Centro Nexa su Internet & Società

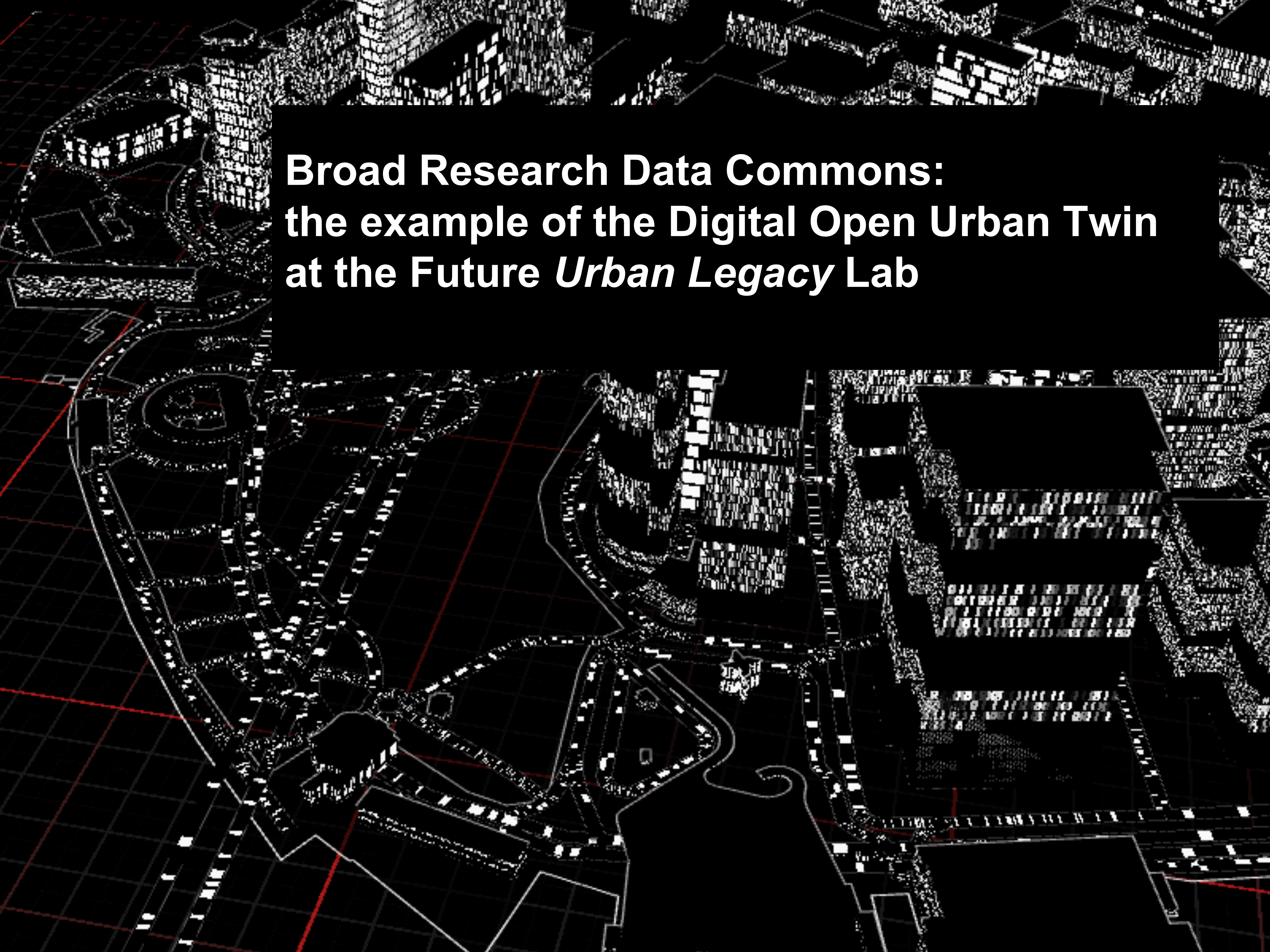
Politecnico di Torino

Future
Urban Legacy
Lab

Antonio Vetrò - Politecnico di Torino

Focus on Open Science – Chapter XIII: Turin, May 7th 2019

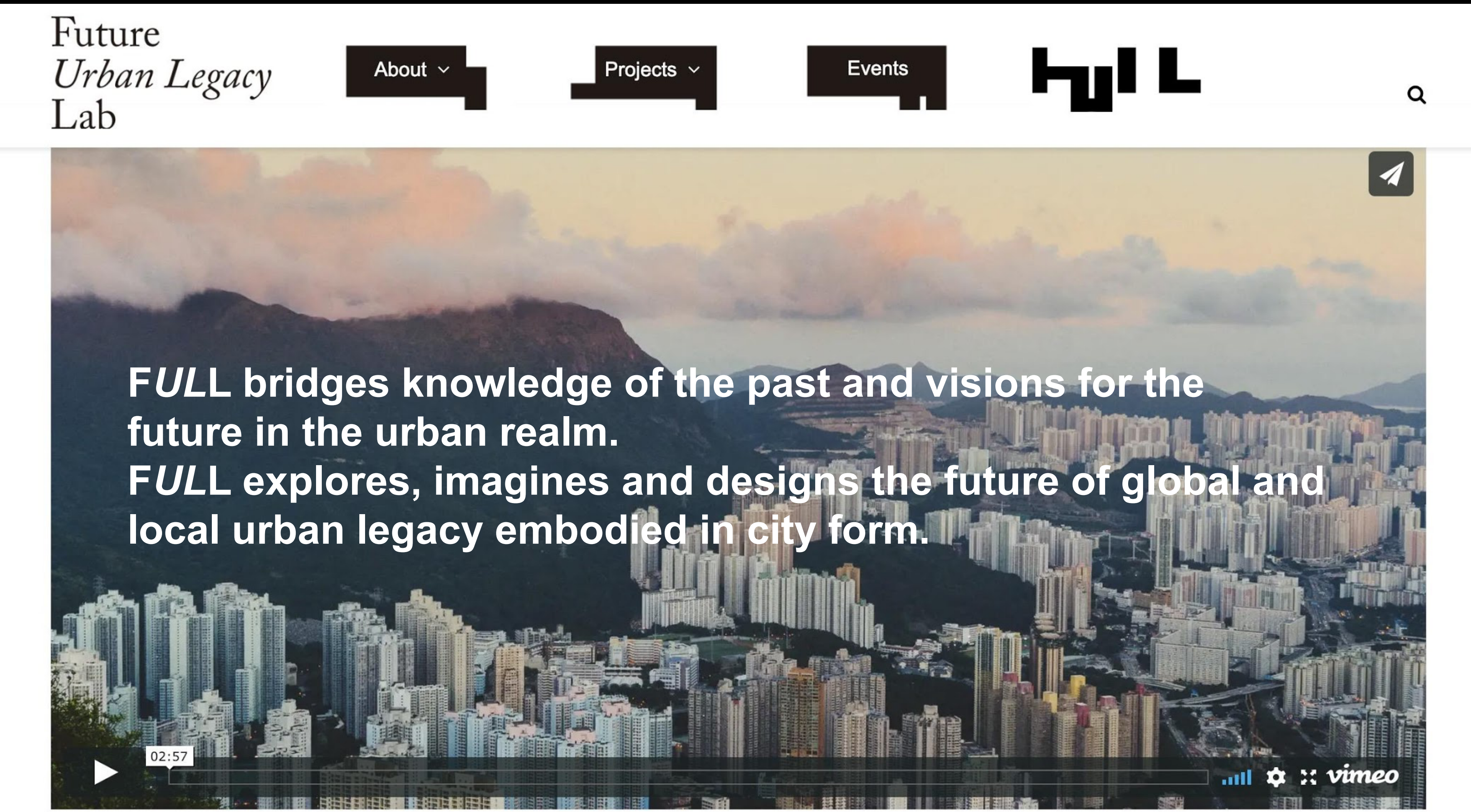
Broad Research Data Commons: the example of the Digital Open Urban Twin at the Future *Urban Legacy* Lab



OUTLINE

- Context
- Goals
- Digital infrastructure
- Esperimental Maps
- Research & innovation model

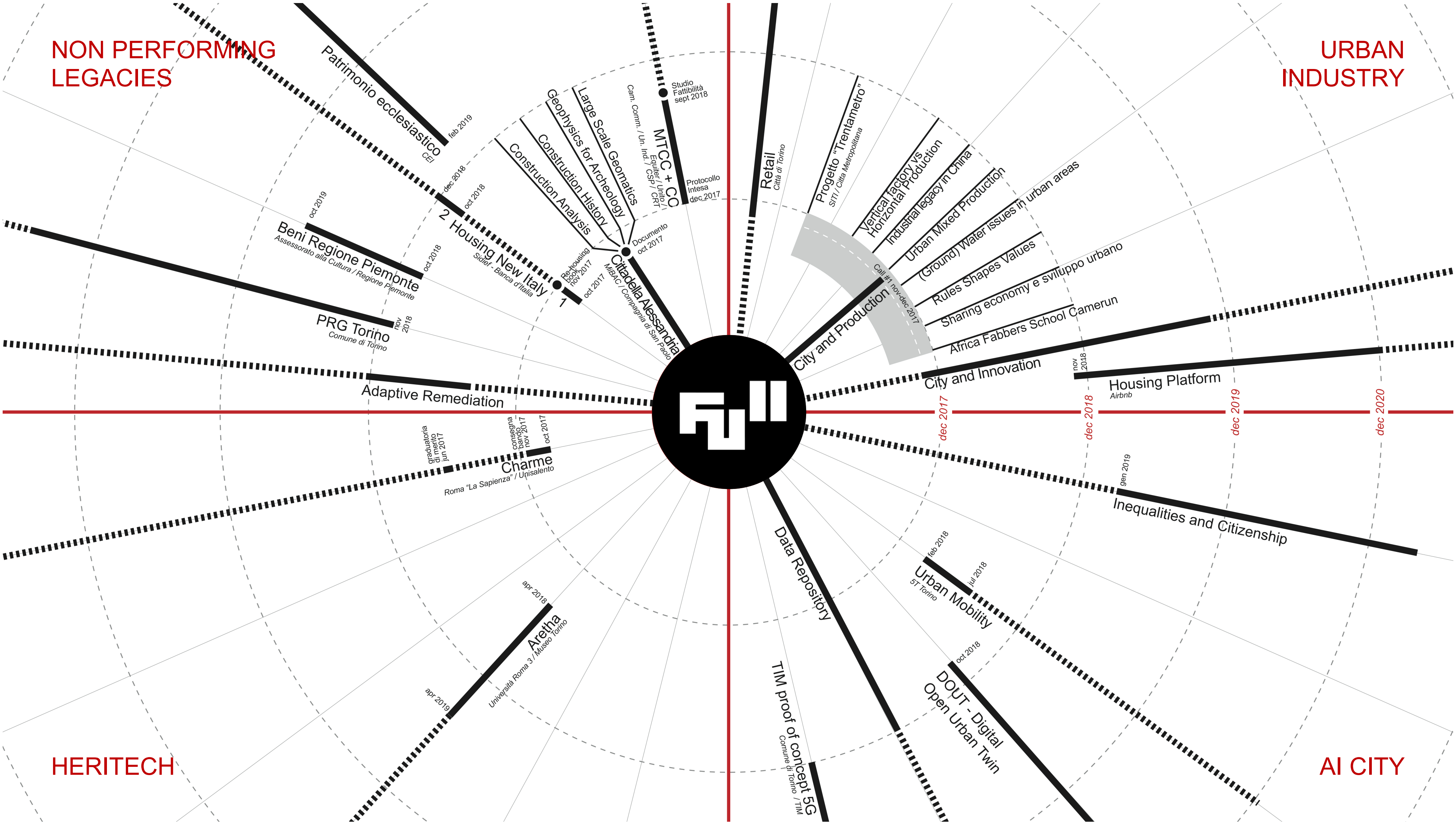
Context



https://full.polito.it

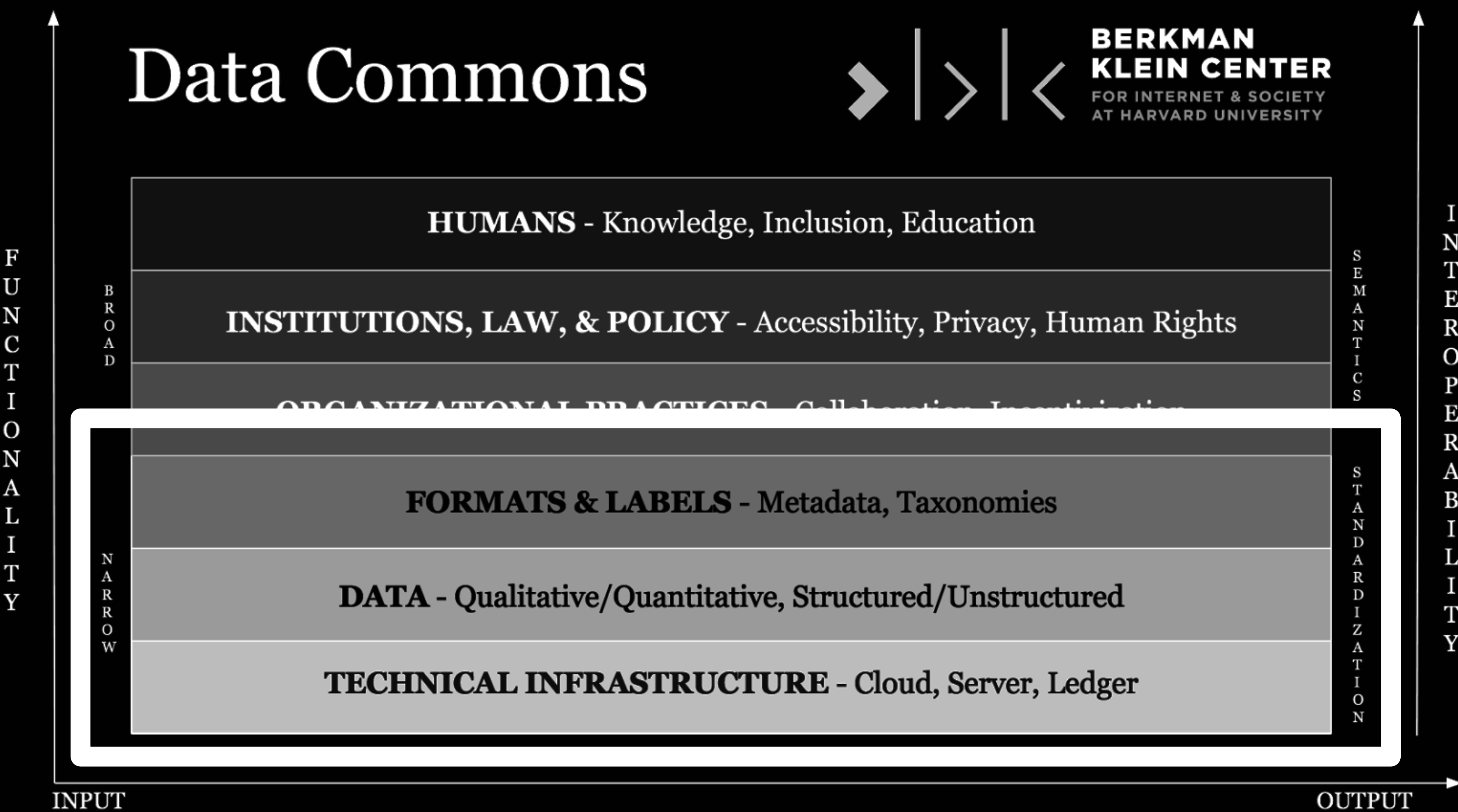

THIS IS FULL
THE FUTURE URBAN LEGACY LAB OF POLITECNICO DI TORINO


Future Urban


NON PERFORMING LEGACIES
URBAN INDUSTRY
HERITECH
AI CITY
Patrimonio ecclesiastico
CEI
feb 2019
Geophysics for Archeology
Large Scale Geomatics
Construction History
Construction Analysis
MTCC + CC
Cam. Comm. / Un. Ind. / CSP / CRT
Equiter / Unito
Studio Fattibilità sept 2018
Protocollo Intesa dec 2017
Documento oct 2017
Cittadella Alessandria
MiBAC / Compagnia di San Paolo
2 Housing New Italy
Sidief - Banca d'Italia
dec 2018
oct 2018
Re-housing book nov 2017
oct 2017
1
Beni Regione Piemonte
Assessorato alla Cultura / Regione Piemonte
oct 2019
oct 2018
PRG Torino
Comune di Torino
nov 2018
Adaptive Remediation
Retail
Città di Torino
Progetto "Trentametro"
SITI / Città Metropolitana
Vertical factory vs Horizontal Production
Industrial legacy in China
Urban Mixed Production
(Ground) Water issues in urban areas
Rules Shapes Values
Sharing economy e sviluppo urbano
Africa Fabbers School Camerun
Call #1 nov-dec 2017
City and Production
City and Innovation
Housing Platform
Airbnb
nov 2018
dec 2017
dec 2018
dec 2019
dec 2020
Charme
Roma "La Sapienza" / Unisalento
graduatoria di merito jun 2017
consegna bando nov 2017
oct 2017
Inequalities and Citizenship
gen 2019
Data Repository
Urban Mobility
5T Torino
feb 2018
jul 2018
Aretha
Università Roma 3 / Museo Torino
apr 2018
apr 2019
TIM proof of concept 5G
Comune di Torino / TIM
DOUT - Digital Open Urban Twin
oct 2018

Data Commons

Source: 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



DR2 : F*UL*L Digital Data Research Repository / Spatial Data Platform @ Politecnico di Torino

11.30 - 12.00 **Gli Open Research Data al Future Urban Legacy Lab.**
Antonio Vetrò, Politecnico di Torino - Centro Interdipartimentale FULL

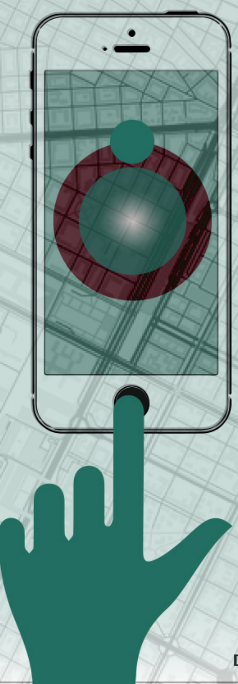
http://www.politocomunica.polito.it/events/appuntamenti/(idnews)/11788

Broad Data Commons: il Digital *Open Urban* Twin

10th Nexa Conference
Workshop Decode Project

in cooperation with FULL (Future Urban Legacy Lab)

Urban Digital Commons
&
The Future of Cities



Tuesday,
18th december 2018
h 9-18

Conference room "Luigi Ciminiera", DAUIN,
Politecnico, Corso Castelfidardo 34/D, Torino

Nexa Center for Internet & Society

decode

Future Urban Legacy Lab

DECODE is funded by the European Union's Horizon 2020 Programme, under grant agreement number 732546.

https://nexa.polito.it/conf2018

Goals

General goal:

Being able to simulate the possible effects of policies and interventions on the cities (also backwards), harnessing available data.

Operational goal:

To have a platform -open in terms of licenses of the data and adherence to open standards- that allows the creation of layers of data “above” the physical city, each one on a specific focus and with potentially different -but coherent- level of details

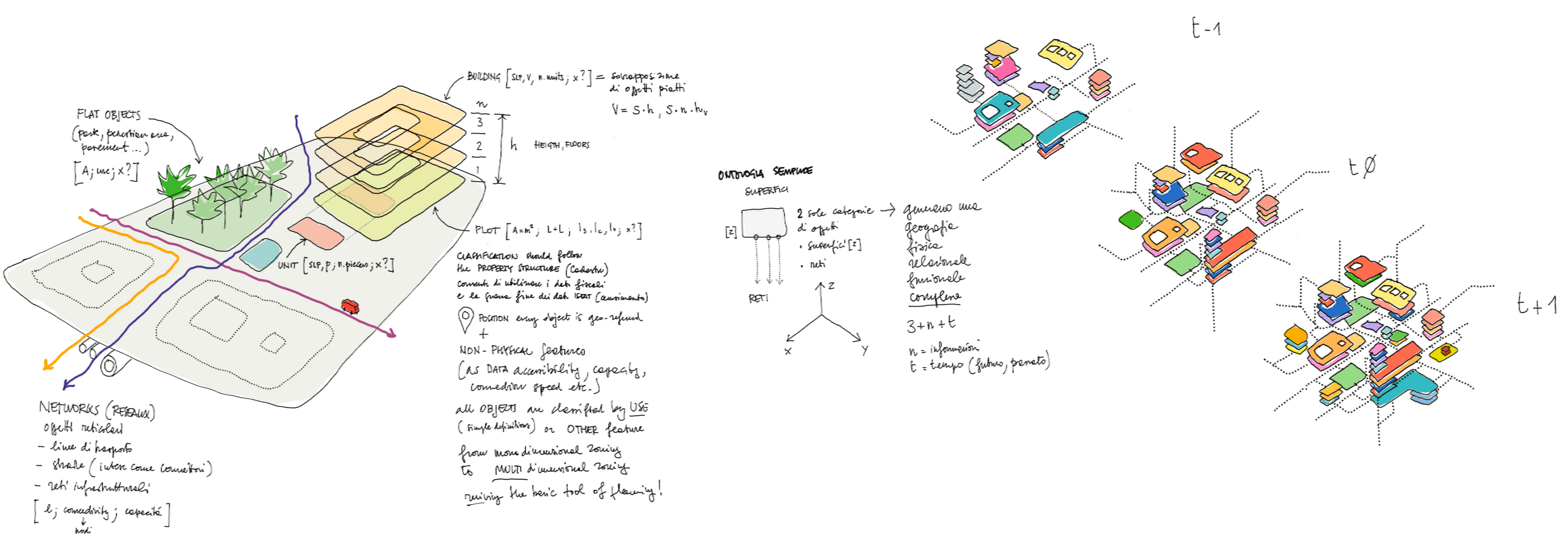
The result is a “digital twin” of the city, which gives to researchers and policy makers the possibility to spatially correlate and visualize how urban phenomena/problems are distributed across different areas of the city and how they are connected each other at multiple scales

Envisioned benefits:

evidence nurturing urban policies for the future of cities;

reduced informative asymmetries among stakeholders (citizens, public authorities, industry);

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

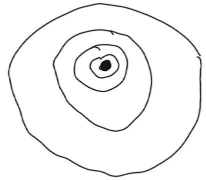
Extensible platform

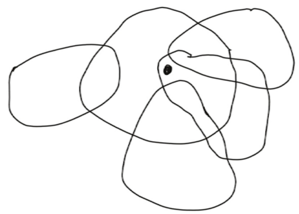
① per ciascun tematismo, ogni livello è contenuto in modo univoco nel superiore

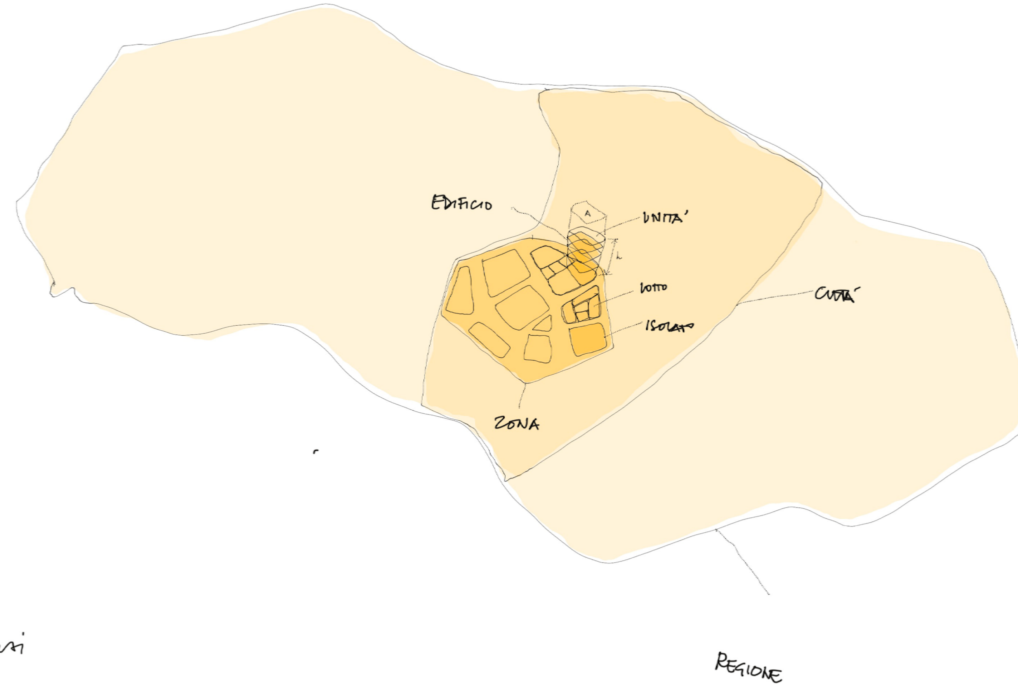
② qualora la fonte di dati non sia disponibile a livello di dettaglio, ogni oggetto riceve le proprie caratteristiche dal primo livello superiore disponibile

③ gli oggetti reali non appartengono a nessun raggruppamento tematico (oggetti fisici)

→ quindi ricevono le proprietà
e
→ possono senza contraddizioni appartenere a insiemi diversi, anche con scale e gradi di dettaglio diversi







DIGITAL OPEN URBAN TWIN

Interoperability and standards (OGC, ISO TC211, Inspire)

Data retrievable also from external services

Accessibility from web interface

Data usage licences

Security and privacy

Digital Open Urban Twin – platforms under analysis

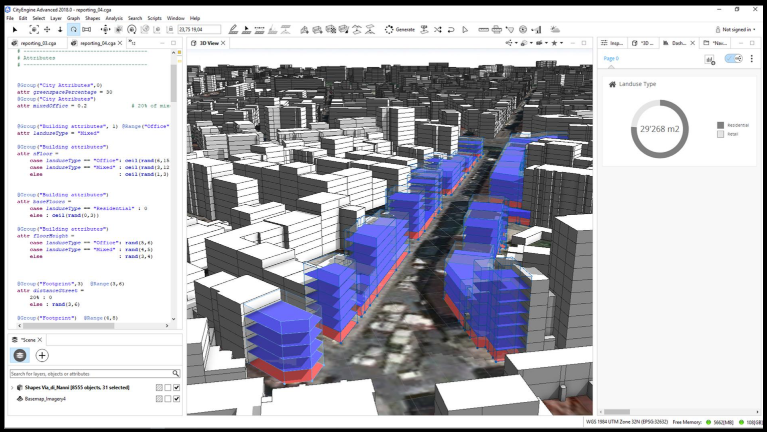
Platforms under analysis for customization

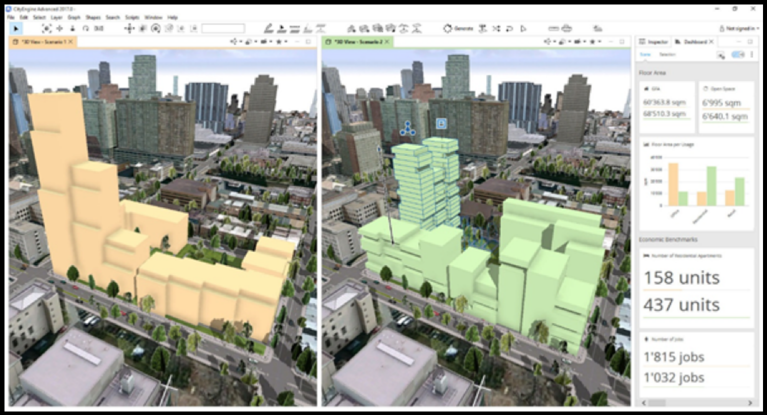
City Engine (ESRI)

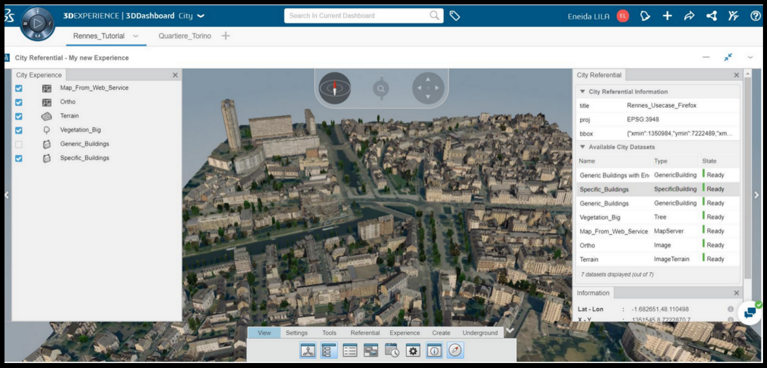
Infraworks (Autodesk)

Virtual City System (VC System Gmbh)

3DCity Experience (Dassault Systèmes)







Evaluation dimensions:

Interoperability (import / export)
Modelling (shapes, semantics, relations)
Management (db interaction, simulation analysis)

2D and 2.5D experimental maps

Types of maps

- **Improved maps**
  better level of details, time dimension

- **New maps**
  representations of recent urban phenomena

- **Matching maps**
  relations between phenomena

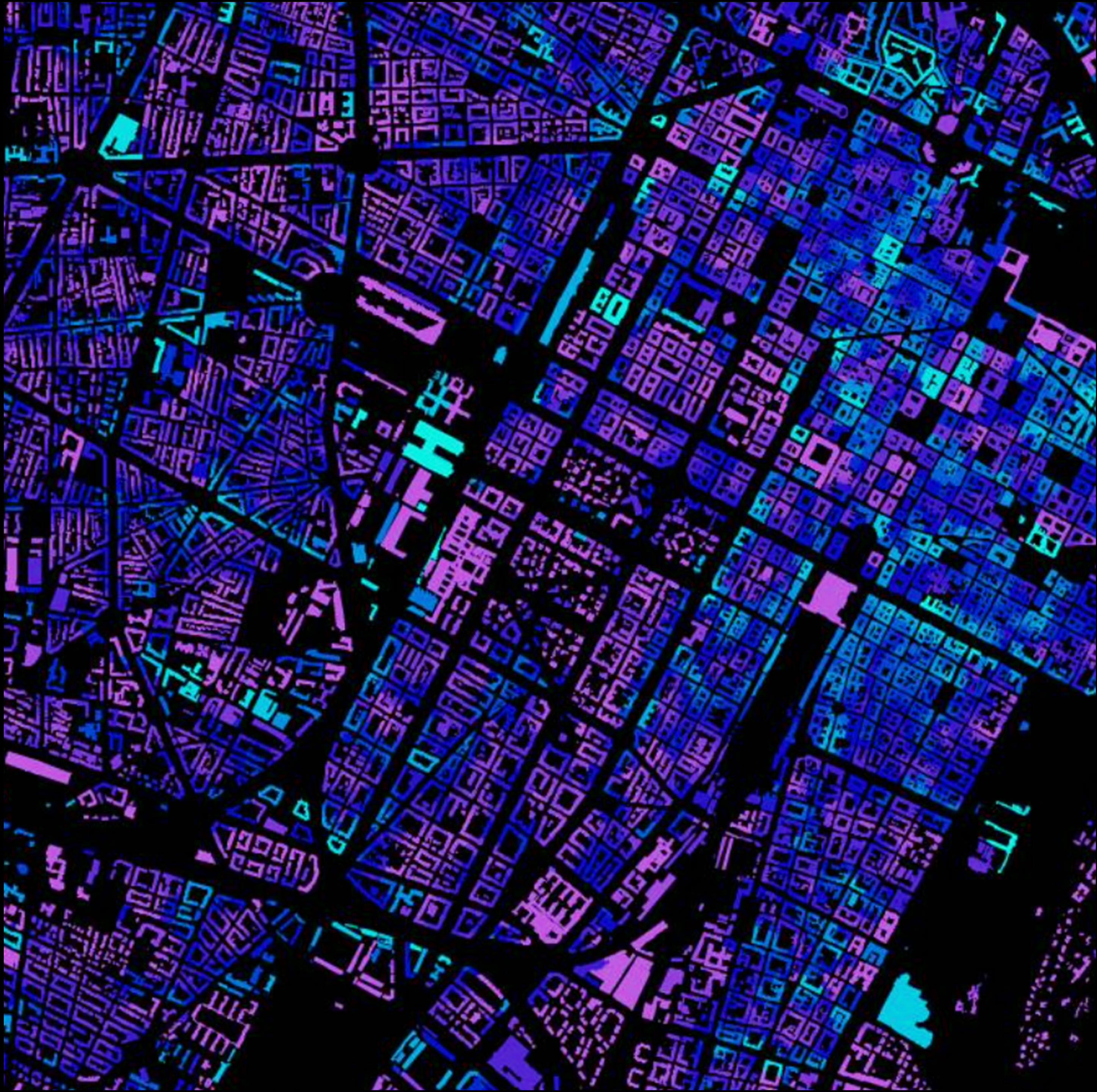
- **Critical maps**
  highlighting urban issues (wicked problems)

Improved maps

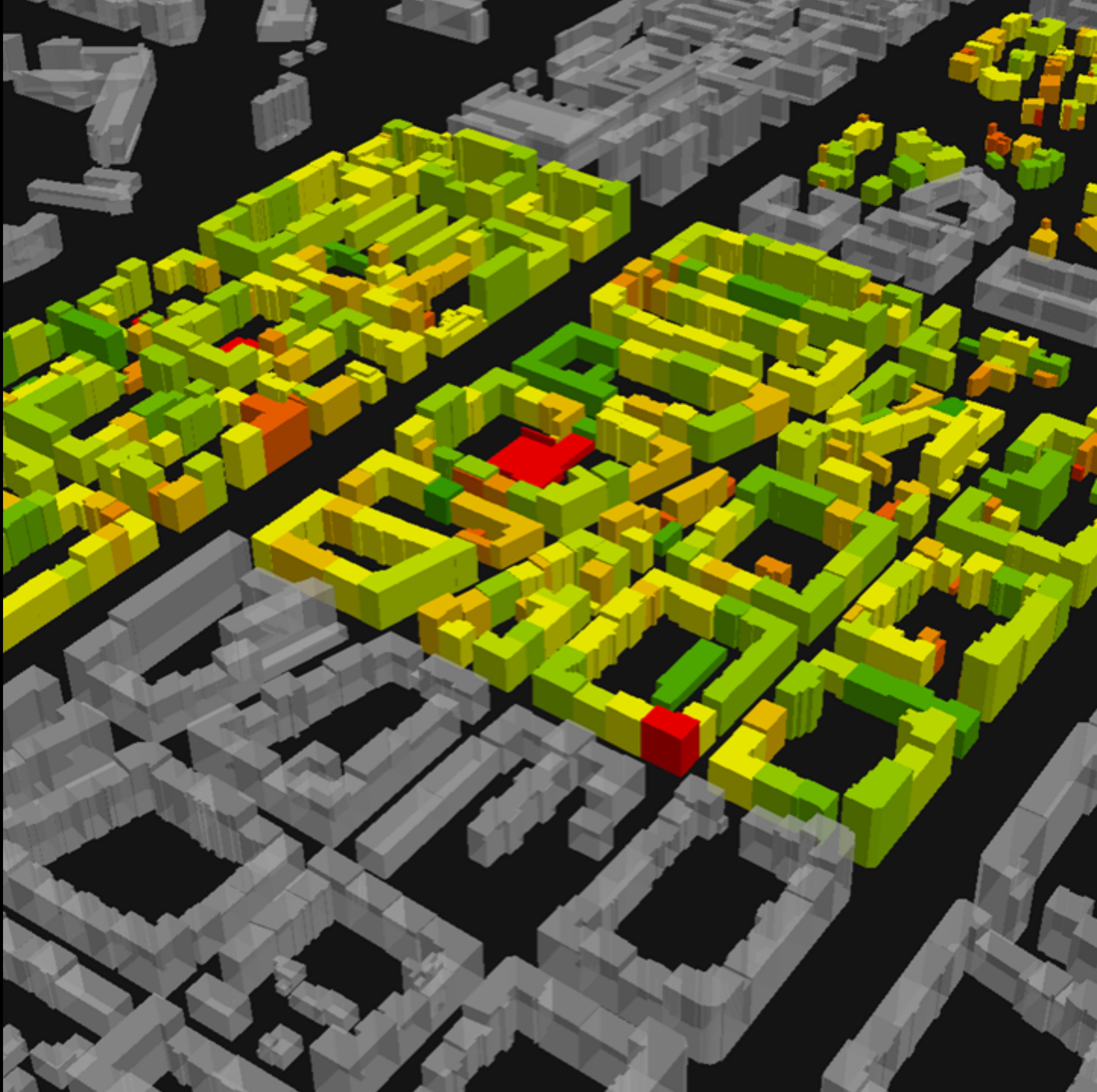
Urban form and retail location patterns

BtwSS

- 0 - 643
- 644 - 1743
- 1744 - 2849
- 2850 - 4012
- 4013 - 5316
- 5317 - 6782
- 6783 - 8409
- 8410 - 10185
- 10186 - 12131
- 12132 - 14261
- 14262 - 16694
- 16695 - 19455
- 19456 - 22630
- 22631 - 26377
- 26378 - 31102
- 31103 - 37353
- 37354 - 45628
- 45629 - 56513
- 56514 - 76133
- 76134 - 120745

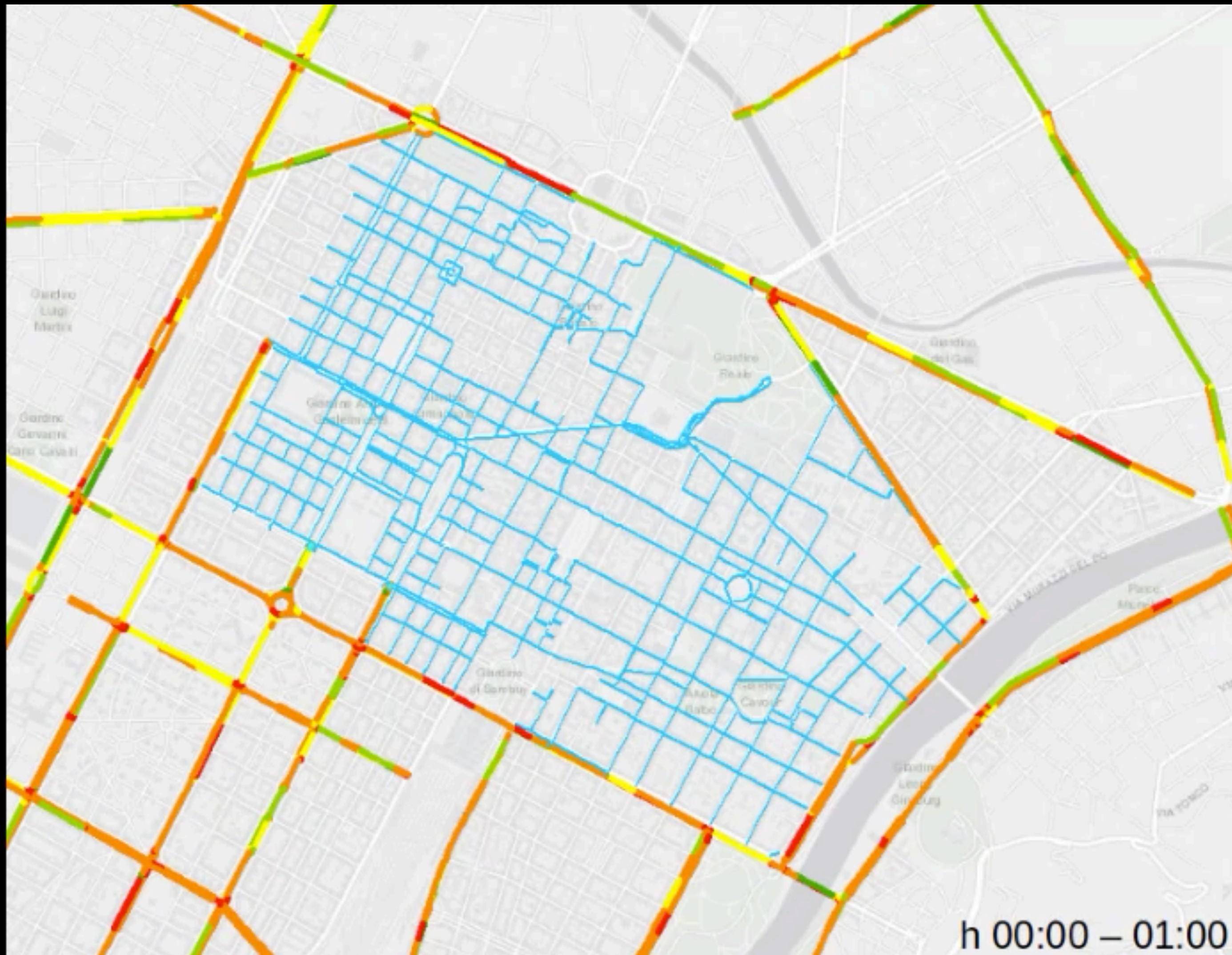


GIS-based Energy Model

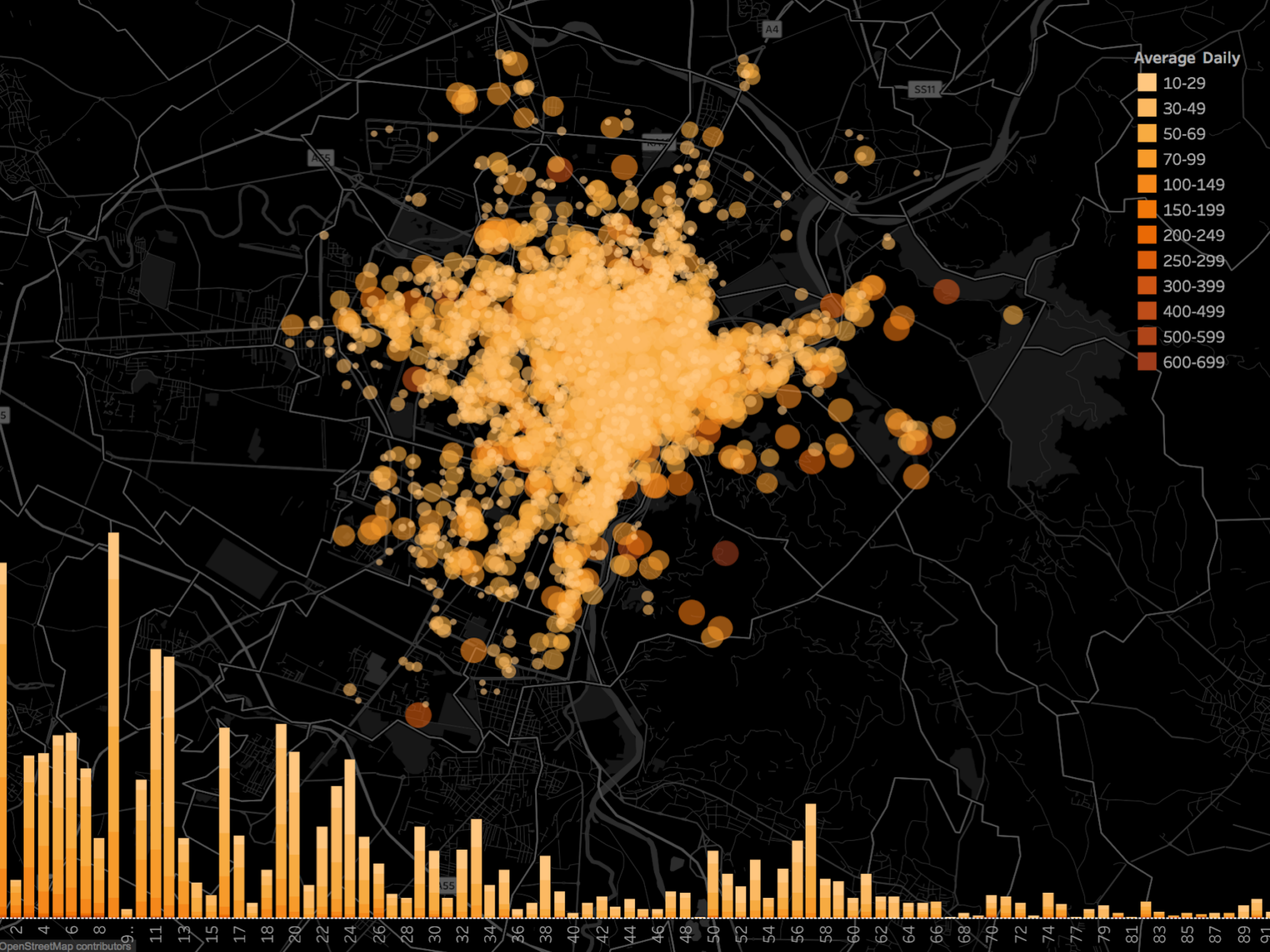


EPgl [kWh/m3/year]

- 4.81 - 16.40
- 16.40 - 27.54
- 27.55 - 31.43
- 31.44 - 34.52
- 34.53 - 37.05
- 37.06 - 40.02
- 40.03 - 44.11
- 44.12 - 49.84
- 49.85 - 58.97
- 58.98 - 94.48
- 94.49 - 127.36


h 00:00 – 01:00

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
A4
SS11
A55
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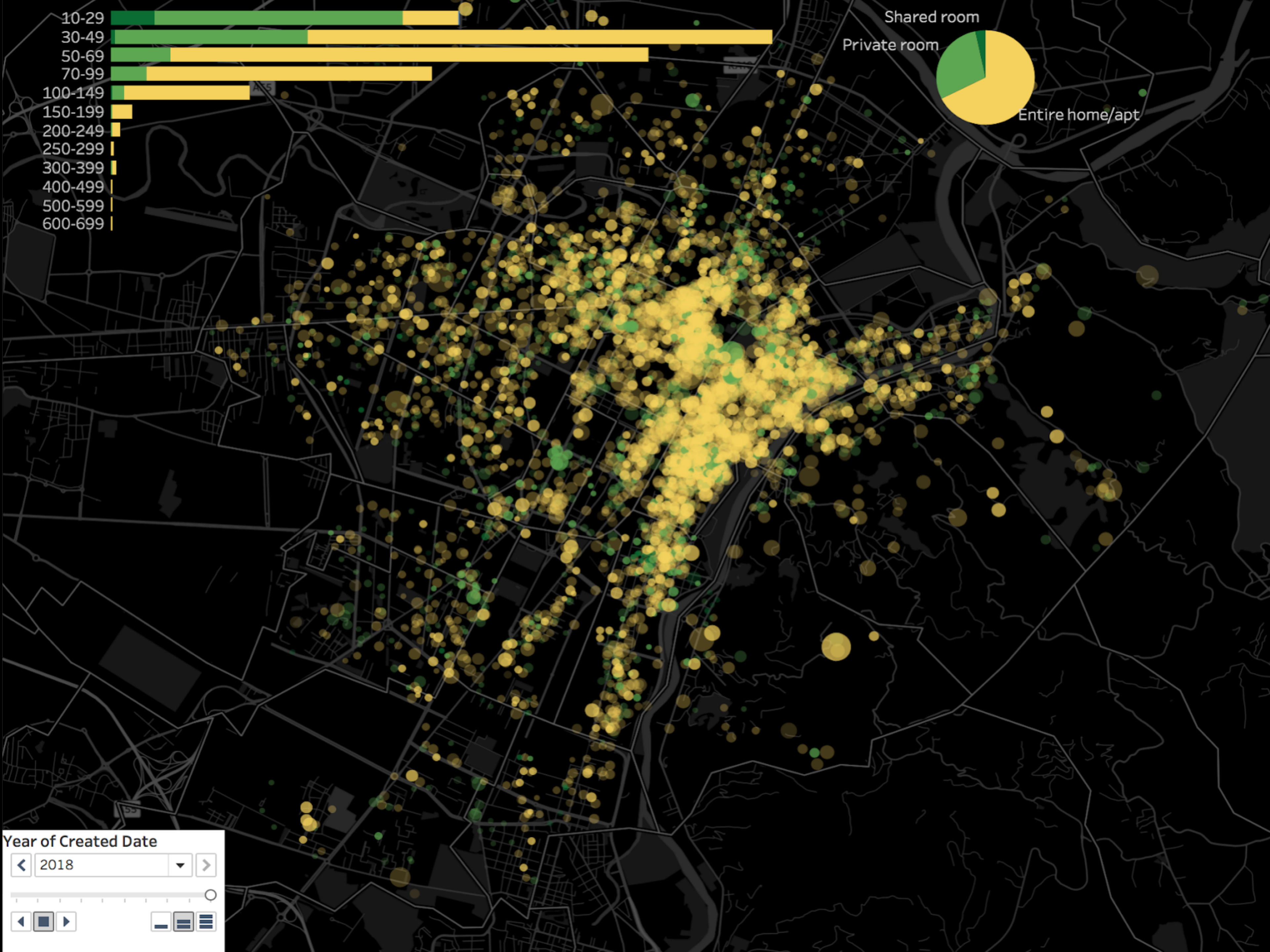
OpenStreetMap contributors


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


SS11

Matching maps

Energy consumption + Retail data

overall

41.928 MWh/year

(selected area)

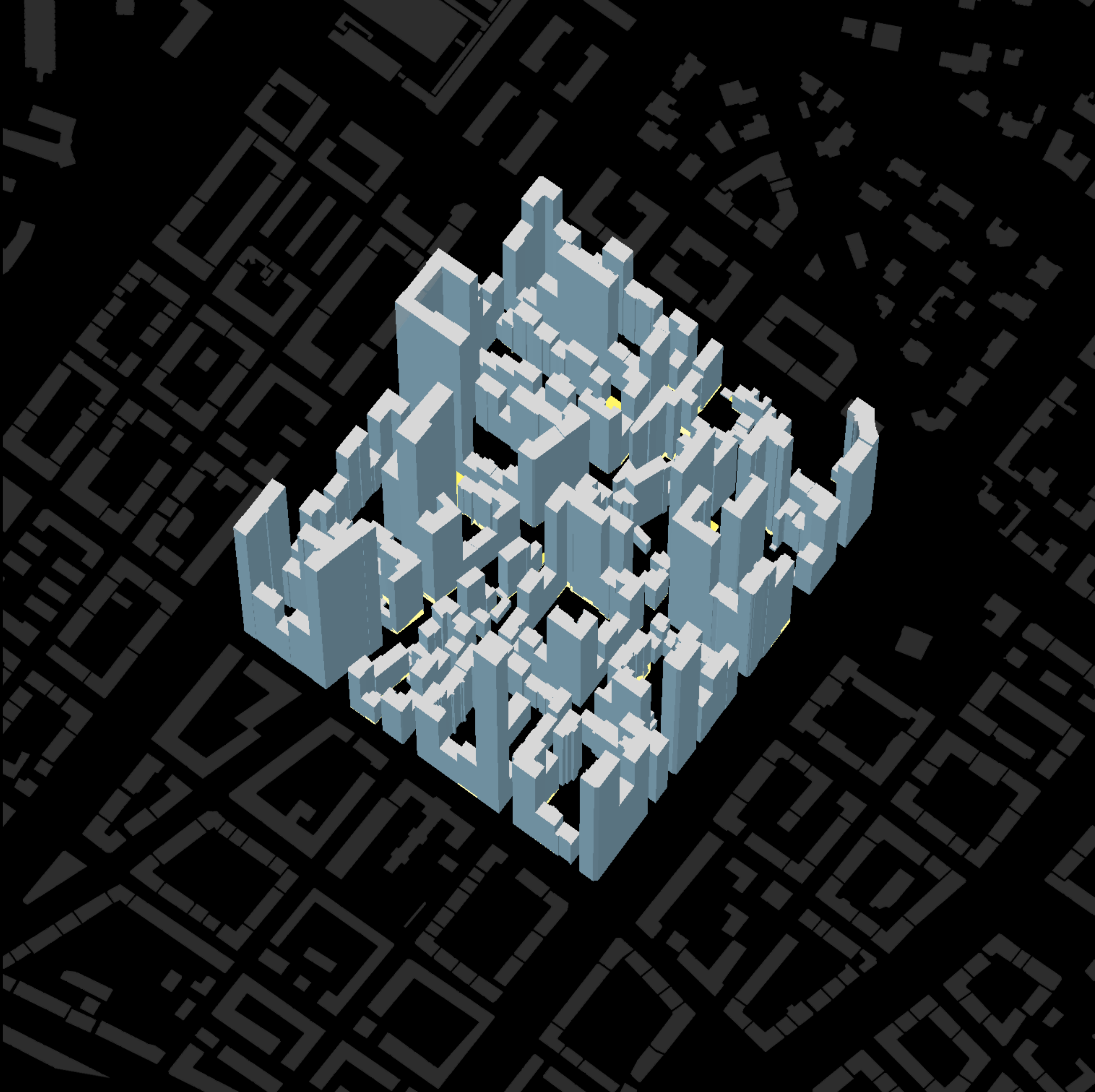
commercial

179 MWh/year

0.4%

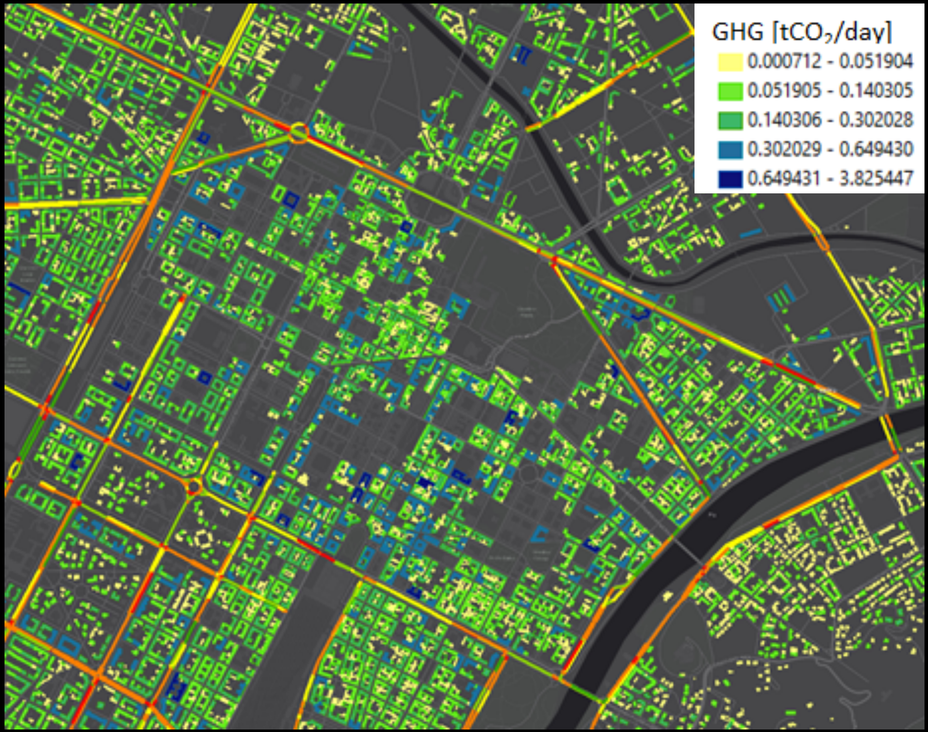
892 MWh/year

2.0%



Critical maps

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 →

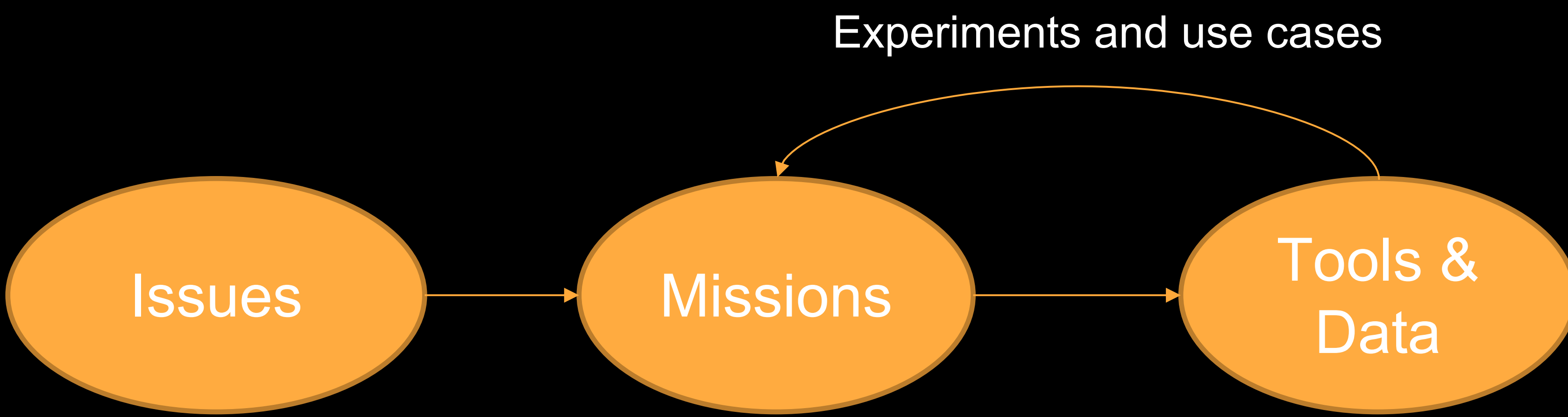
CO2 GHG EMISSIONS (daily value)
5% traffic (ZTL)
95% residential buildings (ZTL)

Coming soon: Inequality maps

Spatialization of inequalities in urban contexts

Effects of data-driven policy decisions

RESEARCH & INNOVATION MODEL



Socio-technical
Wicked problems

Application-oriented
Theoretical reflective

Used by stakeholders
Transformative

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THANK YOU

Antonio Vetrò

antonio.vetro@polito.it

phisaz