

# BUILDING CLIMATE NEUTRAL CITIES

*One district at a time*

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PED Session - OASC Summit



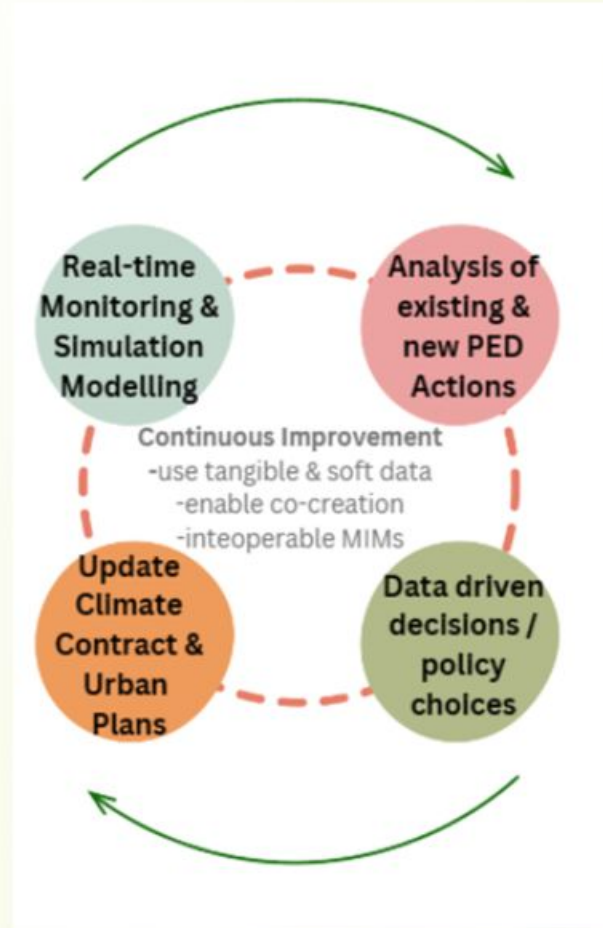


# Project Vision

# BIPED cycle of creating climate neutral Cities supported by Digital Twins

Linking short-term operation DTs with long-term DTs used for City planning

**Extended Digital Twin**  
Prototype the Future

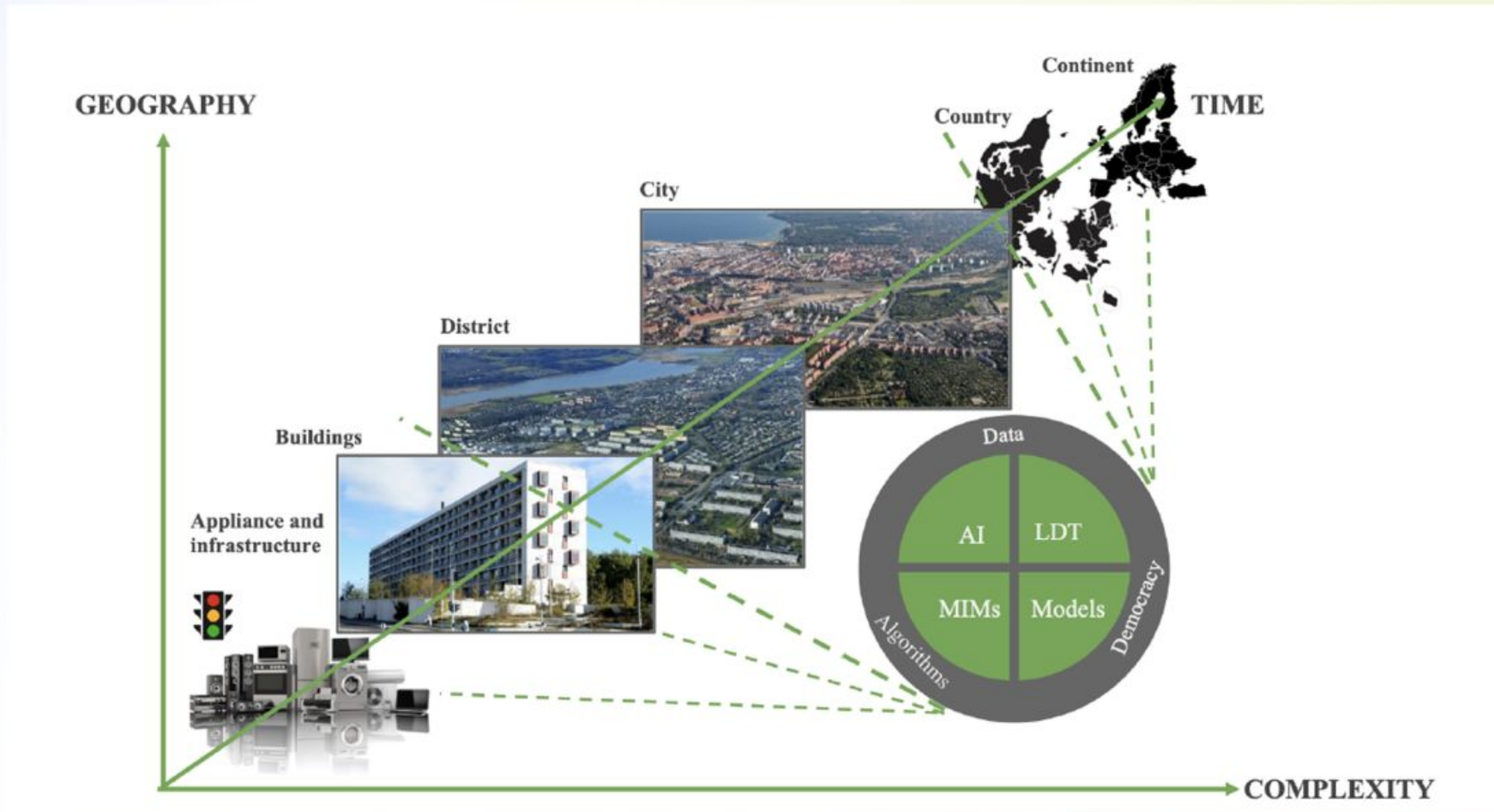


**Urban District**  
Enable the Future



# Spatial and Temporal Hierarchy of Coherent Digital Twins

Aggregation – Disaggregation  
Combined Bottom-Up and Top-Down



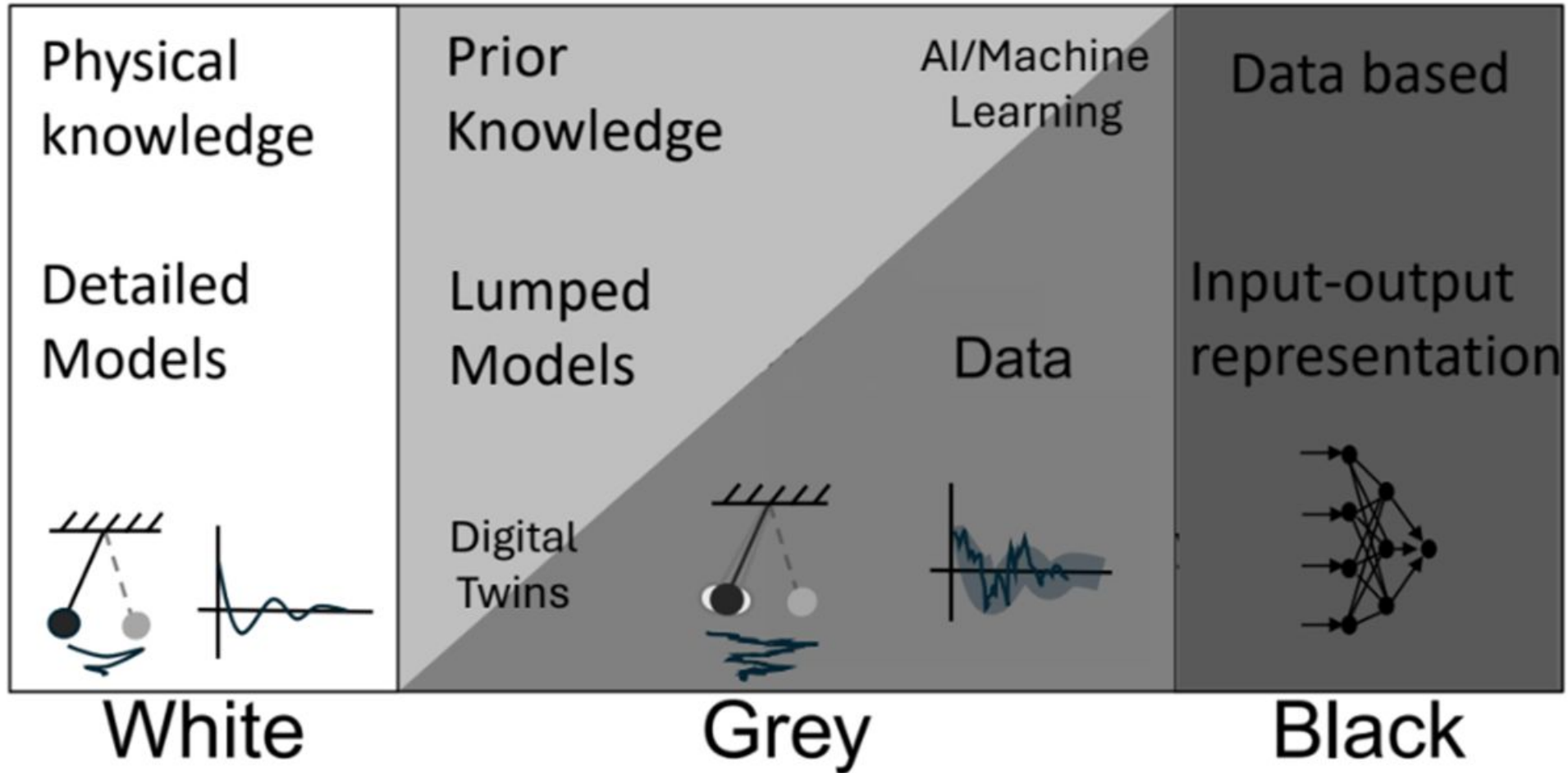


# Data-driven Digital Twin / Green Box Models

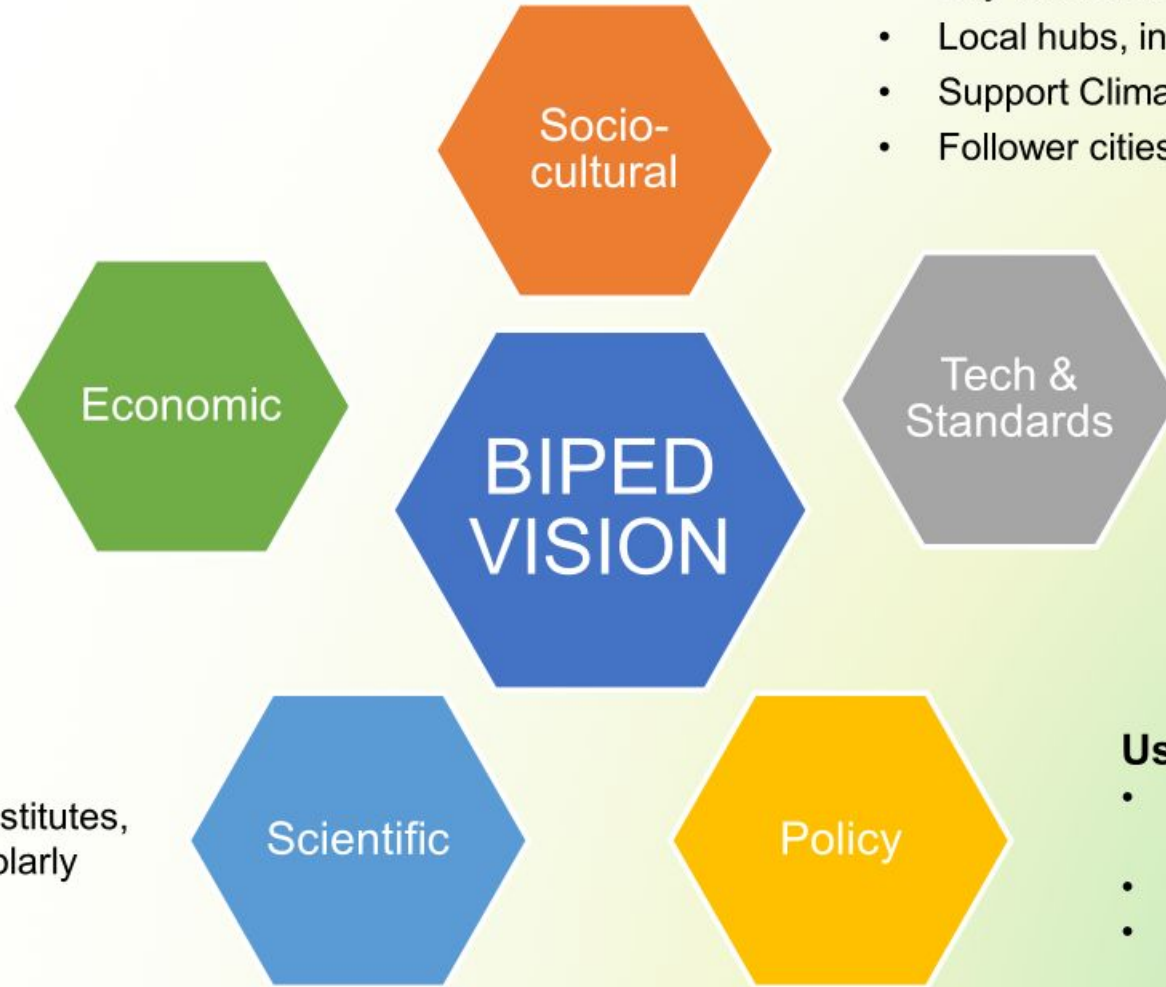
Bridging the gap between physics and AI

Combining symbolic and purely data-driven AI

Offers near real-time data assimilation in LDTs for PEDs



# BIPED VISION



## Use of BIPED by

- By Citizen
- Municipality
- City infrastructure partners
- Local hubs, interest groups and NGOs
- Support Climate action
- Follower cities

## Integration of BIPED into

- Third-party standards,
- Tools, processes and applications

## Use of BIPED to

- Accelerate the green transition (European Green Deal).
- Unlock CO2 and cost savings for the city and the citizen

## Use of BIPED results by

- Researchers, academics, institutes, universities to advance scholarly research

## Use of BIPED to

- Inform policy Development (European Green Deal).
- Make urban policy cycles shorter
- Give advices to regulator offices



# Tech Summary

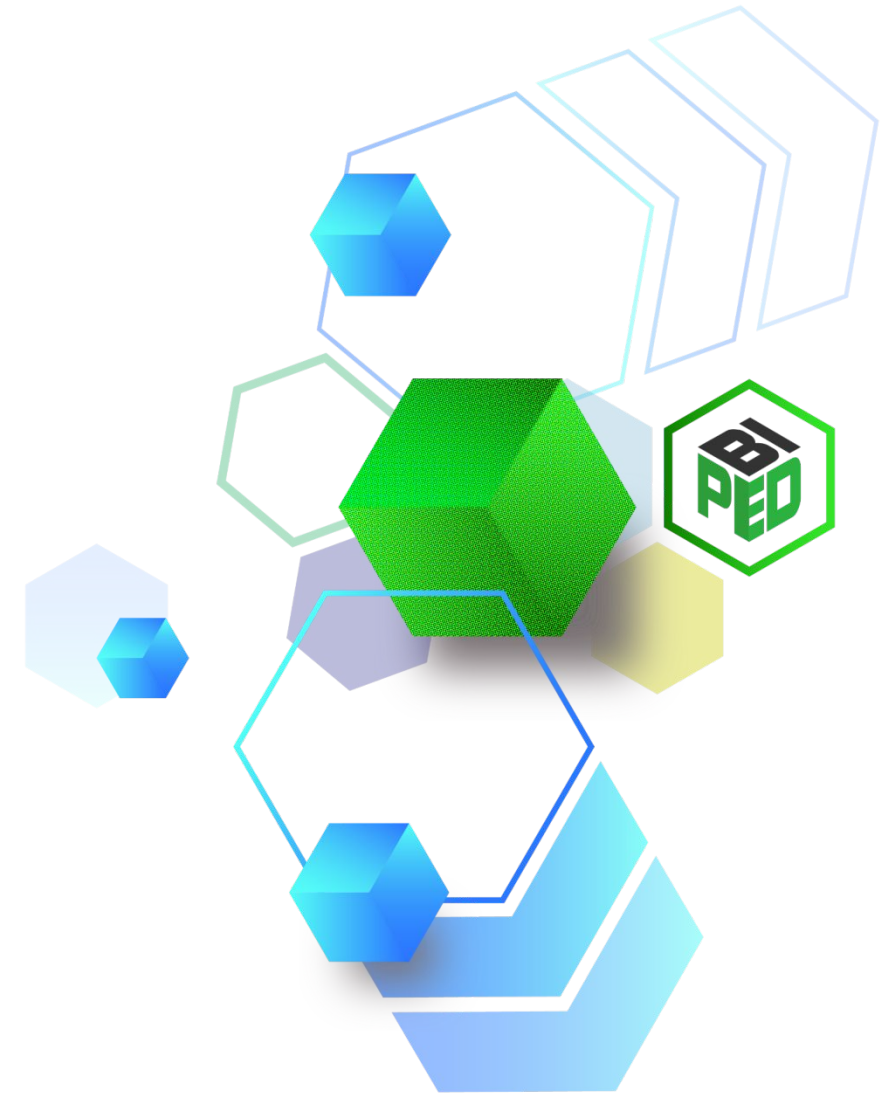
# BIPED LDT Tech Summary

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## WP2 - PED's Digital Twin, Data Space and Advanced Modelling and Visualisation

(Lead: AIT |  
Support: DTU, DKSR, VCS, UWB, RT, INNO)

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# WP Goals

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- Develop and test a baseline **digital twin of a potential Positive clean Energy District (PED)** in a European city, such as the district Brabrand in the city of Aarhus, Denmark, that is closely embedded in the **European data space** landscape
- Include an **energy and mobility model** to the digital twin, assessing its energy and mobility performance depending on various input parameters
- Extend and complete the digital twin by **including cross-sectoral and soft-data modelling**, respecting European data space environments, and define KPIs according to them

# Work plan - Deliverables



BIPED Gantt Chart			M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36						
WP	Task	Lead						MS1						MS2												MS3								MS4								MS5		
WP2	PED's Digital Twin, Data Space and Modelling	AIT						R0						R1																												R3		
T2.1	Digital Twin Platform Development	DKSR						D2.1																																				
T2.2	Energy Modelling	DTU																																										
T2.3	Mobility and Mobility Environmental Impact Modelling	UWB													D2.2												D2.3																	
T2.4	Cross-sectorial & Soft-Data Modelling	DTU																																										
T2.5	Data Space provisioning	OASC																																										
T2.6	Establishing an extended PED Assessment framework	AIT																																										D2.4

**D2.1. Initial release of the digital twin platform & Architecture:** preliminary release of the Digital Twin serving as a solid base to expand on further digital twin development. Lead: DKSR

**D2.2. BIPED Digital Twin Release 1:** first release of the Digital Twin including first versions of modelling tools. Lead: AIT

**D2.3. BIPED Digital Twin Release 2:** second release of the Digital Twin including updated versions of modelling tools. Lead: AIT

**D2.4. BIPED Digital Twin Release 3 & Summary Report:** report on BIPED digital twin development, including final architecture and evaluation of Extended PED Assessment Framework. Lead: AIT

# Work plan - Tasks

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## T2.1 – Digital Twin Platform Development (M1 - M35 - Lead: DKSR | Support: AAKS, AIT, VCS, UWB, RT, INNO)

Initiation of a digital twin implementing an urban data platform for real-time data management and a 3D city model, involving the review and selection of available geospatial data for creating a Digital Twin for Brabrand in Aarhus, Denmark.

- platform consists of an **integration of all of the data collected and models implemented in T2.2, T2.3 and T2.4** into one cohesive platform
- goal is to incorporate **detailed urban information** including building models, topography, land use, textures, semantics and metadata, and real time data.

# Work plan - Tasks

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## T2.2 – Energy Modelling (M1 - M35 - Lead: DTU | Support: DKSR, AIT, VCS, INNO, CDK)

Methods for forecasting, control and optimization of energy systems for the integration of local renewable production will be developed.

- **Energy flexibility of heating in buildings, local district heating systems, EV charging, and similar distributed systems will be modelled** and connected in a PED internal market-driven approach.
- **Simulations of the systems**, including buildings' thermal characteristics, will be carried out, **realising scenarios** with different infrastructures leading to insights and best practices for future planning of PEDs.



# Work plan - Tasks

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## T2.3 - Mobility and Mobility Environmental Impact Modelling (M1 - M35 - Lead: UWB | Support: AAKS, AIT, RT, DKSR, VCS, INNO, CDK)

Creation of a traffic model & implemented into the digital twin, simulating environmental traffic impacts, including air and noise pollution, and provide background data for energy consumption caused by mobility in the area.

- **Reviewing the available mobility-related data and traffic data** in the area of interest, including traffic volume, speed, and composition data (using Glayer engine). Additionally, we will review data on air and noise pollution levels in the area.
- **Generated energy consumption data caused by mobility** will be used in Task 2.2 to calculate the environmental impact of various mobility scenarios.
- **Scenarios will be planned and designed** in collaboration with stakeholders through a dedicated workshop that will be organised in Aarhus.

# Work plan - Tasks

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## T2.4 - Cross-sectorial & Soft-Data Modelling (M1 - M35 - Lead: DTU | Support: AIT, UWB, DKSR, VCS,CDK)

Review, selection and inclusion of additional environmental, social and economic properties of the district (existing data, open source).

- **Involvement of relevant priority datasets as suggested by the European data space community** (close collaboration with T2.5 - involvement of local stakeholders, data providers and city representatives).
- Development novel **soft-data collecting approaches** (i.e. using crowdsourcing)
- Including **Building Information Management (BIM)** data (focused on modelling exchange of electrical energy between individual buildings and electrical distribution network)

# Work plan - Tasks

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## T2.5 – Data Space provisioning (M1 - M35 - Lead: OASC | Support: AIT, DTU, DKSR, VCS, AAKS)

Established connections to European data spaces will be used to introduce BIPED digital twin to and ensure the involvement of relevant priority datasets as suggested by the community.

- **Two webinars, two workshops** and a series of open debates will be organised by OASC, AIT and DTU for stakeholders to provide accelerated access to knowledge on the topics of cross-sector, cross-community, data services, including AI-enabled data services.
- **Data spaces communities will be involved** to shape the contents based on their specific needs and interests to create a knowledge hub serving different EU initiatives.

# Work plan - Tasks

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T2.6 – Establishing an extended PED Assessment framework (M13 - M35 - Lead: AIT | Support: DTU, UWB, DKSR, VCS, RT, AAKS)

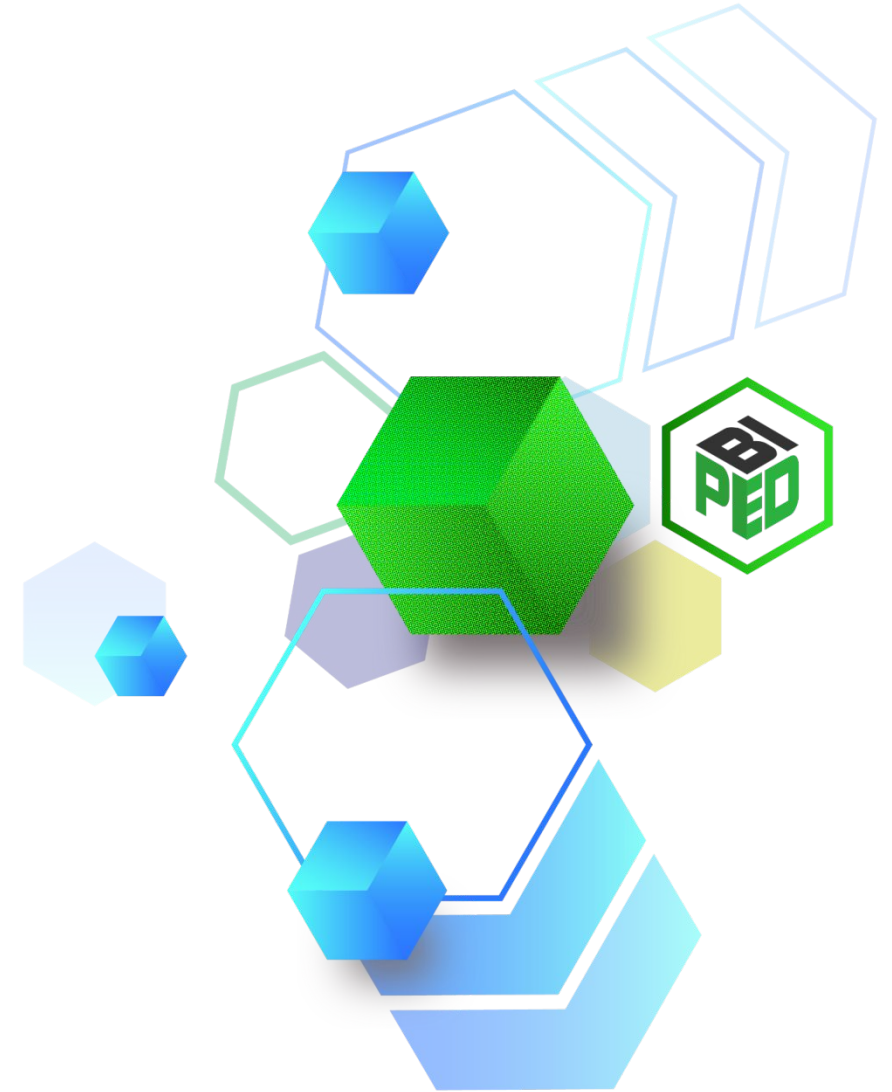
After completion of the integrated BIPED digital twin development (T2.1, T2.2, T2.3, T2.4), **KPIs** that go beyond energy and mobility measures will be defined that potentially affect the district's energy performance, offering the **monitoring and assessment of the PED** throughout the project (T4.1)



# D2.1 (M06) in a nutshell

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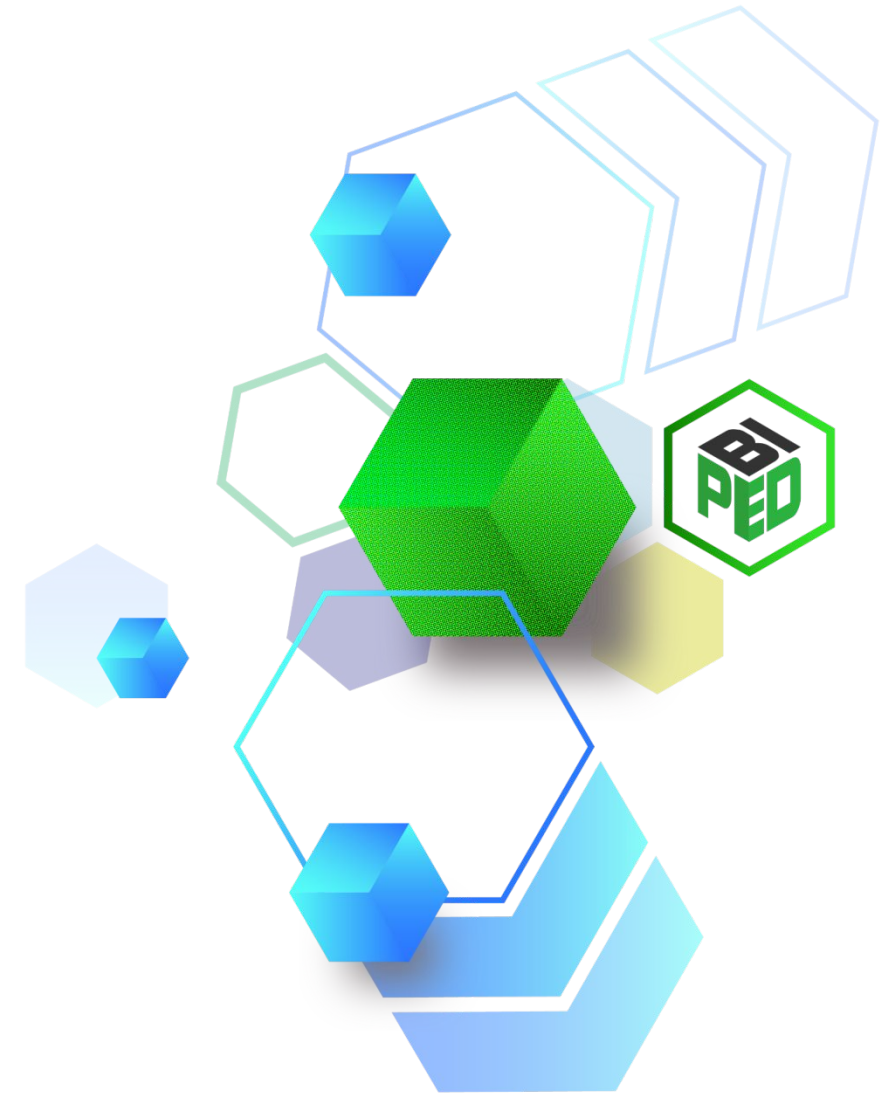
- Digital Twin **technical backbone** established
- Establishment of the **BIPED data sheet**
- Evaluation of EC **priority datasets**
- Data **shortlisting** and prioritization process
- **Access discussions** ongoing
  
- Relevant European **data space communities identified**
- EC priority datasets screened
- initial steps taken for local **community engagement**



# Next steps

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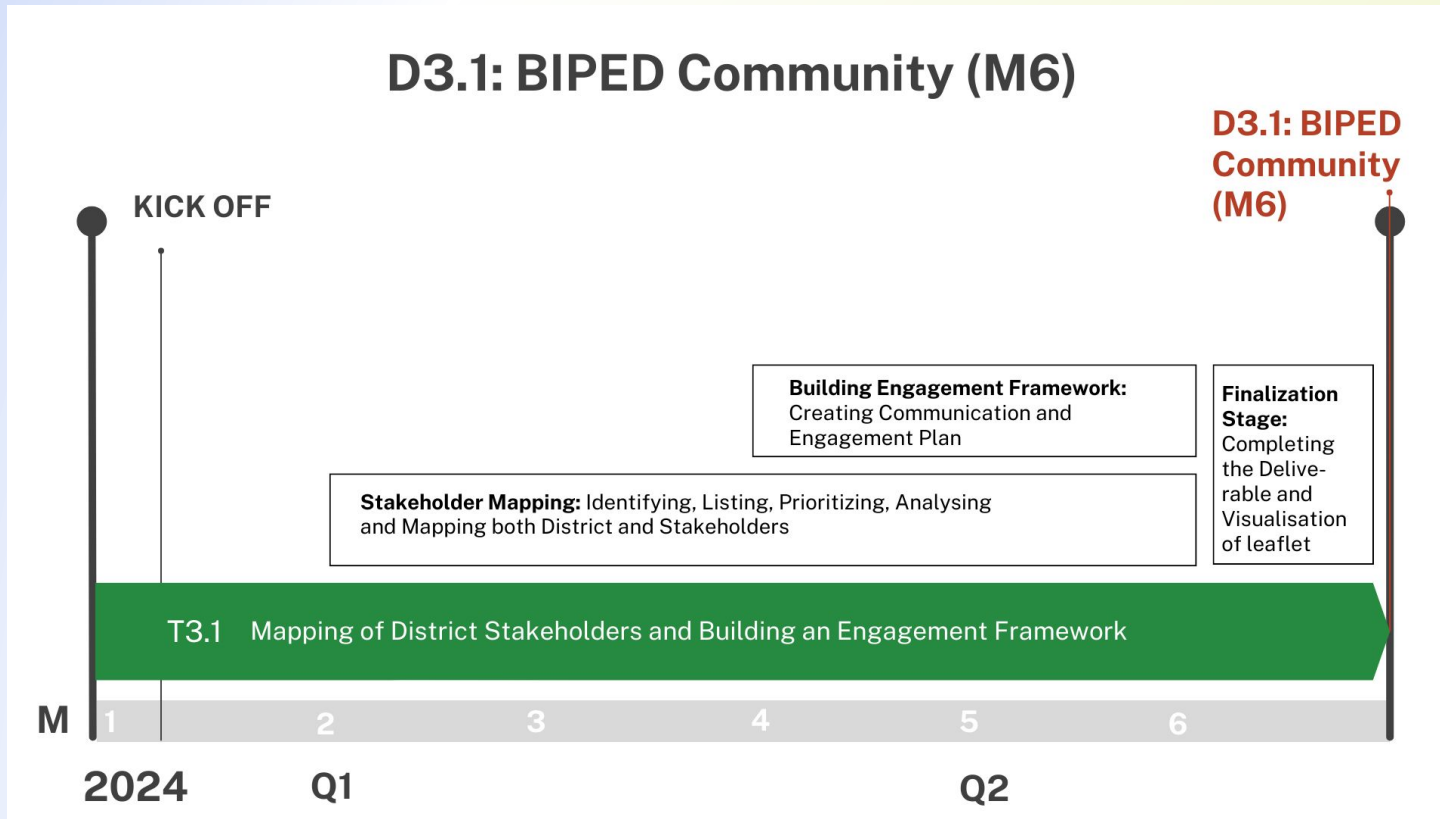
- Developing Models:
  - Energy
  - Mobility
  - Cross-sectorial (weather, socio-economic)
- including into the BIPED digital twin
- stakeholder involvement
- European Data Space communities involvement





# Stakeholder Engagement & Monitoring and Evaluation

# BIPED Stakeholder Engagement



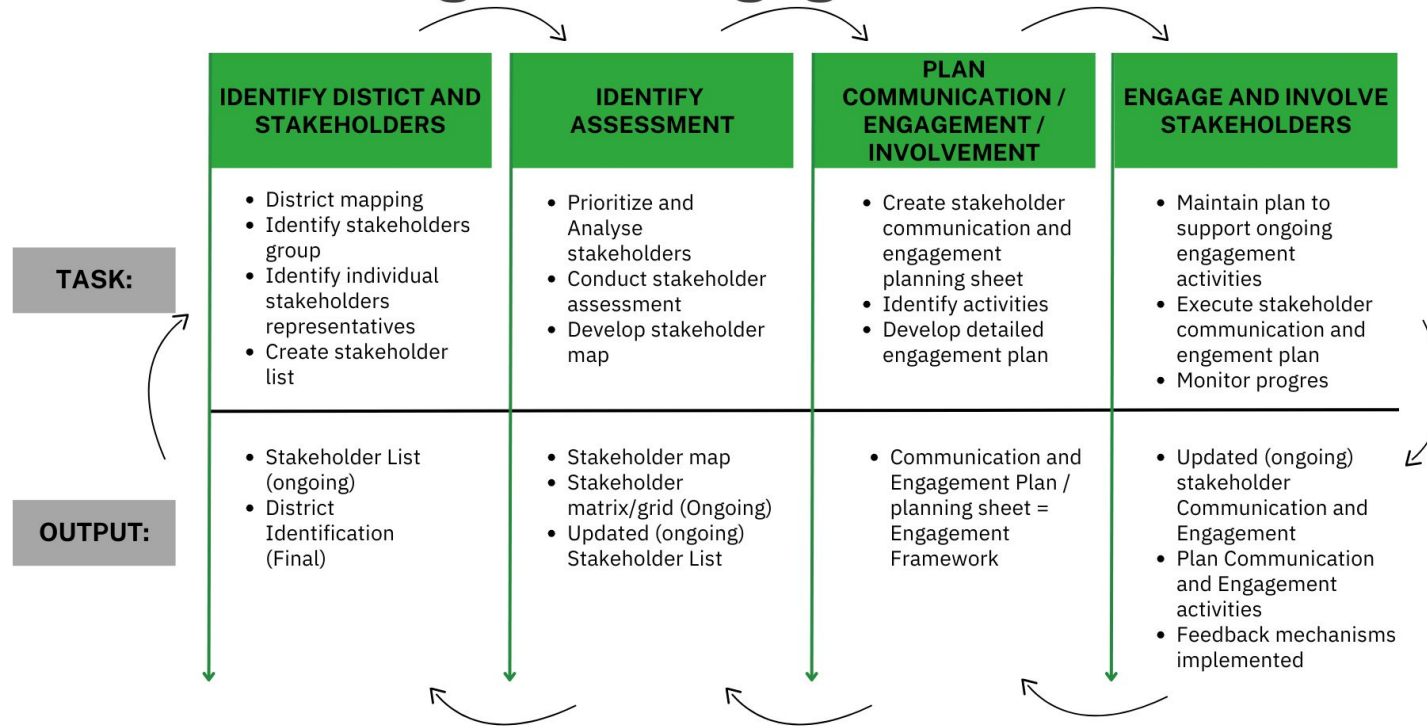
Roadmap of BIPED Community: M01-M06



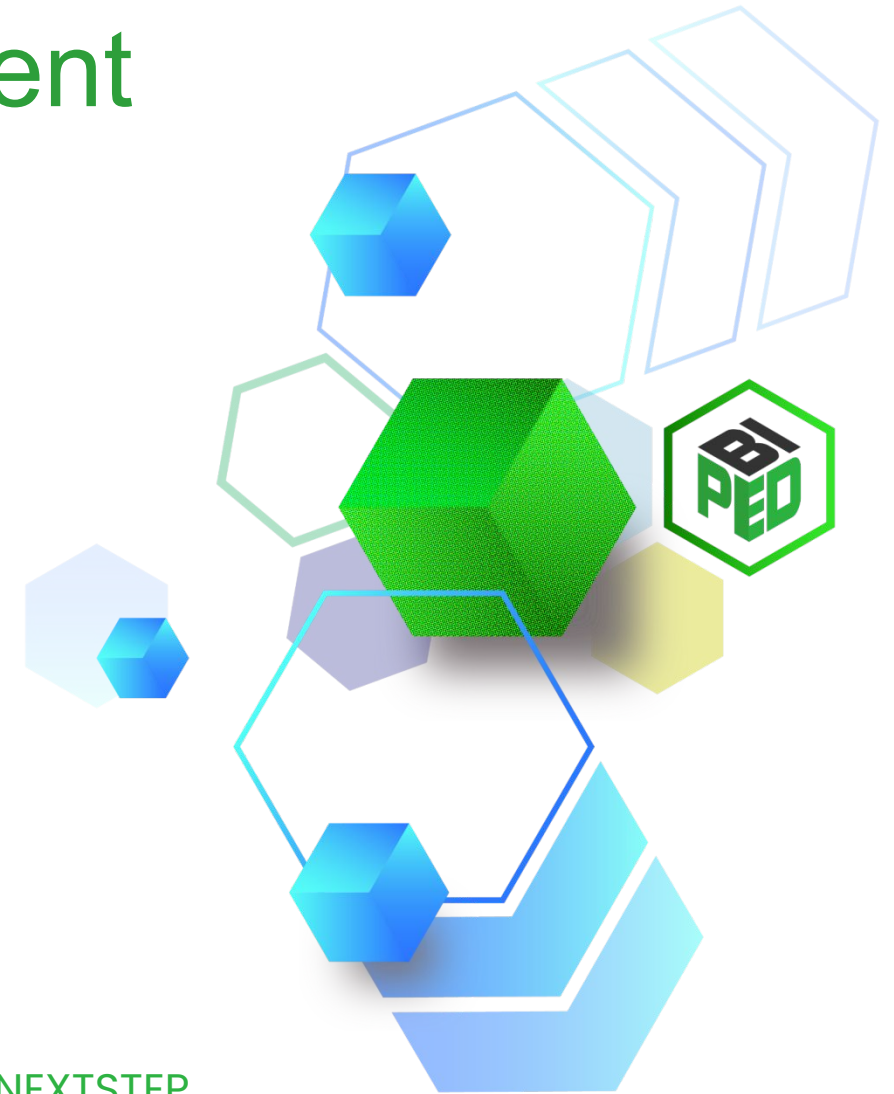


# BIPED Stakeholder Engagement

## Building a PED Engagement Framework



Task and output flow for Building a PED Engagement Framework



NEXTSTEP

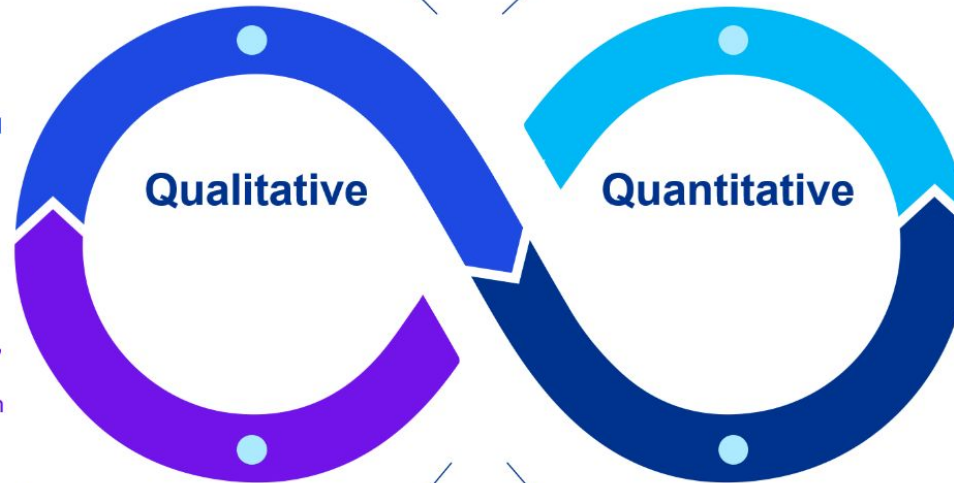
# BIPED Monitoring and Evaluation

## Community Engagement

- Community engagement will utilise citizen feedback mechanisms and participatory platforms to foster a citizen-first approach.
- This approach, alongside data collection and evaluation meetings, will allow BIPED to tailor guidelines to be citizen-focused.

## Policy Context

- As part of M&E, we will track local, national and EU level policy developments in collaboration with partners.
- BIPED will assess current and upcoming regulatory frameworks and evaluate their role in the development of smart cities.



## Energy Consumption

- Monitor energy consumption, grid performance and adoption of green energy sources.
- Exploring community perceptions and behaviours on energy usage.

## Digital Solutions

- Evaluating how Digital Solutions meet the evolving needs of the community.
- Ensure Digital Solutions will be user-centric and adaptable to different scenarios and settings.





Thank you!