# Bologna Digital Twin
## Enhancing the public value of data

Comune di Bologna

FONDAZIONE BRUNO KESSLER

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

CINECA

fondazione innovazione urbana

*Inspiring vision*

# We want to create a more just, fair and sustainable city

The Administration is committed to make Bologna the **most progressive city in Italy,** by promoting an alternative model of development, capable of contributing to the **solution of economic, social and environmental challenges**.

The success of this vision lays on the implementation of major strategies and investments for the social, environmental and technological transition of the city and the enhancement of Bologna's historic values:

| City of Knowledge | 100 Climate Neutral Cities | Green footprint | Housing Plan |
|---|---|---|---|
| To relocate the axis of the city's **economic and social development on the knowledge dimension** with the redevelopment of a large area of the city and the creation of active policies. | To achieve **climate neutrality by 2030** through investments on new mobility, education and information, energy efficiency, waste management and urban greening. | To improve **people's health, quality of life and public spaces** with the construction of a large green infrastructure embracing the entire city. | To tackle the **housing crisis and foster talent retention** by creating ten thousand homes in the next 10 years. |

# A new tool to address contemporary challenges and bring concrete change

Bologna's DT will provide a new civic infrastructure for the entire city. It will be financed through an initial investment of **7 million euro** from PN Metro Plus funds.



Bologna's DT will allow us to:

Using data and knowledge to **implement analysis and forecasts** to address the needs of the city, its citizens and users.

Supporting decisions that bring substantial change to city government and to **tackle environmental, economic and social challenges** by experimenting with different forms of public engagement.

Activate knowledge processes that can generate **new economies** and responsiveness to **improve territorial governance.**

Photo credit: Margherita Caprilli

# An essential pillar of the City of Knowledge

The Digital Twin is a fundamental component of the **'City of Knowledge'**, the strategy that the administration is deploying to drive Bologna into the future through the attraction of new investments with a **high innovation profile** and to foster processes of **social inclusion** and empowerment of the metropolitan **democratic fabric.**

In particular, it is one of the the **Knowledge Policies**, together with the Plan for Science and Research and the Knowledge Factories.

**KNOWLEDGE PATHWAY AND TECNOPOLO**

**CITY OF KNOWLEDGE**

**KNOWLEDGE POLICIES**

Science, research and advanced training

Economic development, high quality work and international attractiveness

Widespread knowledge and culture

*The Digital Twin's added value*

# A strategy to improve the quality of life, generate opportunities and play a new national and international role



### MUNICIPAL LEVEL

A **new civic infrastructure** that can be used to generate public value.

It will enable a **new pact** between the city, its citizens and other relevant stakeholders.

It will improve the **social and economic impact** of urban policies; stimulate the development of **new enterprises and services**; involve all the realities of the **territory.**



### REGIONAL AND NATIONAL LEVEL

It will give Bologna a leading, innovative and frontier role in the development of **Data Valley** (Spoke 9 of the **National High Performance Computing Centre: Digital Society & Smart Cities**).

It will position Bologna as an Italian **model to be followed** in building the Digital Twin.
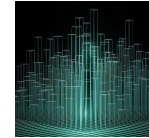


### INTERNATIONAL LEVEL

It will increase the **city's attractiveness** to people and organisations interested in contributing to frontier issues related to global challenges.

It will allow to strengthen **relations with European cities and its excellences as Barcelona Municipality and BSC (international protocol) and Hamburg.**

It will allow to join the **network of cities collaborating on pan-European digital services**.

*Digital Twin Understanding*

# A digital model designed to accurately reflect city behaviour

A Urban Digital Twin is a full digital model of the city, which continually adapts based on the collected online data and information, supports decision making through analysis and forecasting and is capable of co-evolving with its physical counterpart.

A Urban Digital Twin offers a model of the city:

➢ **Comprehensive:** represents the city with its physical infrastructure, processes, social and organisational dynamics

➢ **Integrated:** capable of capturing the complexity of relationships and mutual influences between different urban systems

➢ **Dynamic:** it is able to co-evolve with the city, feeding off data from the city itself

➢ **Predictive:** it is able to predict and anticipate behaviour and changes occurring in the real world
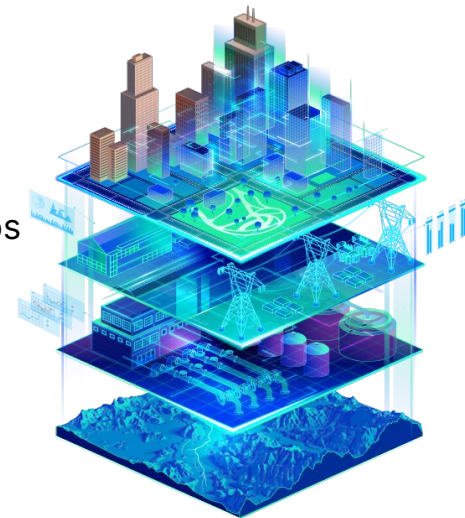
# A virtual tool that works in symbiosis with the city

Real City → Digital Twin

Real City ⇄ Digital Twin

Real City ← Digital Twin

**Analysing, correlating and visualising data** to facilitate understanding and exploration of city phenomena and systems.

**Anticipating** urban developments and emerging risks, and **assessing their impacts**, also by constructing hypothetical scenarios and simulating their evolution over time.

**Monitoring** the evolution and effects of external events and government actions.

**Optimising** the effectiveness of services and the impact of government actions by continuously reviewing them based on data on their functioning.

Supporting **decision processes** and the translation of decisions into **actions** aiming at urban change.

**Involving citizens** in design activities and behavioural change processes, which start from the digital and move into the real city.

# 3 features that make our Digital Twin unique







The **civic value.**

The project is led by the administration and based on a pact with all city stakeholders with the aim to build share knowledge, create new data with citizens and implement new solutions together.

A **Research and Innovation** approach.

Bologna wants to be a research and innovation laboratory where the administration plays a leading role in promoting cutting-edge projects and experimenting with the most advanced technologies and Artificial Intelligence .

The **ethical** dimension

The project is based on the importance of ethics, respect for citizens' digital rights, transparency, fairness, neutrality and data protection and algorithmic ethics.

*Bologna Digital Twin' dimensions*

# A comprehensive and coordinated model of action to generate public value

It is a **POLICY** that generates awareness of the value of data, regulates its democratic and civic use and guides the generation of public value.
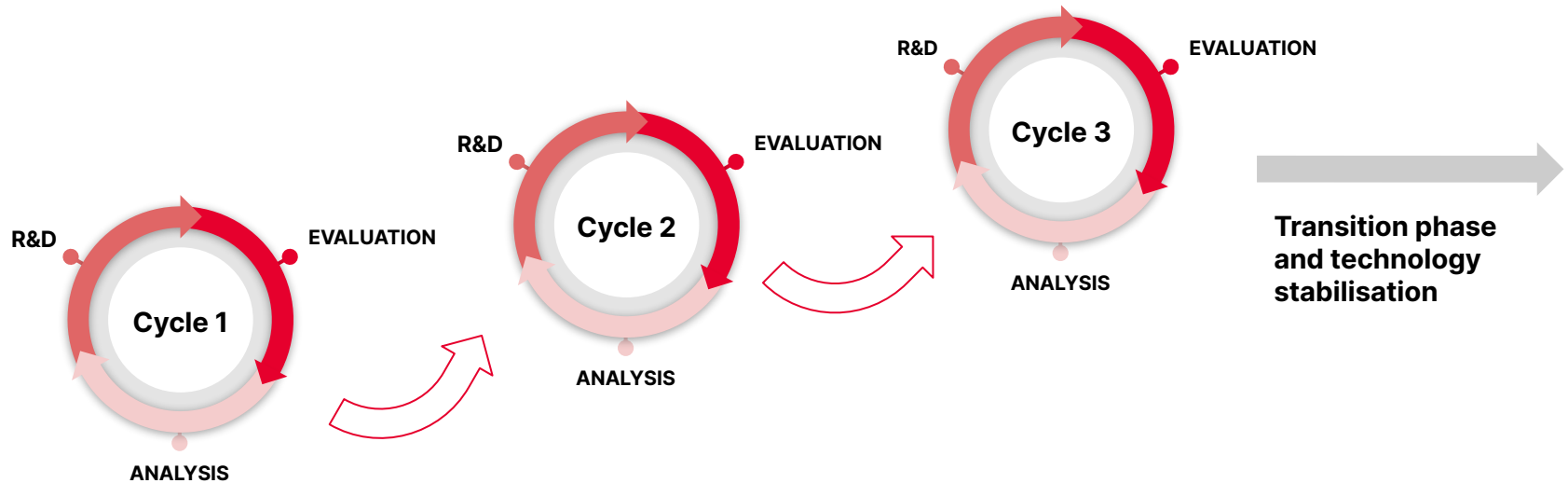
**Bologna DT**
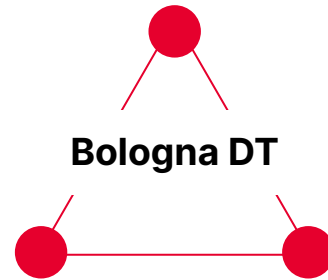
It is a long term **PROCESS** based on new practices, research, scenario creation, forecast development and continuous monitoring.

It is a **TECHNOLOGY** for collecting, analysing, integrating, visualising and simulating city data and supporting decision-making processes.

# An incremental approach to design and test innovation

The development of the Digital Twin of Bologna requires a progressive and incremental project:

- ➢ starting from what we know how to do and studying what we do not yet know how to do
- ➢ starting from problems that are already clear and codified in order to make new, more complex problems emerge
- ➢ building broader and more structured partnerships and collaboration networks



**Transition phase and technology stabilisation**

# Enhance Bologna's human capital, former innovation and existing technologies



**ADMINISTRATIVE CAPACITY**
Key factor in activating and accelerate innovation projects



**DATASETS**
Indispensable for modeling, training and implementing new tools



**DIGITAL INFRASTRUCTURES**
Enabling the connection information, projects and strategic assets
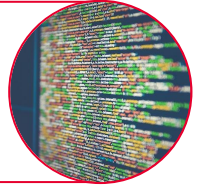


**SOFTWARE & REUSABLE PLATFORMS**
To improve sustainability, interoperability and diffusion



**PARTNERS' CAPABILITIES**
All the necessary skills, experience and track record

# First domains to refine tools and activate experimentations



## MOBILITY

Supporting the city in the challenges that will transform urban mobility (30 km/h city, trams, cycle lanes).

Enhancing data assets: data integration and access; advanced analysis; new data sources from partner companies.



## ENERGY

Analysing the energy response of the city's building stock and supporting sustainability assessments.

Simulating the impact of new projects in urban plans, design alternatives, policies and incentives.



## CLIMATE CHANGE

In light of the emergency that hit the Toscana region, and before Emilia-Romagna, a use case related to the issues of climate change and hydrogeological instability will be developed.

The planning of the activities of this use case will be the subject of the first months of activity of the working group.

*Consortium*

# A public consortium of internationally recognized excellence who have chosen to team together



**Comune di Bologna**

*Strategic management*

The project sponsor and the ultimate responsible for all strategic decisions. Moreover, Municipal department have an active role in the use cases implementations.

**FONDAZIONE BRUNO KESSLER**

*Technical Coordinator & Project Manager*

General manager, coordinating the Bologna Digital Twin Project Consortium and supervising its progress.

**ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA**

*Scientific Manager*

Scientific leader, responsible for the research development and results.

**CINECA**

*Technical Manager*

Supervisor of the technology requirements, of the software development and of the technological infrastructure management.

**fondazione innovazione urbana**

*Community Manager*

Responsible for ensuring that the knowledge produced within the project is shared with citizens and stakeholders.

# Timeline and milestones

**Codesign and dataset construction** with internal users and citizens

**Use cases as** demonstrators of the potential of the model

Business model, data value and BDT governance

Data-driven decision making and **civic use** of BDT

**Finalisation of the platform.**

Launching **evolution and sustainability strategy**

**Ethics and privacy** in the DT system

**2023**      **2024**      **2025**      **2026**

Clear and shared vision, objectives and **workplan**

Economic **resources** and **expertise** needed

Partnership with the **National HPC Center** and the cities of **Barcelona** and **Hamburg**

First **platform prototype**

**Platform extended** version

**Cross-sectoral use cases**, integrating social and economic dimension

**Trustworthy AI** and algorithms privacy preserving

Involvement of **industrial partners**

# Thank you!

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