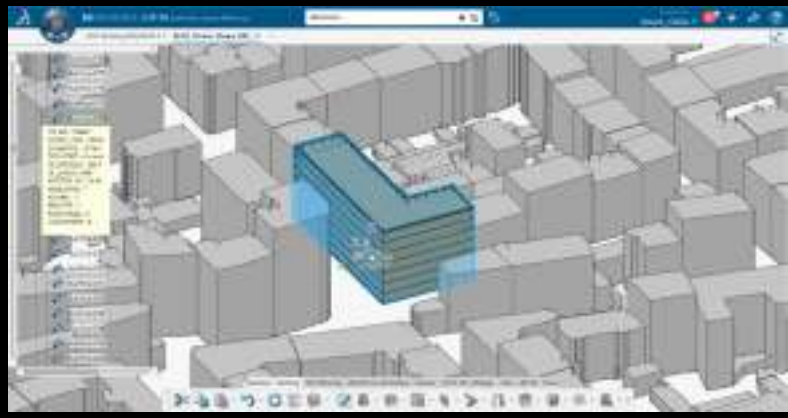
PostgreSQL

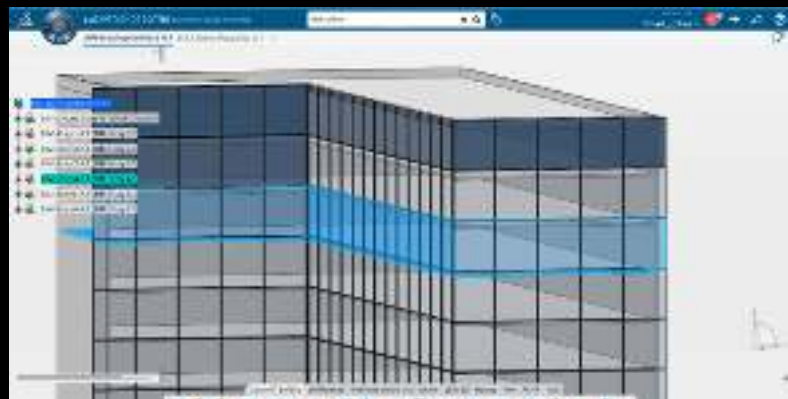
ArcGIS

Feasibility study with Dassault Systèmes









Representations

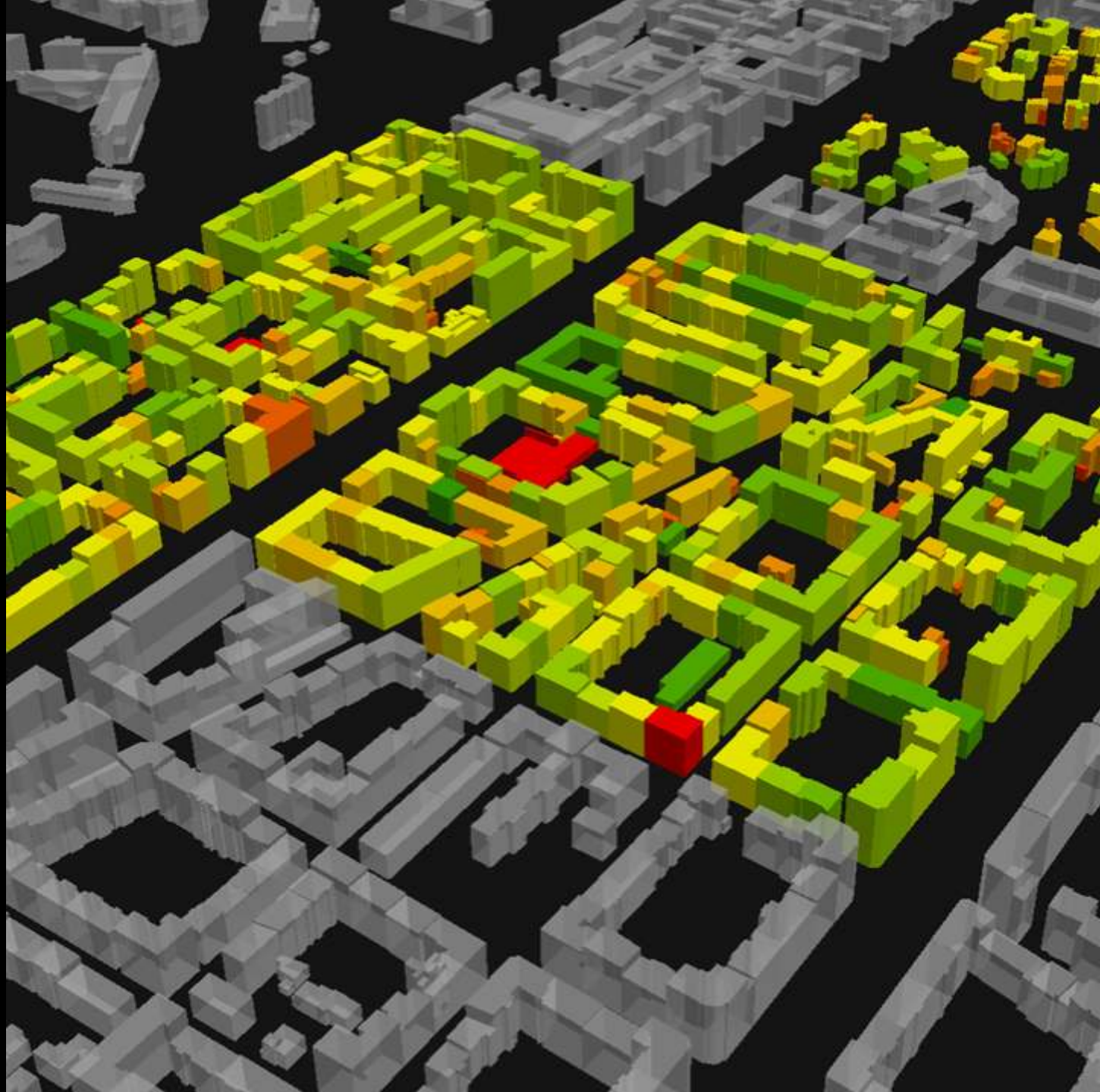
Focus on: representations

- **Improved maps**
  better level of details, time dimension
- **New maps**
  representations of recent urban phenomena
- **Matching maps**
  relations between phenomena
- **Critical maps**
  highlighting urban issues (wicked problems)

Improved maps

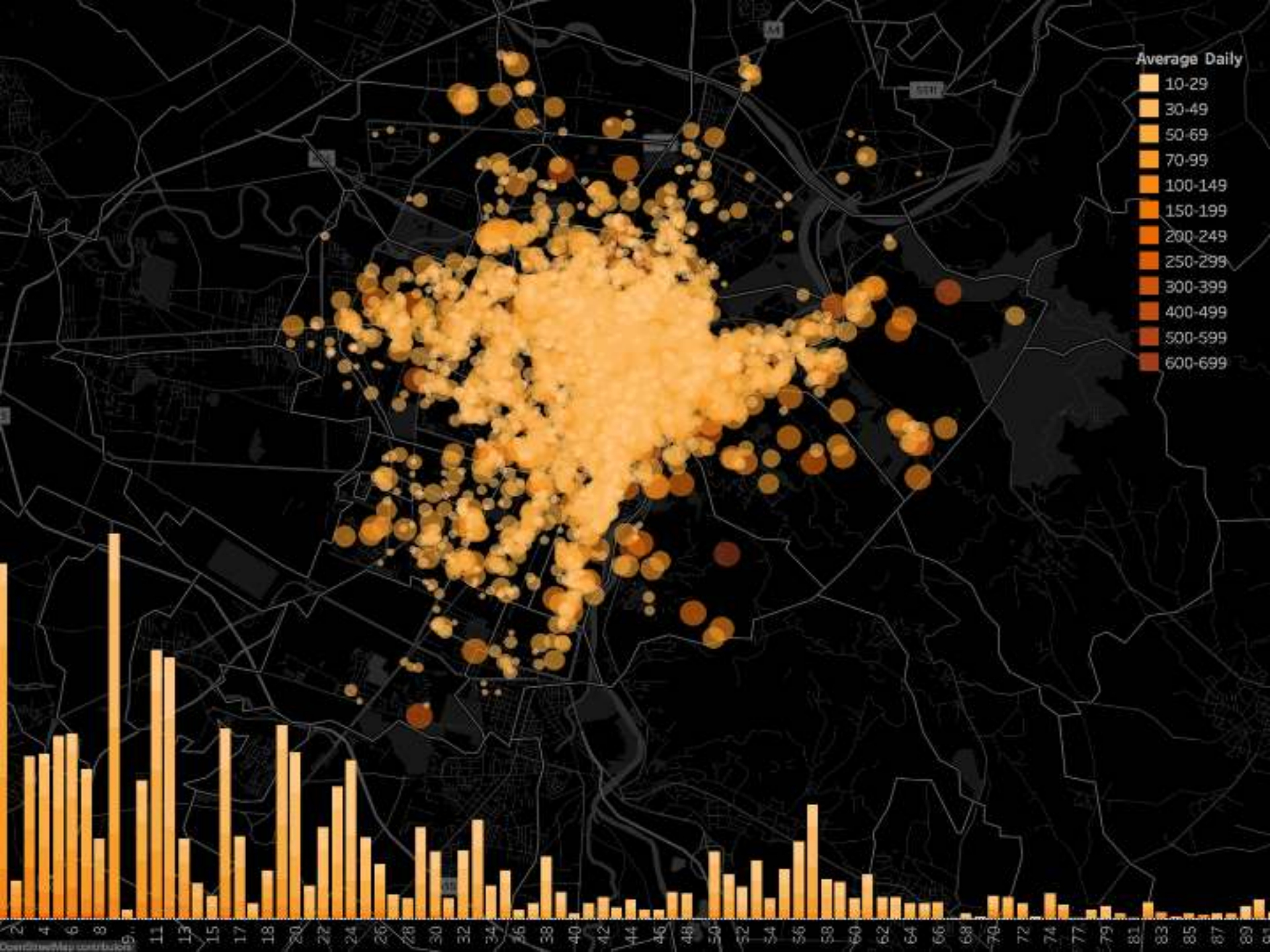
Urban form and retail location patterns

GIS-based Energy Model



link

New maps


Average Daily
10-29
30-49
50-69
70-99
100-149
150-199
200-249
250-299
300-399
400-499
500-599
600-699

Average Daily
10-29
30-49
50-69
70-99
100-149
150-199
200-249
250-299
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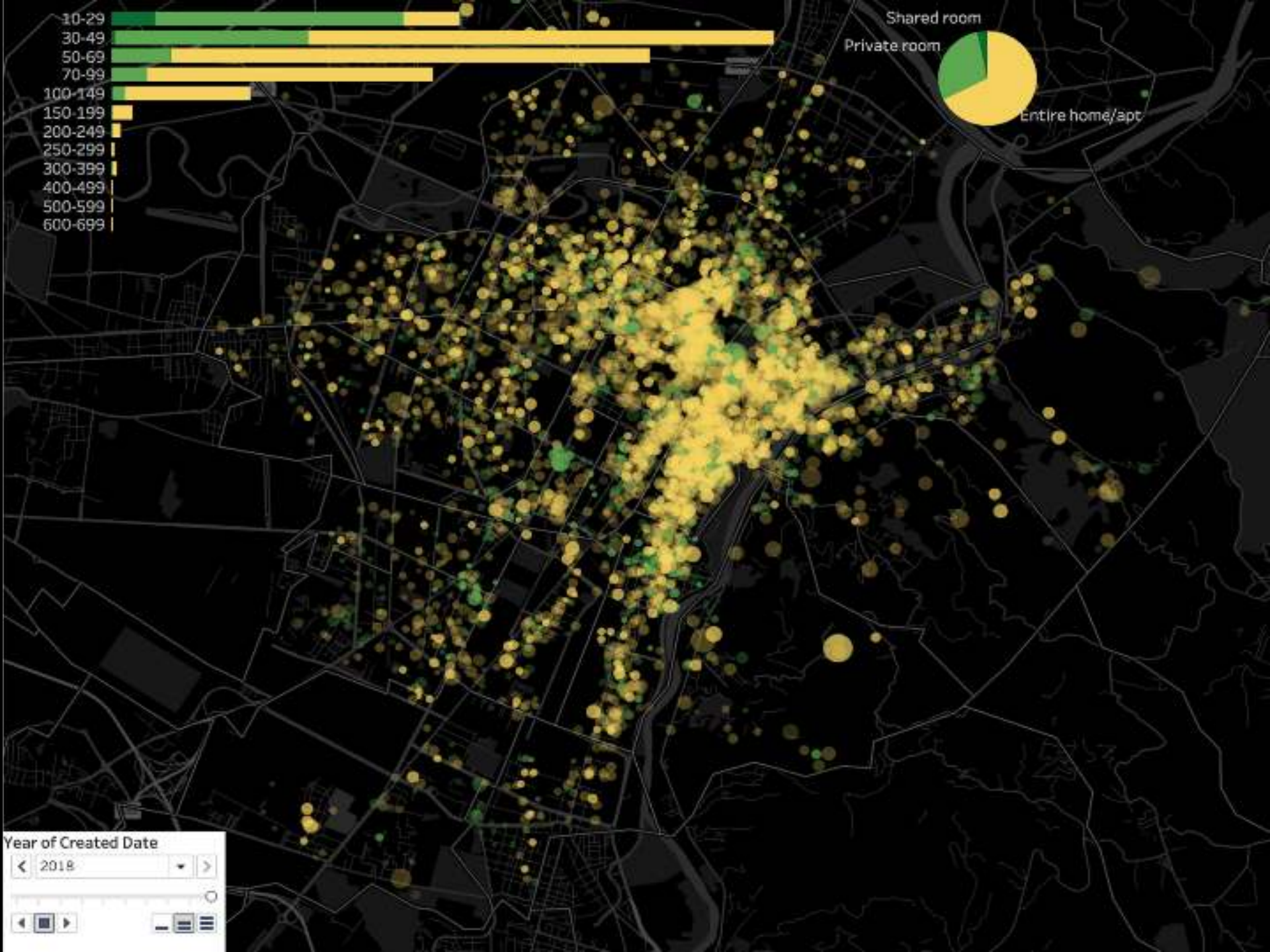
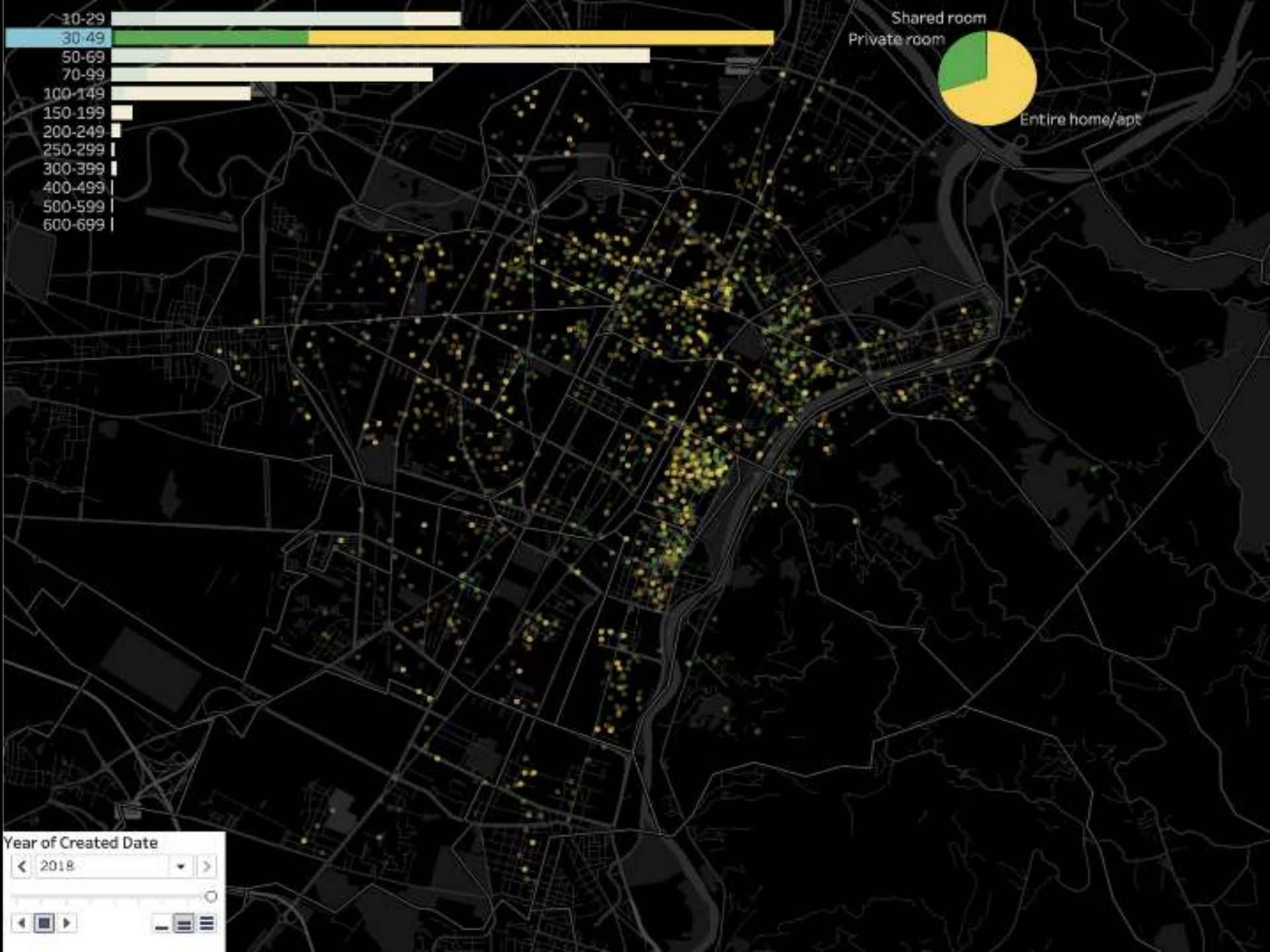
500-599
600-699


10-29
30-49
50-69
70-99
100-149
150-199
200-249
250-299
300-399
400-499
500-599
600-699
Shared room
Private room
Entire home/apt
Year of Created Date
2018


10-29
30-49
50-69
70-99
100-149
150-199
200-249
250-299
300-399
400-499
500-599
600-699
Shared room
Private room
Entire home/apt
Year of Created Date
2019

10-29
30-49
50-69
70-99
100-149
150-199
200-249
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400-499
500-599
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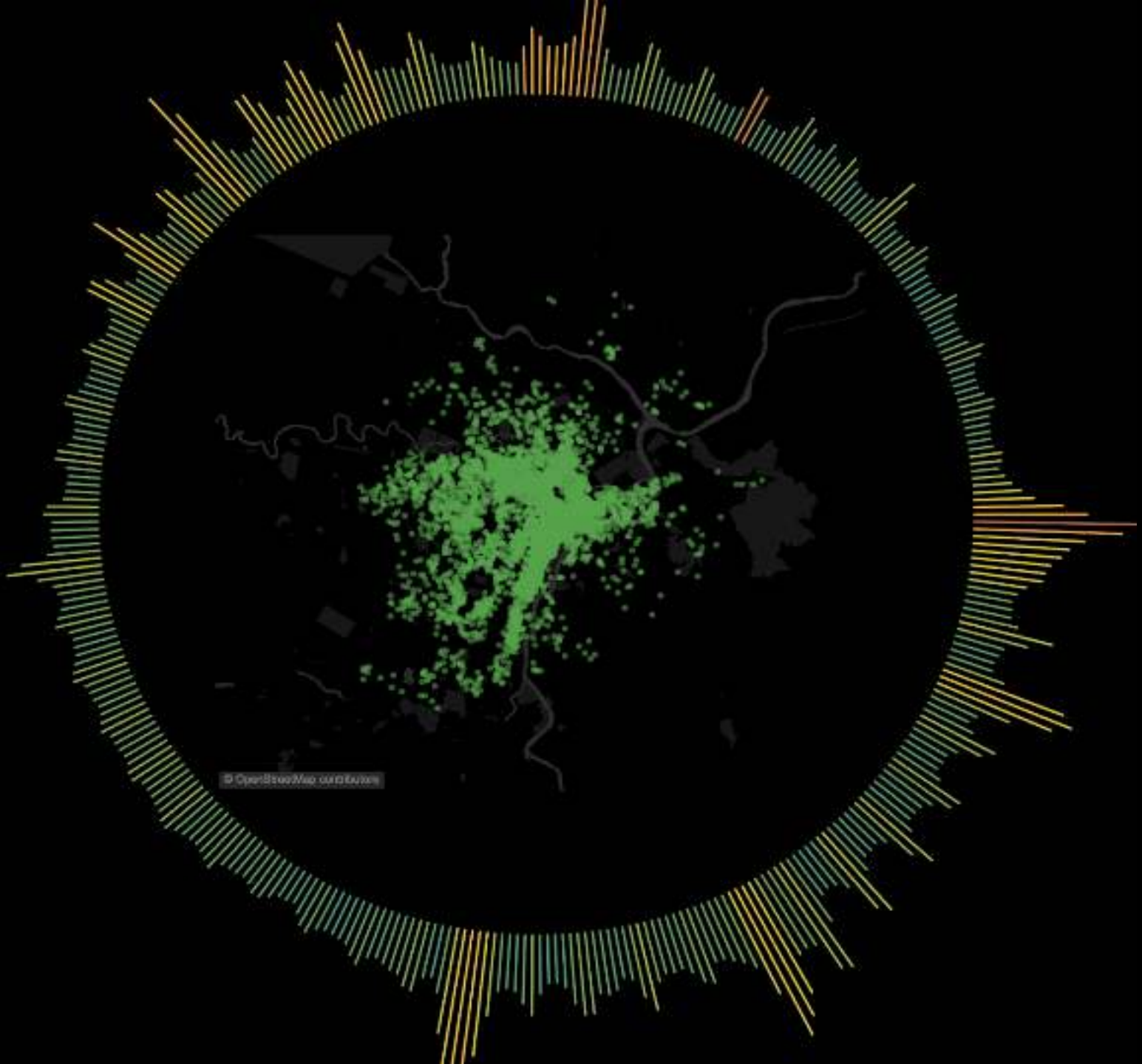
Shared room
Private room
Entire home/apt
Year of Created Date
2015


© OpenStreetMap contributors

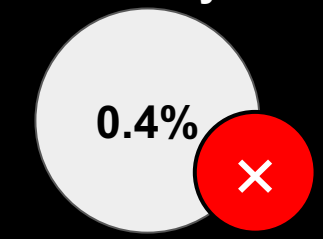
Keep Only
Exclude
Day of Date: 29 luglio 2016
Number of Records: 572
Avg. Price (Native): 50,63

Matching maps

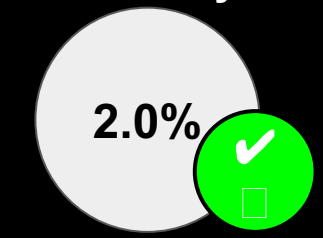
Energy consumption + Retail Pattern

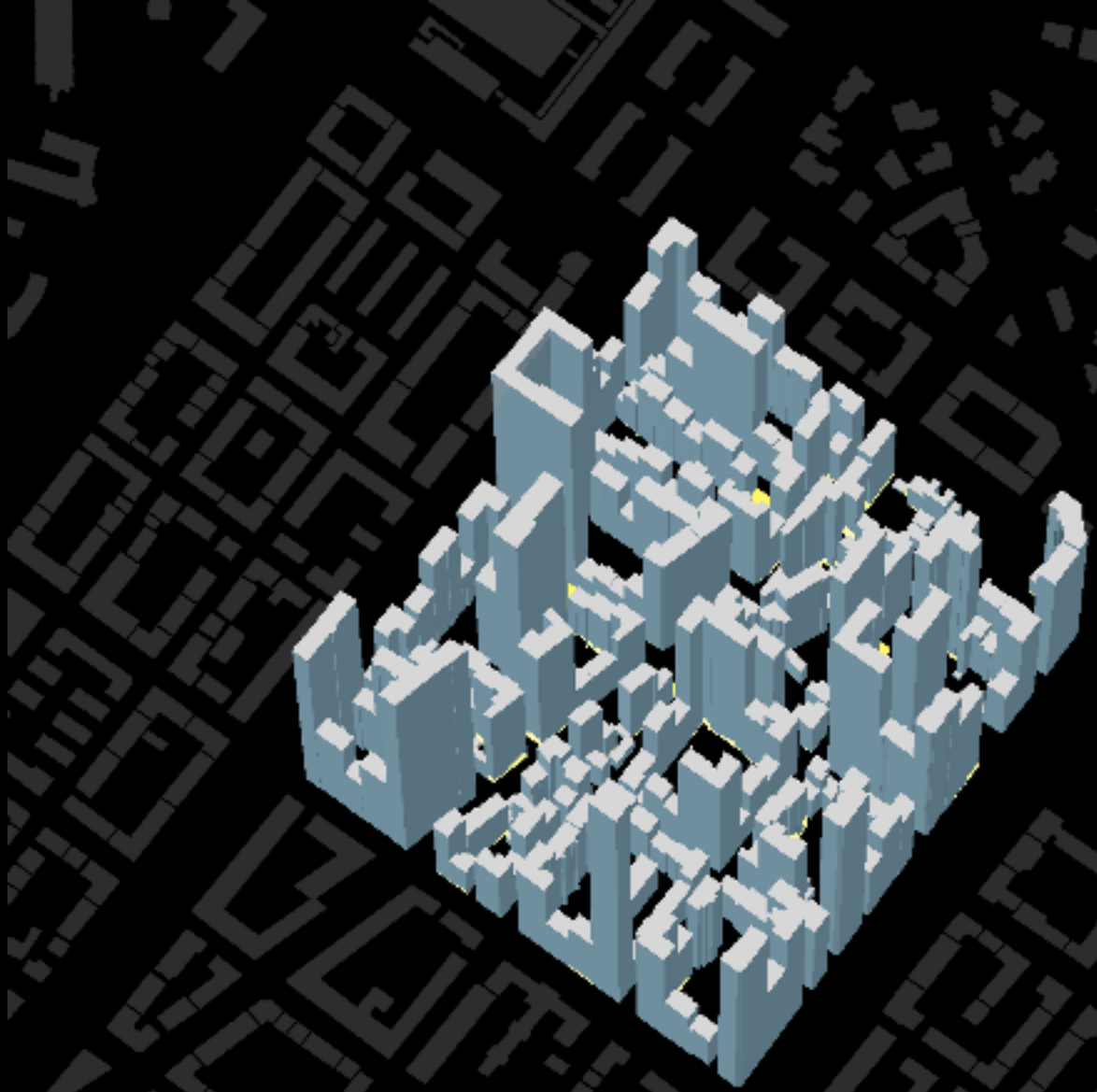
overall
41.928 MWh/year
(selected area)

commercial
179 MWh/year



892 MWh/year





Critical maps

"Ogni anno 900 morti in più a Torino a causa dell'inquinamento da polveri sottili"

I dati dell'Arpa in base a uno studio del 2010

di GABRIELE GUCCIONE

10 febbraio 2017

"Novecento morti l'anno a Torino sono attribuibili all'inquinamento causato dalle polveri sottili". A sostenerlo è il direttore del centro regionale per l'epidemiologia e la salute ambientale dell'Arpa, Ennio Cadum. "Gli studi condotti sinora – afferma il medico – dimostrano che ad ogni picco di emissioni nocive corrisponde nei giorni immediatamente successivi un aumento del numero di decessi".

Fonte: La Repubblica
10.02.2017

Emergenza smog, Torino la peggiore in Italia secondo Legambiente: inchiesta della procura

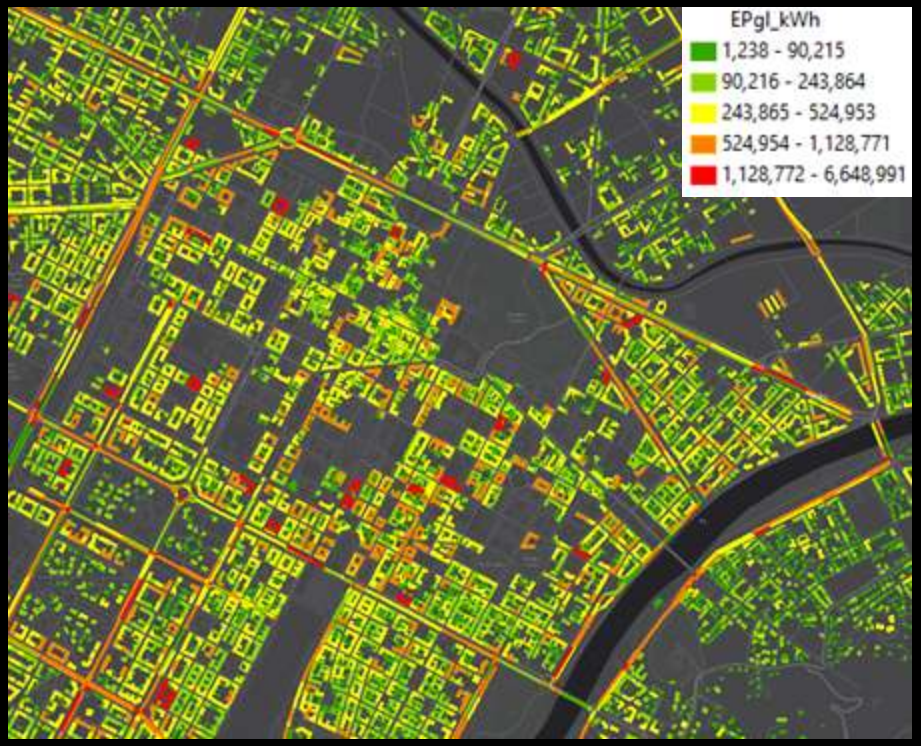
Il capoluogo piemontese maglia nera, Piemonte in ritardo sulle misure anti-inquinamento

LEGGI ANCHE

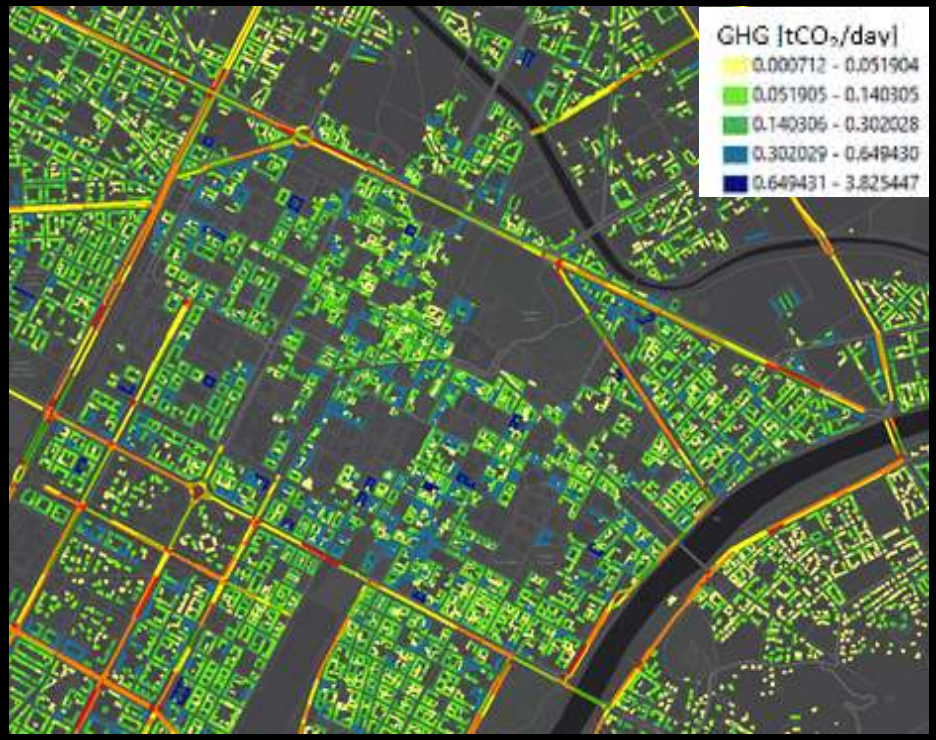
Smog oltre i limiti, Torino anticipa i divieti: da mercoledì fermi i diesel fino all'Euro 4

Emergenza smog a Torino, il Comune: "Non aprite porte e finestre"

Fonte: La Stampa
16.10.2017



Application of GIS-based Model:
distribution of **thermal energy consumptions** for different types of users at building scale [kWh/year] + Traffic Model (7-8 a.m.)



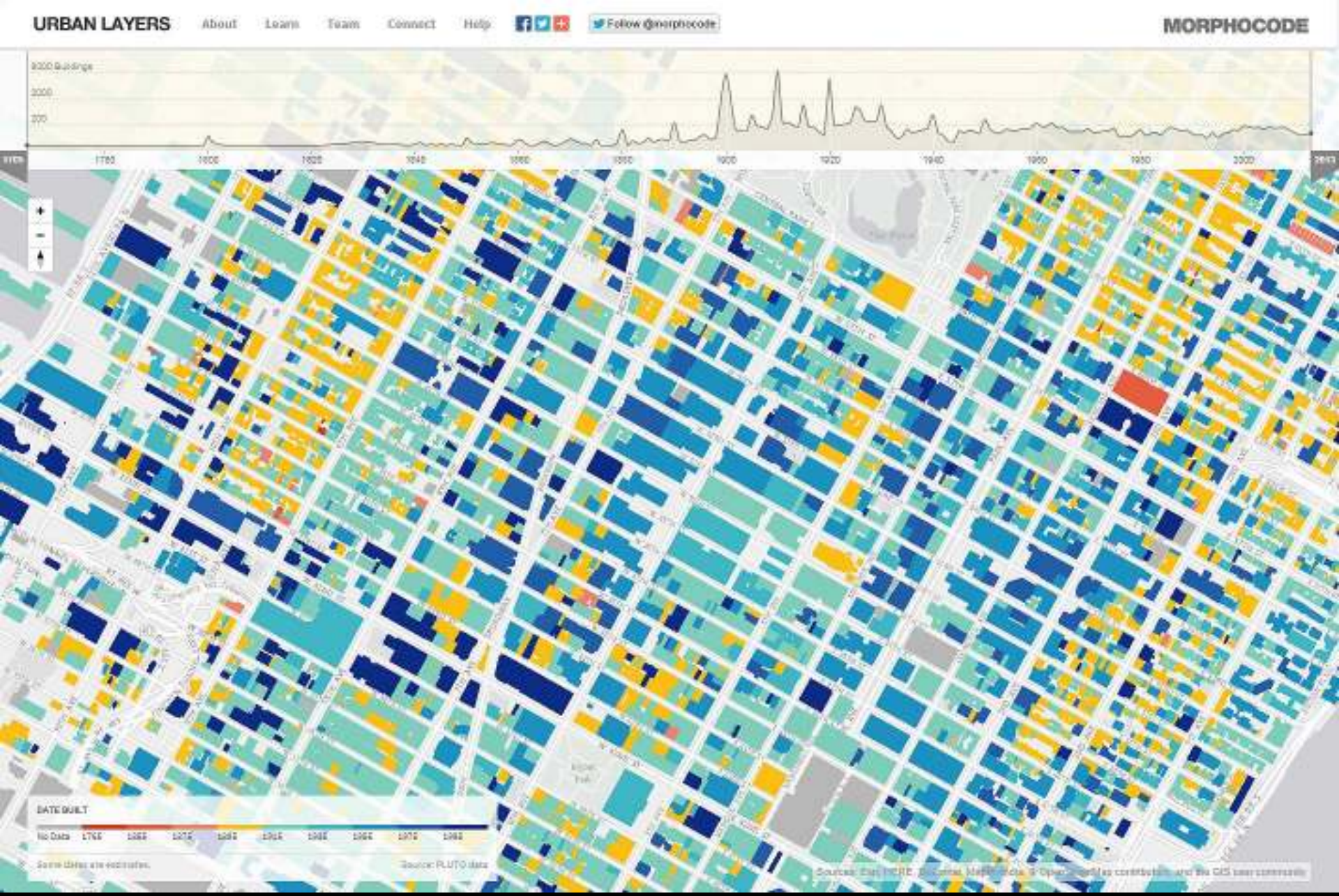
Application of GIS-based Model:
distribution of **daily GHG emissions** for the residential sector due to the thermal consumption [tCO2/day] at building scale + Traffic Model (7-8 a.m.)

Traffic Model + Energy Model → CO2 GHG EMISSIONS (daily value)
5% traffic (ZTL)
95% residential buildings (ZTL)

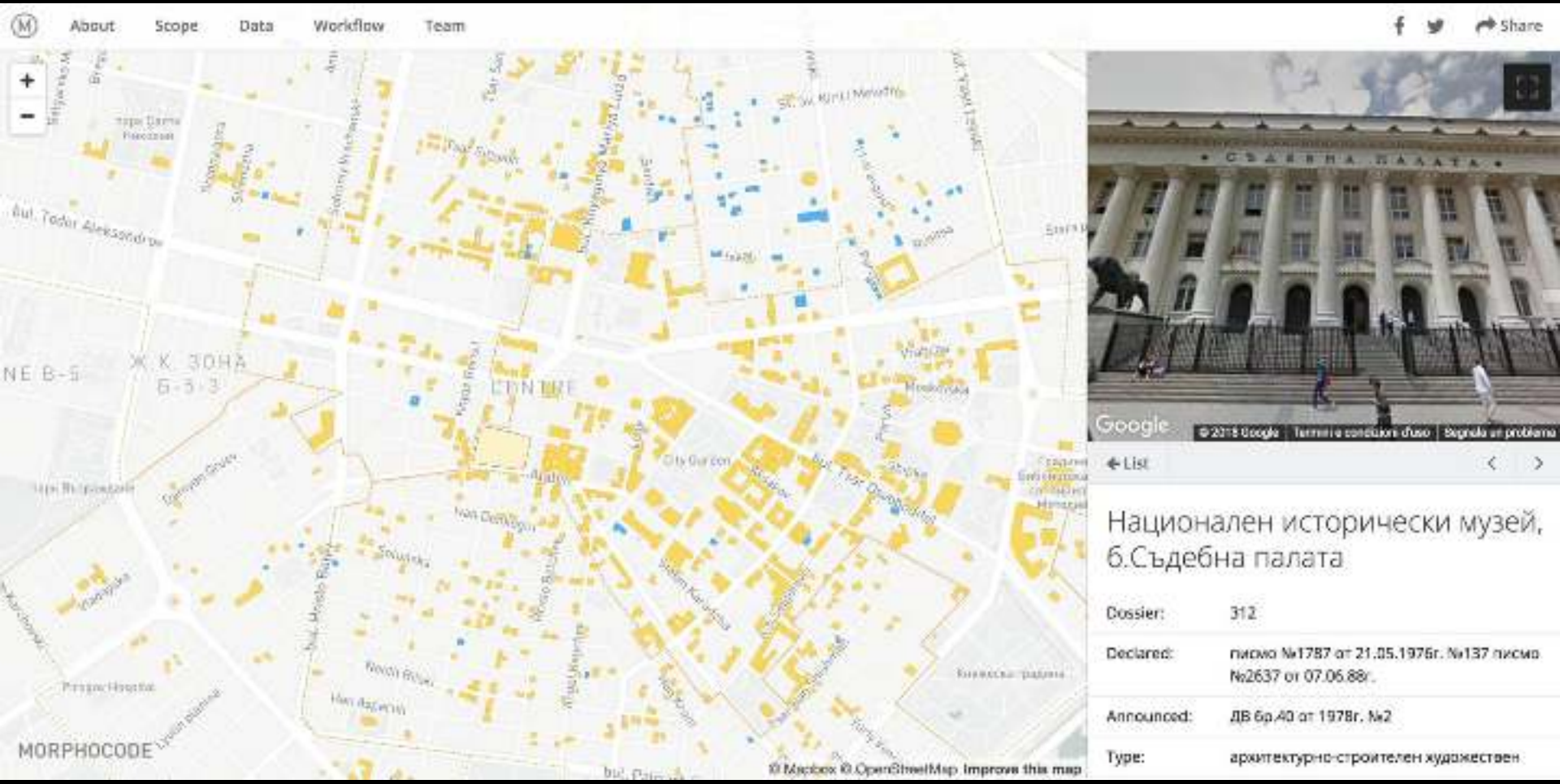
Experiments

The commercial structure and its development in Parisian districts - APUR, Paris
http://carto.apur.org:8080/ibdppc_hist/client/client.jsp#

Carta Històrica de Barcelona - MUHBA
http://cartahistorica.muhba.cat/index.html?lang=en#map=14/242185/5070759/1936//0/0/0/1

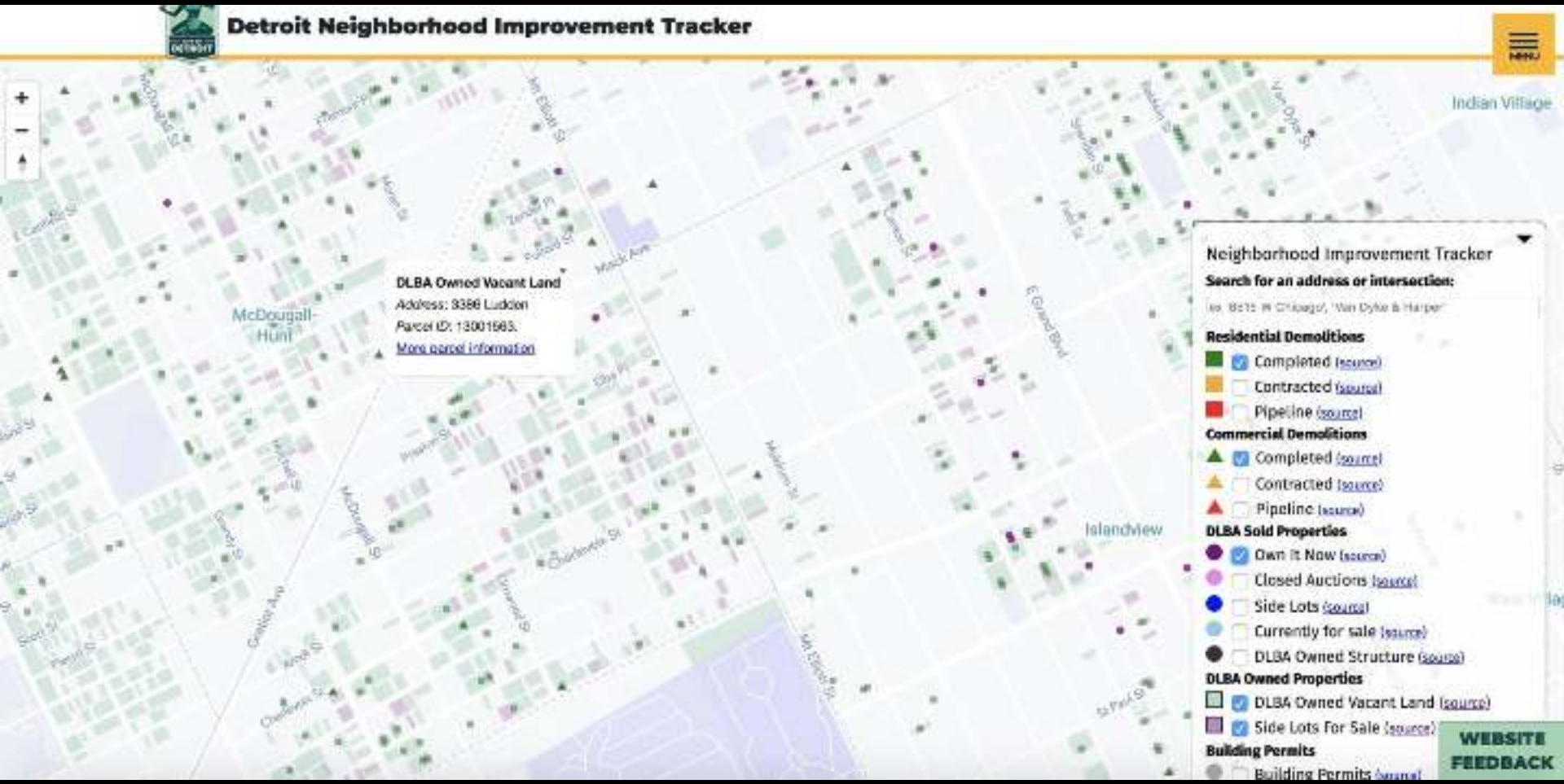


New York Urban Layers - Morphocode
http://io.morphocode.com/urban-layers/



The Heritage of Sofia - Morphocode
http://io.morphocode.com/sofia/en

The Pulse of Melbourne - Morphocode
https://morphocode.com/visualizing-pedestrian-activity-city-melbourne/



Detroit Neighborhood Improvement Tracker
https://detroitmi.gov/webapp/detroit-neighborhood-improvement-tracker

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