

# Urban Digital Twins for PEDs



Data challenges and citizen co-creation in project DigiTwins4PEDs

## Energy ADE 3.0 Workshop

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**DigiTwins4PEDs**

Utilisation of urban digital twins to co-create flexible positive energy systems for districts

**Future Energy Hub.**

The main concept of the DigiTwins4PEDs project is to use Urban Digital Twins as a digital representation of the real world, opening up a wide range of possibilities for modeling the energy aspects of cities.

This innovative approach aims to create a platform for residents and stakeholders to exchange information, enabling them to visualize various PED scenarios before their actual implementation.

**GET STARTED**



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# Background

- Positive Energy Districts (PEDs) have emerged as a new paradigm for urban decarbonization.
  - Unit of analysis shifts from a building to urban districts.
- EU Strategic Energy Technology (SET) Plan for supporting implementation of at least 100 PEDS by 2025 .
- Positive energy status in existing urban district is hard but principles of PED still matters!
- Digital tools such as Urban Digital Twins are increasingly explored for accelerating PED deployment in EU.
- Citizen engagement and co-creation identified as a key driver for successful adoption of PED principles.



**European Union**

**SET-Plan ACTION n°3.2**  
**Implementation Plan**

# Project DigiTwins4PEDs



## DigiTwins4PEDs

Utilisation of urban digital twins to co-create flexible positive energy systems for districts



**DUT** Driving Urban Transitions

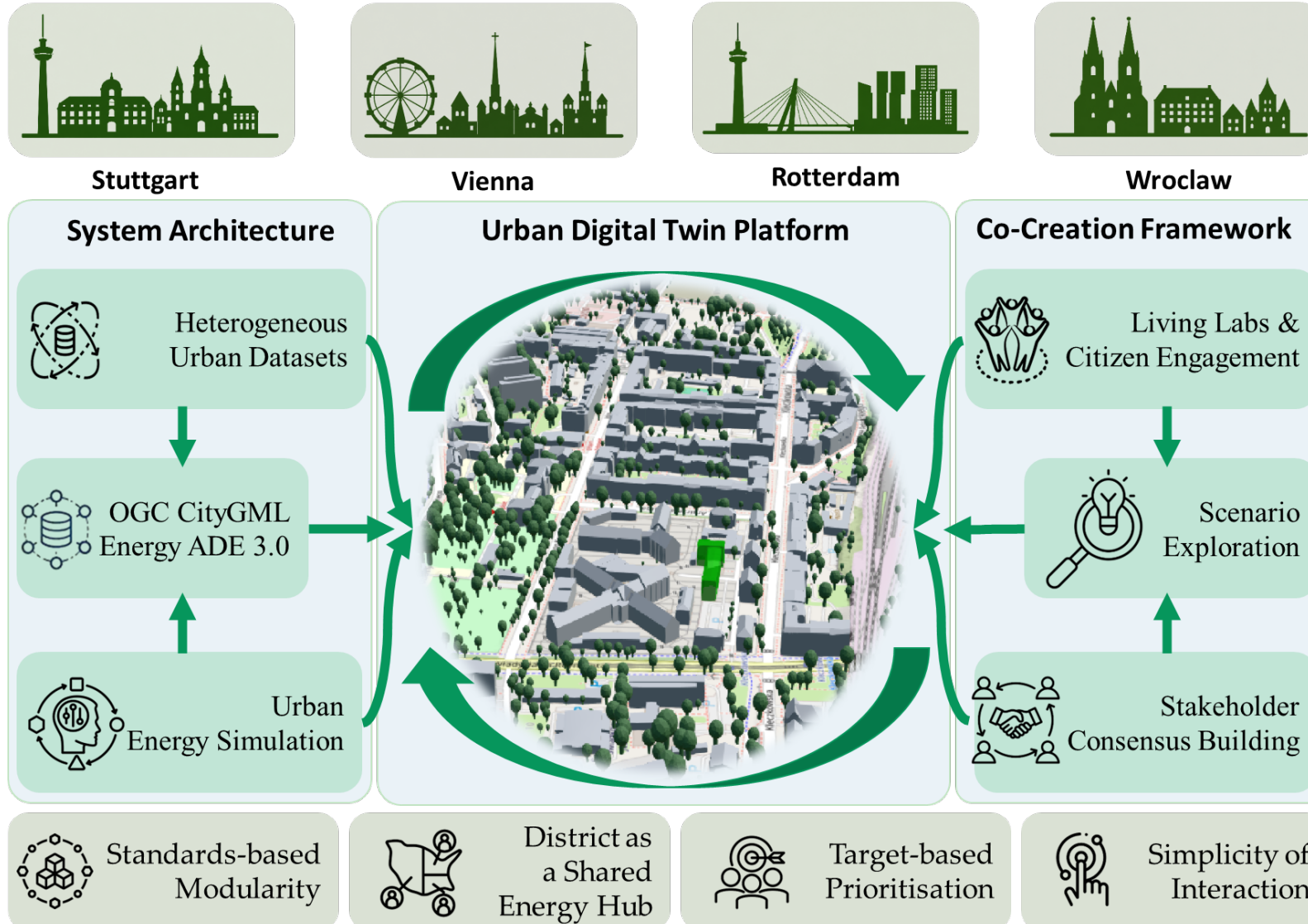
EUROPEAN PARTNERSHIP

 Co-funded by the European Union

|                                                                                                  |                                                                                                     |                                                                                                    |                                                                                                                             |                                                                                                |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <br>10 PARTNERS | <br>4 CASE STUDIES | <br>4 COUNTRIES | <br>2,5 YEARS<br>(Nov. 2023 – June 2026) | <br>FUNDING |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|

DigiTwins4PEDs aims to create a platform for citizens and stakeholders to exchange information, enabling them to visualize various PED scenarios before its actual implementation

# From Energy Simulation to Co-Creation of PEDs



## Case study districts:

1. Nordbahnhofviertel - Stuttgart, Germany
2. District 20 + 2 (WieNeu+) - Vienna, Austria
3. Feijenoord and Prinsenland - Rotterdam, Netherlands
4. Kleczkow - Wroclaw, Poland

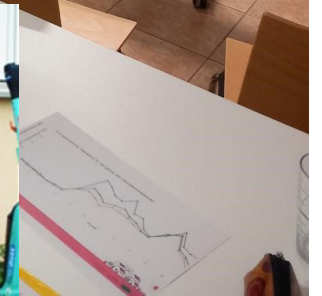
# Urban Digital Twin for early-stage PED planning



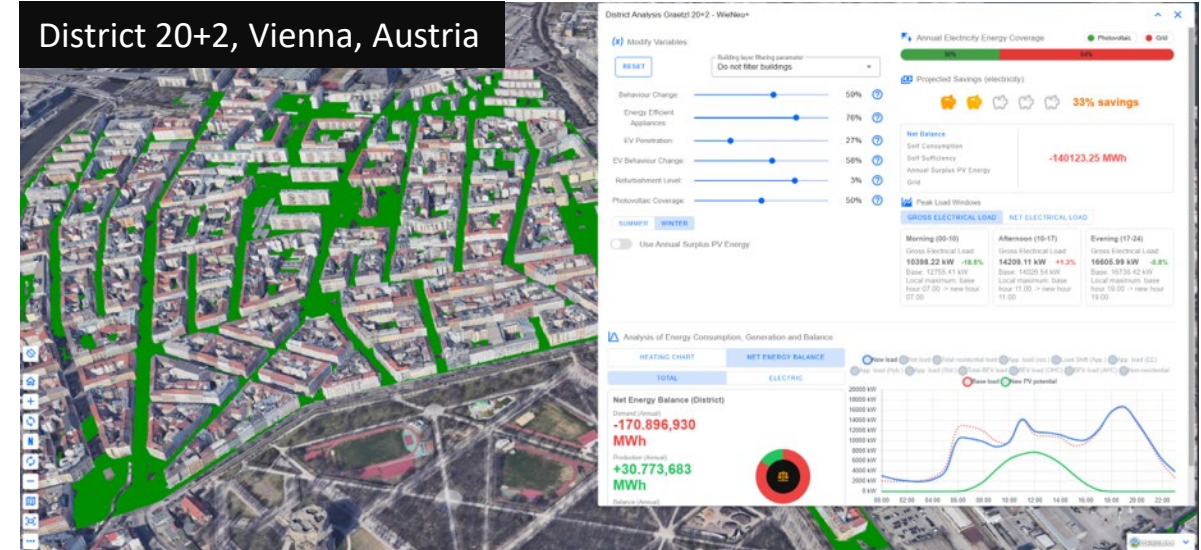
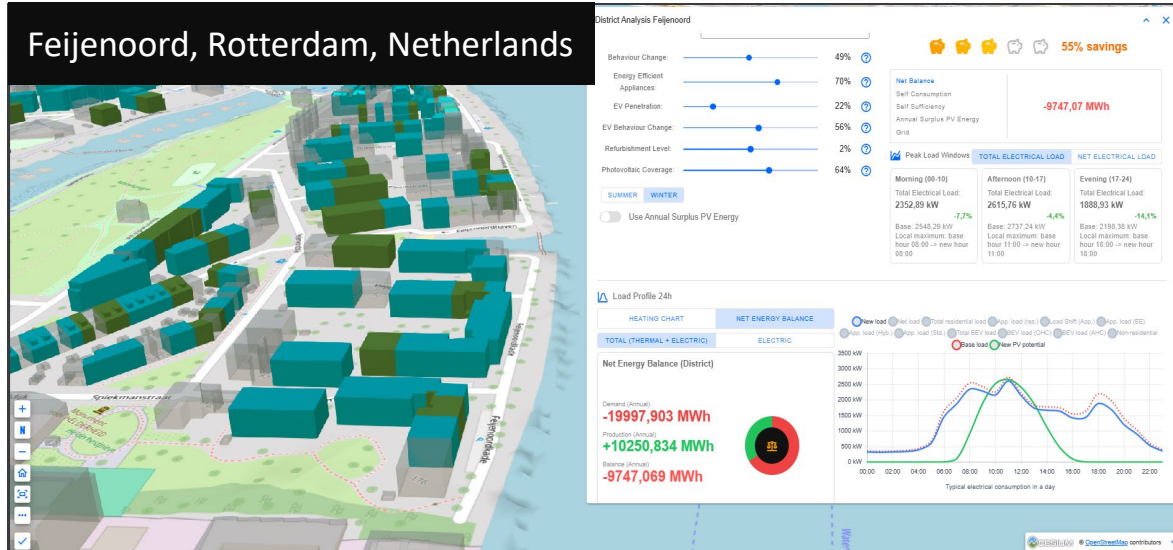
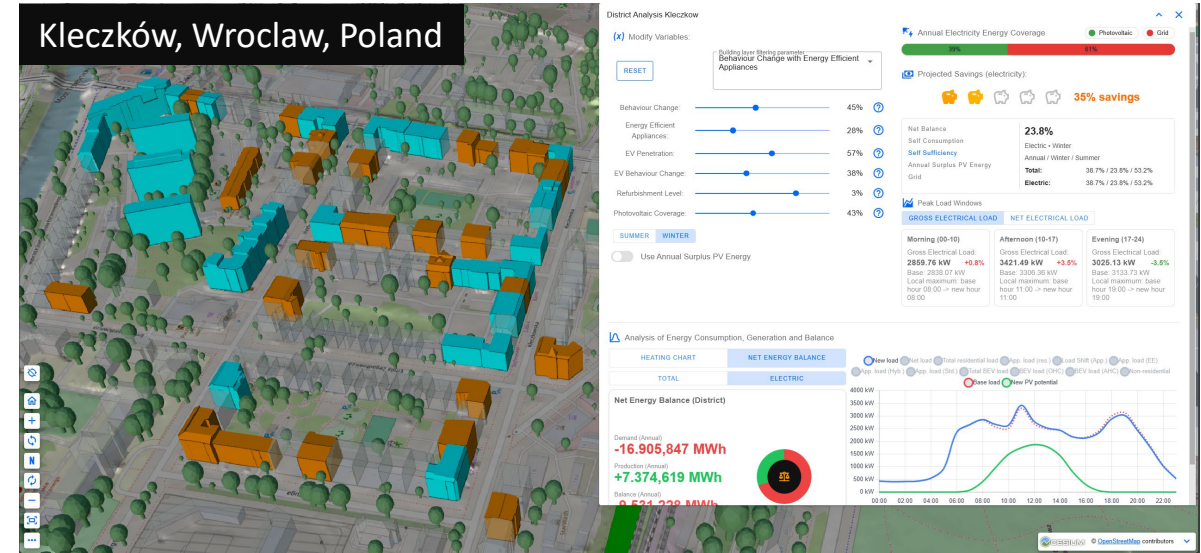
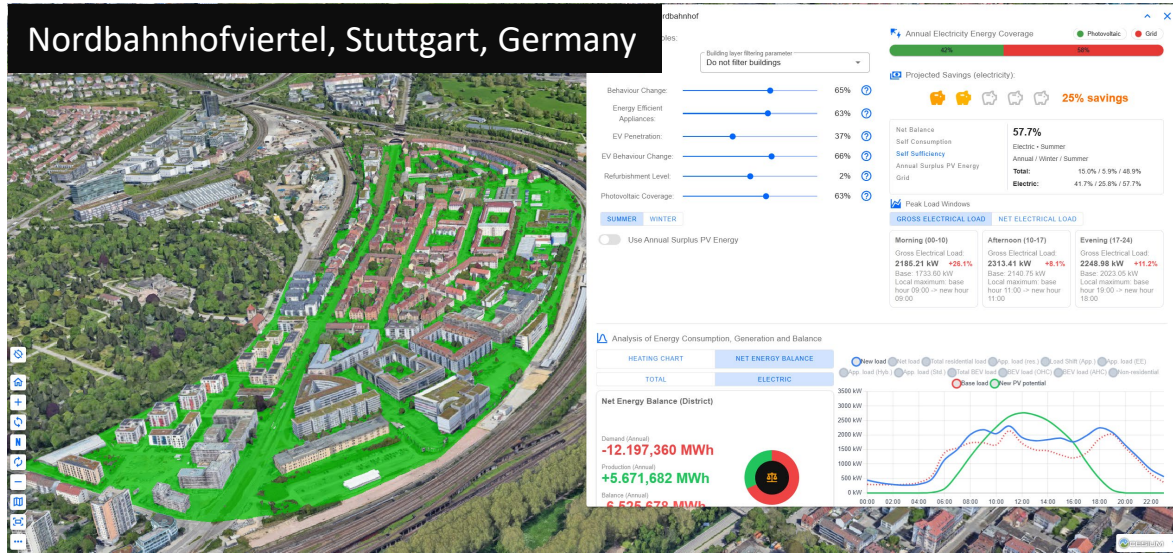
# Citizen Enagement



# Co-creation with Citizens



# Urban Digital Twin for early-stage PED planning



# Towards EU FlexPED project



1. Aim is to develop an open and intelligent energy data and flexibility management system for Positive Energy Districts.
2. Builds on DigiTwins4PEDs by introducing agent based simulation supported by AI to optimize and monitor in real-time energy flexibility and demand side management in city districts.
3. Integration of AI chatbots in the digital twin interface to further assist citizens and decision makers in taking informed decisions.
4. Primary case studies – Rosensteinquartier, Stuttgart and Lozenets, Sofia

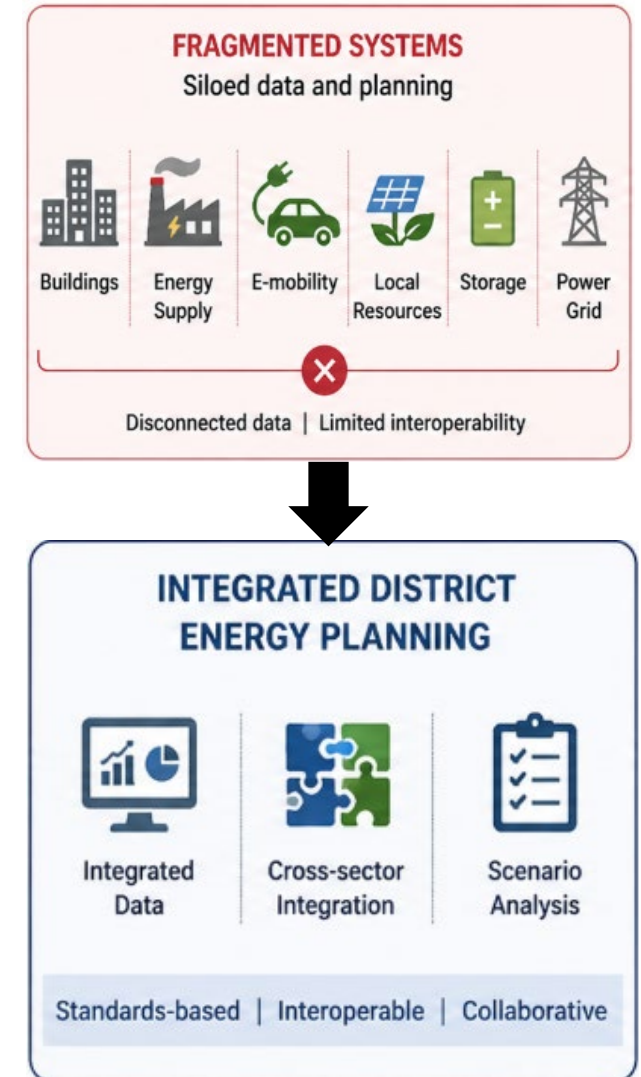
# Challenges in developing Urban “Energy” Digital Twin

In a district energy flows between interconnected urban energy systems:

- Requires data exchange, integration and consistent storage between heterogeneous urban data sources and energy simulation models.

But state of art in data integration for district energy planning workflows:

- Lack of a shared semantic layer to exchange and consistently store energy data across tools at a district scale.
  - Must be tool-agnostic, cross-sectoral and multi-scale in nature.  
(building → aggregates to district → beyond)
- Tool or platform specific data integration pipelines.
- Traditionally energy simulation tools are not integrated with interactive visualization / UDTs.
  - Where integration exists, it is again tool-specific.



# Data requirements to develop Urban “Energy” Digital Twin



## 1. Structured Data

- Consistent representation of buildings and infrastructure
- Reliable geometry, semantics and related information (attributes)
- Data from different sources fits together → improves interoperability

## 2. Basic attributes

- Building function (residential, office, school, etc.), type (SFH, MFH etc.)
- Building age
- Energy-related information (renovation year, energy performance certificate etc.)

## 3. Open and Standardized Data

- Standardized data models eases interoperability and improves quality management
- Easier data sharing across tools and organizations
- Reduced vendor lock-in and improved scalability

# Conclusion

## Key Project Outcomes

- Evidence based decision making using Urban “Energy” Digital Twin (UDT) for co-creation of PEDs.
- Co-creation of PEDs experimented in a moderated living lab environment across four EU districts with UDT.
- Data interoperability and standardization key for scalling UDTs for Urban Energy Planning.

## Key Recommendations

- Better data → Better decisions. Prioritize data quality over data quantity (best if open).
- Use open standards to ensure consistent quality, data exchange, interoperability, and long-term reuse.
- Use urban digital twins to facilitate dialogue, not just technical analysis. or visualization.

# Key Message



*A digital twin is only as good as the data behind it. For urban (energy) applications, success starts with consistently structured, meaningful, and interoperable data; citizen engagement turns that data into impact.*

# Thank you



## From left:

- |                                 |                                            |
|---------------------------------|--------------------------------------------|
| 1. Camilo Leon-Sanchez          | 9. Piotr Janas                             |
| 2. Grzegorz Burry               | 10. Giorgio Agugiaro                       |
| 3. Volker Coors                 | 11. Stanislaw Biernat                      |
| 4. Rushikesh Padsala            | 12. Ali Hainoun (not in the picture)       |
| 5. Amando Reber                 | 13. Pawel Boguslawski (not in the picture) |
| 6. Jędrzej Zielonka             | 14. Barbara Smetschka (not in the picture) |
| 7. Basak Falay-Schweiger        | 15. Jan Peters-Anders (not in the picture) |
| 8. Simon Lempp                  | 16. Janine Singer (not in the picture)     |
| 9. Ernst Gebetsroither-Geringer | 17. Bastian Schroeter (not in the picture) |

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