EBC
Energy in Building and Communities Programme

IEA EBC Annex 83 on Positive Energy Districts: research activities, outcomes and future research

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Workshop: Technologies and innovations for the climate-neutral city
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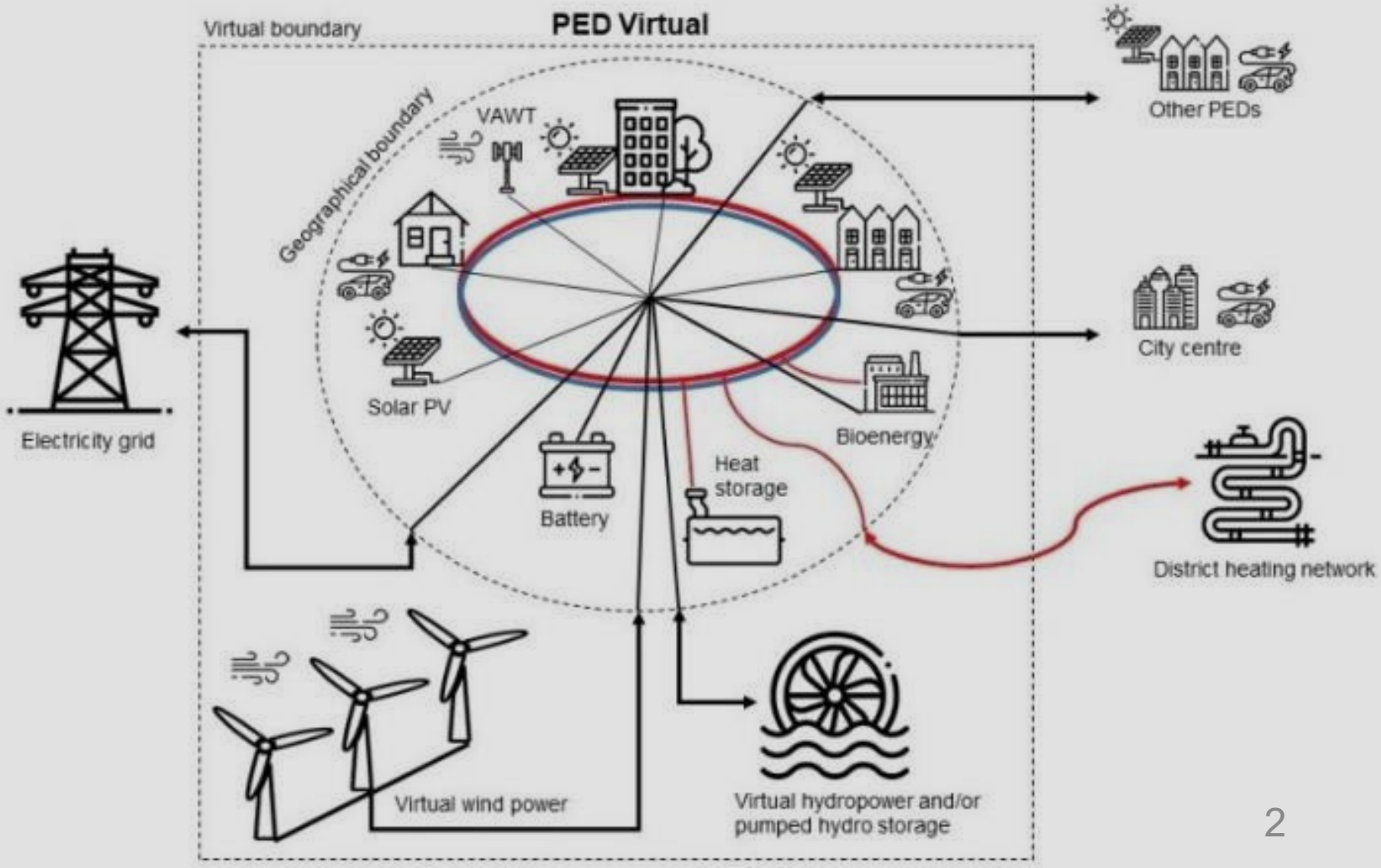
Positive Energy Districts

"**Energy-efficient** and **energy-flexible** urban areas or groups of connected buildings which produce **net zero greenhouse gas emissions** and actively manage an annual local or regional **surplus** production of renewable energy. They require **integration** of different systems and infrastructures and **interaction between buildings**, the users and the **regional** energy, **mobility** and **ICT** systems, while securing the energy supply and a **good life** for all in line with social, economic and environmental **sustainability**."

Positive Energy Districts and Neighborhoods for Sustainable Urban Development, JPI Urban Europe



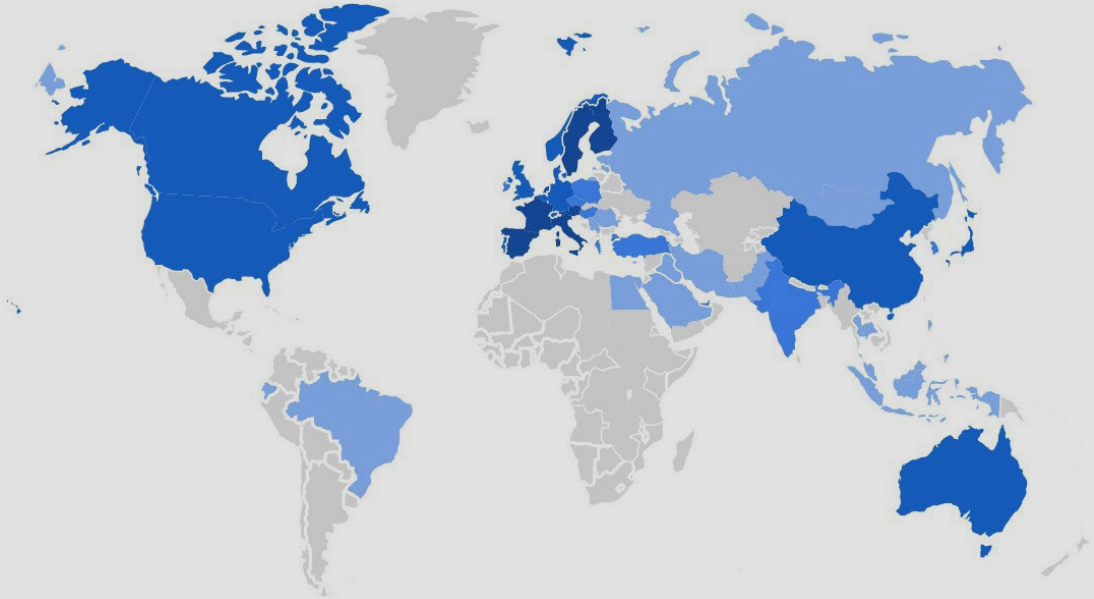
About Annex 83 - Positive energy districts

ANNEX 83

EBC
Energy in Building and Communities Programme

Since November 2020, the annex is an independent, international group of experts from around the world on the topic of **Positive Energy Districts** including more than 100 experts from the whole world.

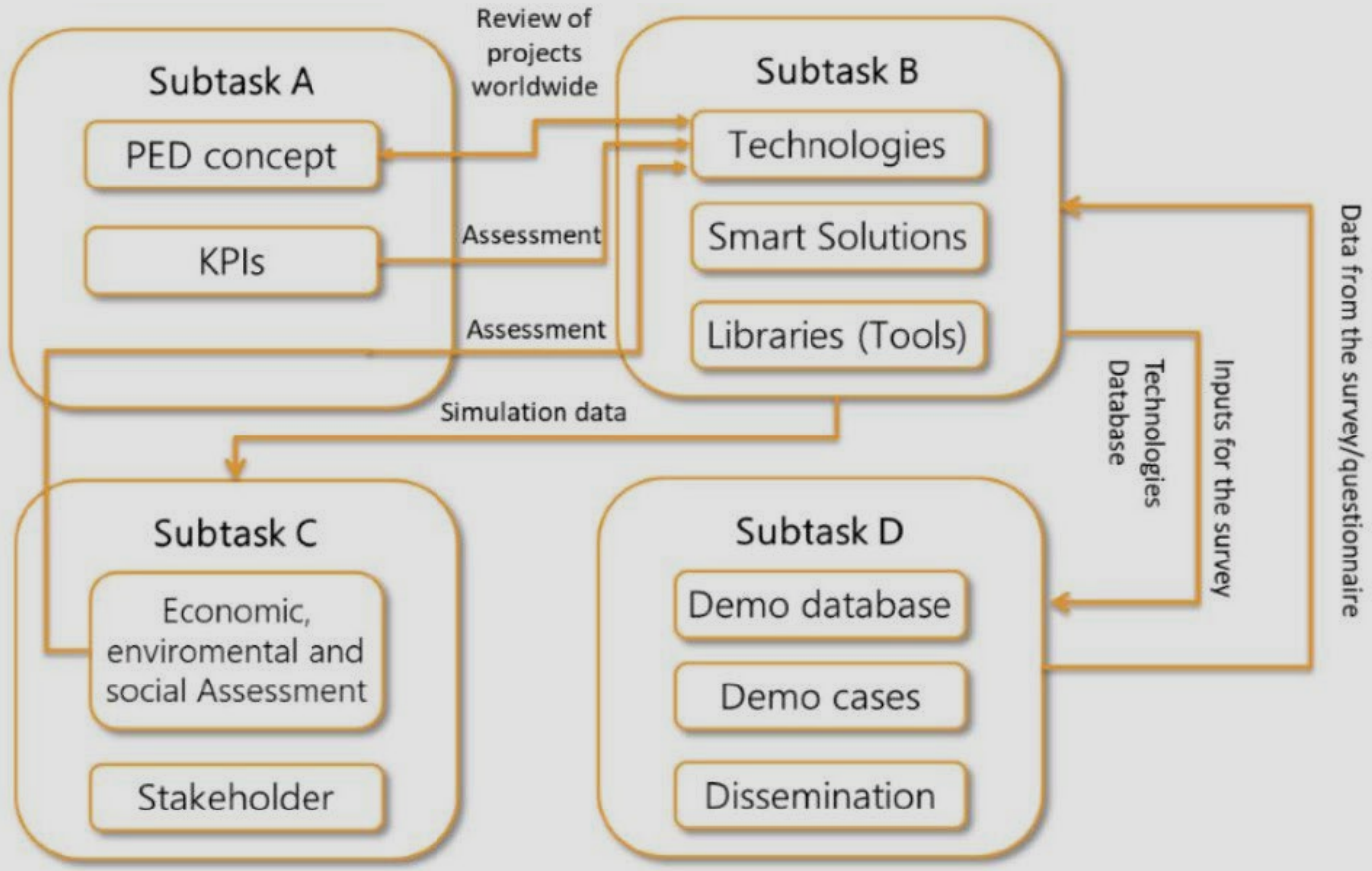
Among the activities of Annex 83 are developing an in-depth definition of PED (Positive Energy District), mapping technologies used and advance in the energy modeling of PEDs, planning tools and the decision-making process related to positive energy districts.



Annex 83 participants map. Source: Google Analytics Tool for Annex83 website.

Annex 83 - Subtasks

- **Subtask A:** Definitions and context
- **Subtask B:** Methods, Tools and Technologies for Realizing Positive Energy Districts
- **Subtask C:** Organizing principles and impact assessment
- **Subtask D:** Demos, implementation and dissemination

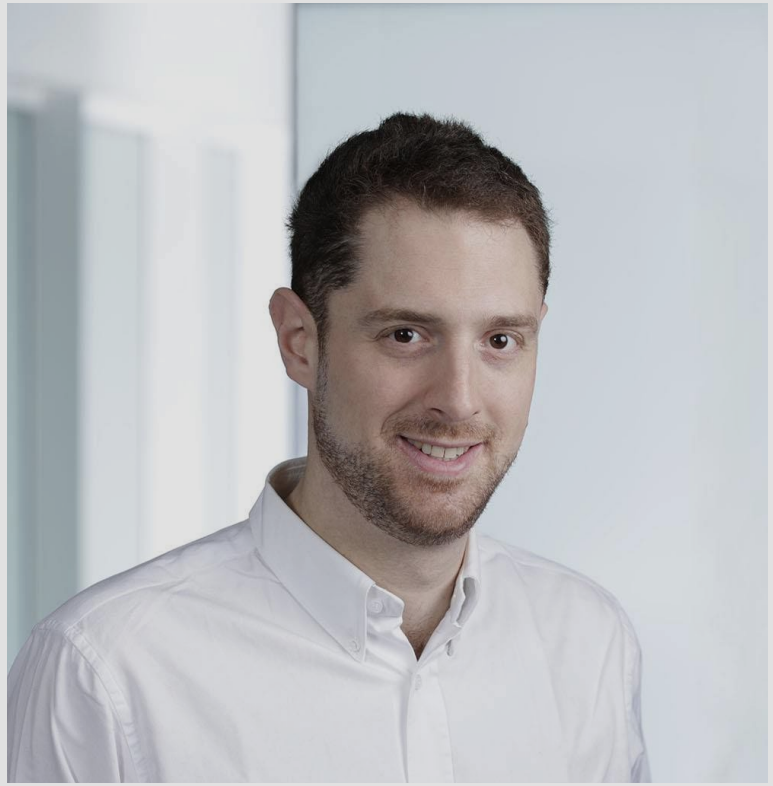


Main Objectives of Annex 83

- **Objective 1.** Map the relevant city, industry, research, and governmental (local, regional, national) stakeholders and their needs and roles to inform the work for Objectives 2, 3, 4 and 5. The main purpose is to ensure the involvement of the main stakeholders in the development of relevant *definitions* and recommendations.
- **Objective 2.** Create a shared in-depth definition of PED by means of multistakeholder governance model. So far international activities have developed generalized definitions that leave many questions open.
- **Objective 3.** Develop the needed information and guidance for implementing the necessary technical solutions (on building, district and infrastructure levels) that can be replicated and gradually scaled up to the city level, giving emphasis to the interaction of flexible assets at the district level and also economic and social issues such as acceptability.
- **Objective 4.** Explore novel technical and service opportunities related to monitoring solutions, big data, data management, smart control and digitalisation technologies as enablers of PEDs.
- **Objective 5.** Develop the needed information and guidance for the planning and implementation of PED's including both technical planning and urban planning. This includes economic, social and environmental impact assessment for various alternative development paths.

Image source: clipart-library.com

Annex 83 – Operating Agents



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Annex 83 ongoing activities

- Contribution to the development of a common European framework on PED Definition led by JPI Urban Europe
- PED Database development in collaboration with CA PED-EU-NET, JPI UE and EERA-net at https://pedeu.net/map/
- Development of a guideline for PED practitioners (88 national guidelines and scientific papers included and reviewed)
- Development of assessment frameworks for PEDs from the sustainability (environmental, social, economic) perspective
- Database for technologies and design solutions for PEDs in different climates
- Database of joint international PED data for monitoring and energy simulation – PED database and library protocol

Annex 83 PhD Network

Aims:

- Facilitate the growth of our researchers in an international environment,
- Creating lasting connections among young researchers within Annex 83.

Initiatives:

- Summer schools,
- PhD talks at every Experts' meeting,
- Exchanges and mobility among institutions within the Annex,
- Workshops and dissemination events,
- Joint publications.

Subtask A activities

Chapter	Sub-chapter
1. State of the art	1. Evolution of the concept of PEDs 2. Existing PED-related Initiatives 3. Existing PED-related Projects (PED definition, project objectives and key concepts) 4. Comparison and discussion of existing PED definitions
2. Definition of PEDs – Energy Balance Calculation Methods	1. Review of energy balance calculation methods in existing PED definitions 2. Test of selected PED definitions and energy balance calculation methods: A case study 3. Recommendations on ways forward
3. PED Characteristics and PED Archetypes	1. General Characterisation of PEDs 2. PED Characteristics: District scale 3. PED Characteristics: Technical components 4. PED Characteristics: Life quality indicators 5. Development of PED archetypes
4. PED Processes	1. Mapping of stakeholders 2. PED-related regulations and legal barriers 3. Process flow of PED development
5. Evaluation of PEDs	1. Proposal of KPIs for the evaluation of PEDs 2. Validation of the KPIs

Subtask B activities

Objectives

- **(B1)identify the different technical solutions** that can be implemented in a PED **and assess them** (PESTLE analysis, KPIs…)
- (B2)investigate **how flexibility management can help to balance energy flows within and beyond the PED boundaries**
- **(B3) Develop and implement joint international library concepts for energy system components, populate them with data and use them for energy system modeling**

Purpose

review which methods, tools and technologies are necessary for realizing PEDs; and **develop the needed information and guidance for designing, planning and implementing PEDs (Objective 3&4 of the Annex 83)**

Tangible Outcomes

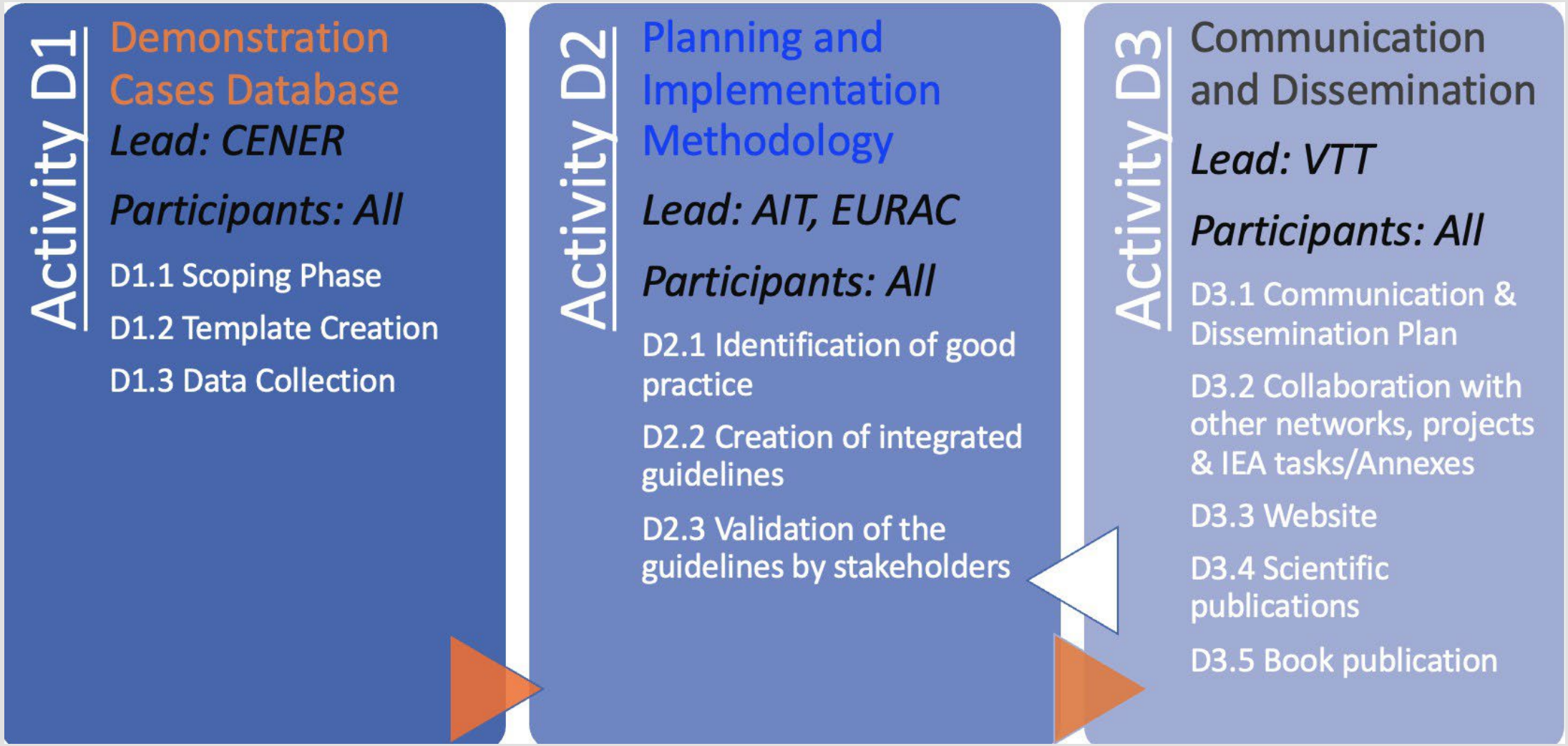
- Inventory (or Guideline) of the different technologies and control solutions
- Prototype implementation of an interface algorithms for decision making solutions for PED
- Libraries
- D1: Final Report: summary of the lessons learnt during the annex
- Paper on lessons learnt of the best technologies applied in PEDs
- Paper urban scale modelling of PED districts

Subtask C activities

C1: Economic assessment	C2: Environmental Assessment	C3: Humanities and Social impact assessment
C1.1: Literature analysis	C2.1: Literature analysis	C3.1: Literature analysis
C1.2: Economic framework analysis	C2.2: Environmental framework analysis	C3.2: Social framework analysis
C1.3: Learning from case-studies	C2.3: Learning from case-studies	C3.3: Learning from case-studies
C1.4: Elaboration of the results and lessons learned	C2.4: Elaboration of the results and lessons learned	C3.4: Elaboration of the results and lessons learned

C4: Synthesis of economic, environmental and social analyses and delivery of the final assessment toolbox

Subtask D activities



Joint PED database

PED EU NET

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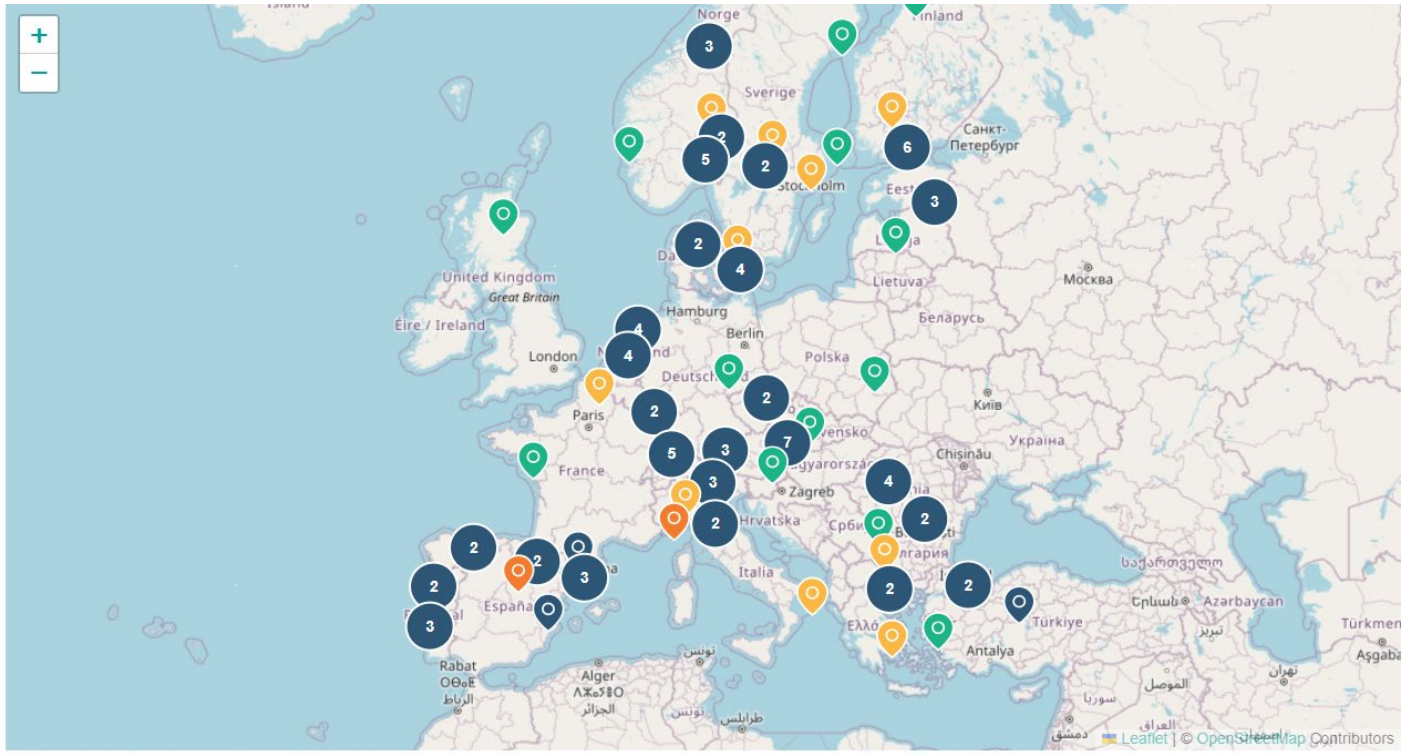
ACTION MEMBERS WORKING GROUPS EVENTS GRANTS DISSEMINATION NEWS PED DATABASE

More than 110 Projec



Joint PED database

All Types | Any Phase | All Projects | FILTER

Clear Filters

Show 10 entries

Search:

Name	Project	Type
Lund/Brunnshög	Cast Studies – Table View	Ped Case Study
Am Kempelenpark	Cast Studies – Table View	Ped Case Study
Évora, Portugal	Cast Studies – Table View	PED/PED relevant case study. / Ped Lab
Kladno, Sletiště (Sport Area), PED Winter Stadium	Cast Studies – Table View	PED/PED relevant case study.
Groningen, the Netherlands – PED South	Cast Studies – Table View	Ped Lab
Groningen, the Netherlands – PED North	Cast Studies – Table View	Ped Lab
Maia, Sobreiro Social Housing	Cast Studies – Table View	Ped Lab
Lubia (Soria), CEDER-CIEMAT	Cast Studies – Table View	Ped Lab
Tampere, Ilokkaanpuisto district	Cast Studies – Table View	PED/PED relevant case study.
Leon, Former Sugar Factory district	Cast Studies – Table View	Ped Case Study

Showing 1 to 10 of 20 entries

Previous 1 2 Next

Joint PED database

Lubia (Soria), CEDER-CIEMAT	Cast Studies – Table View	Ped Lab	Compare
Tampere, Ilokkaanpuisto district	Cast Studies – Table View	PED/PED relevant case study.	
Leon, Former Sugar Factory district	Cast Studies – Table View	Ped Case Study	Compare

Showing 1 to 10 of 20 entries

Previous 1 2 Next

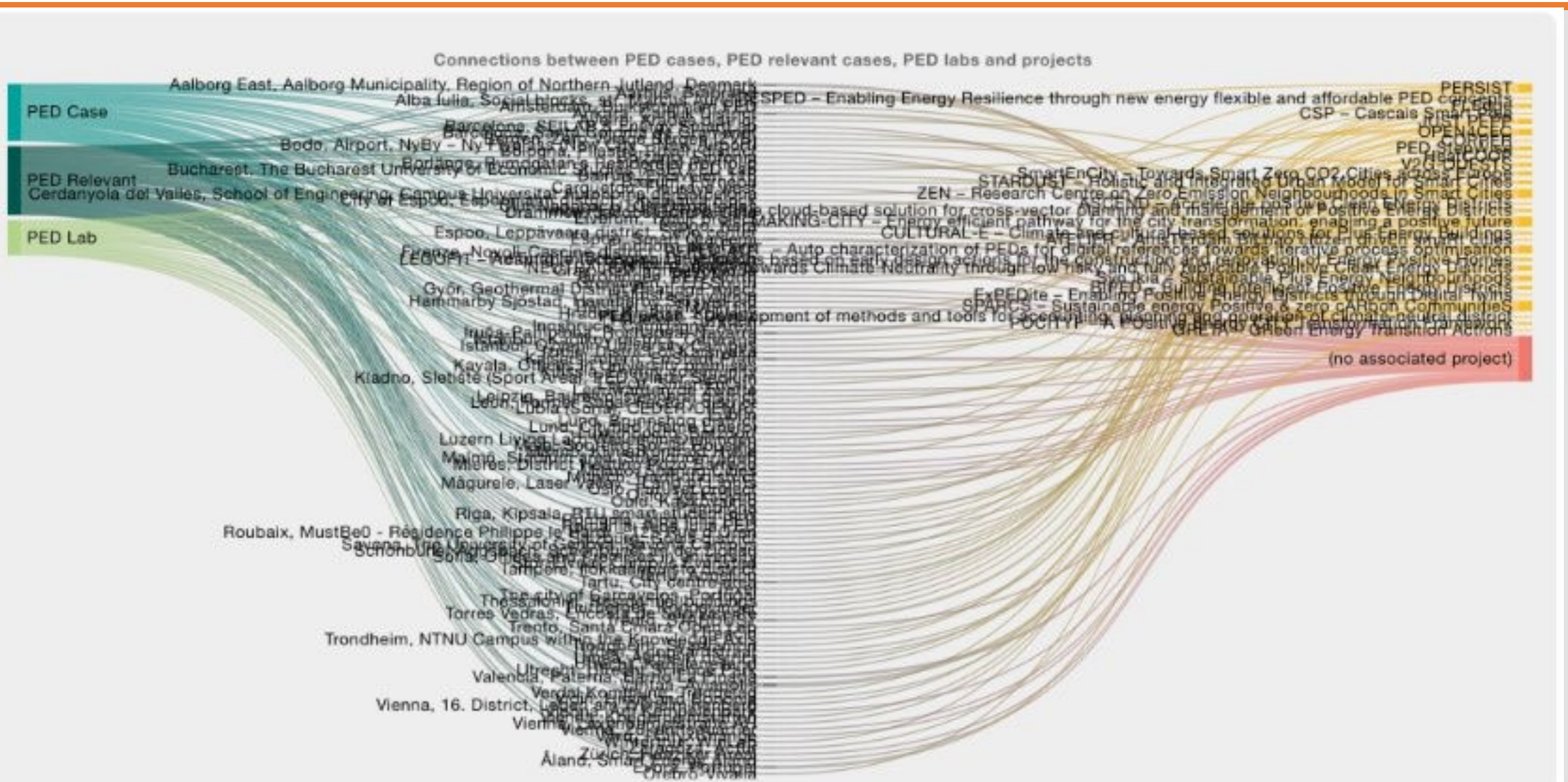
Export All Entries

EXPORT PDF EXPORT CSV

Search:

Title	Tampere, Ilokkaanpuisto district
A1P001: Name of the PED case study / PED Lab	
A1P001: Name of the PED case study / PED Lab	Tampere, Ilokkaanpuisto district
A1P002: Map / aerial view / photos / graphic details / leaflet	
A1P002: Map / aerial view / photos / graphic details / leaflet	Image 1 Image 2 Image 3
A1P003: Categorisation of the PED site	
PED case study	
PED relevant case study	PED relevant case study
PED Lab.	
A1P004: Targets of the PED case study / PED Lab	
Climate neutrality	Climate neutrality
Annual energy surplus	
Energy community	Energy community

Joint PED database



IEA EBC ANNEX 83 Austria

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

AEE INTEC

JOANNEUM RESEARCH

universität innsbruck

FH University of Applied Sciences TECHNIKUM WIEN

FFG Forschung wirkt.

Bundesministerium
Klimaschutz, Umwelt,
Energie, Mobilität,
Innovation und Technologie

IEA Annex 83

Results from the collaborative projects

1. SYSPEQ, Systemic solutions for positive energy districts, AIT

2. Austrian Certification of Climate-neutral Positive Energy Districts according to “Zukunftsquartier” Method, University of applied science, FH-Technikum

3. Campagne: Demonstration project towards PED, UIBK

4. FleXible user-CEntric Energy poSitive houseS, Cost-optimal analysis of EXCESS demo, Johanneum Research

5. Anergy2Plus, Demonstration and expansion of an energy network as part of a holistic energy concept and plus-energy district, AEE-Intec

Connections to the cities TCP (Research scoping)

- Research integration– The domains of interest can be naturally and mutually integrated
- Shared assessment methodologies from all perspectives (e.g., technical, mathematical modelling, sustainability assessment)
- Outcomes exchange from the technical/urban modelling/design considerations in Annex 83
- Scaling up of the district level outcomes & downscaling the cities issues and research to the district level
- Non-technical research and social sciences integration (e.g. social assessment frameworks for PEDs)

Connections to the cities TCP (Joint Activities)

- Exchange of expertise/deliverables/data (Joint approaches to avoid overlapping)
- Definitions framework (e.g., PED/cities definitions and development of joint scoping exercises – Operation energy vs mobility vs embodied energy and carbon and «context factors»)
- Research development on districts integration/cities (e.g., Towards a quantitative cities carbon footprint and energy balance)
- Dissemination and enabling dialogue between technical and non-technical experts (e.g., summer schools, workshop/Stakeholder activation events)

Ten key messages

Conclusions and ten lessons learned

1. **System Boundaries and Virtual Expansion:** Limitations in traditional positive energy district boundaries necessitate the expansion of system considerations to include virtual boundaries for a more comprehensive approach.
2. **Replicability Challenges and Data Quality:** While developed tools are intended for broad geographic replication, a key obstacle lies in securing good quality input data that is specific to each unique context.
3. **Context-Dependent Parameters and Components:** The definition of building archetypes and energy system components is inherently context-specific, and the economic/balance analysis along with regulatory control settings are dependent on local conditions and regulations.
4. **Non-Technical Enablers Precede Technology Deployment:** The realization of positive energy district technologies, though possible, hinges on the prior establishment of non-technical enablers such as funding schemes and regulatory frameworks.
5. **PV Limitations in Achieving Self-Sufficiency:** Although photovoltaic technology is consistently present in PED considerations, its contribution alone is generally insufficient for achieving district self-sufficiency or a fully realized positive energy district.

Conclusions and ten lessons learned

6. **The Challenge of Heating and Cooling Decarbonisation:** Achieving decarbonisation in the heating and cooling sectors remains a significant challenge, with limited widespread adoption beyond heat pumps, highlighting the need for more diverse pilot projects beyond PV-centric approaches to demonstrate the benefits of centralized systems.
7. **Smart Control Complexity and the Promise of Ontology:** The lack of smart control in complex systems comprising smart buildings, flexible assets, and local renewable energies can be addressed by leveraging ontology-driven control developments to accelerate uptake and avoid ad-hoc solutions.
8. **The Need for Standardized Assessment and Harmonized Data:** A consistent schema for rating districts, moving beyond individual or subjective assessments, is required, along with cross-analysis of data cases using harmonized data (harmonized scale and context conditions).
9. **Urban Transformation Beyond Technology and the Importance of Stakeholders:** Urban transformation extends beyond mere technical solutions, necessitating active communication and engagement with a broad range of stakeholders.
10. **The Significance of Hybrid Governance and Embedded Sustainability:** Addressing societal challenges effectively in the context of PEDs requires a hybrid governance approach (top-down and bottom-up), and sustainability performance should be intrinsically embedded within the PED definition, accompanied by clear benchmarks.

Thanks

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https://annex83.iea-ebc.org/,
https://drc.ait.ac.at/sites/annex83austria/
in German

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