

Deliverable 3.1
Constellation mapping and stakeholder engagement strategies for PED living labs
Extended Summary

Responsible partner: TUG

Prepared by:

Christian Dayé, Anna Schreuer, Jürgen Suschek-Berger - TUG

1. Purpose and scope

This deliverable, D3.1 *Constellation Mapping and Stakeholder Engagement Strategies for PED Living Labs*, provides a foundational understanding of the socio-technical environments in which the five eduPED living labs operate and offers guidance for the next steps in their transition toward Positive Energy Districts (PEDs). Using the method of **Constellation Analysis (CA)**, the report systematically maps actors, regulatory conditions, technologies, infrastructures, and local climate factors that shape each living lab's pathway to PED transformation. The results form a basis for designing effective, context-sensitive stakeholder engagement strategies across the project.

The methodological approach is **exploratory and comparative**, aiming less at standardization across sites and more at identifying **local particularities** that influence PED transition processes. CA was selected as an appropriate tool due to its capacity to uncover interdependencies within complex socio-technical systems by integrating diverse expert perspectives. Rooted in Science and Technology Studies (STS), CA assumes that social, technical, and natural dynamics are deeply intertwined and therefore must be considered jointly in any transformation effort. In eduPED, the method was adapted to focus on four core categories—**social actors, regulations and guiding principles, technologies and infrastructures, and local climate conditions**—to ensure relevance to the PED context.

Across the five living labs—Graz, The Hague, Cluj-Napoca, Terrassa, and Torino—CA workshops were conducted in 2025 in varying formats (on-site, online, hybrid). Despite differences in workshop settings and materials, each session successfully produced three key outcomes:

1. A shared understanding among participants of the current socio-technical constellation of their campus or district.
2. A visual map of relevant elements and their interrelations, serving as a resource for identifying stakeholders, comparing patterns across sites, and detecting site-specific challenges or opportunities.
3. Initial experiences of collaborative engagement, fostering a basis for continued involvement of local experts and stakeholders in the co-creation process toward PED development.

Building on these outcomes, the deliverable proposes a visioning workshop design to support subsequent stakeholder engagement in each living lab. This workshop concept aims to translate insights from CA into forward-looking, participatory planning activities that mobilize stakeholders around a shared PED vision and prepare the ground for the co-creation processes in the next phases of eduPED.
Overall, D3.1 establishes the analytical and participatory groundwork for WP3 by clarifying the unique conditions, actors, and dynamics at play in each living lab, and by offering a structured approach to deepen stakeholder engagement as the PED transition progresses.

2. Methodological approach

This Deliverable – D3.1 Constellation Mapping and stakeholder engagement strategies for PED living labs – uses the technique of Constellation Analysis to provide "a structured analysis of each local living lab in terms of relevant actors and regulatory, socio-economic, infrastructural and environmental framework conditions" (Full Proposal of the eduPED project, description of WP3, p. 16). The objective, thus, is exploratory and an auxiliary to the more important task in WP3, the development of strategies to engage local stakeholders across all five eduPED living labs in their transformation toward a PED. Comparisons between the living labs are of interest, but the focus is on identifying particularities. Thus, the variations in carrying out the Constellation Analyses across the five sites are not problematic.

Origins and theoretical foundations

Constellation Analysis (CA) is a versatile technique to have a group of multi- or transdisciplinary participants explore a socio-technical system, or a particular problem within this system.
CA achieves a multi-perspective view on the mentioned interrelationships

a) by bringing together experts from a variety of relevant backgrounds in a workshop or a series of workshops; and
b) by engaging them in a mapping exercise that relies on a set of four main elements.

In its most general form, these elements are

- actors;
- technical elements;
- natural elements;
- and signs.

Participants try to identify the most relevant actors, technical elements, natural elements, and signs of the socio-technical system under scrutiny and to discuss the interrelations between them.

Depending on the materials available during the workshop, a Post-It, a sheet of paper, a digital box, or something along these lines is added to the map for each of the elements identified by the participants. Lines and arrows between the elements are then used to indicate the nature of their interrelation. As a method of exploration, however, there are no strict "Musts" as regards the naming of the element categories or the nature of the interrelations discussed.

Constellation Analysis in the eduPED project

The eduPED project team decided to use four slightly different categories as the core elements of the envisaged constellations. These were:

- the social actors,
- the regulations and guiding principles,
- the technologies and infrastructures, and
- the local climate conditions that the participants deemed relevant in the transition of the campus area to a PED.



Consequently, the question guiding the CA workshops read as follows:

> "What constellation of actors, regulations / principles, technologies / infrastructures, and local climate conditions are relevant for the transition of our campus into a PED?"

By working on this question, the participating experts achieved three things. First, they developed a shared understanding of the socio-technical system at place in each of the livings labs. Second, they jointly created a visual representation of the socio-technical system that can be further used in the eduPED project to identify potential stakeholders and explore patterns across as well as particularities within the eduPED living labs. And third, they collected experiences of working together as a group towards a shared goal, namely the transformation of the living lab into a PED: this, in turn, means that the eduPED project might rely on their support in further engagement activities.

3. Five eduPED living labs, five CA workshops

In line with the exploratory objective of the constellation analysis, the workshops were carried out differently and adapted to the particular needs of the living labs. For instance, the constellation analysis in Graz was carried out as a lengthier process that involved face-to-face meetings as well as interviews (in German) with local experts. Other constellation analyses were carried out as online workshops under the moderation of TU Graz representatives, and thus in English. Finally, the constellation workshop in Cluj-Napoca was face-to-face and moderated by members of UT Cluj. In this case, the workshop language was Romanian.

The following table provides an overview over the constellation analyses in the five eduPED living labs.

Living lab	Date of workshop	Moderation	Mode
The Hague	19 May 2025	TU Graz	Online
Cluj-Napoca	17 June 2025	UT Cluj	On site
Terrassa	21 July 2025	TU Graz	Online
Torino	9 Sep 2025	TU Graz	Hybrid
Graz	Mar–Sep 2025	TU Graz	On site

4. Stakeholder engagement strategies for eduPED living labs

The next step in the stakeholder engagement process within eduPED is a visioning workshop. While this will result in a more precise list of engagement activities, the following considerations will guide further strategy development as principles. They are derived from the constellation analyses as well as from prior experience and additional research on conditions in the five living labs.

The Netherlands

In the case of THUAS, there are already initiatives under which residents and other stakeholders join forces to promote sustainable transitions. The likelihood of success of further engagement activities within the eduPED project will rely on how effective an early involvement of these actors can be accomplished.

Relations to local authorities have already been established, and in terms of legislation and regulation, there is support for the objective of transforming the THUAS campus area to a PED as well as a large awareness of the preparatory efforts required to achieve such a transition.

The fact that adjacent to the campus, there is the waterway of the Laakhaven is a particularity that differentiates the Dutch case from most of the others.

Italy

In the Italian case, the constellation analysis workshop helped to establish links between two of the most important actors driving the transition of the campus to a PED, namely the POLITO leadership and the Municipality of Torino. Further engagement activities will be coordinated by contributions from both sides.
While the workshop helped to identify synergies between the various elements and actors, participants also became aware of particular tensions likely to emerge on the way. This informs a careful selection and approach of stakeholders in the near future, for instance for the visioning workshop.

Spain

The constellation analysis workshop in Spain also helped to strengthen the already existing connections between UPC researchers and representatives of the Municipality of Terrassa. Beyond this, however, *L'Energètica* emerged as another key stakeholder during the discussion. *L'Energètica* is the public renewable energy company of the Government of Catalonia. As UPC is currently in negotiations with this company to become its main energy provider, there are existing relations which the eduPED team might use, but the implications of this potential "double role" have yet to be assessed.

Romania

In the Romanian case, regulation and legislation emerged as a key topic. Therefore, further stakeholder engagement activities will attempt to involve representatives of various levels of policy-making and administration. Based on that, funding options might also become a topic.

Austria

The situation for the campus Inffeldgasse in Graz is different insofar as there is still space for new buildings, which can (and in line with existing planning documents and other agreements: will) implement various provisions that may adding to a positive energy balance, including earth probes.

As roof space for increasing the amount of PV devices is limited, creating energy communities with neighbours might be an option. Thus, owners of the surrounding buildings (both schools and private housing) will also be considered in further engagement activities.

5. Conclusion

This deliverable has laid the groundwork for understanding and supporting the transformation of the eduPED living labs into Positive Energy Districts. By applying Constellation Analysis across five diverse campus environments, the project team has gained a nuanced picture of the socio-technical landscapes in which each PED transition will unfold. The analyses confirm that while the living labs share overarching ambitions and structural similarities, each operates within a unique constellation of actors, regulatory conditions, technological infrastructures, and local climatic factors that shape both challenges and opportunities.

The resulting constellation maps serve as more than descriptive outputs: they are practical tools that enable the identification of relevant stakeholders, reveal leverage points for PED development, and support comparison across sites without losing sight of essential local particularities. Equally important, the CA workshops provided an early platform for collaborative engagement. By bringing together experts from different domains, the workshops helped establish shared understandings and fostered initial relationships that will be instrumental for future co-creation activities.

Building on these insights, this deliverable also offers a visioning workshop concept designed to translate the findings of the constellation analyses into forward-looking engagement processes. This workshop format will support each living lab in developing a collectively endorsed PED vision, strengthening stakeholder commitment, and preparing the ground for more targeted participation strategies in the subsequent phases of eduPED.

In conclusion, D3.1 contributes both analytical and methodological value to the project. It clarifies the complex conditions under which each living lab will advance toward a PED and provides structured approaches for engaging stakeholders in that journey.