TELOS Intensive Study Programme Working Group Report: Bahnstadt Nürtingen: Towards a Positive Energy District

Authors
Maria Beatrice Andreucci, Sapienza University of Rome, Italy
Dorothee Apfel, Nuertingen-Geislingen University, Germany
Dorota Wojtowicz-Jankowska, Gdansk University of Technology, Poland
With the participating students Bahaa Bou Kalfouni, Pinar Zegerek Altunbey, Tracy Saliba, Feven Tamene, Szymon Jackowski

Goals and objectives

In light of the EU's climate goals and the global energy crisis of unprecedented depth and complexity, accelerating the energy transition is becoming increasingly important. The expected outcome of the EU energy transition relies on the emerging concept of Positive Energy Districts[1] (PEDs), representing extraordinary opportunities for building renovation and wider urban regeneration. PEDs can significantly contribute to the decarbonization of the planet and enable renewable energies and participatory processes with its integrated district-based approaches to energy efficiency, productivity and flexibility.

Figure 1: PED as integrated model. Source: DUT Partnership (n.d.)

Ensuring the successful development of PEDs requires the coming together of multiple stakeholders, applying a collaborative governance model, which in this sense is crucial for connecting, aligning interests and priorities, and creating a common vision made up of shared values among stakeholders. In particular, the emerging impacts associated with the development of PEDs can be referred to as incentives to mobilize stakeholder participation (Sareen et al., 2022).

[1] *We base our understanding on the JPI Urban Europe (2020), in which the definition of PEDs is as follows: "Positive Energy Districts are 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".*

Funded by the European Union

One way to make PEDs accessible to the broad range of stakeholders, and a fruitful way to illuminate the debate among academia, policymakers, and practitioners about the sustainability assessment of PEDs, is to link PEDs to the concept of nine planetary boundaries – PB (Cfr. Haase & Andreucci, E2024, in progress). They represent a safe operating space for humanity. As recently updated by Richardson et al. (2023) six of the nine boundaries have been trespassed (see Fig. 2).

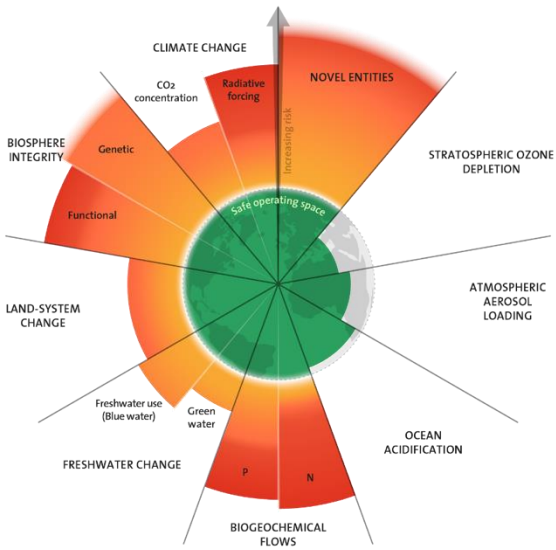

Figure 2: Planetary boundaries in 2023. Source: Licensed under CC BY-NC-ND 3.0. Credit: "Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023".

Even if the PB framework does not indicate how societies - or PEDs - should develop, by identifying a safe operating space for humanity on Earth, it can make a valuable contribution to decision-makers in charting desirable courses for societal development, encompassing PED implementation. Therefore, we investigated the approach of PEDs in the realm of the nine planetary boundaries. In doing so we integrated two core claims which stem from the combination of these two approaches. First, to put focus on a regenerative sustainable model for the built environment, which allows us to plan and design settlements and urban areas that stay within the "safe operating space", and second a rethinking of our relationship with our planet, which is needed for the regeneration of its social ecological systems.

Against this backdrop, we chose a “human-centered” approach to investigate the energy transition at the local level of Nürtingen. Our working group explored the concept of PEDs, informed by the PB framework, using the case of a new urban district, the so-called “Bahnstadt” Nürtingen. Our guiding questions were: *How might the concept of PEDs be transferred to the new district development? And what could be the role of the existing neighboring district and community in this?*

A summary of the forum process

In this work process, the human-centered approach, which is based on the innovative business model “public-private-people-partnership”, was confronted with the planning and governance process of the city of Nürtingen. By applying this approach, we were able to merge PED and PB understandings, aiming at creating positive impacts rather than reduce negative impacts (i.e., the “regenerative design” approach). This means that overarching goal of the human-centered approach is to help improve the quality of life of the people as well as of the environment. It was noted that the municipality has a public-private partnership approach that neglects people’s visions and needs, and also does not go beyond limiting negative impacts, which were identified as the main pitfalls for a PED in safe operating space. This is discussed in detail in the next section.

We used the approach of mixed methods (see Fig. 3), by integrating the analysis of official documents of the city administration of Nürtingen, as accessible via internet, the direct exchange with citizens developed on site using the method of go-along interviewing (Bartlett et al. 2023), conducting a SWOT analysis, and integrating best practices, already known and as experienced during a visit of two case studies in the city of Tübingen.

Figure 3: The Forum process as defined by the Energy Team.

Outcomes and findings

The results of analysis and conclusions on working with the municipality project “Bahnstadt” were checked against the understanding of a human-centered PED. We examine the five action areas: mobility, water management, energy efficiency and supply, carbon footprint, and social inclusion. The whole process was developed aiming at providing recommendations to further improve the community's participation within the existing planning processes and goals.

1. As for **mobility,** it was found that the municipality concept foresees the isolation of bike and pedestrian ways, a car-free space in the district and running the road parallel to the railway tracks on a dam, which would eventually lead to a separation of the districts on the west and east sides of the railroad. TELOS proposal was to improve mobility in and around the new district, leading to improved connectivity between the west and east sides of the railroad by laying the road at ground level, parallel to the railway tracks and building a bridge to reconnect the two parts of the city.

2. For **water management,** it was noted that no engagement has been taken so far by the municipality, notwithstanding the urgency and severity of this challenge. Due to the need of rainwater management and the potential of water to improve micro-climatic conditions it was suggested to collect rainwater and greywater to be treated and reused for irrigation and other purposed not demanding potable water. Major “nature-based” solutions included dry or wet rain gardens and bioswales, water reservoirs, biological areas for water collection, dry streams to manage excess flooding, and the use of local plant species with high water treatment capacity.

3. **Energy efficiency and energy provision** was addressed by the municipality at the *status quo* level in Germany. This means the realization of the German 40% energy efficiency standard for buildings, installations of solar energy systems on buildings, and a feasibility study for geothermal energy. However, planning a new district from the scratch offers possibilities to go beyond “greening” the energy-mix. Measures at different levels for an integrated energy planning were consequently proposed. They included the installation of geothermal pumps, the integration of solar panels on building facades, the use of smart (led) lighting and ventilation systems, mechanical ventilation with heat recuperation, the production of surplus energy to benefit public buildings in the neighborhood, and the introduction of innovative business models such as “energy communities” to share costs and benefits of the initiative.

4. Regarding the **carbon footprint**, besides CO_2 reduction expected by cleaner energy provision, it must be noted that the municipality has already included in their plan the use of recycled materials, green building facades, and green courtyards. On this basis, it was additionally proposed the use of regional materials, the enlargement of green spaces in between buildings to serve as noise and pollution buffer zones, and the protection of existing trees and greenery.

5. The need for substantial improvement of **social inclusion** was already evident meeting the citizens during the conducted study walk. The lack of a human-centered approach was also evident in the planning documents. If cities are set to achieve the overarching goal of improving living conditions for all (i.e., well beyond benefitting only the residents living in newly constructed and efficient districts) the whole planning and implementation process must be changed and adapted to these goals leveraging on citizen participation and co-creation activities. It was suggested to further develop the municipality concept of two playgrounds and space for social activity into a district with community gardens; and to increase the level of safety by providing smart lighting systems (gradual switch-on when people are present) and the

enhancement of the tunnel underneath the railroad to become a positive experience for the users.

All photos: Good practices from the study walk in Tübingen. Source: Energy Team.

Reflection and Outlook

The conducted study aimed at answering two questions: *How might the concept of PEDs be transferred to the new district development?* And second, what could be the role of the existing neighboring districts and communities in this process?

The answer to the first research question is sobering, and a reflection is needed on the existing municipal approach to the “Bahnstadt” in Nürtingen. Reviewing city council documents, newspaper reports, and publicly available documents of the local energy provider (German: *Stadtwerke*) some relevant limits in the approach to planning for this new district emerged. It was evident that life-cycle considerations are lacking, as is a shared (and commonly agreed upon) vision of how this new area should be developed. Thus, it was not surprising that planning that could go beyond the mere provision of basic infrastructure and buildings in compliance with federal and state laws is lacking. Unfortunately, an exchange between the responsible departments of the city administration and the energy provider could not be achieved for our working group. Nevertheless, the available material was a sound basis for looking into the possibilities towards a “human centered Bahnstadt”.

The answer to the second research question is twofold. On the one hand, there was an opportunity to meet citizens and learn about their common interests as well as their concerns and fears. It was possible also to gain insights into the current planning processes, and it was found that formal citizen participation is perceived as unsettling. It also became apparent that people in the nearby existing neighborhood were thinking less about playing an active role in integrating the two districts and more about the changes that might be triggered, which had few positive connotations and more negative ones. On the other hand, a number of ideas emerged from reading the municipality's documents, especially with respect to how existing structures are supposedly included, and to how interconnections of districts could be realized. Regarding specifically PEDs, consulting both the community's documents and the citizens, it was not possible to detect innovative approaches to energy-related citizen participation or even possible steps forward in that direction.

Finally, referring to the work of Sareen et al. (2022) who developed "Ten questions concerning positive energy districts", it is possible to relate the conducted research and obtained results to the framework conditions the authors identify. In the case of the "Bahnstadt" it is possible to refer to:

- “The ability to integrate technical and non-technical capabilities and engage stakeholders within and outside the city hall, complemented by the capacity to learn, are key relational components to success.”
- Key structural aspects that include urban governance models and institutional architecture and that can ensure effective implementation, based on research and innovation, pilot projects, and strategic capacity-building.”

In future collaborative studies, it appears therefore advisable to focus first on individual success principles that have already been identified in order to advance them, and subsequently conduct appropriate studies with the involvement of all stakeholders.

References

Bartlett, R., Koncul, A., Lid, I. M., George, E. O., & Haugen, I. (2023). Using Walking / Go Along Interviews With People in Vulnerable Situations: A Synthesized Review of the Research Literature. *International Journal of Qualitative Methods*, *22*. https://doi.org/10.1177/16094069231164606

DUT Partnership (n.d.): *The Positive Energy Districts Transition Pathway (PED)*. Available at: https://dutpartnership.eu/the-dut-partnership/the-positive-energy-districts-transition-pathway-ped/ (last accessed 4 October 2023).

JPI Urban Europe (2020). Available: https://jpi-urbaneurope.eu/wp-content/uploads/2020/06/PED-Booklet-Update-Feb-2020_2.pdf (last accessed 4 October 2023).

Richardson, J., Steffen W., Lucht, W., Bendtsen, J., Cornell, S.E., et.al. (2023). Earth beyond six of nine Planetary Boundaries. *Science Advances*, 9, 37. 10.1126/sciadv.adh2458

S. Sareen, V. Albert-Seifried, L. Aelenei, F. Reda, G. Etminan, M.-B. Andreucci, M. Kuzmic, N. Maas, O. Seco, P. Civiero, S. Gohari, M. Hukkalainen, H.-M. Neumann (2022).Ten questions concerning positive energy districts. *Build. Environ., 216*. 10.1016/j.buildenv.2022.109017