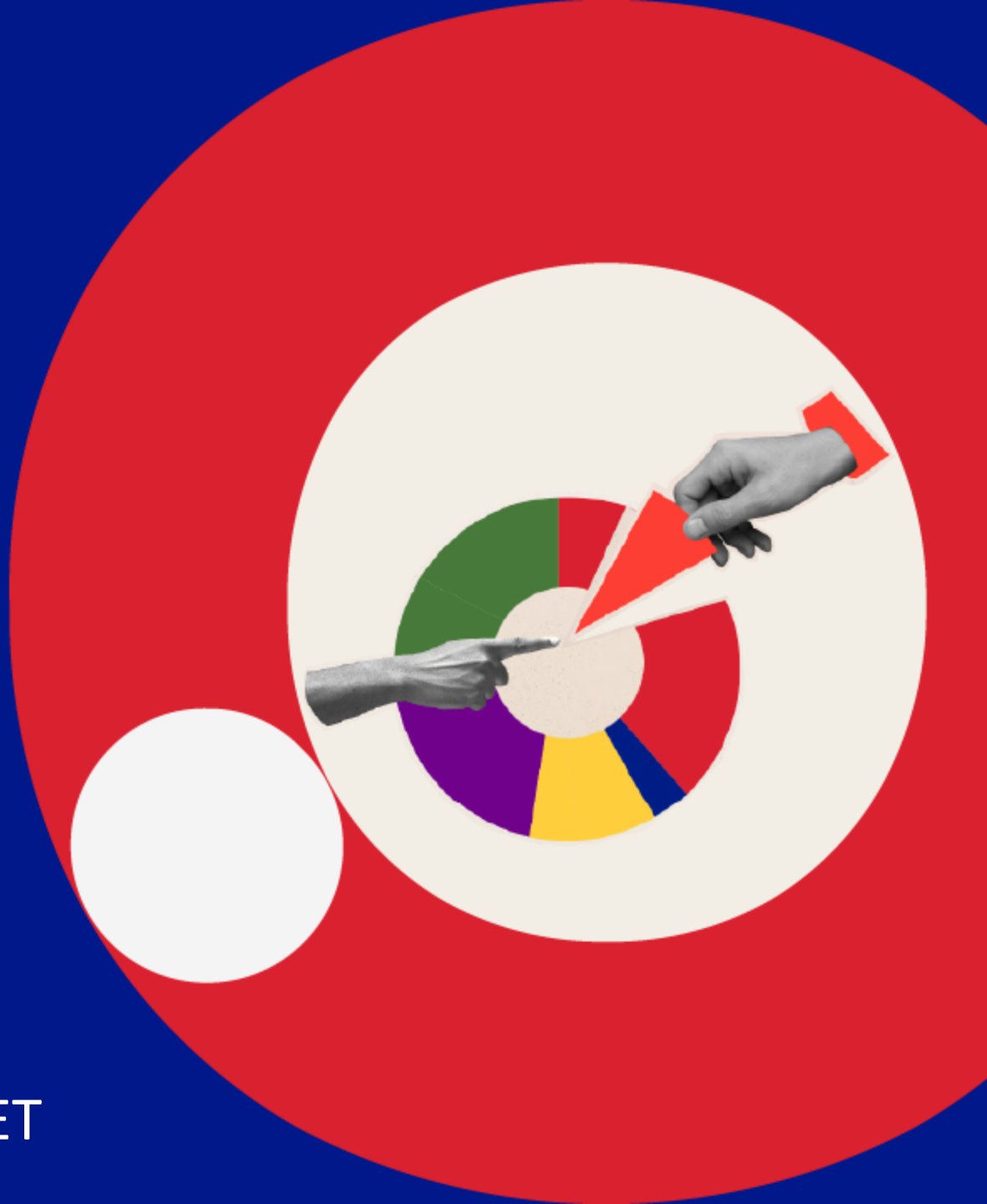
WEBINAR

Smart cities and digital twin technology: the case of Bologna



data.europa academy

23 January 2026

10.00 — 11.00 CET

Rules of the game

The webinar will be recorded and published on the data.europa academy

For questions, please use the ClickMeeting chat

Please reserve 3 min after the webinar to help us improve by filling in our feedback form

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Today’s speakers

Hannah Kroker
European Data Portal (data.europa.eu)
Publications Office of the EU

Stefania Paolazzi
Innovation Manager
Comune di Bologna

Marco Pistore
Lead Researcher
Fondazione Bruno Kessler

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Agenda

10.00 – 10.05	Opening and introduction – *Hannah Kroker*
10.05 – 10.25	Deep dive into case study of Bologna: introduction and context – *Stefania Paolazzi*
10.25 – 10.50	Deep dive into case study of Bologna: steps taken and use case – *Marco Pistore*
10.50 – 11.00	Q&A and closing remarks

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Bologna Digital Twin

Enhancing the public value of data

Agenda

1. **Bologna Digital Twin: project presentation**
   - Context and strategic vision
   - A Geometric, Physical... and Civic Digital Twin
   - How we work
   - Use cases

2. **Key aspects**
   - Data and AI Platform
   - Data governance
   - Models and Algorithms
   - Codesign methodology

3. **Status and next steps**
   - First Outcomes and Available Tools
   - Next steps

Project presentation

Context and strategic vision

Bologna in facts:

1.016.034 inhabitants in the metropolitan area

2nd largest Italian **province by employment**

Oldest University in Europe with **+20.000 graduates** and **+9.000 international students** per year

+ 300 patents per year - **6.6% national capacity** and **30 research products** per day

+ 300 innovative start-ups registered

+ 60 innovative hubs as incubator,accelerator, fablab and technopoles

Europe's **2nd most powerful Supercomputer** (Leonardo) enhancing the concentration of **90% of national computing capacity**

1 Big Data Technopole at the center of the Italian Data Valley

Context and strategic vision

The Municipality of Bologna aims to **enhance the city's capacity to address economic, social, and environmental challenges through data-driven and inclusive urban governance**.

In response to increasing urban complexity, the Municipality has identified **key strategic assets** to strengthen urban resilience:

Urban data and evidence to support informed policymaking

Advanced digital technologies, including Machine Learning and Artificial Intelligence, embedded in a strong research and innovation ecosystem

Social capital, knowledge, and expertise mobilised through the active involvement of urban stakeholders and citizens

A Geometric, Physical... and Civic Digital Twin

The Bologna Digital Twin is a **new technological infrastructure serving the city**.

It will help us **enhance the value of data** held by the Administration and urban stakeholders to support **more effective decision-making and policy development.**

Bologna Digital Twin enables us to:

- **Analyse, correlate, and visualise data** to facilitate understanding of urban phenomena.
- **Monitor** the evolution of **public policies** and the **effects of external events** on government decisions.
- Anticipate and test urban developments and assess their potential impacts by **building scenarios and simulating how decisions evolve** over time.
- **Involve citizens in urban planning** processes and in reshaping their behaviours.

A Geometric, Physical... and Civic Digital Twin

Urban Digital Twins are often inspired by industrial twins: this is important for capturing the physical aspects of the city.

However, caution is needed:

- **cities are** not machines to be regulated or processes to be optimized, but **ecosystems in constant evolution;**
- **citizens are not passive users**: they are co-authors of urban space policy impacts;
- every urban choice shapes citizens' lives just as much as **citizens' daily decisions shape the city**.

Civic Urban Digital Twins focus on these aspects and

- **represent people's behaviors and social dynamics**;
- their analyses and simulations are designed to be **understandable also to non-experts**;
- **allow citizens and urban stakeholders engagement** in co-design and collaborative processes.

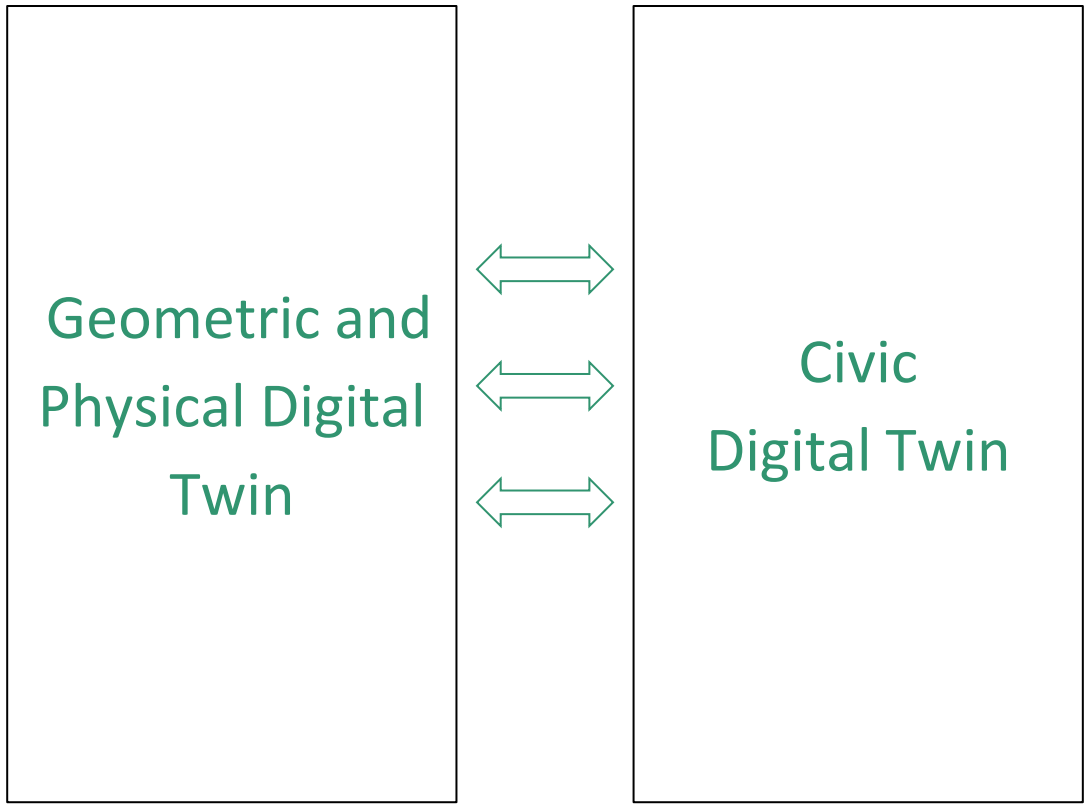
A Geometric, Physical... and Civic Digital Twin

Modelling of Buildings and Infrastructure

- Using LIDAR data, satellite imagery, and orthophotos
- 3D modelling of city buildings Urban green spaces

Modelling of the City's Physical Processes

- Building's Energy Modeling
- Integration of climate and environmental data calculation of specific indicators for vegetation and the environment



Modelling of Social Dynamics

- Individual and collective behaviours

Modelling of Transformation Processes

- Citizen attitudes toward change
- Impact of shifting attitudes on transformation processes

Engagement Tool

- Enhancement of data collected through civic engagement and public consultation

How we work - Strategic partnerships

Comune di Bologna

FONDAZIONE BRUNO KESSLER

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

CINECA

Fondazione IU Rusconi Ghigi

ICSC Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing

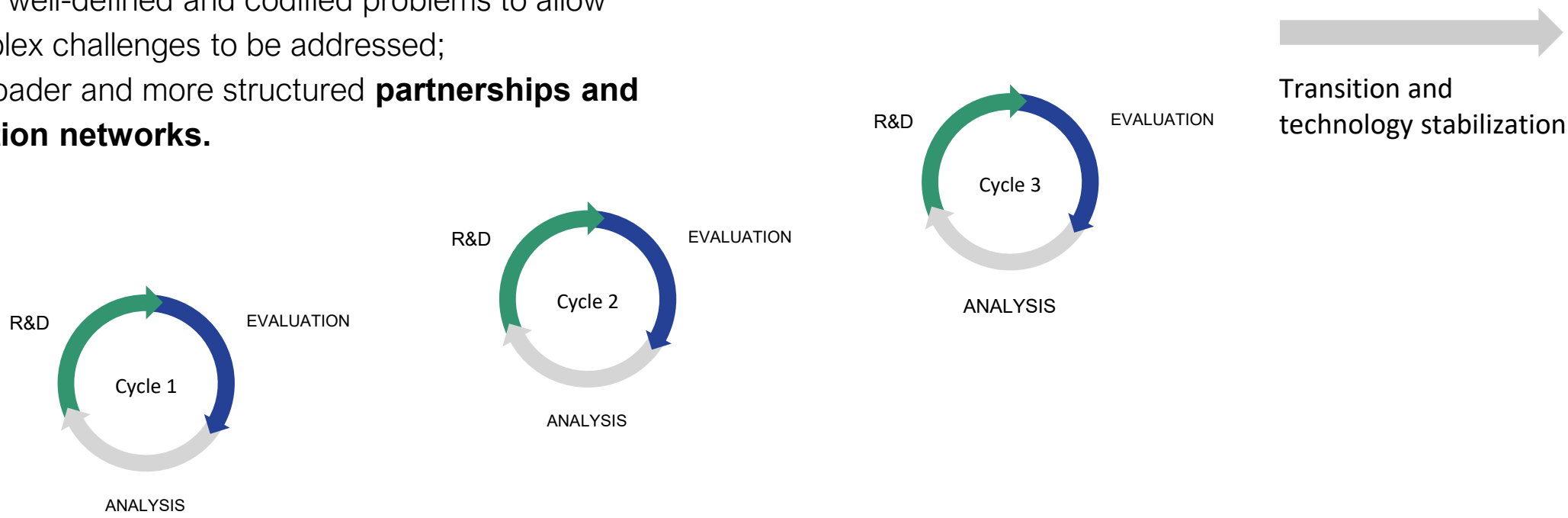
CRIF, ARUP, UVA - The University of Virginia.

Other possible future collaborations.

How we work - An incremental approach to innovation

We design and test innovation using an incremental approach:

- beginning with established solutions and **investigating open questions;**
- addressing well-defined and codified problems to allow more complex challenges to be addressed;
- building broader and more structured **partnerships and collaboration networks.**



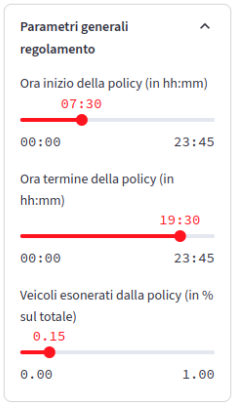
Use cases - Mobility

Objective: to assess in advance the potential direct and indirect impacts of actions and policies related to sustainable mobility in the city of Bologna.

Key aspect: the need to model

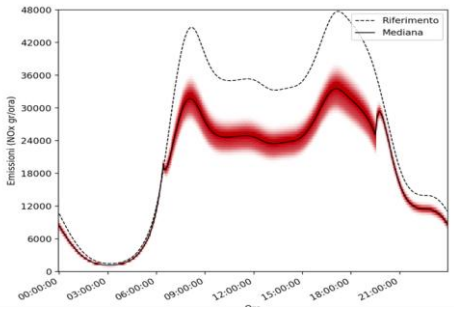
- traffic and mobility dynamics
- trends (e.g. electric vehicles)
- people's behaviour
- social vulnerabilities
- …

Parameters

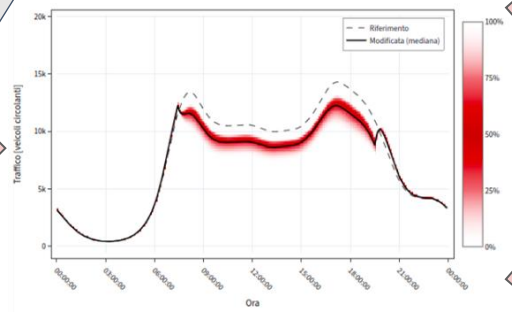


Behavioural rigidity

Emissions

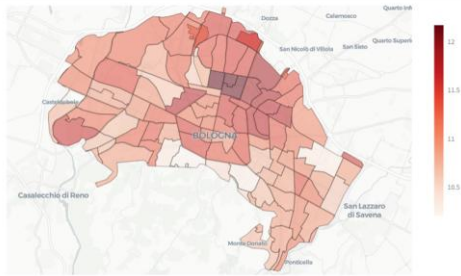


Traffic



Analysis of social vulnerability

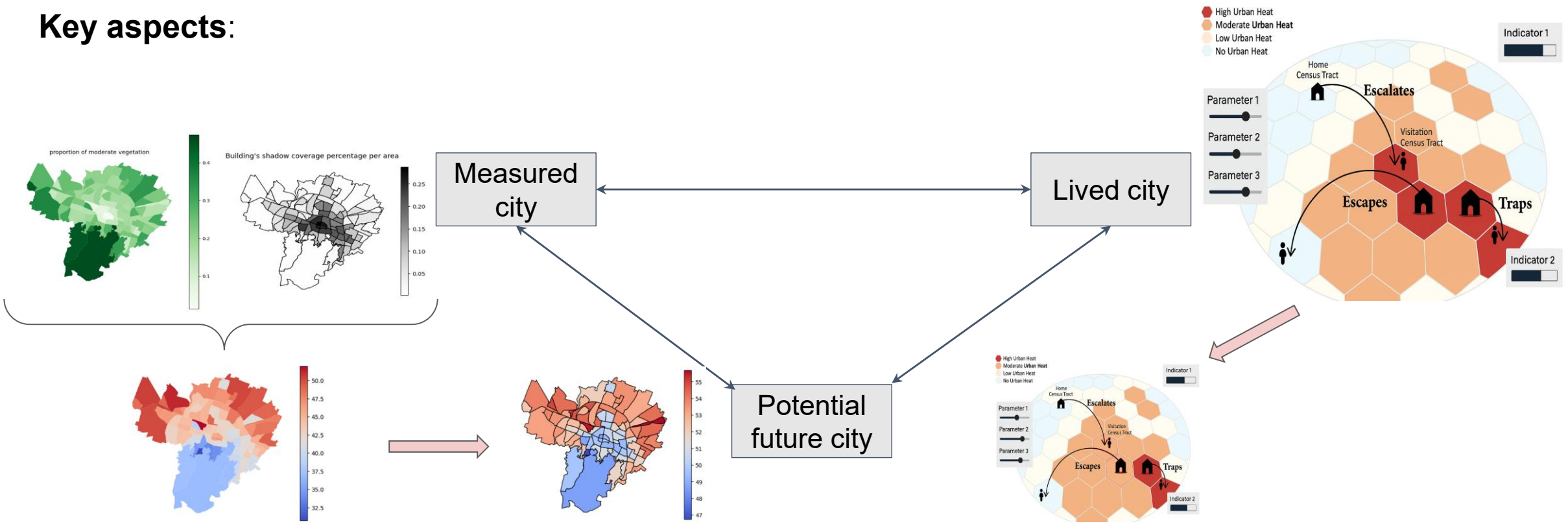
Social Impacts



Use cases - Heat waves

Objective: to study the impacts of heatwaves on the city and its residents, and to assess the effects of potential mitigation and adaptation measures and actions.

Key aspects:

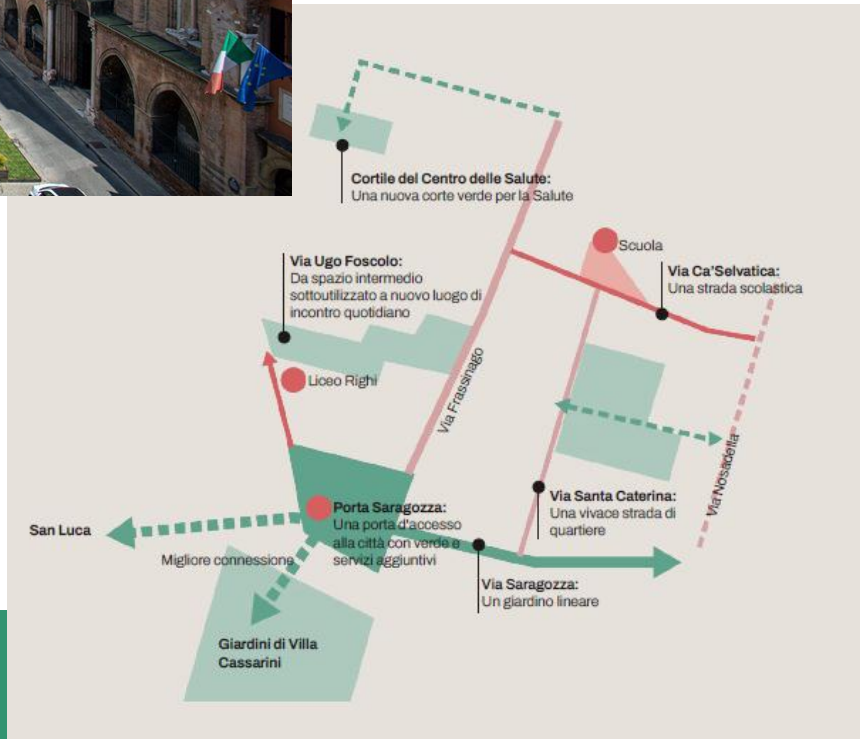


Use cases - Historical city centre

Objective: to co-design actions to improve the liveability of the historic city centre of Bologna, involving citizens directly in defining the actions themselves.

Key elements: a multi-objective approach

- preserving the historic urban fabric
- upgrading public space
- enhancing the dimension of proximity
- strengthening resilience and adaptation to climate change



Key aspects

Key Aspects

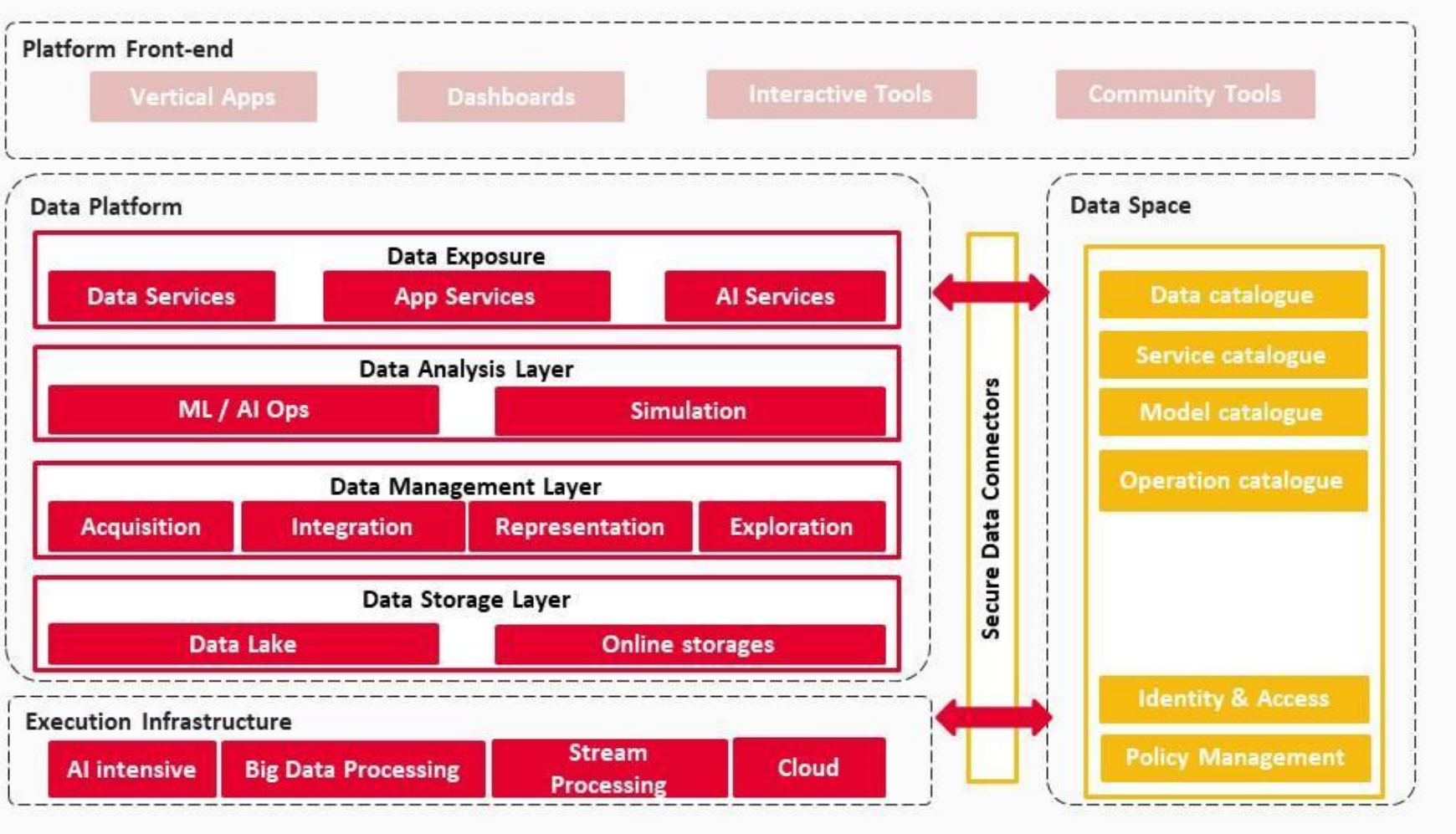
- Data and AI Platform

Data and AI Platform

Technological foundation of the Bologna Digital Twin:

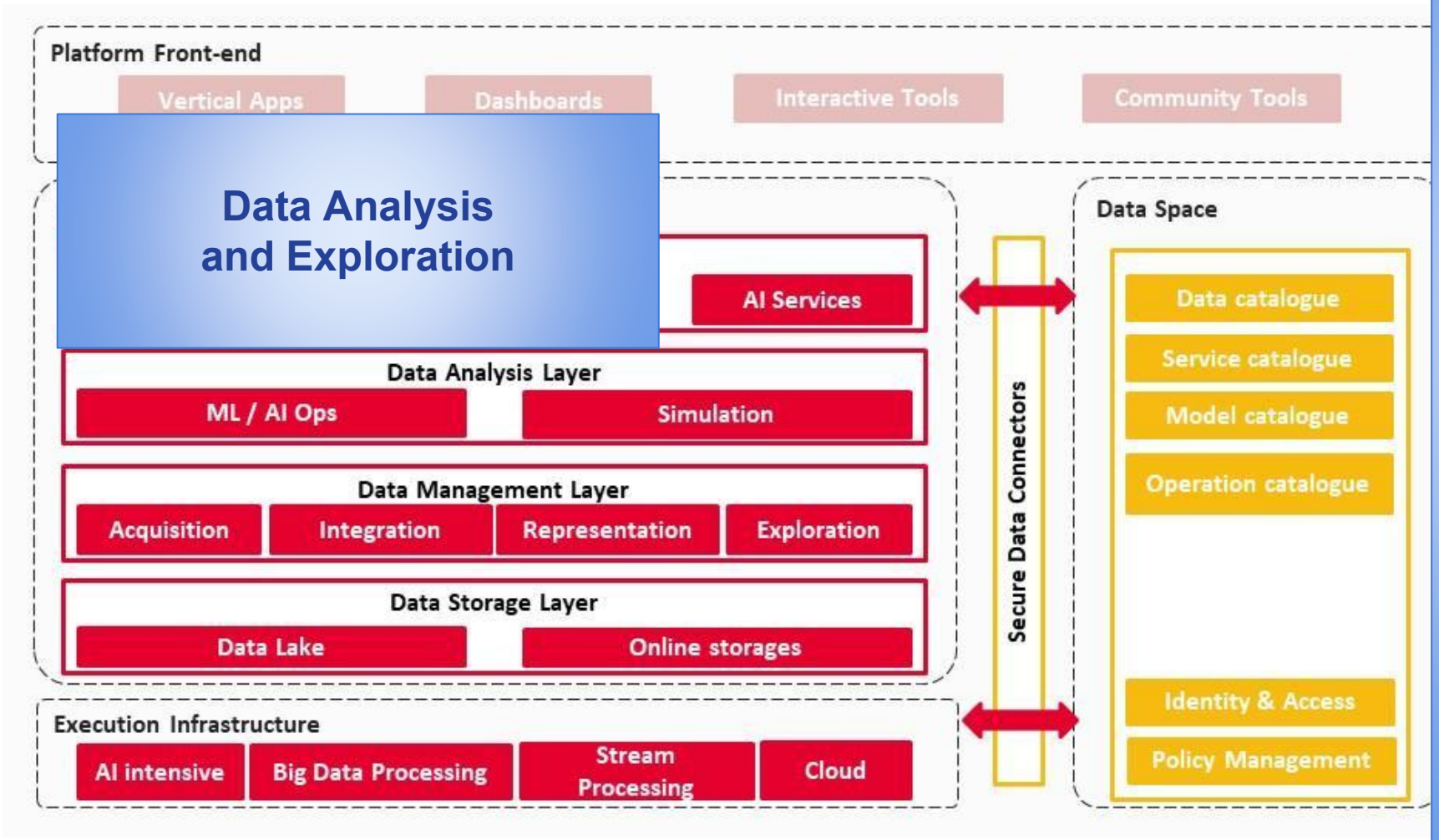
- Collection, management, sharing and exposure of **data**
- Integration and implementation of **analysis** tools (not only AI)
- Support for **decision-making** scenarios
- Support for **visualisations**
- Authentication, **authorization** and access control
- Data and service **interoperability**
- Support **traceability**, **accountability**, quality assessment, …

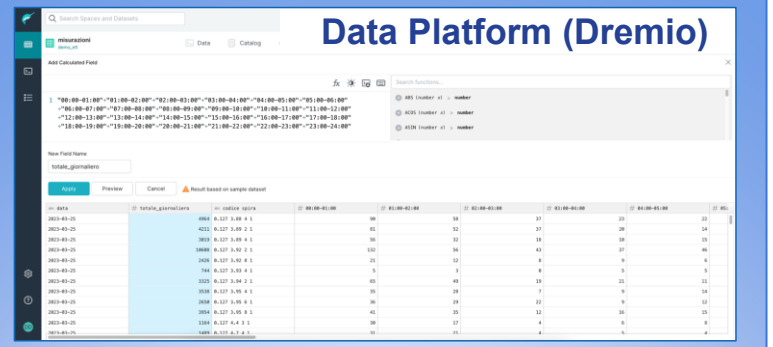
Data and AI Platform

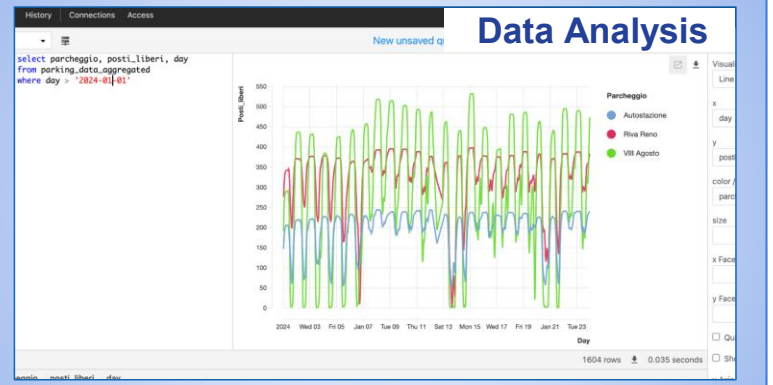


- **Open source**
- **Cloud**-native
- Access control and **security** mechanisms
- **Multitenancy**
- Support for **extensions**

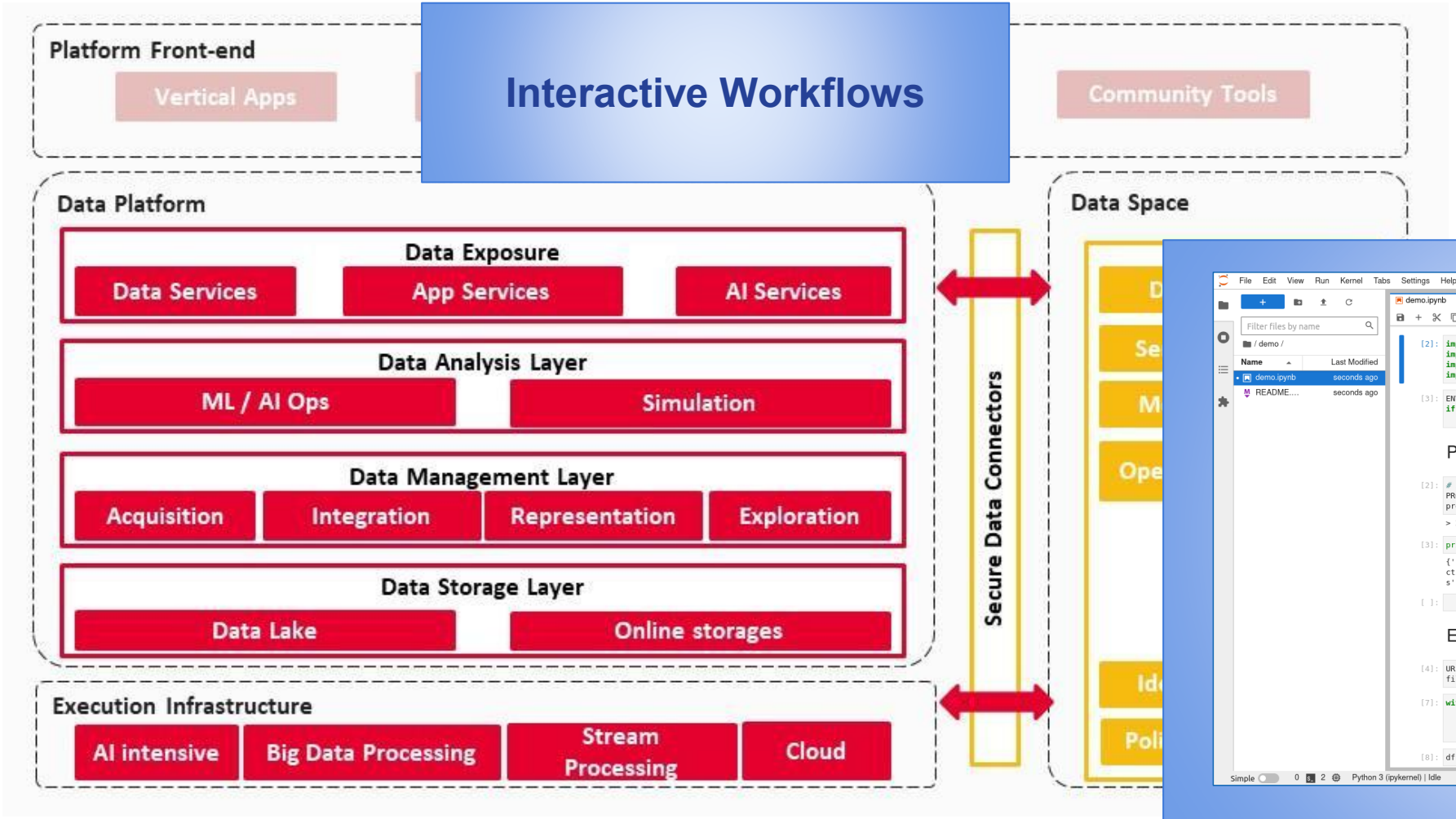
Data and AI Platform

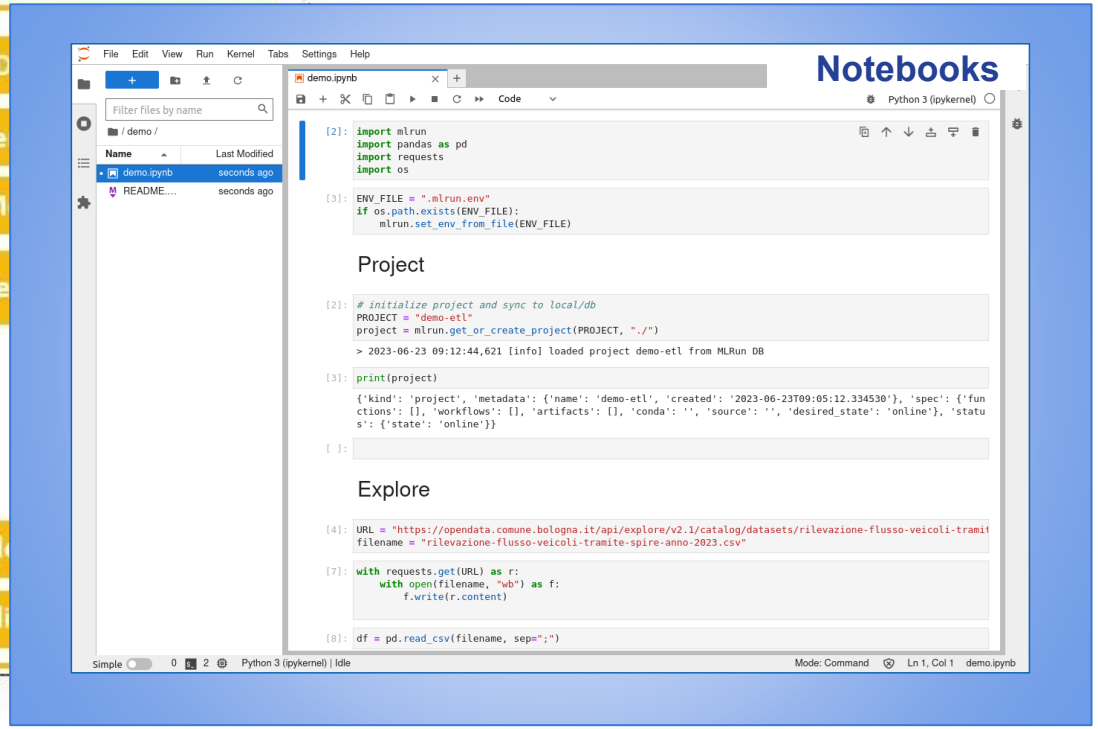




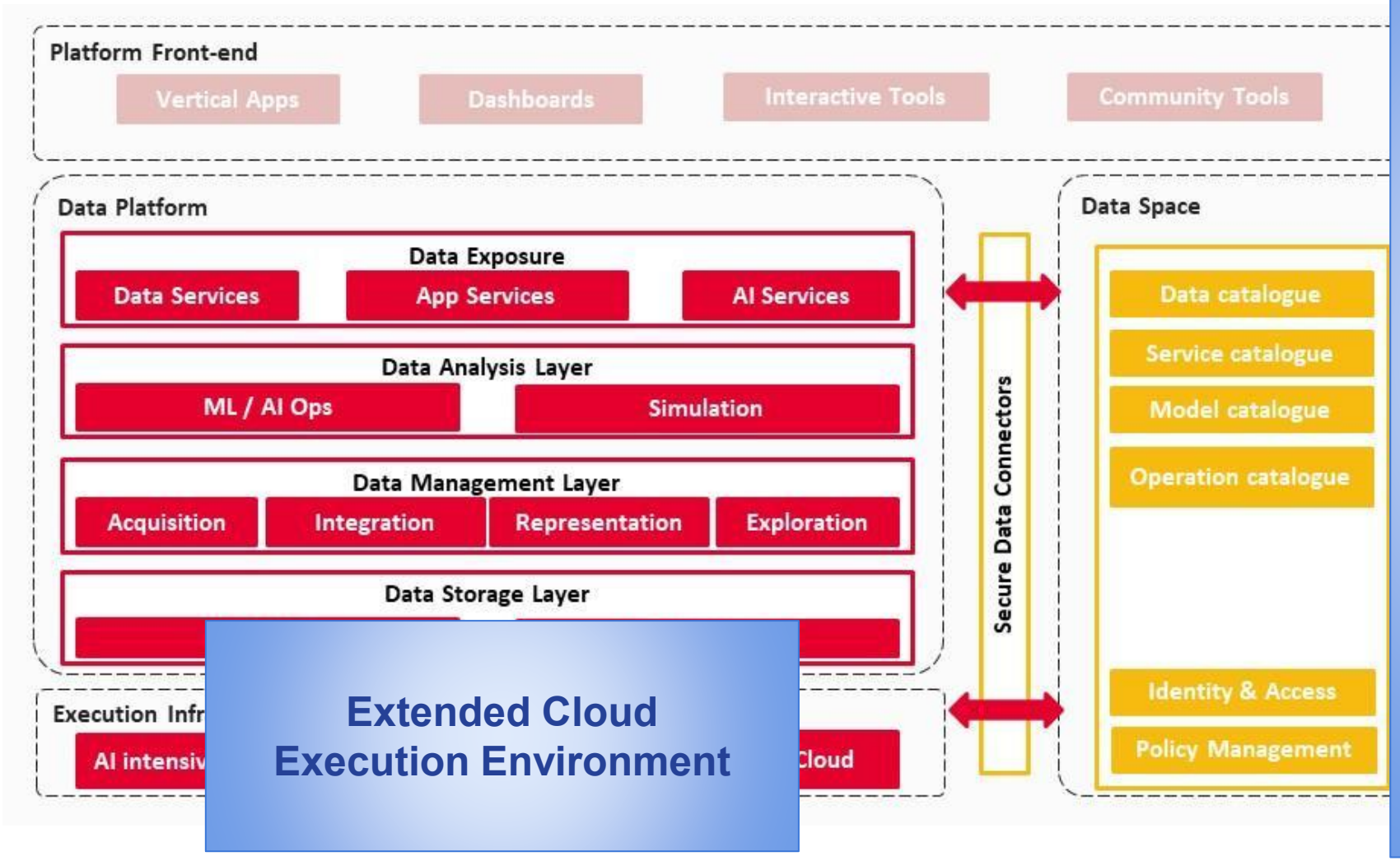


Data and AI Platform

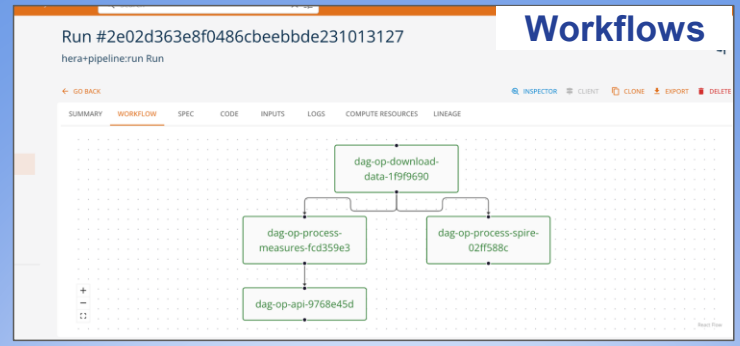


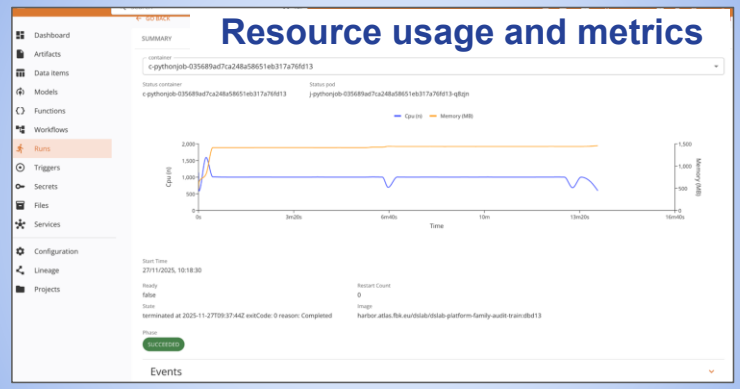


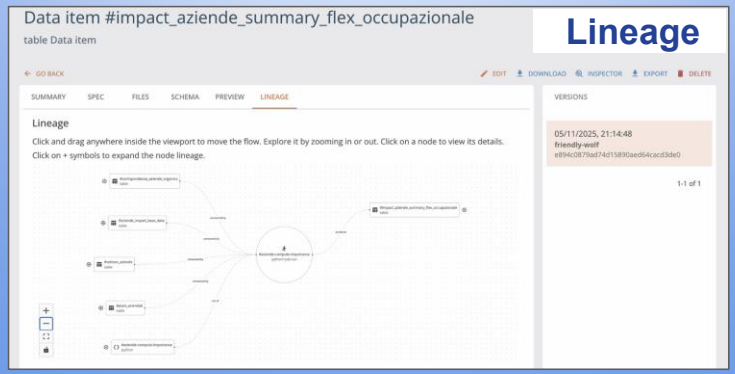
Data and AI Platform



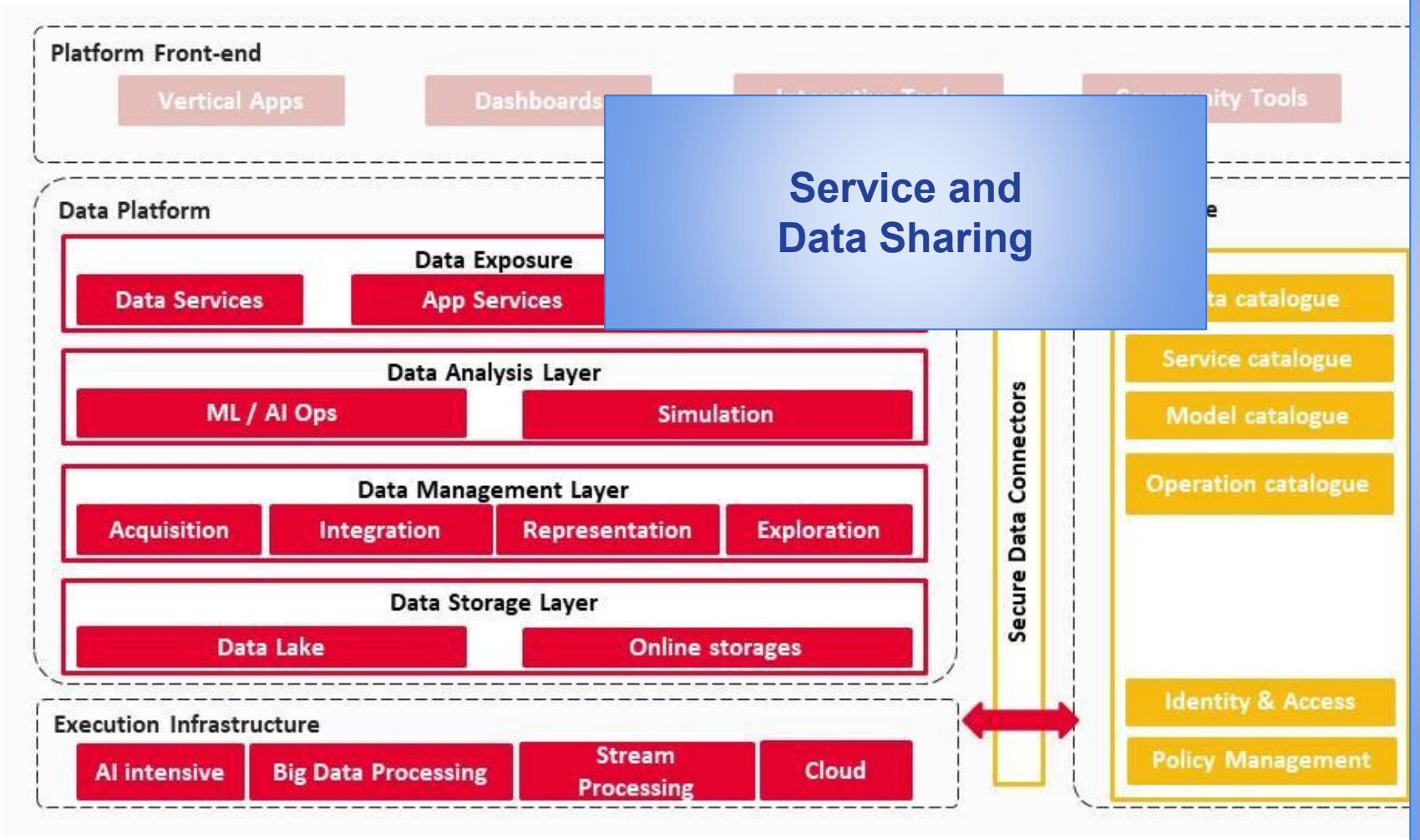
Extended Cloud Execution Environment

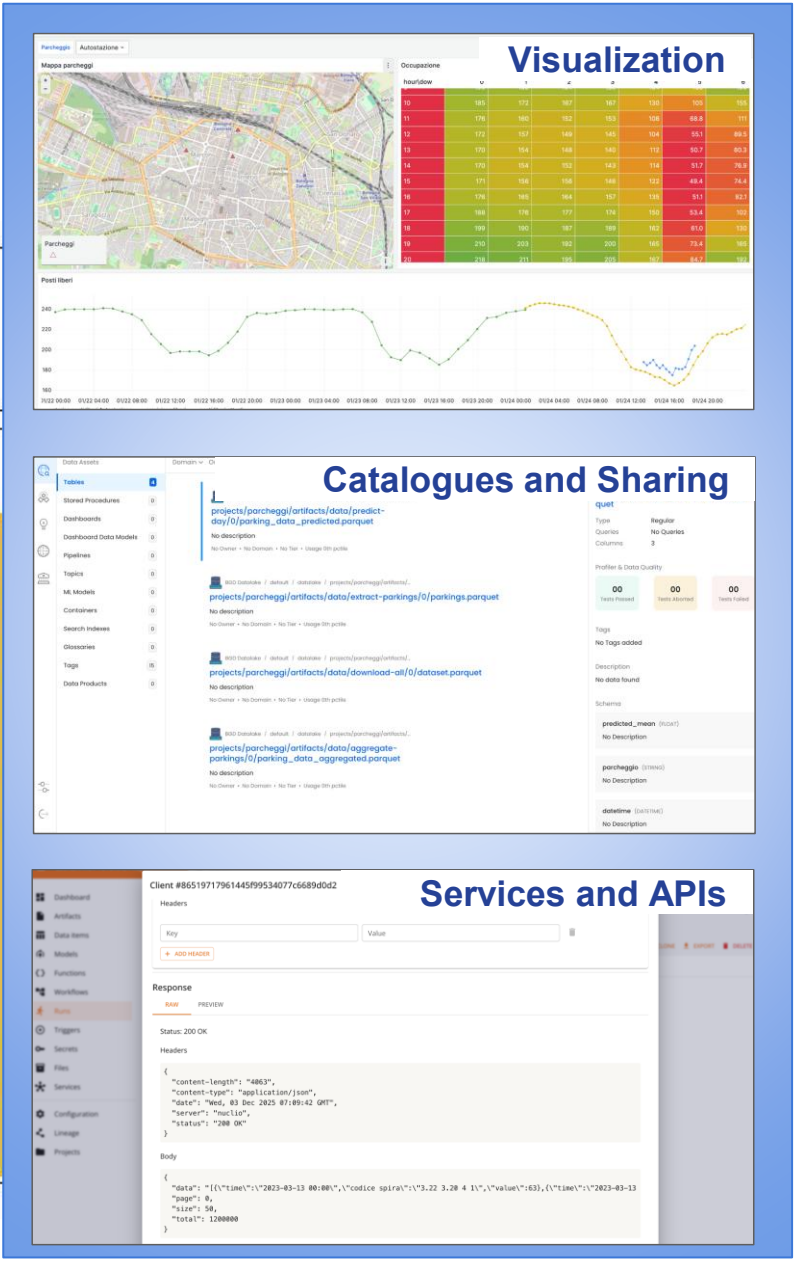






Data and AI Platform





Key Aspects

- Data and AI Platform
- Data governance

Data Governance

- New data management **needs** (Digital Twins, AI, …)
  - ➢ Disruptive technologies require continuous, cross-domain data use → the Municipality needs flexible data **governance processes and tools**
- From open data to a **data ecosystem**
  - ➢ Urban Digital Twins rely on **data sharing** among public, private, and research actors → beyond open data, profiled and purpose-bound data sharing is required
- Clear **rules** for the Digital Twin
  - ➢ The Digital Twin is a shared operational environment → data governance is the **rulebook** defining access, usage, responsibilities, and accountability.

Data Governance

Tools and Technologies

- Data Space
- Data Catalogue
- Data Marketplace
- Data Quality
- Data Fairness

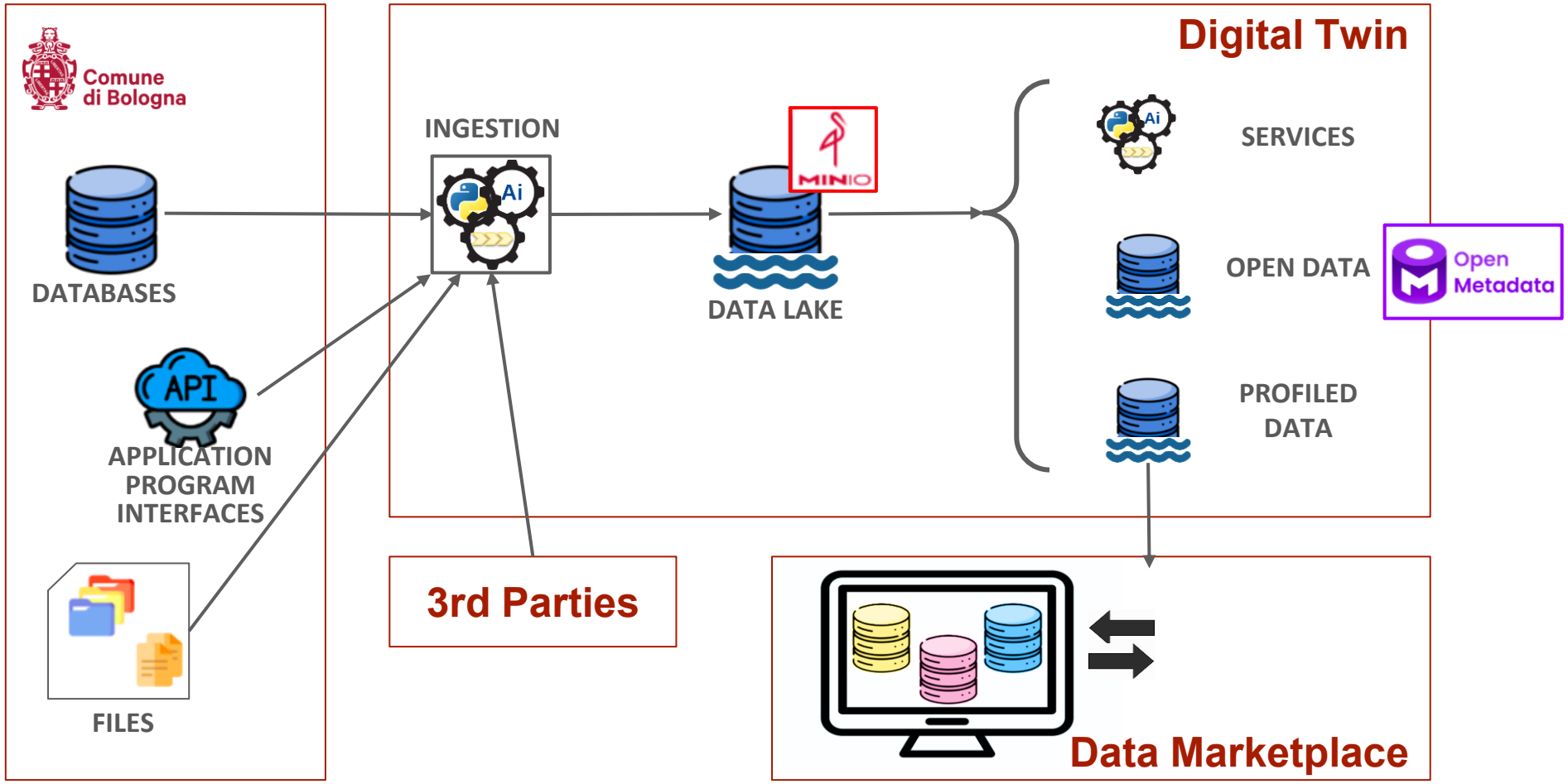
Processes

- Data Management
- Metadata Management
- Master Data
- Data Lineage
- Data Quality
- Data Sharing
- Data Democratization

Roles

- Data Owner
- Data Steward
- Technical Steward
- Data Analyst / Scientist

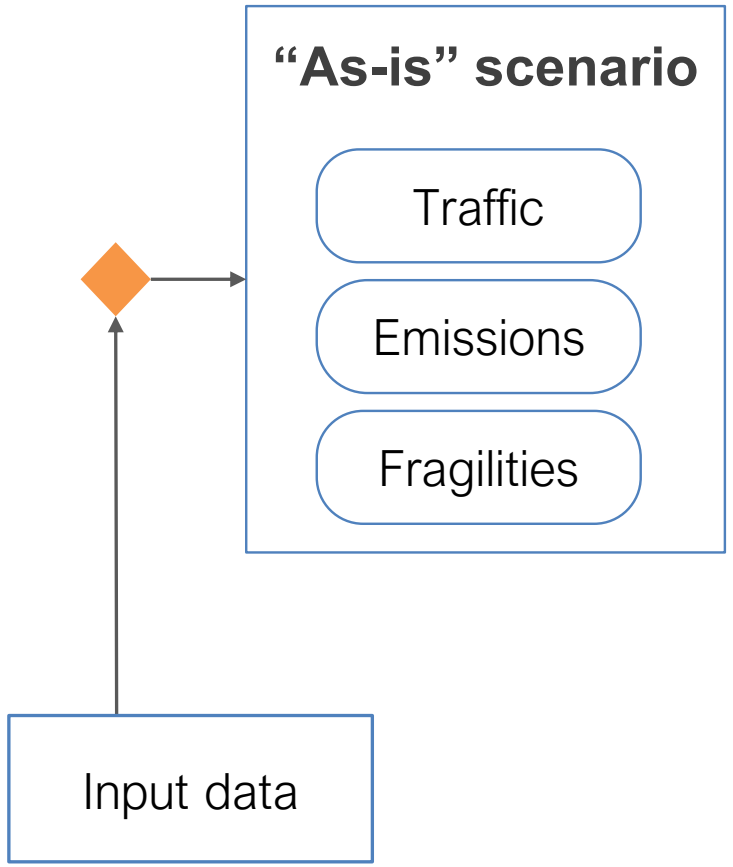
Data Governance



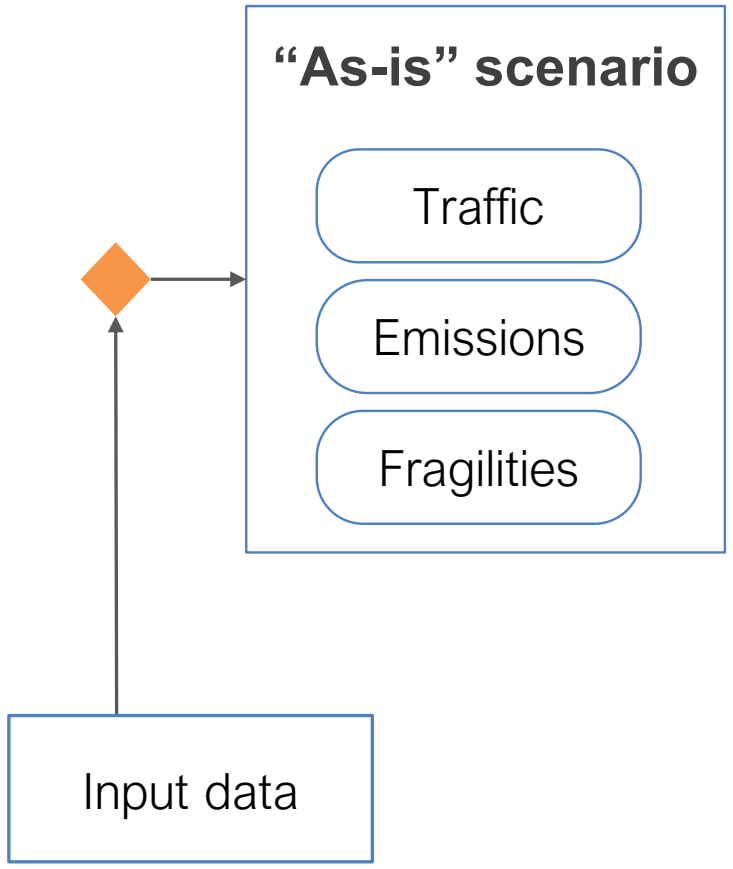
Key Aspects

- Data and AI Platform
- Data governance
- Models and algorithms

Models and algorithms - Example: the Mobility use case

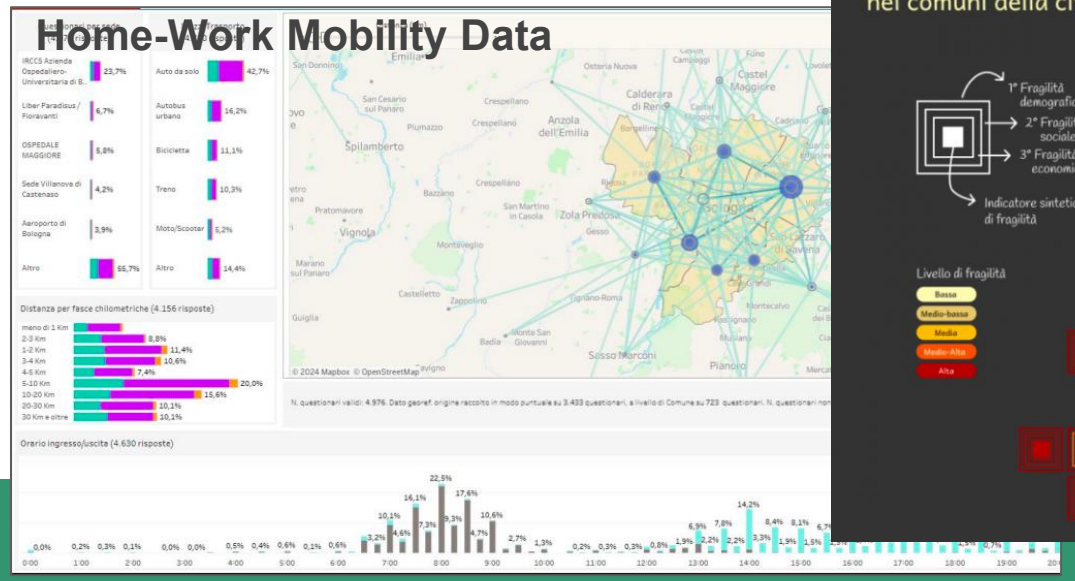


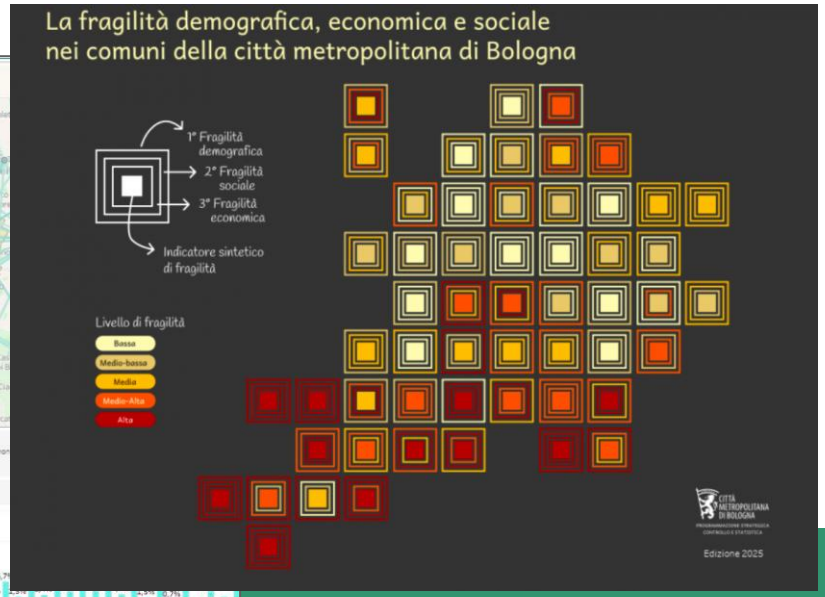
Models and algorithms - Example: the Mobility use case



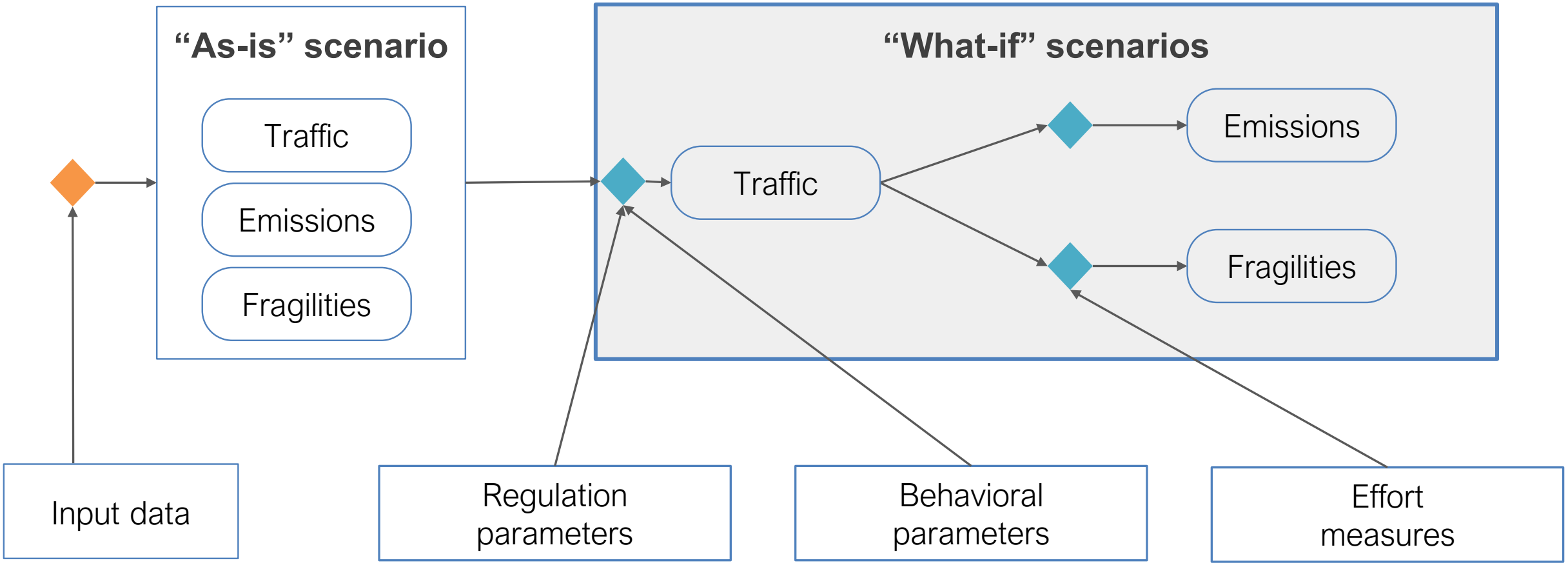
Input data:

- Road network
- Origin-destination data
- Traffic data (from coils sensors)
- Urban mobility plans
- Citizens’ habits (e.g., surveys on commuting)
- Social fragilities
- …





Models and algorithms - Example: the Mobility use case



Models and algorithms - Example: the Mobility use case

DEMO

Models and algorithms - Urban fragilities

Goal:

- Identify and manage indirect discrimination and mobility gaps (due to gender, age, abilities, economic condition, language, ...)

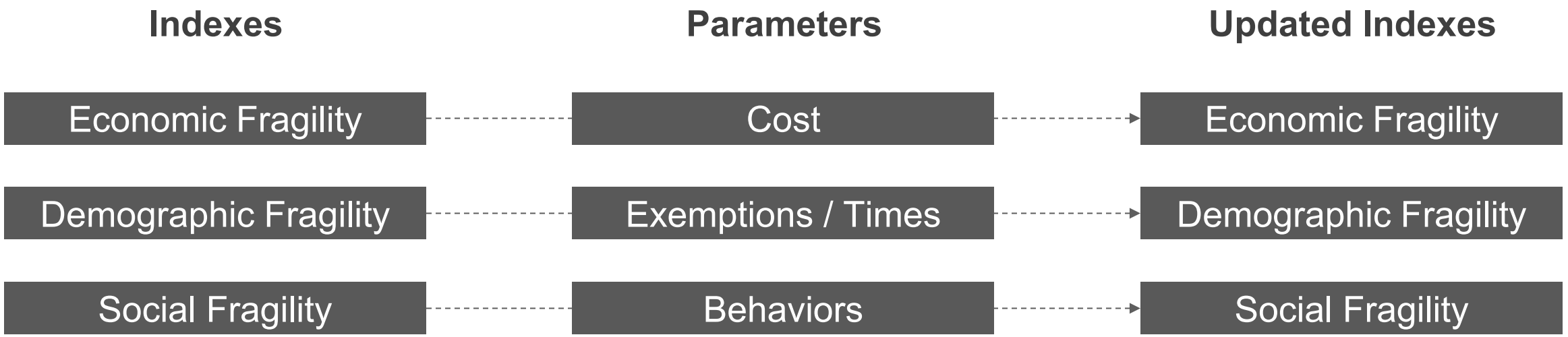
Approach:

- **Fragility indexes**: analytical and summary indicators of demographic, social and economic fragility in different zones of the city (“as-is” scenario)
- **Effort functions**: measure the additional effort (cost, time) for fragile groups of citizens due to a mobility policy
- **Updated fragility indexes**: updated analytical and summary indicators, for zone and for fragile groups of citizens (“what-if” scenarios)

Models and algorithms - Urban fragilities

Goal:

- Identify and manage indirect discrimination and mobility gaps (due to gender, age, abilities, economic condition, language, ...)



Models and algorithms - Urban fragilities

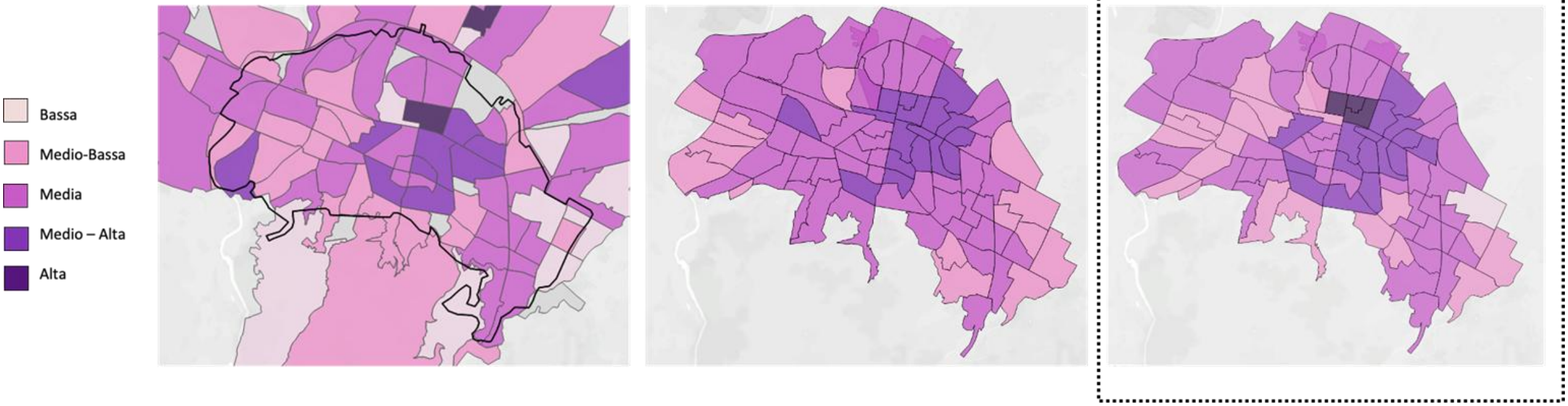
Key issue: Fairness in data and algorithms

Conversion to mobility zones

Statistical areas

Average

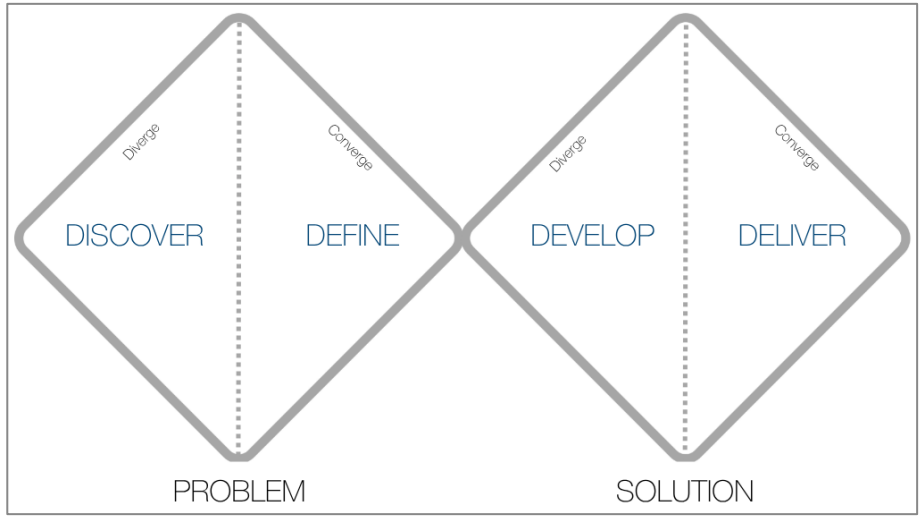
Weighted average



Key Aspects

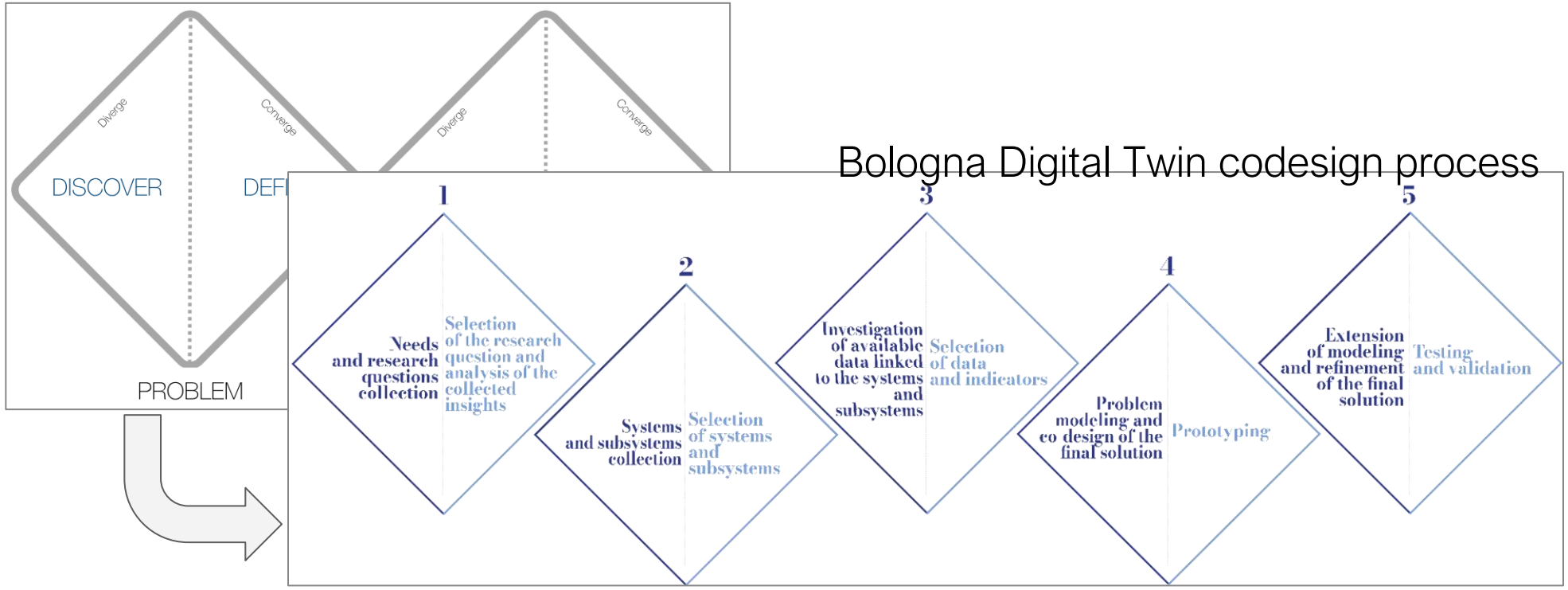
- Data and AI Platform
- Data governance
- Models and algorithms
- Codesign methodology

Co-design methodology

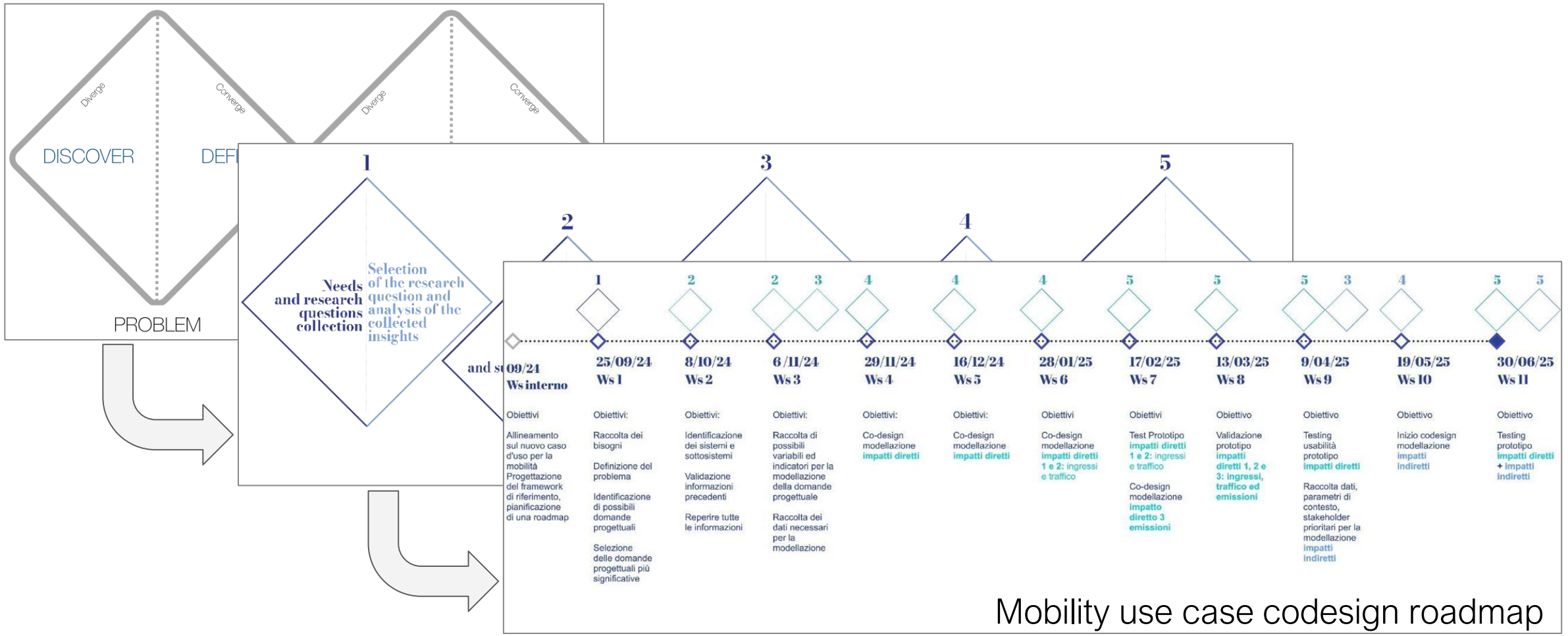


Design Thinking
“double diamond”

Co-design methodology



Co-design methodology



Mobility use case codesign roadmap

Status and next steps

First Outcomes and Available Tools

Bologna Digital Twin currently provides the Municipality with an initial set of technological and procedural components:

- Data and AI Platform
- Strategy and Initial Tools for Data Governance
- Application to Specific Policy Domains
- Civic Digital Twin Solution
- Geometric and Physical Model
- Codesign and Capacity Building methodologies for Digital Transformation

Next steps - 2026 priorities

Civic Digital Twin Model Evolution

Extension of the model, new tools, and public interface: thematic focus on Mobility, Heatwaves, Historic Center.

3D Geometric Model

Development of an interactive 3D city model with integrated thematic data and combined with the Civic Digital Twin for comprehensive simulation

Data Governance

Evolution of processes and tools for secure, transparent and integrated data management.

Fairness and Inclusion

Development of indicators to assess equity in models and scenarios for vulnerable groups.

AI Ethics and Reliability

Sandbox for AI Act compliance: safety, transparency, and reliability.

External Engagement

Civic participation, data crowdsourcing, and codesign of the public interface.

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Cofinanziato dall'Unione europea
Presidenza del Consiglio dei Ministri
Dipartimento per le politiche di coesione e per il sud

Q&A

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Comune di Bologna

Marco Pistore
Lead Researcher
Fondazione Bruno Kessler

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Continue the discussion after the webinar!

Smart cities and digital twin technology: the Case of Bologna

Submitted by Hannah KROKER on Wed, 07/01/2026 - 17:21

Topic: Academy webinars

You have watched our **smart cities webinar about Bologna's digital twin** and still have questions or comments? **Then you are in the right place!**

On the 23rd of January, we were joined by Stefania Paolazzi from the Comune di Bologna and Marco Pistore from Fondazione Bruno Kessler, the organisation monitoring the digital twin, to hear about how this smart use of data supports the governance of Bologna.

Is your city applying similar smart city tools or looking to do so? Can you think of any other use cases for such urban technology?

Let us know in the comments!

Login using your EU login account to share your thoughts in the comment section down below.

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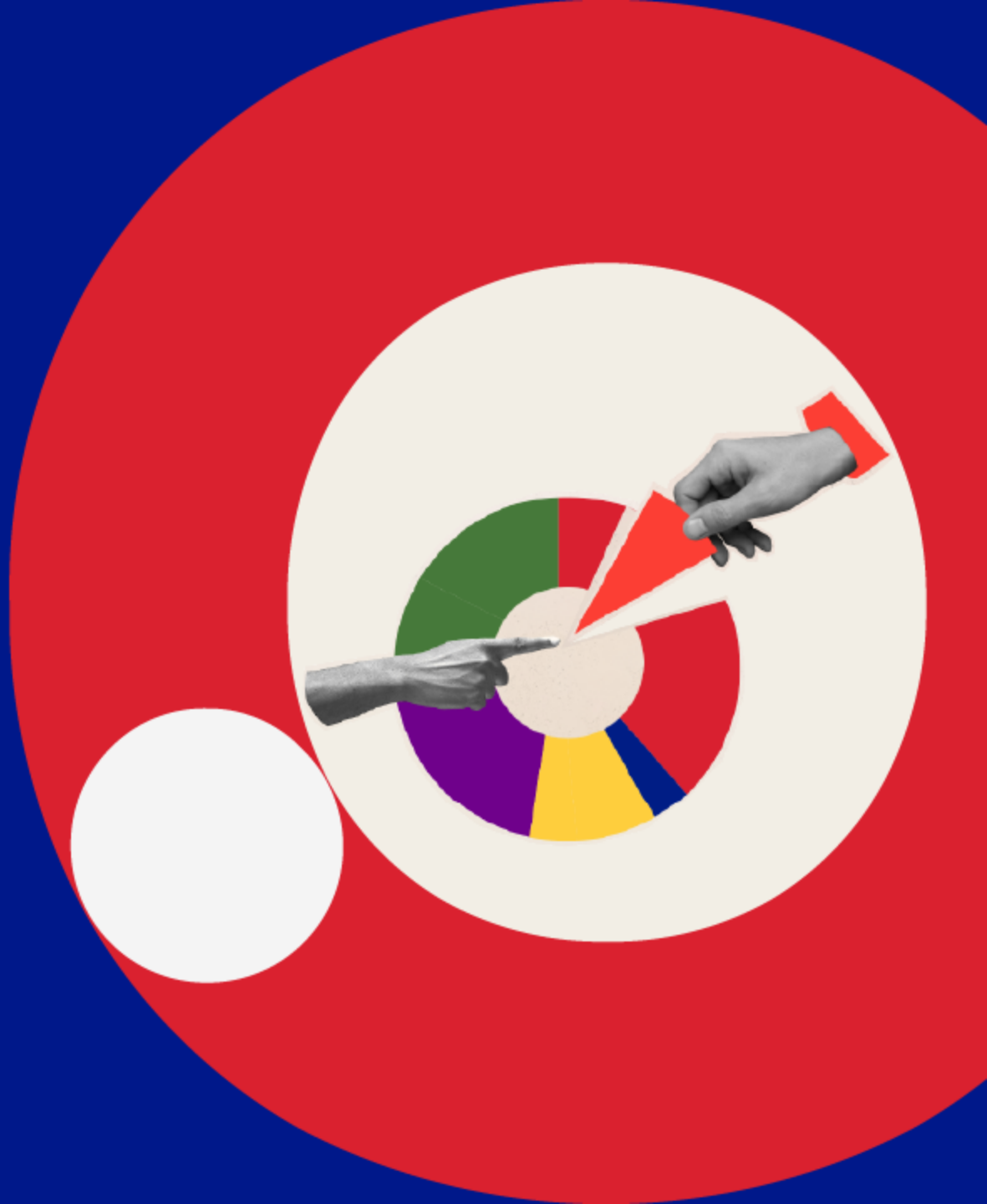
Your opinion is important to us!



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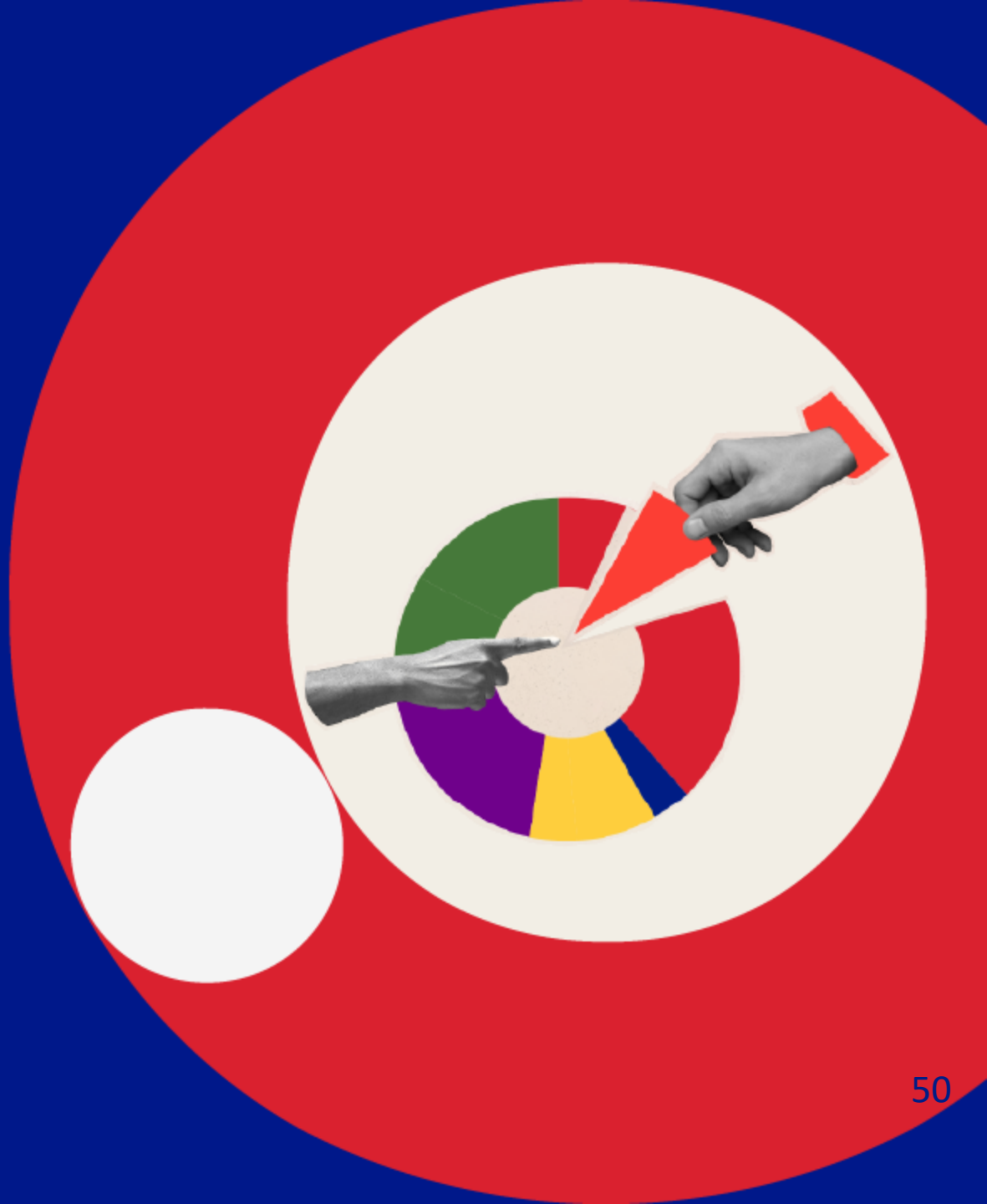
Thank you!



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