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UP-SCALING, GROWTH AND REPLICATION OF POSITIVE ENERGY DISTRICTS

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INTRODUCTION

This deliverable report focuses on both concepts about and experiences with the up-scaling, replication and growth of Positive Energy Districts (PED). While achieving socio-technical energy innovations within the boundaries of a city district is a primary aim of PEDs, it is also necessary to move beyond PED limits to support urban transformation process in the wider city and further beyond. This process of up-scaling raises fundamental issues about how knowledge travels and is translated and applied in other contexts, and needs to address the multiple tensions between place-based priorities and actions and broader transformation processes (Hodson et al. 2018). This requires learning processes which are not only broad, but deep, multi-layered and reflexive, including both first and second order learning (e.g. user context, regulation, societal impact) (Ryghaug et al. 2019). In this report we reflect on the need to move beyond individual cases by developing a portfolio of growth, replication, networking, and linking approaches to upscale PED findings to inform systemic urban transformations (Naber et al. 2017; Lam et al. 2020).

Up-scaling requires much more than simply applying the findings from an existing PED at a larger scale or to another neighbourhood/district. In this report, we review academic literature on up-scaling to identify the various ways that up-scaling can be integrated into PED governance to achieve broader sustainable urban transformations. In general, we build on the typology of Naber et al. (2017). Growth strategies in this context aim to expand PEDs spatially and socially to include additional areas and stakeholders or by 'deepening' the PED with new functionalities such as business models, services, and technologies. Replication aims at transferring and adapting elements of PEDs to other places.

To explore experiences with opportunities and barriers to up-scaling through growth and replication, we conducted interviews and organised workshops within each of the 5 PEDs in the TRANS-PED project. The results and insights from the practitioners of these PEDs are discussed in the second part of this deliverable.

REPLICATION, GROWTH AND UP-SCALING – A LITERATURE REVIEW

In this section, we review key literature on up-scaling and replication. Much of this literature does not address the up-scaling of urban districts, but draws more broadly on cases of experimentation and pilot projects which in a next stage are intended to be scaled up to a broader level. However, PEDs are usually framed as pilot and demonstration projects to reconfigure energy use in cities, and they can be conceptualised as testbeds or living labs (see Magnusson and Rohracher 2022).

PILOT / DEMONSTRATION PROJECTS AND SOCIO-TECHNICAL EXPERIMENTS AS A BASIS FOR UP-SCALING

In a first step, we reviewed the literature on experimentation, pilot and demonstration projects to create a context for the analysis of up-scaling and replication. Experiments and demonstrations are a central instrument to govern urban sustainability transitions (see e.g. Markard et al. 2012; Evans et al. 2016; Schot et al. 2019; Ryghaug and Skjølsvold 2021; Bylund et al. 2022).

Hellsmark et al. (2016) distinguish three particular literature streams that address demonstration projects: (1) Natural science and engineering studies with a strong focus on the technical challenges of up-scaling and verifying new technology; (2) technology and innovation management literature studying learning, validation and verification of product or process innovations; and (3) innovation and transition studies looking beyond technical uncertainties and firm level learning to analyse the contribution of such projects to the establishment of new markets, institutional alignments, public attitudes and so on. From an innovation studies perspective, the purpose of demonstration projects is "to test a given technology and its ability to enter the market to support the diffusion of technologies" (Mosgaard and Kerndrup 2016: 2706). They are situated between basic R&D and knowledge generation and the wider diffusion of new technologies, and support optimisation, up-scaling, verification, market creation and so on (Frishammar et al. 2015). There is wide agreement about different contributions of demonstration projects to innovation processes (Brown and Hendry 2009; Koch and Bertelsen 2014; Hellsmark et al. 2016), such as the reduction of uncertainty and risk through new information. Demonstration projects can be regarded as a 'platform for learning', "a place where participants interact and build a shared body of knowledge" and "where a consensus about the properties of the new technology" is built (Bossink 2015: 1412). From an external perspective, demonstration projects also create visibility and contribute to broader public awareness for certain products and technologies, just as they establish clear institutional barriers (Karlström and Sandén 2004).

Demonstration projects are described as important steppingstones towards dominant designs (Brown and Hendry 2009; Koch and Bertelsen 2014), which is a precondition for wider product dissemination or infrastructural change. Finally, demonstration projects can help to build new networks of actors along the value chain, establish advocacy coalitions to drive institutional changes and thus embed new technologies in their social, cultural and economic context (Brown and Hendry 2009). All these mechanisms are obviously also very important to further implement and spread PEDs.

However, empirical studies of demonstration and pilot projects also point to various challenges and limitations. When high-performance pilot buildings are revisited later during daily operation, it is common to find gaps between claims made during their commissioning and their actual daily performance (Day and Gunderson 2015; Fedoruk et al. 2015). Related to this, many pilot projects encounter problems due to a lack of consumer engagement and insufficient benefits to users. Klitkou et al. (2014) studied over 400 Scandinavian pilot projects in sustainable energy and transport and identified the need to support the demonstration of several alternative solutions and facilitate learning across projects to facilitate knowledge sharing. Insufficient engagement with user needs in favour of the technological aspects of demonstration projects is a recurring theme in such empirical analyses (see also Koch and Bertelsen 2014; Wallsten 2017, Pallesen and Jacobsen 2021), as is the development of demonstration projects without accounting for the experiences and insights from previous demonstration projects (Femenías and van Hal 2003; Beukers and Bertolini 2023).

Despite many overlaps with the innovation studies concepts discussed above, the literature streams on experiments in relation to climate change and sustainability usually offer a perspective which goes beyond a focus on the firm-level and technology learning. 'Sustainability experiments' are a core part of literature related to strategic niche management and sustainability transitions, and are increasingly prominent in the field of urban studies (Castán Broto and Bulkeley 2018; Evans et al. 2021; Ehnert 2023).
Niche management approaches claim that temporary protected spaces (which can be market niches, public subsidies as in the case of demonstration programmes, or grassroots initiatives) are of crucial importance for the development of radically new socio-technical configurations (see e.g. Schot and Geels 2008; Smith and Raven 2012). Sustainability experiments (Berkhout et al. 2010) (arguably, many pilot projects fall into this category) can provide such spaces to create new networks of actors around certain technologies (including e.g. municipalities and NGOs), to develop new social practices of use, align them with institutional contexts or contribute to institutional change, create new skills and competencies, align expectations about the further development of these technologies, mobilise political support and so on. In relation to the innovation projects mentioned earlier, such experiments emphasise long-term perspectives of systemic change, the inclusion of 'outsiders' and the development of new social relations and practices which depart from the currently dominating structures in socio-technical regimes, such as energy and mobility systems. Compared to demonstration projects, experiments are more tentative, open to different outcomes and to failure (Sengers et al. 2016). Crucially, they also entail the negotiation of interests and multiple expectations of possible futures (Berkhout 2006). While niches tend to centre on the development of new technologies (along with the social relations they are part of), concepts of 'bounded socio-technical experiments' (Szejnwald Brown et al. 2003) or 'grassroots experiments' (Smith and Seyfang 2013) put more emphasis on civil society initiatives, citizens and social learning.

The role of experiments in the field of climate change and sustainability is of growing interest to urban studies scholars. Climate change experiments and initiatives are becoming key governance strategies for cities to combat climate change (Bulkeley and Castán Broto 2013; Williams 2016) – not least reflecting shifts in public authority which restrict cities to enabling modes of governance such as facilitating new forms of cooperation and the development of new initiatives e.g. in transport, energy generation or urban agriculture. Such experiments are often "critical sites through which visions of low carbon cities are created, networks built and learning enacted" (Bulkeley and Castán Broto 2013: 373). More closely related to pilot and demonstration projects, such urban initiatives are often framed and set up as 'urban laboratories' (Evans and Karvonen 2014; Karvonen and van Heur 2014) or 'living laboratories' (Voytenko et al. 2016; Schliwa and McCormick 2016; Bulkeley et al. 2019). Living labs are defined as "physical arenas in which different stakeholders have space to experiment, co-create and test innovation in real-life environments" (Schliwa and McCormick 2016: 174). They are characterised by an experimental logic of empiricizing the urban landscape through monitoring and instrumentation (Evans and Karvonen 2014).

UP-SCALING AND REPLICATION

While moving „beyond experiments" (Turnheim et al. 2018; Sengers et al. 2021) is a key element in the literature on experimentation and pilot projects, the mechanisms and projects by which this is achieved is often not discussed in depth. Instead, such questions are addressed in a separate strand of literature with a more explicit focus on up-scaling and replication. Much of this discussion however has a predominantly technical focus as exemplified in the literature on the up-scaling of demonstration projects on smart grids (which arguably also are an important feature of PEDs). As Sigrist and colleagues (2016) point out in a comparative analysis of smart grid demonstration projects in the European Union (GRID+ project, Sigrist and Rouco (2012)), scalability and replicability are the two qualities of smart grid pilot projects which reduce barriers for the growth and reuse of the solutions tested. They define scalability as the "ability of the system to maintain its performance and function (...) when its scale is increased" (p. 2). This requires a modular design because centrally organised systems cannot be easily increased in size. Replicability, in turn, "denotes the property of a system that allows it to be duplicated at another location or time" (p.2). This largely depends on standardisation and interoperability. Only if a smart grid solution is interoperable with existing grid infrastructures in other places, and the solutions as well as interfaces are sufficiently standardised, does it have a chance to be replicated in other places (from an engineering perspective). In both replication and up-scaling, they identify economic factors (e.g. the economic viability of scaling up small-scale solutions) and market-related institutional factors (e.g. similarities of market designs along with regulations which define the role of different actors, tariff structures etc.) as important to the viability of business models and replicability of solutions (see also May et al. 2015). As a final factor, stakeholder acceptance is pointed out as a precondition to scale or replicate projects.

SOCIO-TECHNICAL CONCEPTS OF UP-SCALING

From a socio-technical perspective, social, economic and institutional factors are not discussed in sufficient depth and differentiation in the aforementioned technology-oriented analyses. Techno-economic performance is insufficient for successful diffusion and up-scaling. From a socio-technical perspective, new technological configurations are entangled in a range of socioeconomic and cultural relations (a common characteristic of sustainable urban districts), questions of replication and up-scaling become more complex. Moreover, the replication and up-scaling of solutions from pilot projects needs to be integrated in a broader perspective of systemic change to achieve the longer-term aim of transforming the existing energy system. This goes beyond the replication and economic success of specific PED solutions. Such an attempt is e.g. undertaken by Naber et al. (2017), who put these questions into a broader context of socio-technical transitions. Table 1 gives an overview of the different processes of up-scaling as defined in their transition context.

Patterns of upscaling (based on previous studies).

Pattern of upscaling	Description
1. *Growing*	The experiment continues and more actors participate, or the scale at which technologies are used increases
2. *Replication*	The main concept of the experiment is replicated in other locations or contexts
3. *Accumulation*	Experiments are linked to other initiatives
4. *Transformation*	The experiment shapes wider institutional change in the regime selection environment

Table 1: Different patterns of up-scaling smart grid experiments (source: Naber et al. 2017)

These patterns closely follow concepts of strategic niche management (Schot and Geels 2008; Smith and Raven 2012), where radically new socio-technical configurations initially take form and gain strength in protected niches such as publicly subsidised pilot or demonstration projects. Niches contribute to processes of social learning, the formation of social networks, and the alignment of expectations of different actors. Through processes of interlocal learning (Geels and Raven 2006), the variety of local experiments contributes to the development of a global niche. Under certain conditions, when dominant socio-technical regime structures (in our case, the current organisation of energy infrastructures supported by specific regulations, rules and incumbent actors) come under pressure (e.g. through climate change and the need to integrate a high share of renewables or through new technological developments such as the pervasive use of ICT), such niches may challenge and eventually overturn socio-technical systems such as the traditional organisation of urban energy systems.

As an analogy to these niche development processes, sustainable energy solutions might find their way into a global niche or even become part of a modified or transformed regime. Pilot projects may grow in size (e.g. include additional actors or households) and may be replicated in other places. Eventually, these projects may be aggregated, e.g. through the work of intermediary organisations which facilitate the knowledge flow and learning across smart grid pilot projects and may finally transform current urban energy structures. Analysis of a variety of case studies shows that replication often does not involve the repetition of an entire experiment, but that most parts (e.g. technologies, routines, institutions) of a project are replicated and circulated across multiple contexts.

Also, other researchers have proposed socio-technical concepts to better understand and categorise scaling-up processes. Van Winden and van den Buse (2017) identify three types of up-scaling in their review of the literature:

1) roll-out mainly refers to manufactured smart city products and service innovations and their scaling up on the market (market roll-out) or in organisations (organisational roll-out);
2) expansion refers to increasing the size of existing smart city projects (such as mobility platforms); and
3) replication refers to the implementation of solutions developed in pilot projects in other contexts (other organisations, other parts of the city, other cities).

In general, such types of up-scaling include spatial dimensions (geographical enlargement), intertemporal dimensions (expanding duration and continuity) and attempts to influence institutional environments to accommodate the up-scaling process. The last element is similar to the 'transformation' pattern of up-scaling in Naber et al. (2017). Van Winden and van den Buuse (2017) emphasise the conditions and drivers for up-scaling processes, and they identify four main issues, which are largely in line with Sigrist et al. (2016):

1) prospects of economies of scale, which provide a strong incentive for firms to scale-up projects;
2) managing the interplay of exploration and exploitation activities and the different competencies related to this at the firm level (see also Hansen and Mattes (2018)) as a precondition for up-scaling;
3) meeting the challenge of knowledge transfer (particularly tacit knowledge) is a key issue for transferring new solutions to other contexts and replicate them; and
4) the conditioning role of regulatory, legal and policy frameworks, when projects are replicated in other places.

Key lessons of their research include (1) the need to design pilot projects in a way which makes it easier to scale them up, and (2) the sensitivity of smart grid technology projects with respect to social, cultural, political, institutional and behavioural contexts. By taking the social, cultural and institutional local structures and relations (despite a highly complex, interwoven and networked society) into account, theories on regions and urban competitiveness have increasingly emphasised the "place-basedness" of local experiments, policies and implementation projects in the last decade (Friedmann 2002; Camagni 2019). We will come back to several of these issues in our own conceptual approach below, developed in a different project.

A further distinction of up-scaling patterns is made by van Doren et al. (2018) regarding cases of urban low-carbon initiatives. Here a horizontal pathway of scaling up, which refers to the spatial growth of initiatives and includes replication, diffusion or other forms of scalar expansion, is distinguished from vertical pathways of scaling up, which focus on 'structural learning' and institutional change and include related terms such as translation, mainstreaming and institutionalisation. A strong performance in horizontal up-scaling (replication) significantly increases the chances of vertical up-scaling and institutional change. Vertical up-scaling can also involve the successive embedding of smart grid projects in wider institutional fields (regional, national, international) which in this process are adapted to meet the requirements of smart grids (see also van Doren et al. 2016). In relation to Naber et al. (2017) the horizontal expansion means remaining in the same niche, while horizontal up-scaling means going beyond the niche to transform regime structures.

Lam et al. (2020) organise and extend these typologies by reviewing a broad range of literature including social-ecological transformations research, social innovation research and the discussions within socio-technical transitions research (as reviewed above). One important point they make, and which resonates with the typologies above, is that not all these mechanisms are about changes in scale. Consequently, they speak about ‚amplification processes' which „describe diverse actions deployed by sustainability initiatives together with other actors (e.g., from government, business, or society) to purposively increase their transformative impact (e.g., initiating a new initiative in another city). The emphasis is thus on the extended impact of initiatives, which is created when new ways of thinking, doing, and organizing things (e.g., practices, processes, or products) get adopted and amplified" (ibid. p.3). Summarizing the different bodies of literature, they arrive at an integrated typology as presented in Figure 1.

In addition to the mechanisms discussed above, this typology also includes processes such as stabilisation or ‚speeding up' as a form of amplification within the same initiative, while ‚scaling up' in this scheme refers to impacts at higher institutional levels (e.g. changing rules of logics of an incumbent regime) and ‚scaling deep' addresses changes in values and mindsets (i.e. peoples values, norms and belief) (see also Moore et al. 2015 for a more extensive discussion of these forms of scaling).

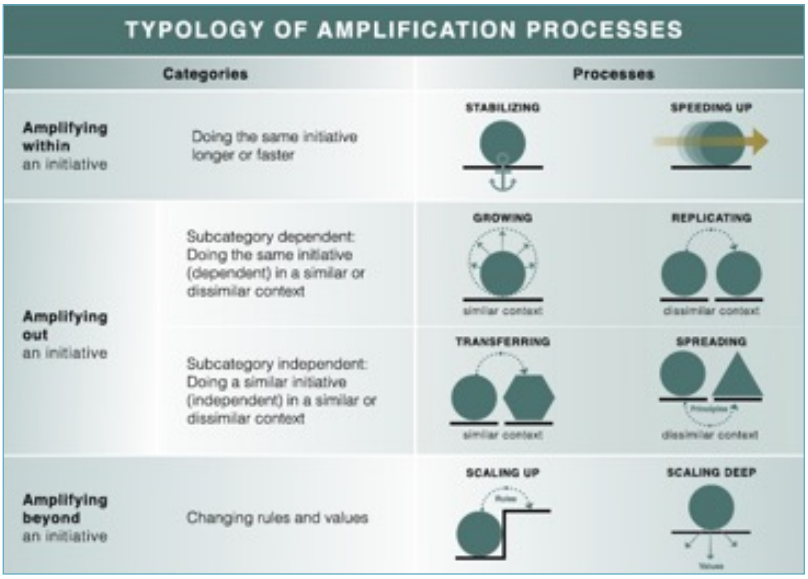

Figure 1: Typology of eight amplification processes (Lam et al. 2020)

In conclusion, the current literature on the replication/scaling-up of pilot projects and sustainability initiatives makes a main distinction between (A) different forms of scaling-up within given institutional and socio-cultural contexts, and (B) more far-reaching up-scaling strategies, involving different forms of system transformation and institutional change. The first category includes different scaling-strategies such as the expansion of pilot projects, the replication of new energy solutions in new contexts, and the roll-out and diffusion of new products and services. A key tenet of these studies is the importance of socio-cultural, institutional, political and economic contexts as a pre-condition, incentive and shaping factor of up-scaling processes. An important observation is also made by Petrovics et al. (2022) in their study of the ups-scaling of energy communities: The above mentioned pathways of scaling often exist in parallel, especially in complex projects such as energy communities and PEDs. In these cases, we often see a diversity of co-existing scaling pathways.

A CONTEXT-SENSITIVE PERSPECTIVE ON THE REPLICATION OF PED SOLUTIONS

As pointed out above, replication is just one of the strategies to go beyond models and pilot projects. The following conceptual framework provides a possible guideline for how solutions developed in PEDs can be taken up and replicated in other places. Such a spreading of PED solutions can be seen as a first step towards the transformation of an entire city and wider institutional changes of the energy system at the national or international scale. However, as pointed out above, replication rarely involves implementing an identical PED somewhere else. Rather, certain elements or solutions developed within a PED are transferred to new contexts, a transfer which often requires some level of translation or adaptation of these solutions. In relation to PEDs, it is crucial to ask: Which elements and solutions of the PED can be replicated elsewhere? Which context dimensions are critical for the replicability of these solutions? If these critical context conditions are not matched at the new place where a similar PED solution should be implemented, the solution in question is either not applicable, or in some cases, the framing conditions might be changed to accommodate the new PED. Such an adaptation to new contexts can be regarded as an innovation in itself (Peng et al. 2019). The scheme of analysis outlined below was developed in an earlier project related to smart grid pilot projects (project ReFlex), which is sensitive to the specific institutional, economical, technological, geographical and stakeholder contexts of the smart grid pilot projects as well as the different contexts where outcomes of the experiments are supposed to be applied. Similar considerations can be applied to the replication or up-scaling of PEDs. It is important to note that such approaches are ‚reductionist' because they only focus on certain transferable elements of a PED (including technologies and products as well as specific social or institutional innovations such as PED-related business models). Nevertheless, the idea is that such elements are more than just technologies or new forms of organisations, but are complex socio-technical arrangements which include contexts of use, changes in social practices and so on.

The first question to ask is: Which elements of the PED are expected to be transferred to another place? In principle, the range stretches from highly standardised technical products (such as a new local energy monitoring or visualisation devices which can be widely disseminated) to the whole set-up and configuration of a pilot project (which can be implemented in a similar way elsewhere). While the former requires technical preconditions to ensure the operability of a technical device in the new context (see the above criteria criteria defined by Sigrist et al. 2016), the much more complex set-up of the latter is transferrable only under very specific circumstances. But even in the case of a technical product, it is important to ask how it is actually used and embedded in a broader socio-technical PED context.
An intermediate and sufficiently flexible level could be to focus on specific 'use cases' to describe the socio-technical transfer of PED solutions. This includes different type of context dimensions which are needed to understand certain PED implementations. For example, such a use case might involve the implementation of a district energy management system in a PED to optimise onsite electricity generation from PVs. Apart from its technical set-up and implications for the use of e.g. household appliances, a description would also comprise business models, regulatory preconditions and more. Such basic socio-technical configurations (including a solution to particular problems and needs, social practices of use and relations to wider cultural and institutional contexts) provide a practicable level to analyse the socio-technical requirements and pre-conditions to transfer solutions tested in pilot projects to other contexts.

In this replicability approach we take the following dimensions into account, to analyse a use case as a socio-technical configuration:

- Technological dimension: the functionalities of the technological components and the whole system relevant for the use case (e.g. building infrastructure, energy sources, storage equipment, loads)
- Spatial-structural dimension: In many cases geographical characteristics such as climate zone, shape and geography of the district are crucial for the implementation of certain PED solutions. Also the spatial scale of the pilot project may play a significant role in its replicability. In certain scale-specific cases, the possibilities for up-scaling are limited.
- Mission and macro-economic dimension: What are the key (long-term) missions, visions and non-commercial strategies and policies of public and private actors implementing the specific PED solution (e.g. commitment to climate reduction goals, sustainability development goals and so on)? What are the macro-economic effects (benefits and costs) of a solution for third parties?
- Micro-economic dimension: Which are the relevant market and contractual relations? (e.g. between energy supplier and building operators or other customers, between grid operator and municipality etc) Which are the key economic actors (including customers) involved? What is the value added for the economic actors driving the PED use case?
- Actor dimension: Which actors are involved in the use case and how? What is the concrete ownership structure in the urban district? Which stakeholders are relevant? What are their positions and are there controversies involved? Are certain actor groups explicitly or implicitly excluded?
- Institutional dimension: see the following paragraph

For the institutional dimension, we refer to the 'field' concept of Beckert (2010), which analyses the dynamics among three social forces (a) institutions (mostly formal), (b) social networks and (c) cognitive frames:

a) Formal institutions include legislative regulations, ownership and possession rights, market rules of the involved markets, organisational structures, technical standards, as well as formally agreed strategies;
b) Social networks of incumbent and new actors involved in the use case and stakeholders affected by it or influencing its context. This goes beyond the role of individual actors, which are dealt with separately (see above);
c) Cognitive frames, as the "culturally shaped meaning", which collectively shape the way formal institutions, habits and practices are built (e.g. mental models of energy systems and markets, locked-in social practices influencing energy consumption, or acceptance criteria for new market rules or privacy risks for end-user groups).

Such a mapping of relevant contextual conditions and use case descriptions can be used to systematically identify preconditions for the replicability of PED use cases. At the same time, it can be useful as an analytic tool in the early phase of new pilot projects to identify which lessons and solutions from existing projects can be integrated in the new set-up. Figure 2 provides an overview of the dimensions involved in the replication and dissemination concept described above.

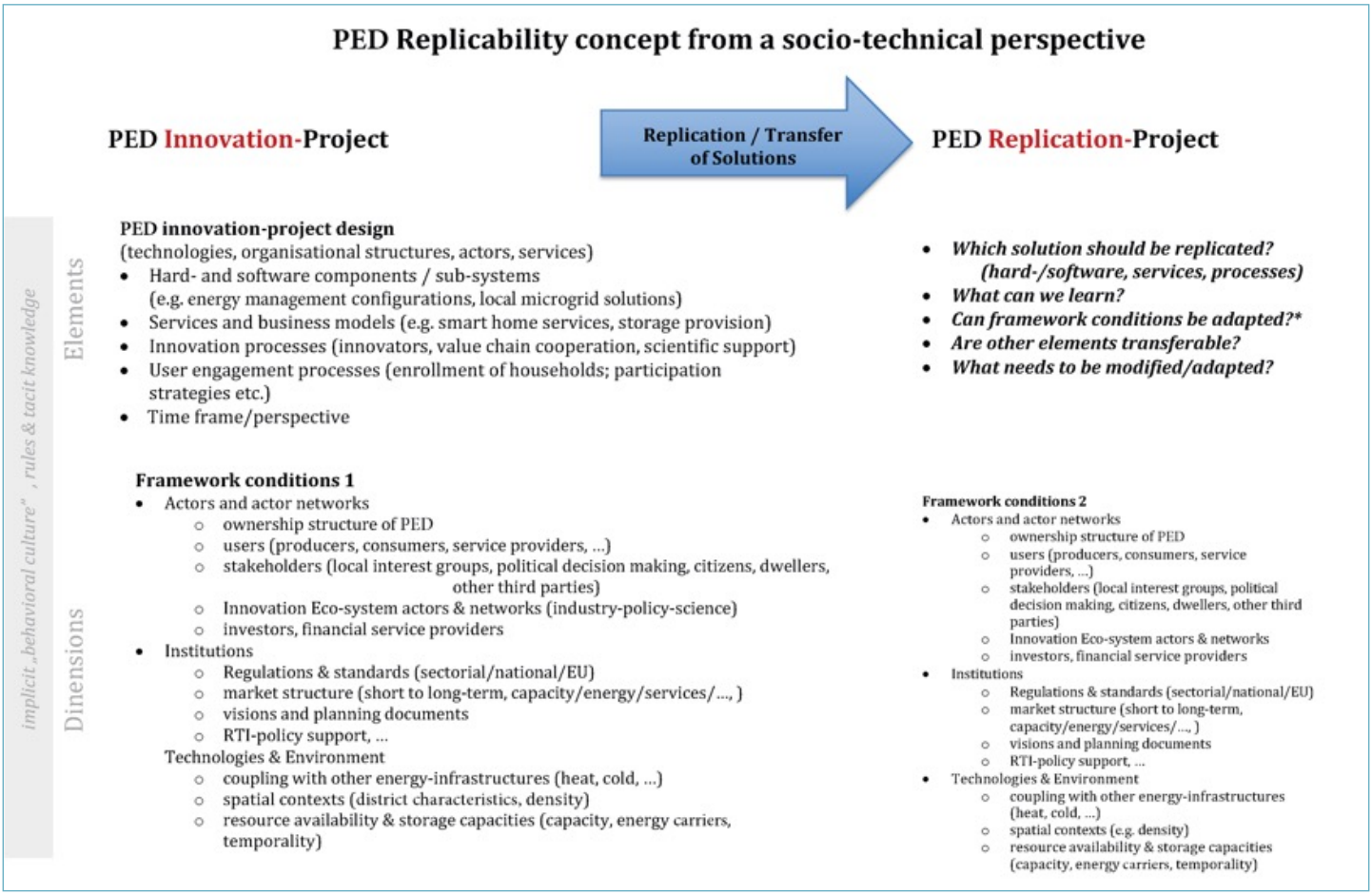

Figure 2: Transferring PED innovations between different socio-technical contexts

As noted by Peng et al. (2019), this transfer to new contexts results in the need for new alignments of actors, resources and institutional arrangements for the transferred PED solutions (Figure 3).

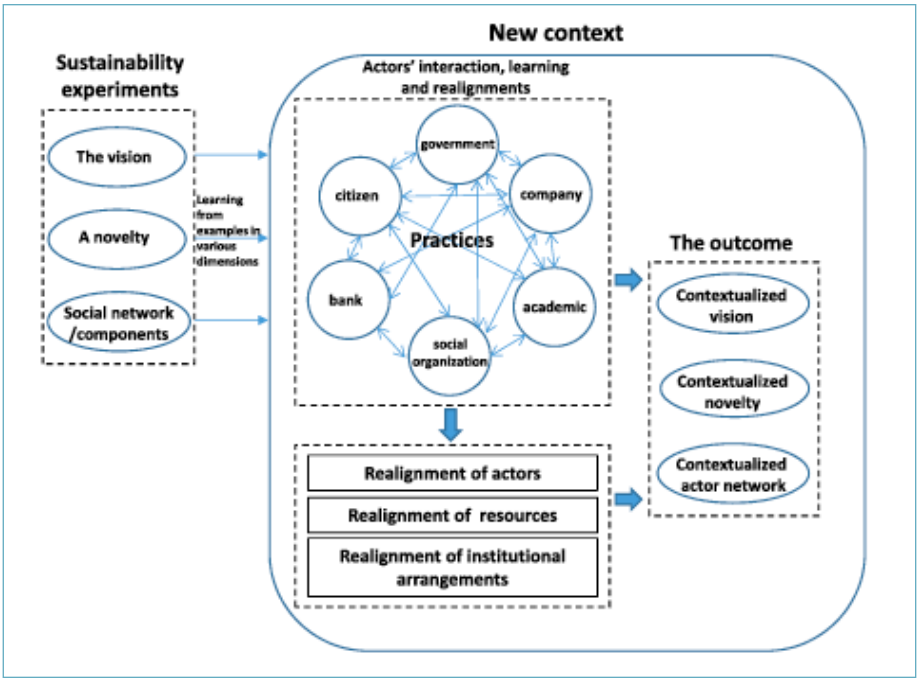

Figure 3: Alignment processes as a consequence of transferring innovations to a new context (Peng et al. 2019: 309).

However, such new alignments do not simply emerge on their own but require dedicated work (Laakso et al. 2021). Rather than direct diffusion, the transfer of practices to new contexts requires reinvention. Laakso et al. (2021) distinguish three different types of work involved in such a transfer and up-scaling: (1) proximate work to make the practice transferable; (2) work to gain allies and resonance for the practice; and (3) work to shape the conditions of up-scaling.

CRITICAL PERSPECTIVES AND LIMITATIONS TO UP-SCALING

Despite the thriving literature on up-scaling and a ‚logic of up-scaling' as integral to the concept of pilot projects or experiments, such pilot projects often do not scale up. In this short section, we will review some texts on preconditions and dilemmas of up-scaling while also raising a more fundamental critique of the idea of up-scaling and its consequences.

As Bundgaard and Borrás (2021) point out, successful up-scaling urban pilot projects such as PEDs or smart city projects requires a preexisting set of governance conditions. The five governance conditions they identify include: (1) Collaboration intensity, i.e. the engagement and collaboration of a broad range of actors; (2) capable municipalities, i.e. organisational and technical capacities of the respective municipalities to accommodate and work with innovative solutions; (3) articulation of public needs, i.e. the specification of the needs of the entire city rather than a limited district; (4) social legitimacy, i.e. the support of its citizens; and (5) perception of technological uncertainty, i.e. the acknowledgement of uncertainty in the up-scaling process and strategies to address this challenge. Beyond the dependence on appropriate governance conditions, the up-scaling of pilot projects also faces more fundamental dilemmas. Augenstein et al. (2020) describe three such challenges. One is what they call the problem of inter- and transdisciplinary knowledge integration, or the Babylon dilemma. This refers to the problem that different actors, particularly from research and practice, may have very different understandings of what up-scaling means and they often fail to establish a reflexive dialogue to resolve incompatible perspectives and expectations. The ‚simplification dilemma' addresses the risk of oversimplifying processes of change in the debate on up-scaling. Not understanding and embracing the complexities of social change and accepting that such processes are neither predictable nor controllable often leads to unsuccessful attempts of up-scaling or the limited dissemination of new products or services. A third possible dilemma is what they call the ‚scaling-aversion dilemma', i.e. the tension faced by new initiatives and social innovations between remaining in a small, alternative and unique niche versus growing in size and striving for wider adoption. Such a tension might be particularly prevalent with energy communities and other community-driven innovations in PEDs, where it is often just assumed that such communities might have an interest in replication and growth. The pressure to up-scale grassroots initiatives can result in the loss of their innovative potential, as Druijff and Kaika (2021) observe in their research on a grassroot artists and community initiative in Amsterdam. Municipal actors were in the end „more concerned with making grassroot actors and practices fit into existing planning institutions and practices, and less concerned with learning and reforming institutional practices." (p. 2184). Up-scaling can in such circumstances act as a defense mechanism by not handing over the up-scaling initiative to community actors. At the same time, involved communities realise that up-scaling might not only threaten their internal coherence, but also requires enormous amounts of additional resources, as well as particular types of expertise, organizational knowhow and PR tactics (p. 2204). In a sense, these problems are related to the ‚scaling-aversion dilemma' mentioned above.

Ambitions to up-scale new projects and initiatives also face more fundamental critiques which we briefly describe in this paragraph. Pfotenhauer et al. (2022: 3) criticise the „fixation on ‚scaling up' which has captured current innovation discourses" and point out how the „preoccupation with scalability reconfigures political and economic power by invading problem diagnoses and normative understandings of how society and social change function." One of the results of such a ‚politics of scaling' is a tendency towards 'solutionism' and the foregrounding of specific types of problems and their purported solutions. An ambition to up-scale directs our attention to types of solutions which are potentially scalable while neglecting all the more situational elements of a successful urban district which cannot be scaled. Moreover, Pfotenhauer et al. (2022) argue that the ambition to up-scale enacts futures 'as if' consensus about this future had been reached' and neglects conflicting values and imaginaries of urban futures which do not conform to the innovations in question.

Tsing (2012) concludes that it is time for a ‚theory of nonscalability', as scalability by design „allows us to see only uniform blocks, ready for further expansion" (p. 505) and ignores the heterogeneity of the world. A nonscalability theory would require attention to historical contingency, unexpected conjuncture and frictions. Such fundamental critiques of up-scaling emphasise the need for caution and an acknowledgement of the limitations of up-scaling in real-world contexts.

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REPLICATION, GROWTH AND UP-SCALING IN PEDS

In this section, we summarise the lessons learned about up-scaling and related concepts in the five PEDs of the TRANS-PED research project.

METHODS AND INVOLVED ACTORS

The TRANS-PED project involved universities, private entities, and municipal actors from Austria, Belgium, and Sweden. The PEDs include Abbatoir in Brussels, Austrian cases Reininghaus in Graz, and Sonnendorf in Schwoich, along with Swedish cases Hammarby Sjöstad in Stockholm and Brunnshög in Lund. These PEDs are described in detail below. As a significant component of the research project, several workshops and interviews were conducted. Four workshops were held in Brunnshög, involving stakeholders from both within and outside the research project. These workshops served as preparation for internal project workshops and as empirical research. Internal workshops were held in June and September 2023 among all TRANS-PED partners to identify potential up-scaling possibilities and obstacles for the PEDs. In January 2023, national workshops were conducted to delve into the specific contexts of each country. In the final stage, representatives from the PEDs were interviewed individually.

Abbatoir is a large slaughterhouse district located in central Brussels. It is undergoing redevelopment and will be transformed into a mixed-use area with residential buildings alongside a food market and old industrial facilities. Over the past years, several projects focusing on renewable energy investments have been executed, resulting in a significant urban PV installation, utilization of heat surplus, and urban farming. The area is also dedicated to activities promoting social sustainability, overseen by an NGO focused on community-building. The project is managed by a single company with the support of consultants who provide expertise in sustainability activities.

Reininghaus is an urban redevelopment area in Graz, Austria. It is situated on a brownfield site and upon completion, it will accommodate 10,000 residents. The area includes a mix of residential buildings, commercial spaces, and school facilities. The project involves multiple private developers who have established a city district management group consisting of developers, residents, neighboring companies, and the municipality. The energy setup revolves around low-temperature district heating sourced from a nearby steel plant, supplemented by heat storage and ambitious sustainability targets for mobility and buildings. The project is scheduled to be completed in 2025.

Sonnendorf is a new district within the municipality of Schwoich in western Austria. It will comprise 46 residential units across 33 buildings upon completion. The project aims to provide affordable housing in rural areas, with a specific portion of units sold at affordable prices to locals, while the rest are priced at market rates. The buildings will be constructed using timber and high thermal insulation values. They will also be connected to the Sonnendorf geothermal park, with solar PV installations and battery storage in certain units, along with an e-car sharing program. The Tyrolean Land Fund, a public institution focused on affordable housing, acquired the land for the development. An Austrian architectural firm won the design competition and subsequently established a development company in collaboration with the Tyrolean Land Fund and a local carpenter, as other stakeholders considered the project too risky.

Hammarby Sjöstad in Stockholm is arguably one of the world's most renowned eco-friendly districts. Constructed in the early 1990s on a brownfield site, it embodies high sustainability aspirations through integrated technical systems designed to reduce metabolic flows. For instance, energy is derived from wastewater and utilized in the district's heating system. An initiative called Hammarby Sjöstad 2.0, driven by citizens, has raised concerns about the district's actual environmental performance. This initiative has spurred new projects focused on areas such as microgrids, energy conservation, and EV charging. Presently, around 20,000 residents inhabit the area, while several building projects are still ongoing.
Brunnshög is a significant urban development zone within Lund municipality in southern Sweden. Construction began in 2010 and is being managed by the municipality. The district spans 220 acres and, upon completion, will accommodate 40,000 residents and workers. The district includes two large research installations that produce excess heat for a low-temperature district heating grid in Brunnshög. Additionally, the project places high emphasis on climate-friendly mobility, facilitated by a new tram line, EV charging infrastructure, bike-sharing, and car-sharing services. The project also sets ambitious goals for energy efficiency within the buildings.

PATHWAYS OF UP-SCALING AND AMPLIFICATION

Based on the literature and empirical material, we have identified three pathways for up-scaling and amplification including:

1) **Intensification and deepening of existing PEDs**
2) **Increasing the impact on the wider city**
3) **Spreading of knowledge and learning outcomes beyond the city**

These pathways serve as examples of potential activities and processes that have been successful in the five PEDs. The reality has proven to be significantly more complex and challenging than initially presented. Most respondents agreed that replication of projects in different contexts is not feasible, primarily due to the substantial differences in prerequisites. The primary takeaway is that while direct replication may not be viable, learning can still take place, and specific outcomes can be adapted and implemented elsewhere. A respondent shared insights from a prior „flagship" city district and emphasized that seeking direct replication might be overly narrow, and that it's not just about technical components but also about models and organizational forms.

No, but it is an experience I also have from the Western Harbour project that there is such a desire to be able to quickly see a method and an organization and replicate, but it is very much about the individuals. And the possibilities to do exactly the same organization or the same may not exist at all so there is no soil to plant in, so to speak.
(Respondent, Lund Municipality)

Before delving into the three pathways in greater detail, it is important to note that many of the respondents discussed the configurations of actors involved. While this pertains specifically to PEDs, the finding has broader relevance to up-scaling and amplification. The respondents generally agreed that setting clear project goals and adopting a holistic perspective from the outset are crucial. Such a holistic approach ensures that the majority of stakeholders align with a common vision. This perspective becomes especially important when aspiring to establish a PED, where energy-efficient measures and low-carbon solutions can be integrated early on. Such optimization necessitates specialized competencies, and having a single actor in charge of this optimization is favorable. The respondents observed different actors taking on this role, whether public or private. When this role was lacking, projects were less successful and lacked long-term focus.

This led to the fact that Reininghaus was not actually planned as an overall system, but was sold, I don't know, I think, to seventeen property developers, and they said you don't have to do anything by yourselves because you'll get cheap district heating, you get a low-temperature house, i.e. a 70 degree supply and you don't have to do anything yourself.
(Respondent, Graz)

He further argued that it meant that fruitful and innovative solutions were disregarded as all the different actors decided to opt for district heating, despite early ambitions for other solutions that were carbon neutral.

Hammarby Sjöstad presents a contrasting example, where an energy and sustainability-focused organization was established in an existing area. Unlike the other projects, which are new urban districts, this organization (ElectriCity) drives initiatives and leads energy system development and innovation. Though the district already boasted a high eco-profile, the organization's creation aimed to propel progress even further by coordinating all projects. The subsequent section will delve into greater detail regarding the distinct pathways. It is important to note that there are no rigid boundaries between these categories and overlaps are common.

INTENSIFICATION

Intensification involves various forms of development within the project. Many of the five PEDs are quite large, featuring diverse actor constellations, activities, and technical systems. A distinction exists among them, with four of the five projects being urban and three as new development areas and two in existing districts. The national contexts introduce differences in prerequisites stemming from legislation, sociotechnical configurations, and institutional structures.

An important point to note is that the conclusion of the building phase does not mean the end of development. Abbatoir and Hammarby Sjöstad exemplify this concept. The former is in a robust development phase, with significant growth anticipated in the coming years. At present, PED activities revolve around the slaughterhouse and other businesses. In the case of Hammarby Sjöstad, ongoing development and construction continued. However, ElectriCity primarily focuses on existing residential buildings to enhance sustainability efforts and elevate aspirations. This highlights that through a new organizational structure, it is possible to alter existing frameworks. However, effective implementation requires coordination and individuals capable of instigating subsequent steps.

In several of the projects, it was evident that PED development needs to be undertaken incrementally. The respondents from Abbatoir elaborated on this notion as follows:

Yeah, but there are some very concrete next steps. So we start with the realization of heat. And we already had, let's say, a small heat network for one of the buildings. But now it's going to be realized for the whole of the site. So, then all buildings will be connected (Respondent, Abbatoir)

The respondents emphasized the significance of viewing development as a step-by-step process. Typically, they commence with ambitions that might be initially vague. Alternatively, if these ambitions are already well-defined, the possibility of progressively intensifying activities becomes feasible as the journey unfolds. This notion can even be embedded in the initial goals: the integration of learning throughout the process.

No, but it is probably more in the vision work right from the start, to have gradual improvements as you learn. What requirements are possible, and thus you push the limit of possibilities forward through projects like this. It's not just what is technically possible, but it has to be financially possible as well (Respondent, Lund)

However, to establish such a structured plan, a clear organizational framework and a strategy for managing learning outcomes while driving development forward are imperative. This aspect emerged as a significant challenge in most projects, given the dynamic nature of developments and the evolving external prerequisites. In the case of Reinighaus, for instance, notable changes in ownership and organizational structure created uncertainty regarding who could assume overall responsibility for the project, particularly concerning PED development. As previously mentioned, the respondent from Reinighaus contended that initial comprehensive energy planning would have been essential to undertake responsibility for system integration.

To intensify and sustain learning processes throughout the entire journey, the overarching organizational setup plays a pivotal role. Nonetheless, this becomes complicated in smaller projects and organizations.

Interviewer: But you need at least someone who somehow drives it and should be initiated? Respondent: Exactly, and that is also the shortcoming of small communities. Exactly who does this? Who cares? Who takes responsibility, who has the authority? Exactly this question, there is nobody. And that is exactly the problem of small municipalities. So I have the feeling that we have to make the municipalities fitter in many areas, in the sense that we have to help them build up skills. (Respondent, Sonnendorf)

For private companies, this can be a challenge without the support of public actors.

And I think it's an issue everywhere is the question about who's going to be the coordinator of this kind of project, who's going to take the lead in it. And Abattoir is a private company, can have an idea, can make a business plan, can take financial, technical, even legal issues. But then in the end, I think we need a kind of overall management to make it happen for sure. If it's different plots, different owners coming together. And then I think the public sector has an important role. (Respondent, Abbatoir)

In smaller municipalities, accomplishing this task proves challenging due to limited competencies. In such settings, planning staff are typically generalists with expertise in the planning process itself, but not necessarily equipped with the same level of knowledge as energy planning consultants. Expecting these organizations to plan for subsequent steps involving specialized expertise is quite demanding. In contrast, in larger municipalities such as Lund, such endeavors are more achievable, often hinging on individual actors assuming pivotal roles in coordinating and facilitating learning processes.

Another avenue for intensification involves fostering increased citizen engagement. The respondent from Hammarby Sjöstad underscored this approach, which is particularly advantageous when working within an existing city district where citizens are already present. While it might seem straightforward, newly constructed areas face challenges in engaging citizens who have yet to move in. In Hammarby Sjöstad, two strategies have been employed for intensification and citizen involvement. The first is the establishment of an energy community, representing the next phase after addressing individual buildings and housing cooperatives with energy efficiency measures. However, this undertaking also demands the cultivation of new competencies within the organization. The second approach centers on information dissemination to citizens, aiming to enhance their awareness and involvement.

But at this stage that we are in right now, when we are going to try to set up an energy community, then we have to have competence, because here it can go really wrong financially. So, then we have the privilege of having just brought in a new person in ElectriCity who has been at Vattenfall, and she has held high positions or CEO positions everywhere. She will now step in as chairman of our energy community (Respondent, Hammarby Sjöstad)

In Hammarby Sjöstad, this achievement was facilitated by the robust competencies present within the existing organization and the capacity to attract qualified individuals. Given that the district is situated in central Stockholm and characterized by a high-income demographic, the potential to engage interested residents is greater. This distinct aspect of the district and its organization is challenging to directly replicate, yet it underscores the importance of leveraging existing competencies and resources. However, this feat would be arduous to achieve without a capable organization adept at informing and orchestrating the necessary processes.

The second approach involves disseminating information to both the district's residents and individuals from other areas. The presence of an exhibition center named GlashusEtt, established during the inception of the Hammarby Sjöstad project, offered an opportunity for the organization to capitalize on:

We have already initiated and had two events, but we now have a whole series of lectures and so on in the spring where we will shed light on exactly these questions and how we can get people to think smarter. Really climate-smart, around eating and shopping and recycling and all that. So now there will be study circles and lectures and practical projects and so on. (Respondent, Hammarby Sjöstad)

This initiative also centers around disseminating knowledge beyond the district, which leads us to the second pathway.

INCREASING THE IMPACT ON THE WIDER CITY

In several of the five PEDs, a robust link to the broader city was evident. This connection could be attributed to the actor constellation, such as projects under municipal auspices, or those with explicit goals of integrating with neighboring areas. A notable instance can be found in the Abbatoir project, which not only harbored aspirations for social sustainability and fostering connections with neighboring residents and stakeholders but also recognized technical benefits arising from collaboration:

But there is also this idea of maybe linking with neighbours. There is a high school next to the site. There is also older housing. So we want to see if there are possibilities to make a connection, to see if there is a kind of interest for Abattoir to do this. And if the public sector, the Brussels region, the commune of Anderlecht could also play a role in all that but this is still to discover. That's one of the next steps we would like to take. So we have concrete things and then we have ideas. (Respondent, Abbatoir)

The respondents noted that the configuration of actors significantly influences the potential to achieve a broader impact within the city. For entities such as private companies, collaboration with public actors becomes crucial, as the latter possess overarching responsibilities, along with political and financial resources essential for orchestrating connections between projects and neighborhoods. Conversely, when public actors take on the role of responsibility, as seen in instances such as Lund, achieving impact becomes more feasible, although it is not always perfect. Brunnshög stands out as a project with exceptional characteristics, particularly due to the substantial size of the district. Recognizing this, the municipality has allocated additional resources to support the planning and innovation team. Some of the team's strategies and organizational methods have been adopted in other municipal projects as well.

The closest thing to hand is something we call Västerbro, which is currently an industrial area to be rebuilt into a mixed area. There they have also started a team that leads... that it is not divided into different administrations, there is a management group for the area. It was unique to Brunnshög for us, to work like that. Several different competences ... instead of being in charge of each administration, they put it together as a group. Then maybe they got a salary from the different administrations, but they sat together. They organized it the same way at Västerbro too (Respondent, Lund)

However, the respondents acknowledged that replication is not a straightforward task, primarily because Brunnshög follows a unique trajectory. As a result, a direct copy-paste approach is not feasible. Economic constraints and limitations in terms of aspirations come into play—essentially, having the necessary resources to infuse greater ambition into other projects.

We see Brunnshög as a big ... like a spearhead, right. We who work with environmental issues. There are seven other expansion areas in Lund as well, which are more traditional. So, there are projects in several places. But in my opinion, they are not as exciting. (Respondent, Brunnshög).

Another instance of an organization disseminating its ideas is Hammarby Sjöstad, both through the aforementioned activities and by engaging with initiatives in other districts of Stockholm. According to the respondent, other larger initiatives have been inspired by the PED and incorporated certain ideas while striving for heightened environmental objectives. It is important to recognize that Stockholm possesses a unique quality in this regard—numerous opportunities exist to impact like-minded entities, and knowledge dissemination and networking occur through preexisting networks. Conversely, the connections with the municipality have not remained as robust in recent years, as attention has shifted to the newer Royal Seaport development.

The initiatives undertaken by ElectriCity in Hammarby Sjöstad have a distinct character, with their aspirations to disseminate knowledge extending well beyond the city's boundaries. This naturally leads us to the final pathway.

SPREADING OF KNOWLEDGE AND LEARNING OUTCOMES BEYOND THE CITY

In most of the involved projects, the role of study visits emerged as a prominent strategy to disseminate knowledge by visiting other projects as well as hosting visits with external parties. Hammarby Sjöstad boasts a lengthy history in this practice and continues to attract visitors from around the globe. Brunnshög, while more recently engaged in this approach, has experienced a steady rise in interest. Respondents from Brunnshög emphasized the importance of visiting other pertinent projects, both within and beyond the TRANS-PED research project.

Study visits also play a multifaceted role in place branding. They serve as a significant platform to showcase the districts' innovative and impactful nature to a wider audience. This motivates all involved districts to allocate resources to accommodate visitors. For instance, Brunnshög found it imperative to establish a dedicated organizational structure focusing solely on marketing and visitor management. The districts are meticulously presented and packaged to highlight their most successful components, effectively functioning as reference points for others:

But I'm convinced that these districts can and will be perfectly communicated, because these are exactly the kind of district references that we need, just like we need to get our work with our development area and get it under control. (Respondent, Sonnendorf)

Conversely, this also involves the challenge of not just packaging and presenting positive outcomes. A substantial aspect of knowledge sharing revolves around transparency and discussing what did not work as anticipated. While these conversations can occur among professionals, they are often omitted from the narrative presented to a broader audience for evident reasons.

Furthermore, knowledge transfer and impact extend beyond the city district through the individuals involved. In the Austrian cases, an actor who had participated in the early stages of Reininghaus, alongside engagement with the high-profile Aspern Seestadt project in Vienna, went on to contribute to the Sonnendorf PED. This interconnected experience illustrates how knowledge spreads through the involvement of key individuals across various initiatives:

And yes, I think there are certainly insights that also came from this discussion and the discourse, which we will definitely transfer. For example, in the meantime I am of the opinion that you really have two options, you reduce the community aspect to a minimum and still make sure that you achieve a positive energy balance, or you strengthen the community aspect much more, much further , also goes far beyond the pure provision of energy, where there is also mobility and local supply and so on, make sure that something is set up jointly and that a separate legal structure is established. And I think that's an interesting process and we're going to tackle that in the next project so that we can also create something like a legal body that takes care of common things. Because I believe that will be necessary in the future, firstly so that the community can articulate itself somewhere and so that synergies can be leveraged more strongly (Respondent, Sonnendorf).

In Lund, a key individual had also been engaged in the development of the renowned Western Harbour area in Malmö subsequently joined the Lund team. Throughout that journey, she accumulated valuable insights into effective strategies and identified areas where challenges arose. Subsequently, she endeavored to „translate" those lessons to the Brunnshög project, capitalizing on her experience to enhance its development:

Yes, but it is clear that when I worked in Malmö in the Western Harbor, I was doing something like a test bed and then we invited the residents once a month and discussed various issues and got experience feedback and so on. But it costs money. There must be such a will from the municipality's management, and it actually becomes a bit sensitive. (Respondent, Lund)

The respondent recognized the delicate nature of giving disproportionate attention to a particular city district, particularly when some time has passed since its construction. From a political standpoint, it's crucial to convey the importance of treating all areas with equal significance and recognizing that even high-profile regions ought to be regarded as „normal" areas over time.

All the involved actors were integral to a research project, which was not their first nor would it be their last engagement. Participation in such projects also aligns with a strategy adopted by innovative actors and districts. It allows them to secure additional funding for their endeavors and facilitates learning from other projects. Furthermore, it serves as a platform for self-promotion, demonstrating ongoing developments and serving as a means to connect with other actors engaged in similar projects. For instance, Hammarby Sjöstad collaborated in a research project with stakeholders from Örebro, contributing to the development of a city district characterized by ambitious innovative energy solutions:

No, but we meet regularly, Örebro and Hammarby sjöstad. But we work individually, so that ... but we learn from each other, and we face the same problems ... not the same, but similar problem. (Respondent, Hammarby Sjöstad)

A final intriguing discovery pertains to how certain districts craft business models for activities that can subsequently be disseminated to other entities. The most notable instance is observed among the actors in Hammarby Sjöstad, who are developing an app to provide households with energy use information and planning assistance. As a forward-looking approach, they intend to market this app to create a profitable business venture. This strategy once again underscores the capacity of private actors with ambitious goals to drive innovation, unencumbered by the constraints often associated with public actors. Similar ideas extend to their plans for the energy community currently under establishment.

OBSTACLES OF UP-SCALING

The respondents underscored that up-scaling PED activities comes with its own set of challenges. While certain obstacles are specific to PED development, others are of a broader nature, encompassing concerns related to subsidies and legislative frameworks. A noteworthy observation is the limited prevalence of well-defined up-scaling strategies within the districts themselves. While there might be ideas about future steps, the primary focus remains on the immediate district. This tendency is not surprising given the high stakes involved, demanding the districts' success to be prioritized in the present rather than the future.

However, there are exceptions, such as Hammarby Sjöstad and a few other instances, where the level of district advancement is influencing the emphasis on future endeavors and next steps. In the earlier stages, attention is generally less oriented toward future projects. The organizational structure and the emphasis on learning play crucial roles, along with an understanding of how ideas, products, and models can be disseminated and implemented elsewhere. Experience gained from prior projects proved valuable, aiding in the translation of lessons into new ventures. Yet, this process requires considerable time and effort, which might not always be feasible across all districts.

A significant challenge in terms of intensifying efforts arose in several districts when it came to engaging citizens and emphasizing the social components. While the PED concept leans heavily toward the technical, conversations with the respondents revealed their clear ambitions for social sustainability and participation. Nonetheless, involving citizens, particularly in novel districts, presents difficulties, as behavioral change is hard to achieve. Hammarby Sjöstad, for instance, pursues ambitions through their app and various activities centered around providing information as a means to enhance citizen involvement.

POLICY AND PRACTICE RECOMMENDATIONS – GROWTH AND REPLICATION

Based on the literature and analysis of the five PEDs, a number of conclusions for practitioners and policy makers can be made:

- Energy planning is an important tool throughout the process and needs to be in focus especially in the early phases of PEDs. Lack of planning and potential mistakes made at the beginning can be very difficult and expensive to change later on.
  - It is important for key persons to be responsible for the energy strategy and to have a holistic perspective instead of focusing on isolated dimensions
  - However, this can be difficult with splintered activities and changing actor constellations
- It is important to identify appropriate actor constellations. PEDs need broader actor constellations when compared to standard development projects to address relevant dimensions early on.
  - Who has the initiative and who is coordinating?
  - What type of competence is needed (generalist vs specialist)?
  - Which actors need to be involved?
  - What is the role of intermediaries and champions? Do they remain in the organization or move on?
- Intensifying the PED can be achieved by starting with a more limited, but well-planned core and then adding more components to gradually increase the complexity.
  - Working more intensively with existing buildings. The end of the building phase does not mean the end of development
- An important step in PED development is to involve citizens
  - If possible, citizen involvement should start in early stages to inform planning concepts where there are no inhabitants in the district.
- Geographical expansion/replication of PED as a possible step for up-scaling
  - Inclusion of surrounding neighborhoods, similar planning models for new development in the district, impacts on the wider region, cooperation with other districts
  - Taking inspiration from other districts by attending expos and conducting study visits
- Understanding specific and general characteristics of a particular PED as a precondition to plan dissemination and up-scaling. Without understanding one's own context, it is difficult to decide which elements of a PED can be useful in further district development processes.
  - What can be spread to other districts and what is specific and difficult to replicate?
- Scaling technical vs social aspects. It is important that up-scaling of PEDs is not limited to technical configurations, but also includes social innovations and institutional changes.
  - Many social aspects can be up-scaled using citizen engagement methods
  - Technical up-scaling is sometimes easier to achieve but the involved actors and practices are important. Who is in charge? Which interests are at play? Are there prerequisites (e.g. waste heat, existing infrastructure) to consider?
- Knowledge travels between projects through key actors
  - Several of the districts included key actors who were involved in similar previous projects
  - Translation of experiences from 'old' to 'new' districts by understanding the differences and similarities in context
- Learning is sometimes built into the district structure
  - Working in phases, with explicit aims of learning between phases can lead to positive effects

POLICY AND PRACTICE RECOMMENDATIONS – NETWORKING AND LINKING

Up-scaling can also be realized through linking, networking and integration with other types of low-carbon city development projects. As part of the TRANS-PED project, discussions were held around networking and partnerships within the project team and with external actors. Based on the discussions, the following recommendations and suggestions can be made:

- The increasing availability of research funding provides opportunities for networking and subsequently up-scaling, but requires new and different competences within the planning organization
  - Not all organizations can structure projects around applying for additional funding because this requires an investment in time to cooperate with other actors and write applications
  - When successful, and when projects are built into the PED-development, there is large potential for innovation and learning within and between projects and organizations
  - Writing applications requires competences and experience and this can be difficult for smaller organizations
  - Synergies between project are possible and often necessary to elevate projects from 'ordinary' city-building projects to e.g. PED-projects
- Broadening the PED concept. Up-scaling of PEDs can be supported by linking it to other policy issues and ambitions, such as social policies, justice and climate change.
  - How can the PED concept be connected to other sustainability ideas? "Sustainable cities" concepts can be vague while PEDs have a specific focus on energy.
- Study visits play a crucial role in knowledge transfer and networking
  - Most included actors stressed the importance of study visits to other relevant nationa l and international projects
  - Inspiration and learning of pros and cons concerning certain innovative practices
  - Informal conversations are more fruitful than official visits and can often lead to further contacts
  - Study visits require funding that is not available to all municipalities and projects
- It is important to get more people involved in networking beyond the key champions
  - Contacts tend to be focused around a few people, but these contacts can easily get lost as people move between employers and projects
- Broad actor involvement is crucial
  - In order to up-scale, it is important to involve more actors than the 'usual suspects'. This can include funders for projects, investors to develop business models, citizens for implementation and diffusion, as well as actors involved in technical development

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More information on Responsible Innovation

For more information on this topic, see the reports on the Trans-PED website.

All about the Trans-PED project

Check out the Trans-PED website for details on the project, the international consortium of partners, as well as the participating PEDs.

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