EU INITIATIVES AND OPPORTUNITIES IN THE SMART CITY DOMAIN: TOWARDS NETWORKED LOCAL DIGITAL TWINS

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BDV BIG DATA VALUE ASSOCIATION
in collaboration with
LNDS LUXEMBOURG NATIONAL DATA SERVICE
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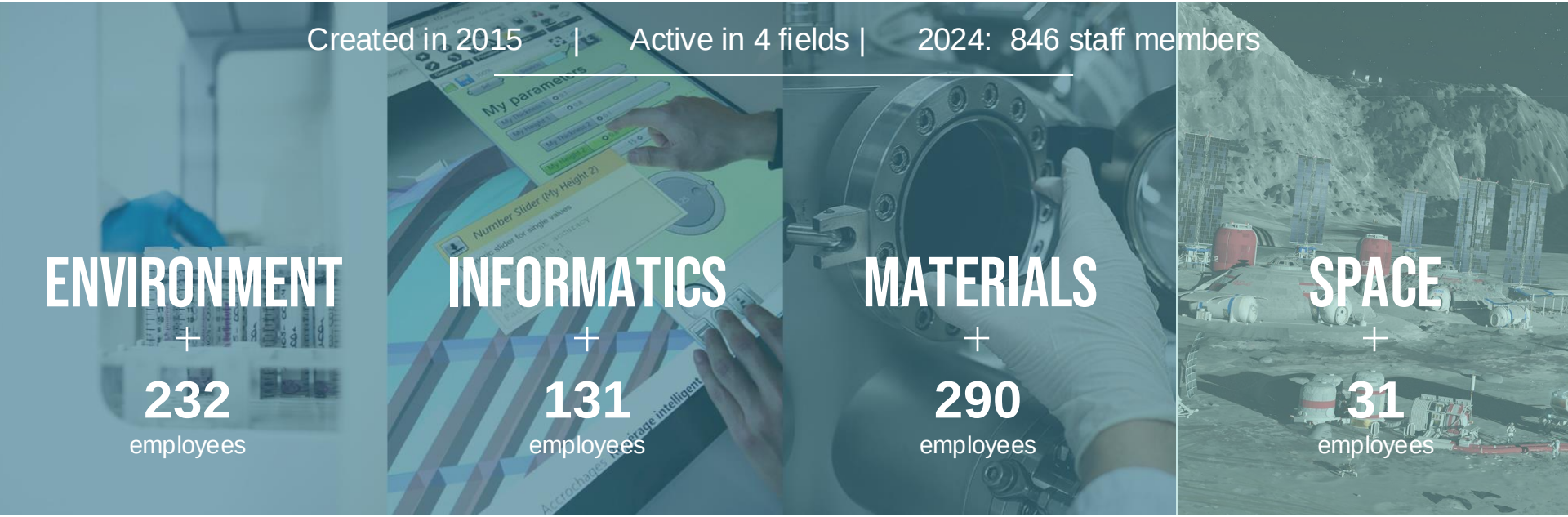
THE LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY

A REFERENCE IN RESEARCH AND INNOVATION FOR A DIGITALIZED, RESILIENT & SUSTAINABLE SOCIETY

Created in 2015 | Active in 4 fields | 2024: 846 staff members



ENVIRONMENT
\+
232
employees

INFORMATICS
\+
131
employees

MATERIALS
\+
290
employees

SPACE
\+
31
employees

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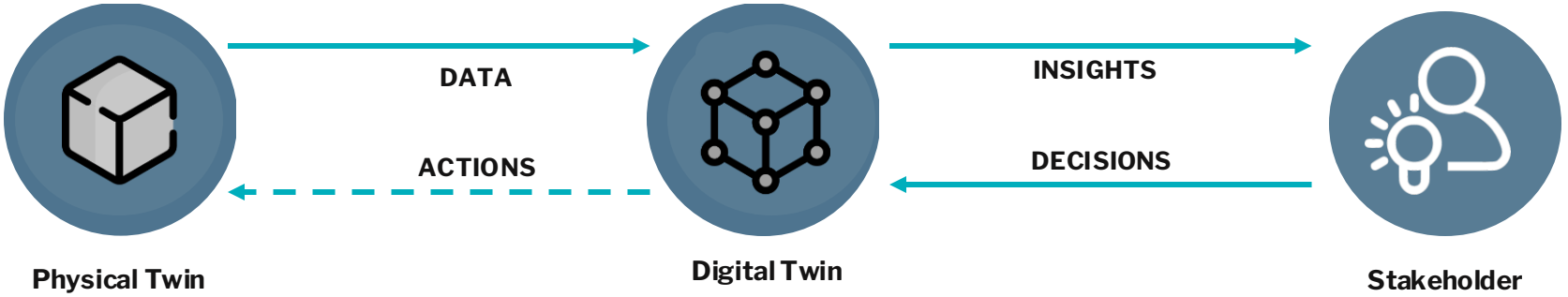
WHAT IS A DIGITAL TWIN?

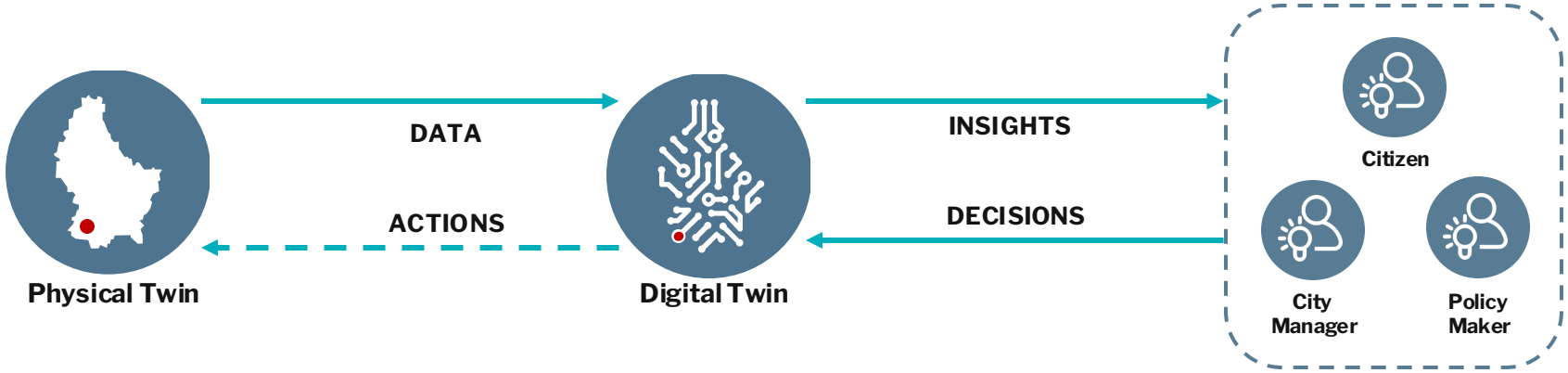


- A Digital Twin is a comprehensive **virtual representation** of a real-world physical entity (product, system or process)
- A Digital Twin mimics the *properties*, *conditions* and *behaviour* of the physical entity using **Models** and **Data**

But, to do what?

- To better **understand** the physical entity
- To **monitor** its status and ongoing events
- To **predict** its future behaviour
- To **simulate** *what-if* scenarios
- ➢ To **support** (and actuate) **decisions**!

DIGITAL TWINS IN SMART CITIES: LOCAL DIGITAL TWINS (LDT)



- A **Local Digital Twin** focuses on a specific geographic region, community, or local entity (e.g., a city or district), covering several topics of interest.
- It integrates **local data**, **context-specific models**, and **real-time feedback loops** to represent and simulate the local environment.

- **Why Use an LDT?**
  - To address **local challenges** (e.g., mobility, energy usage, waste management, noise, pollution).
  - To support the **evolution of local infrastructure** through what-if scenarios analysis.
  - To enable **data-driven collaborative decision-making** between local stakeholders and citizens (e.g., Citiverse).

Opportunity → Accelerating LDT adoption by using common (AI) **tools** and **data spaces**, embracing **interoperability**

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SEVERAL ONGOING INITIATIVES RELATED TO LOCAL DIGITAL TWINS

European dat
for smart co

What are their roles?

Which expected outcomes?

itCom AI

DT CitiVERSE
EDIC

What a long-term strategy?

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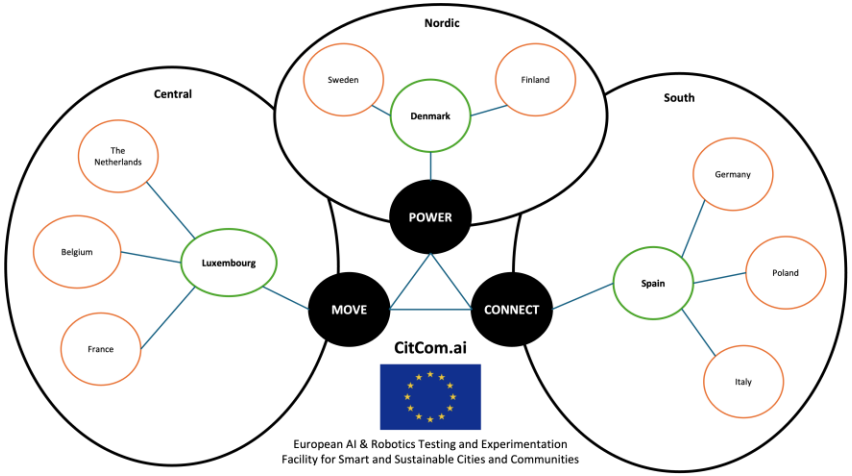
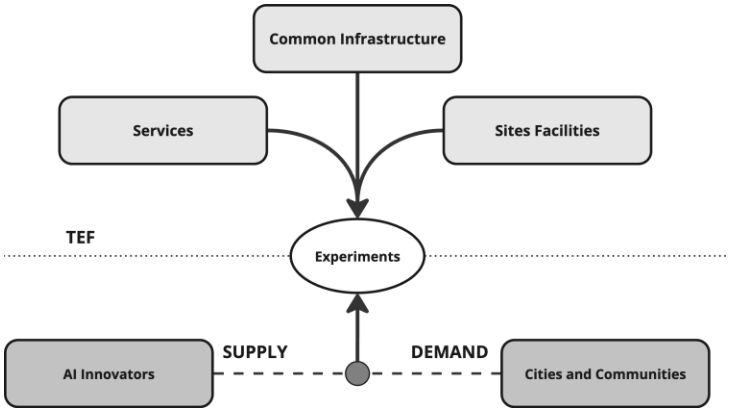
TEF
BRINGING RESPONSIBLE AI TO EUROPE AND THE WORLD

CitCom.AI

- The **EU AI Testing and Experimentation Facility (TEF) for Smart Cities and Communities**, one of the four TEFs in the EU
- TEFs are **specialized large-scale reference sites open to all technology providers across Europe** to co-funded test and experiment at (city) scale with state-of-the-art AI solutions
- CitCom.ai allows AI Innovators and Smart Cities and Communities to experiment across **15 TEF Sites in the EU offering a complete Service Catalogue**:
  - ***Access to Physical Facilities*** (e.g., Smart Intersections, IoT sensing deployments)
  - ***Access to Virtual Facilities*** (e.g., LDTs, Data Platforms, Computing Environment)
  - ***Algorithm Creation and Validation*** (e.g., co-creation or AI solutions for cities)
  - ***Compliance and Ethics Assistance*** (e.g., regulatory sandboxes)
  - ***Opportunity Assessment and scoping*** (e.g., digital opportunity assessments)
  - ***Impact Assessment*** (e.g., viability and desirability of AI innovation in cities)
  - ***Ecosystem Engagement*** (e.g., showcasing AI innovators technologies)





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SERVICE CATALOG IS ONLINE: CITCOM.AI/SERVICES

11 Countries

15 TEF Sites

135 Services online

Services

Everything Virtual Facility Access Physical Facility Access Compliance and Ethics Assistance Scope Definition / Opportunity Assessment Community & Engagement Services Algorithm Creation & Validation Services

Everywhere Belgium Denmark Netherlands France Spain Poland Italy Sweden Finland Luxembourg

Virtual Facility Access

Virtual facility services provide easy access to computing resources, supporting remote experiments and real-time data analysis. Data models enhance interoperability, offering domain-specific datasets.

Physical facility services enable AI innovators to test in city infrastructure, receiving support for procedure guidance, street closure, and installation.

This accelerates solution validation, advancing Technology Readiness Levels. Citizen engagement involves creating specific scenarios, and physical infrastructure, combined with a regulatory sandbox, ensures legal compliance for testing zones. This comprehensive approach closes gaps between AI innovators and cities, reducing deployment time and fostering collaboration, advancing innovation and creating value across domains.

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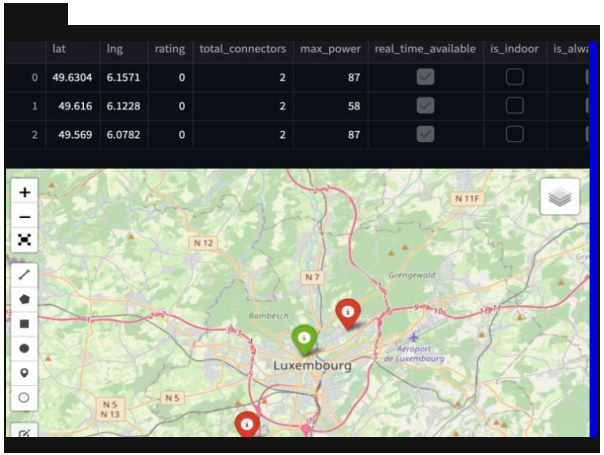
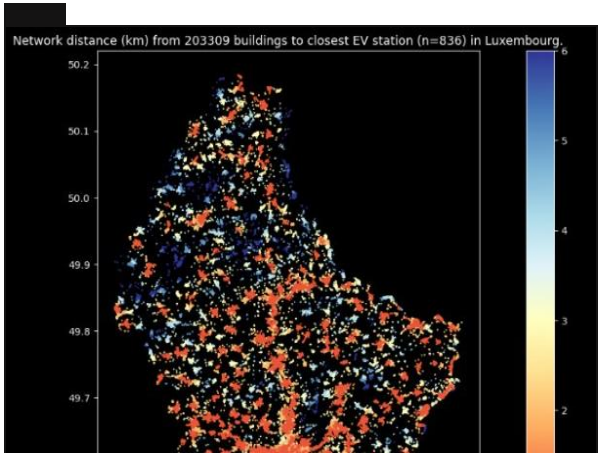
EXPERIMENT EXAMPLE #1: ALGORITHM CREATION AND VALIDATION



	lat	lng	rating	total_connectors	max_power	real_time_available	is_indoor	is_alwa
0	49.6304	6.1571	0	2	87	☑	☐	
1	49.616	6.1228	0	2	58	☑	☐	
2	49.569	6.0782	0	2	87	☑	☐	



The Partner

SWIO (LOSCH Group)

CPO in Luxembourg (#2 in the market)

Growing their network across LU cities

The Problem

Obtaining the best possible location for future EV stations is not evident, trade-off between investment and predicted occupancy

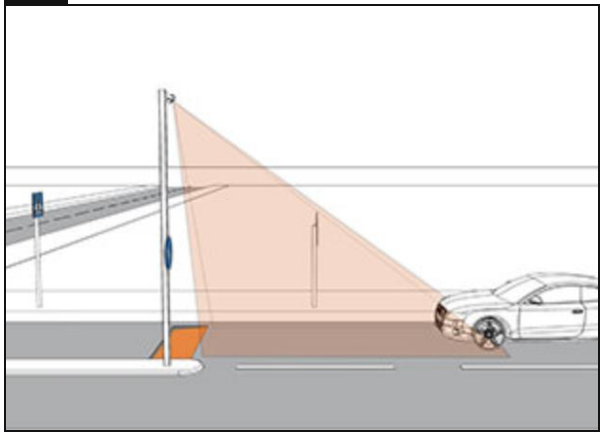
Taking into account nearby point of interests and contextual/demographic information.

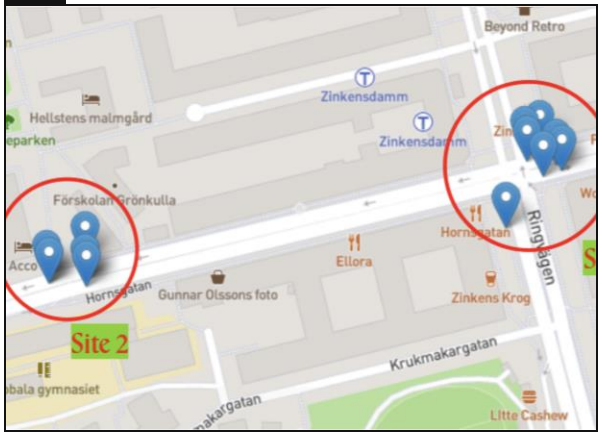
The Outcome

A powerful dataset: augmented customer charging transactions with Open Data Portal (LU) and ChargeMap availability maps

An ML model to predict occupation and a Streamlit tool to (i) understand the main trends of occupancy of chargers and (ii) optimize the location of chargers based on contextual data

EXPERIMENT EXAMPLE #2: COMPLIANCE AND ETHICS





Partner

Edeva AB

Service ID: AI Policy Evaluation Guidance

The problem

Prediction of traffic flow for dynamic traffic management applications

Verify an AI system for traffic management purposes (TRL 8), test its functionality, and analyze its legal implications concerning the AI Act as a potential high-risk model

The Outcome

Site support for aggregation of traffic and mobility data

SME support for generating AI models and synthetic data set(s)

Policy support (law, standards etcetera)

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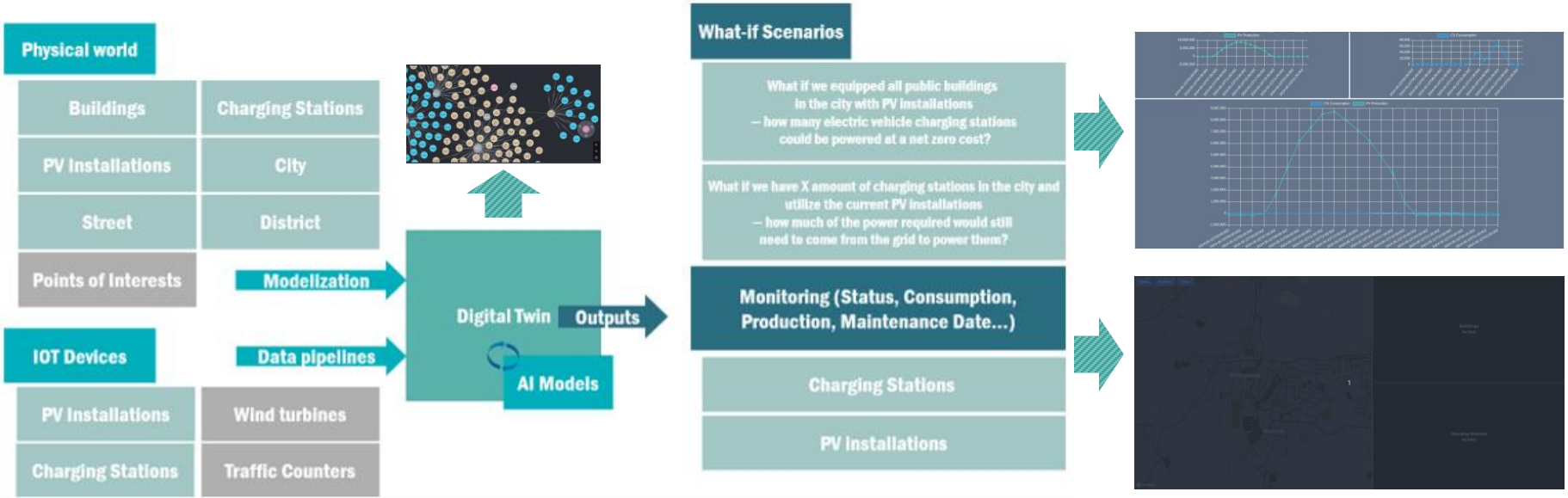
EXPERIMENT EXAMPLE #3: VIRTUAL FACILITY

Testing LDT toolboxes for cities to model clean transition to Electromobility



JOIN THE TEF!

You are an **AI Innovator** aiming to test your AI solution in reference SCC **TEF**

- **Contact us to frame an experiment in one (or more) of our EU Facilities**
- **Testing and Experimentation are possible (and co-funded) through CitCom.ai !**

You'd like to evaluate the use of **AI & Local Digital Twins** for your **City**

- **Take a look to our AI Testing, Evaluation, and Assessment Services**
- **We support co-creating, testing and validating your first AI solutions through CitCom.ai TEF**

CitCom AI

Online Service Catalog: https://citcom.ai/services

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The EU LDT Toolbox | Overview

EU LDT TOOLBOX

Digital EU Tender “Development of the Local Digital Twins (LDT) toolbox for Advancing the transformation of Smart Communities” (Lot 1: Development, Lot 2: Monitoring & Quality)

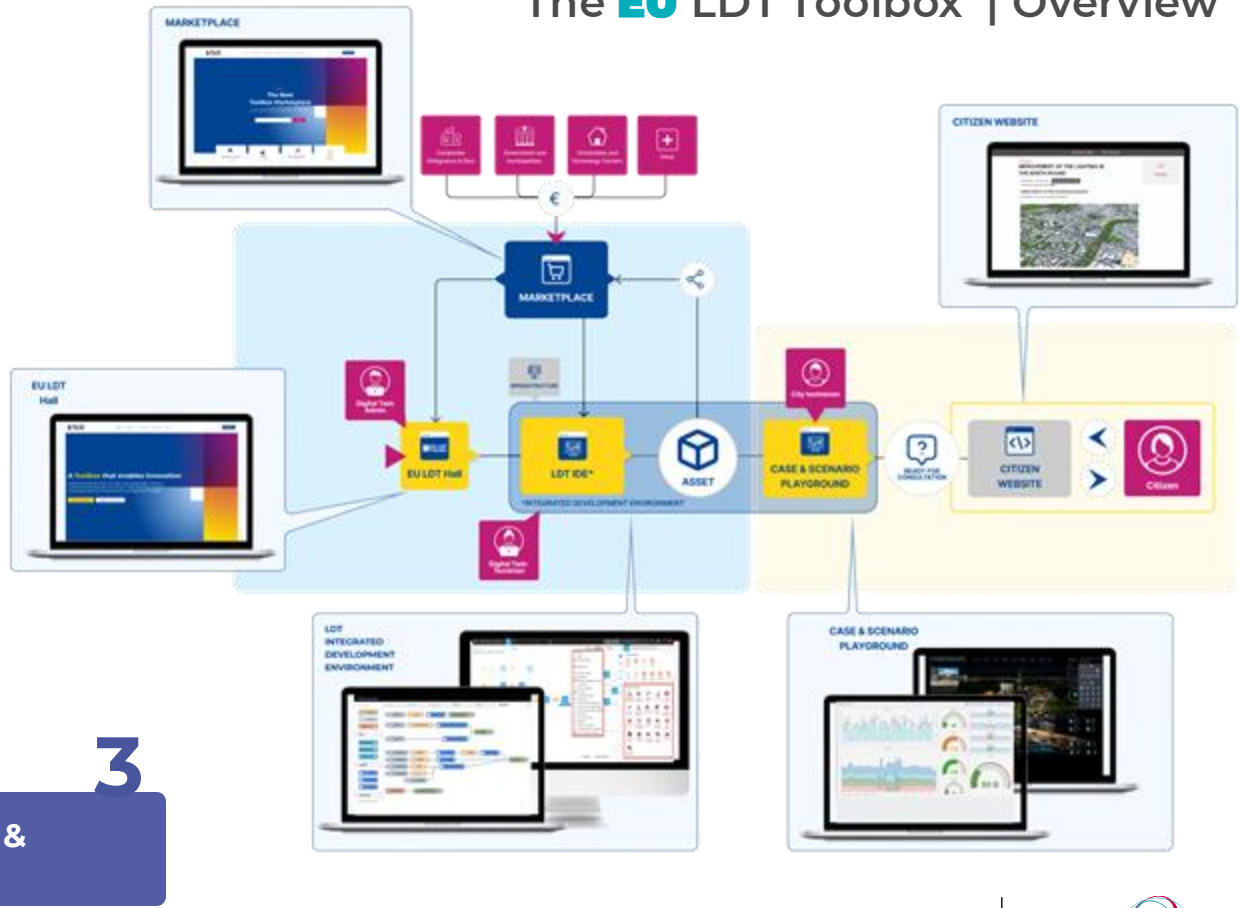
The **EU LDT Toolbox** is a suite of tools to enable digital twins benefits in EU cities, driven by interoperability.

DEVELOPMENT ONGOING

1 **Capture, integrate & develop**

2 **Simulate & forecast**

3 **Participate & engage**



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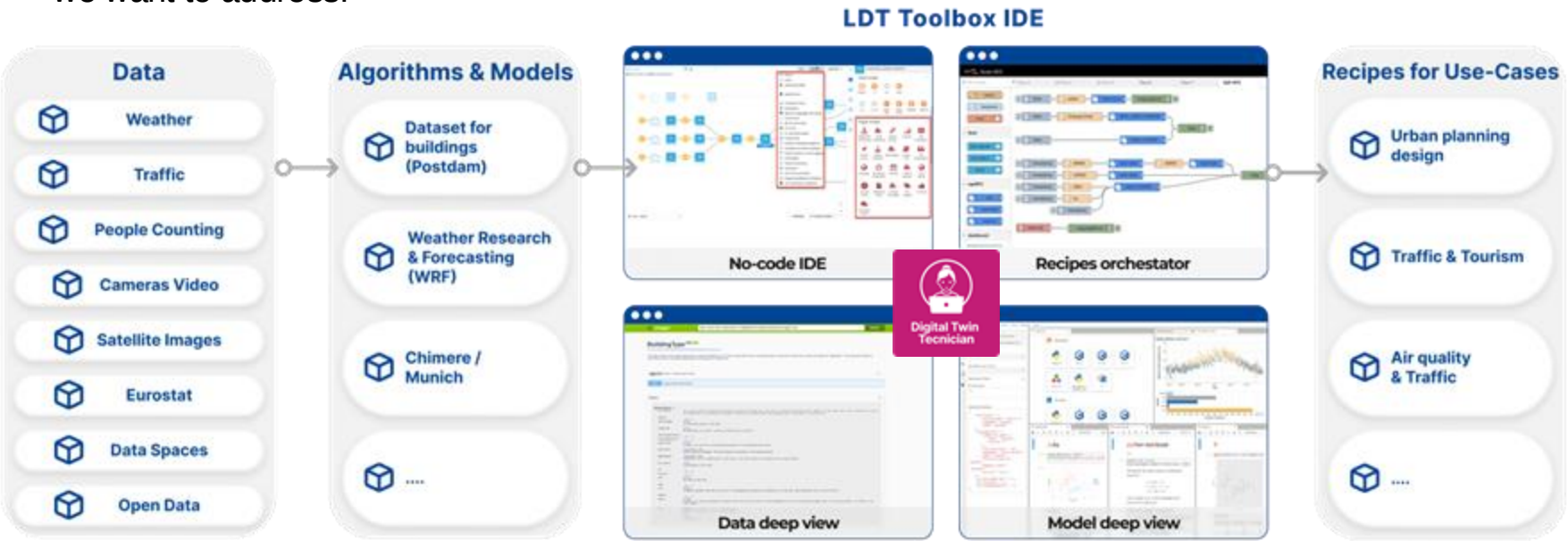
1. Capture, integrate and develop

Capture and integrate data, then develop algorithms, models, and recipes for the use-cases we want to address:

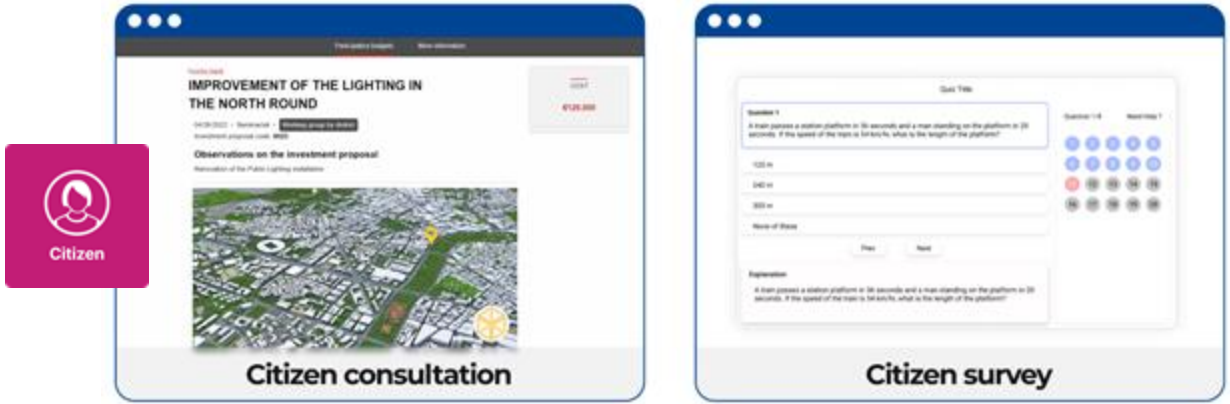


2. Simulate & forecast

City technician

3. Participate and engage

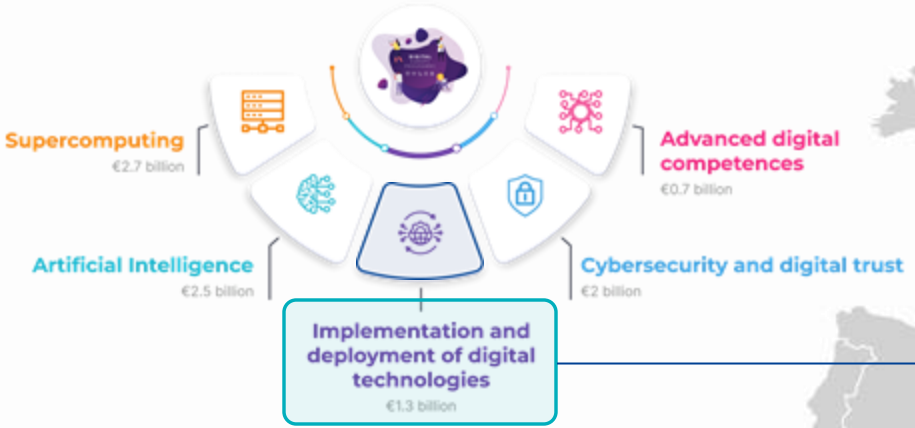
- Validate
- Monitor



EU DIGITAL STRATEGY

FUNDING FOR DIGITAL PROJECTS

DIGITAL EUROPE PROGRAMME



EU Digital Infrastructure Consortium

Instrument of the Digital Decade Program fast implementation of multi-country projects.

Established by a Commission decision and made of 3+ member states

Deploying a common infrastructure and delivering services to member states

EDIC LDT & CitiVERSE

Exploiting the different EU assets, including the LDT Toolbox in a Sustainable mode with a dedicated entity

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Reasons Why

1. To create a **common** & **sustainable** European Digital infrastructure for LDTs
2. To enable a **true ecosystem** of **networked** LDTs across the EU cities and regions
3. To **go beyond** pure research activities, experiments and pilots
4. To **avoid repetition** and enable **replicability**
5. To support the deployment of large-scale innovative technologies, **powered by AI innovators**
6. To provide **recommendations** for future RDI in SCC

Who?

Member States:

- Signatory Member States: Spain, Slovenia, Estonia, Latvia, Croatia, Portugal, France, Czech Republic, Luxembourg, Belgium, Slovakia, Italy.
- Now collecting interest from Cities & Regions from member states and beyond

Synergies with other EU initiatives:

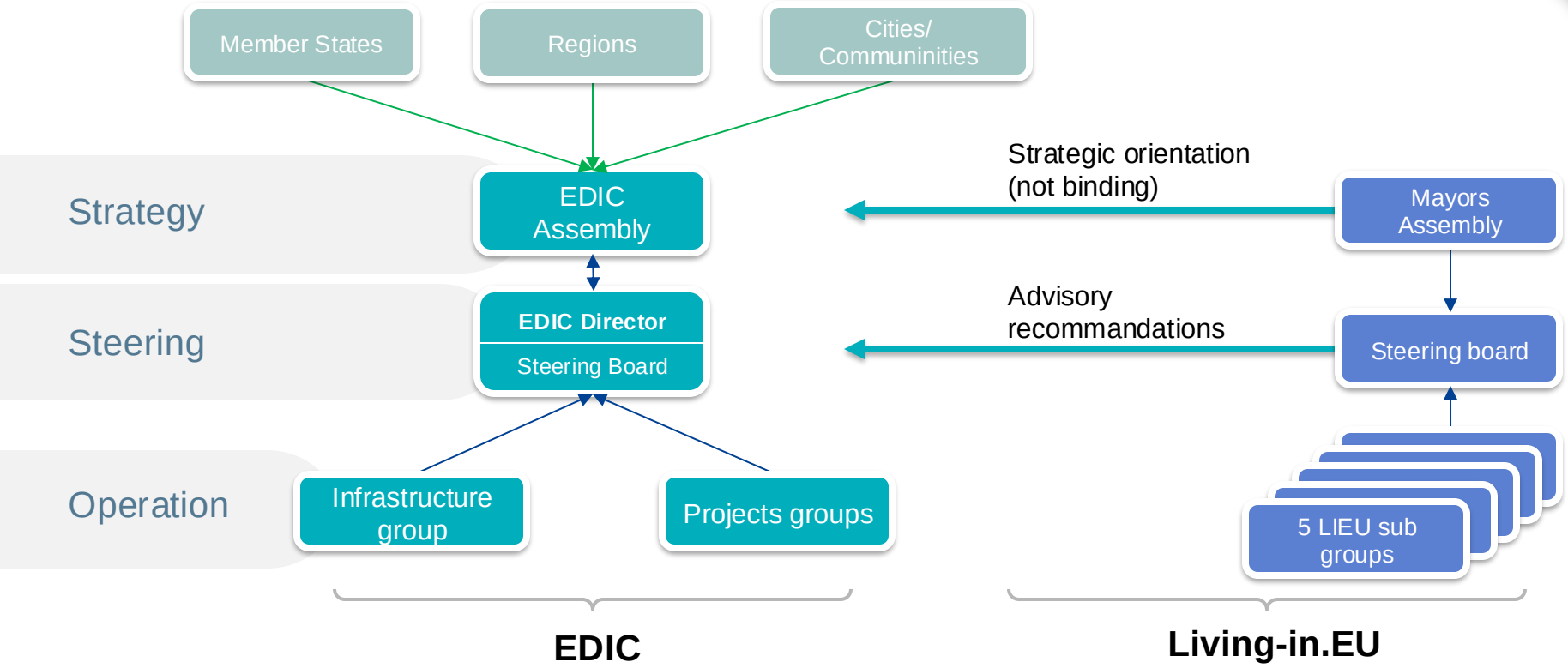
- Living-in.eu
- EDIH
- Scalable cities
- TEFs (AI)
- DS4SSCC (EU Data Space for SCC)
- National Networks: Innpulso, RECI
- International Networks : ITU (UN), OASC

EDIC Chair

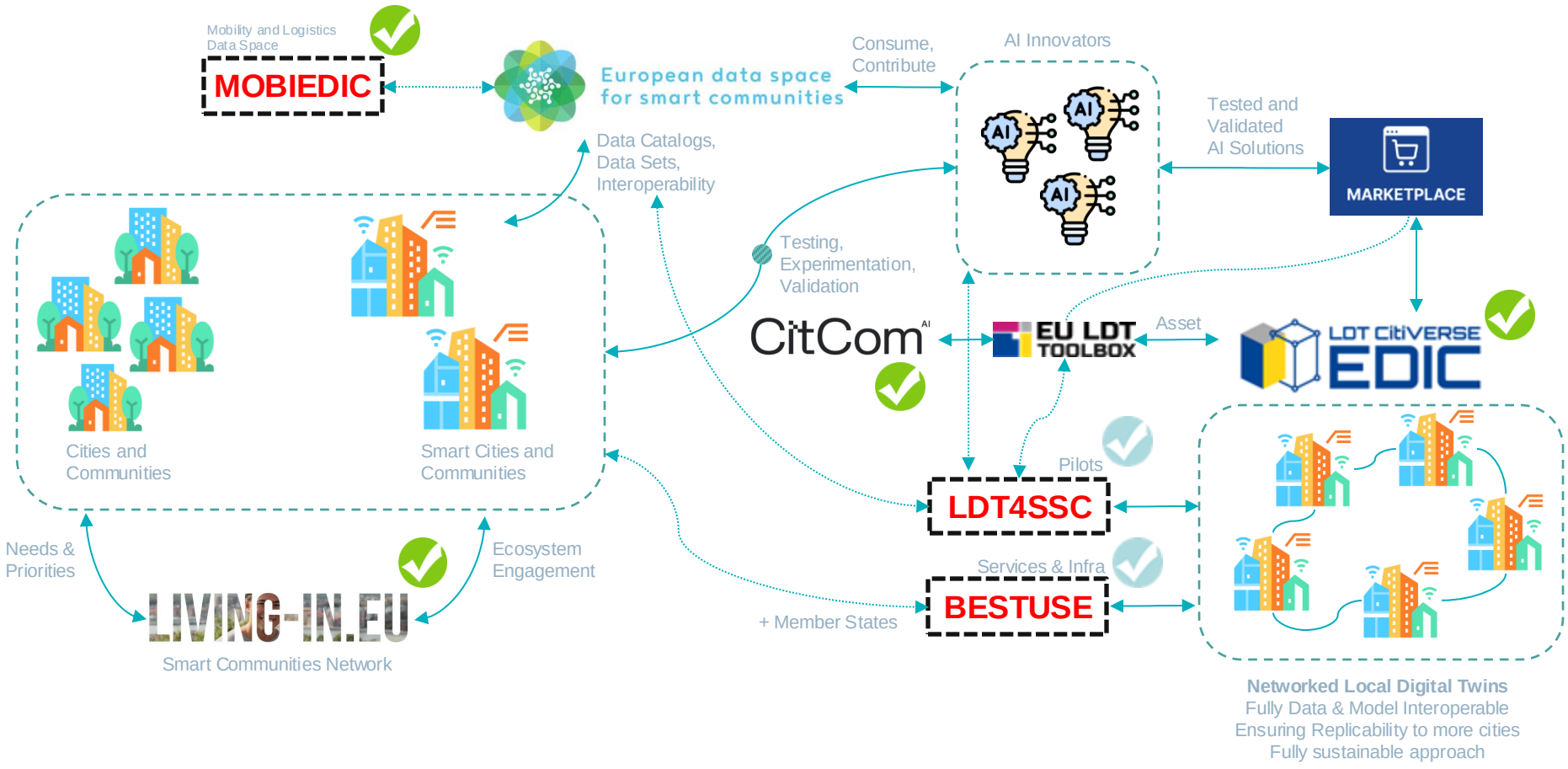
AJUNTAMENT DE VALÈNCIA

SmartCity València

Governance


Member States
Regions
Cities/ Communinities
Strategy
EDIC Assembly
Strategic orientation (not binding)
Mayors Assembly
Steering
EDIC Director
Steering Board
Advisory recommandations
Steering board
Operation
Infrastructure group
Projects groups
5 LIEU sub groups
EDIC
Living-in.EU

STRATEGIC ALIGNMENT TOWARDS THE EDIC



KEY TAKEWAYS

- Local Digital Twins (LDTs) represent the upcoming evolution of smart communities, with a strong focus on **interoperability** standards and integrating **data spaces**, ultimately facilitating the **adoption of AI components**
- EU's Vision for **Networked** LDTs goes in the direction of developing a **sustainable**, common European infrastructure, enabling replicable and scalable solutions for Smart Communities coming from a growing marketplace.
- <u>Many opportunities for collaboration:</u>
  - CitCom.ai: bridging the gap between smart communities' demand and innovators' supplies
  - EU LDT Toolbox: City-wide pilot opportunities are upcoming, stay tuned!
  - Becoming a member of the EDIC (as a City of Member State) to access key services and infrastructure

AI-generated image

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EXCELLENCE FOR IMPACT

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