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From Social Barriers to Transformative Planning in Energy Transitions: Learning from Norwegian Planners' Perspectives

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Abstract

This study investigates social barriers in Norwegian urban energy projects from the planner's perspective, bridging institutional and reflexive approaches in the field of planning. Compared to technological barriers encountered in the energy transition, social barriers have received relatively little attention. While the former implies a need for hard technological fixes, social barriers cross sectoral dimensions and can potentially be transformed through strategic action during the life of a project. When planning energy transitions under the popular guise of smart and sustainable cities, social barriers arise in the context of urban experimentation, which challenges institutional constructs, participatory planning principles, and knowledge. These aspects are addressed from the planner's perspective through analysis of planners' experiences in seven energy pilot and demonstration sites in Norway. The results identify categories of social barriers related to the understanding of a shared vision amongst stakeholders, lowered ambitions over the course of a project, lack of user involvement, and structural constraints to planning. A framework for a deeper understanding of social barriers is proposed, extending to the notion of planners' transformative agency to support sustainability transitions, which has the potential for future enrichment through the addition of cases and application in other fields of sustainability transitions.

Keywords

demonstration sites; energy transition; Norway; social barriers; sustainability transitions; transformative agency

1. Introduction

In recent years, the energy transition has become a crucial topic for sustainable urban planning and development, connecting discourses on smart cities (Balest et al., 2019; Mooses et al., 2022), green growth (Loewen, 2022), and citizen participation (Chilvers et al., 2021) in the era of climate change and global development goals. Following the 2015 Paris Climate Agreement and the adoption of the United Nations Agenda 2030 and Sustainable Development Goals (United Nations, 2015b, 2015a), planners have been tasked with translating complex goals, strategies, and targets from international and national levels to their local contexts. While planners have carried the mantle for sustainability in their communities since the 1980s, often privileging the knowledge, capacities, and experiences of high-profile metropolises (for example, C40 cities; see https://www.c40.org), the energy transition has the potential to funnel targeted actions for meeting sustainability challenges down to a "world of cities" (Robinson, 2005) including out-of-centre and small and medium-sized urban areas. At the same time, the localisation imperative has the potential to further stress the already limited capacities of ordinary cities and the roles and abilities of planners who find themselves charged with leading cities and their inhabitants towards sustainability.

Knowledge, participation, and consensus building have been recognised as continuous challenges in planning for environmental sustainability (Calderon et al., 2022; Plüschke-Altof et al., 2023; van den Hove, 2006). This is also the case in planning for the energy transition, as planners are confronted with the need to integrate highly technical and specialised knowledge while coordinating, educating, and convincing stakeholders with diverse and conflicting interests to collectively achieve a transformation of the built environment, all while adhering to democratic planning principles. Despite the opportunity for planners to integrate energy transition into sustainable urban development, aided by universal policy goals and technological availability, there is a shortage of studies linking planning with energy transition from a social rather than technological development perspective (cf. the "smart cities" literature). This article thus explores the urban energy transition in Norway, a country widely considered to be a leader in decarbonisation and use of renewables (International Energy Agency, 2022), despite critique as an oil and gas producer (Korsnes et al., 2023), by investigating the experiences of planners across a range of renewable and sustainable energy pilot project and demonstration sites.

Norway has benefitted from a strong legacy of technologically and, more recently, socially-oriented research and innovation programmes initiating energy transition projects since the 2000s, for example, through technology and social-science-oriented Centres for Environmentally Friendly Energy Research (FME) funded by the Research Council of Norway (RCN). While these programmes have primarily been driven by a need for technological development, tested through urban experimentation in pilot and demonstration sites, the current study shifts attention from planning technological to social aspects, in line with the priorities of recent research and innovation agendas (e.g., the European Green Deal and "human-centred city"; European Commission, 2019a, 2019b). Thus, the study aims to learn from the experiences of pilot and demonstration sites from the social perspective, specifically, by focusing on social barriers to implementation in urban energy projects.

In mature research environments like Norway, social barriers to sustainability transitions pose the key remaining challenges to socio-technical system transformation. Even so, social barriers have mainly received indirect attention in the literature, alongside enablers, and an indicative agenda for their investigation is

lacking. From a socio-technical system perspective, social barriers are highly contextual, and research approaches may depend on types of technological interventions (e.g., wind, solar, or hydropower installations) as well as researchers' focus on different types of stakeholders and communities. Understandably, the case-based literature tends to be eclectic, referring to the particular theoretical underpinnings or goals of particular projects rather than seeking to inform a theory or practice related to social barriers. This is apparent, for example, in the grey literature produced around zero emission neighbourhoods (ZENs) in Norway, which count various economic or political regulatory barriers and challenges of citizen participation among their findings (see Kauko et al., 2022; Vergerio & Knotten, 2024), yet do not intend for serious consideration of social barriers in themselves. Indeed, this has not been the primary objective of the mentioned research programmes. Nonetheless, the eclectic nature of the social barriers literature creates a challenge when seeking to unify learning across cases for feedback to theory. For this reason, social barriers are approached from the perspective of social innovation and planning sustainability transitions. The approach builds on the work of Baer et al. (2021) which analysed social innovation in Norwegian energy transition projects through the key social aspects of citizen involvement, stakeholder interaction, and capacity building, rooted in energy transition policy (SET Plan Temporary Working Group 3.2, 2018). To further work in this area, the article is exploratory in its aim of providing a useful starting point for the study of social barriers in planning, open to enrichment and theorisation from other cases and planning contexts, in support of planning urban energy transitions.

The analytical approach links planning with innovation and transition theories, placing the "urban" energy transition, referring here to the built environment also in suburban and rural areas, in the context of socio-technical system transformation. Building on a growing literature on transformative change in planning for sustainability (Castán Broto et al., 2019; Filion et al., 2015; Plüschke-Altof et al., 2023; Wolfram, 2016), the analysis considers the utility of theories around transformative agency and capacities for planning energy transitions, i.e., planners' reflexivity and institutionalism. In dealing with socio-technical systems and planning, it also adheres to an institutionalist view that acknowledges the structural constraints and agency of planners dealing with physical infrastructure (i.e., the built environment) and communities within local and/or national planning systems.

In the following section, the article backgrounds planning and barriers in socio-technical systems, considering distinctions to be made between technological and social barriers and drawing a connection to planning for transformative change. Section 3 presents the methodology and introductions to the case areas, and Section 4 presents the results of the inquiry into social barriers from the selected pilot and demonstration sites. Finally, a combined discussion and conclusions section considers the results in terms of themes derived from the barriers and their implications for planners and planning practice.

2. Planning for Energy Transitions

2.1. Urban Experimentation and Transformative Change

Planning for sustainability transitions has come to be associated with a culture of experimentation through real-world interventions, especially regarding flagship projects of strategic importance (Ehnert, 2023; Karvonen & van Heur, 2014; Witzell & Oldbury, 2023). Urban experimentation in smart and sustainable cities pilot projects aims to support transformative change in socio-technical systems (Isaksson et al., 2022;

Ryghaug & Skjølsvold, 2021). Yet, amidst the openness of experimentation, there is a degree of uncertainty over what is to be transformed and how it relates to the system. Evidence from the EU's Horizon 2020 (EU H2020) Smart Cities and Communities programme participants illustrates the difficulties of learning from urban experimentation, specifically a lack of process learning (Evans et al., 2021). This can be interpreted in part as a lack of synthetic knowledge, including knowledge of barriers and strategies to overcome them. Recently, scholars have highlighted the need for a critical alignment of goals and values, i.e., the what, how, and why (Isaksson et al., 2022), amongst public actors that can set a path of transformative change in motion beyond the lives of individual projects. By the very nature of urban experimentation, pilot projects have specific objectives, but the outcomes may be relatively open or unexpected. Thus, lacking a common approach to build upon lessons learned from experimentation, the momentum for transformative change can wane by the end of a project.

In order to learn from experimentation, a more structured approach for examining the barriers encountered at various stages of a pilot project is needed, through which researchers stand to benefit from more precise identification of challenges and strategies used to overcome them based on critical reflection of participants. Practically, this has value for the evaluation of demonstration and pilot projects, where barriers are often discussed ad hoc and ex post in terms of individual project findings but are rarely synthesised across projects or contribute to theorisation.

2.2. Social and Technological Barriers to Urban Energy Transitions

Accordingly, in urban experimentation, barriers may be discussed as findings in opposition to drivers or enablers of transition processes, but research rarely takes an interest in barriers as a starting point for inquiry. For socio-technical systems, barriers may be approached from the technological or social (non-technological) perspectives, from which discussions tend to privilege technological aspects that may be readily identifiable in terms of project outcomes that emphasise technological "fixes." Social factors, on the other hand, may influence or even stand alone from technological barriers hindering transitions. Social factors may therefore present more nuanced challenges to address from a social sciences perspective. For energy transitions, the initial interest and reliance on technological innovation has lent increasingly to social aspects of implementation and scalability, as seen through periodic updates to the EU's Strategic Energy Technology (SET) Plan (e.g., European Commission, 2023). In the case of urban energy transition projects—where urban planning meets technological experimentation, piloting, and demonstration in interaction with multiple stakeholders—a variety of social barriers are poised to appear from which planners and other stakeholders can learn.

Recent research on social as opposed to technological innovation can inform an approach to the study of social barriers in urban energy transitions. The theoretical distinction between technical and social innovation follows early understandings of material inventions (i.e., technological or mechanical changes) that could produce multiple social effects, which were to be distinguished from social inventions considered non-material even when enabled by technological change (Ogburn & Nimkoff, 1950). By this view, mechanical or technological elements were not deemed necessary for social inventions. In comparison today, social innovations are often understood as being social in their means (Hoppe & De Vries, 2019). They can also include technological solutions for socially defined needs, as in the case of digital social innovations for sustainability (Dionisio et al., 2024). In the search for an approach to analyse social barriers, it is not

necessary to exclude the technological, but rather, as in the case of urban energy transitions, it is relevant to focus on social aspects of technological development and deployment in a complex built environment filled with socially constructed subjectivities.

In Europe, urban energy transitions target the nexus of sustainable building stocks and transport, moving from the individual building to neighbourhood, district, and city scales. ZENs, and later positive energy districts (PEDs) which generate more renewable energy than they consume, are the key model concepts for integrated energy planning. The SET Plan, which aims to produce 100 PEDs, provides an example of intertwined streams of technological and social innovations (European Commission, 2023). Of these, three domains of social innovation are identified: stakeholder interaction, citizen participation, and capacity building (European Commission, 2018). Given the coordinated research agendas for ZEN and PED deployment in Europe, a valuable literature on experimentation has emerged that considers both technological and social aspects (Baer et al., 2021; Brozovsky et al., 2021; Derkenbaeva et al., 2022; Sareen et al., 2022).

Reviews of the PED literature have determined social aspects to be the least addressed (Brozovsky et al., 2021) and the most polarising among other types, including governance, market, context, incentive, process, and technological factors (Krangsås et al., 2021). Moreover, the consideration for social innovation in PED projects is suggested to increase with experience with PED development and implementation, supporting transformative change in the socio-technical system (Baer et al., 2021). These findings correspond with the growing field of social innovation as it relates to regional energy transitions (Suitner et al., 2022) and socio-technical energy transitions (Wittmayer et al., 2020).

2.3. Planning to Overcome Social Barriers in Energy Projects

Relatively few theoretical connections have been made between the planning and energy transitions literature to date, yet much can be learned to overcome social barriers from wider applications of planning for sustainability. Polarising and contested social aspects can be addressed through planning processes and practices with respect to institutional structures, requirements for public participation, the planner's role as a coordinator of competing interests, and the planner's role in leading toward urban sustainability. Institutional perspectives frame much of this literature. Filion et al. (2015) identified social obstacles to urban transformation from an institutionalist perspective, pointing to the importance of practical knowledge and professional values. Since then, learnings on social barriers can also be drawn from experiences of planning nature-based solutions, which identify structural, relational, and inner conflicts to be navigated by planners when fulfilling their expected roles (Dorst et al., 2022; Plüschke-Altof et al., 2023). Furthermore, research on PEDs suggests a clear role for the planner in mediating polarising social aspects (Krangsås et al., 2021) while being situated in their institutional context.

Whether planners recognise their mediating role in energy transitions and act upon it could potentially influence their own initiative to develop transformative agency in leading toward sustainable development. Related to transformative change, transformative agency describes the ability of actors to collectively transform an activity system, a process dependent on practitioners' knowledge and experience, in a way that redefines the object or outcome of the system (Virkkunen, 2006). In this way, the re-orientation of planning towards sustainability calls upon the exercise of transformative agency in planning, which has so far been

addressed in socio-ecological systems (Plüschke-Altof et al., 2023; Westley et al., 2013; Wolfram, 2016) but not in socio-technical systems (e.g., for energy transitions). Thus, there is an opportunity to develop conceptual linkages between the socio-technical system perspective and the potential for transformative agency, drawing on their common concern with context and agency.

Both socio-technical system and transformative agency theoretical approaches are used to relate strategic action to system change toward sustainability. Moreover, both are context-specific and dependent on relational and structural understandings of actors and systems. A conceptual difference can be seen, however, in the scale of action and change. Since the socio-technical system approach is primarily concerned with technologies in either a market dominance or challenger position, the scale of action accounting for change is often collective and generalised in such a way that makes tracing change down to individual actions difficult. The most commonly used socio-technical system frameworks for sustainability transitions, including the multi-level perspective and transition management (Markard et al., 2012), are particularly focused on the macro or meso levels and lack attention to individual agency. In contrast, the theory of transformative agency can usefully provide a link between individual action and institutional change, supporting a pathway to system-level change based on learning about the actions of specific (types of) actors. Of relevance for the current study, context and agency have been a topic in the socio-technical system context of community energy pilots, drawing attention to policies, culture, visions, and learning from multiple stakeholder perspectives (Ruggiero et al., 2021). The current study takes the first steps to address transformative agency in planning energy transitions, based on examples in Norway, going deeper into the experiences of planners in their shared institutional context.

3. Case Method and Approach

3.1. Case Summary

The study draws on learnings from seven Norwegian urban energy pilot and demonstration sites at various stages of planning and implementation (Table 1), funded by flagship programmes of the RCN, the EU, and Smart Innovation Norway. The selected projects primarily target urban energy transitions through the development of ZEN and PED projects but also include smart city initiatives involving, e.g., the installation of photo-voltaic panels, smart grids, and electric vehicle charging infrastructure. As such, those projects related to RCN and EU programmes have been monitored with respect to their technological ambitions, as reviewed in academic literature (e.g., Baer et al., 2021; Brozovsky et al., 2021) as well as research reports (e.g., Gjertsen et al., 2022; Kauko et al., 2022; Vergerio & Knotten, 2024). Shifting attention to social aspects, this study further contributes to the literature on smart cities, citizen participation, and competing discourses of planning for sustainability in Norway (Gohari et al., 2020; Haarstad, 2017; Oseland & Haarstad, 2022). More specifically, it builds upon the work by Baer et al. (2021) analysing 12 ZEN and PED projects for social innovation, which provided a detailed comparison of project ambitions, technological specifications, and methods for citizen participation.

The sites in focus include both small and large urban and semi-urban contexts across coastal and inland Norway but exclude sites in the capital and largest metropolitan area of Oslo (Figure 1). While this leaves geographical variation in the selection, the cases represent the breadth of an “ordinary” Norwegian planning context, and the focus of the study thereby avoids exceptional cases of globally recognised cities with

potentially outsized resources for transitions (Robinson, 2005). For further understanding of the national context, Norway has a relatively decentralised urban structure whereby nearly 83% of the population lives in urban settlements defined as continuous built-up areas, of which a large proportion comprises small- and medium-sized cities distributed along coastal areas from south to north. Only 10 of nearly 1,000 urban settlements in the country have more than 50,000 inhabitants, and six have more than 100,000 (Statistics Norway, 2023). Unlike pilot and demonstration sites in other European countries, the ones in Norway can be found throughout the country, from the most populated urban centres to comparatively rural and remote communities which still statistically qualify as urban settlements. Likewise, for the planning context, a similar range of stakeholders including planners, research institutes, state agencies, commercial partners, and local communities emerge for the facilitation of the ZEN and PED projects.

The exploratory nature of the study welcomes inherent variation amongst the cases, within the confines of an ordinary planning context in Norway. As such, it is not the intention to control for variation amongst the cases but, taking advantage of this, to gather and reflect on a breadth of planners' experiences around social barriers. Similarly, the potential variation of stakeholder constellations is not of particular concern in this study. Rather, the role of the planner incorporating energy transition into long-term planning and coordination—often

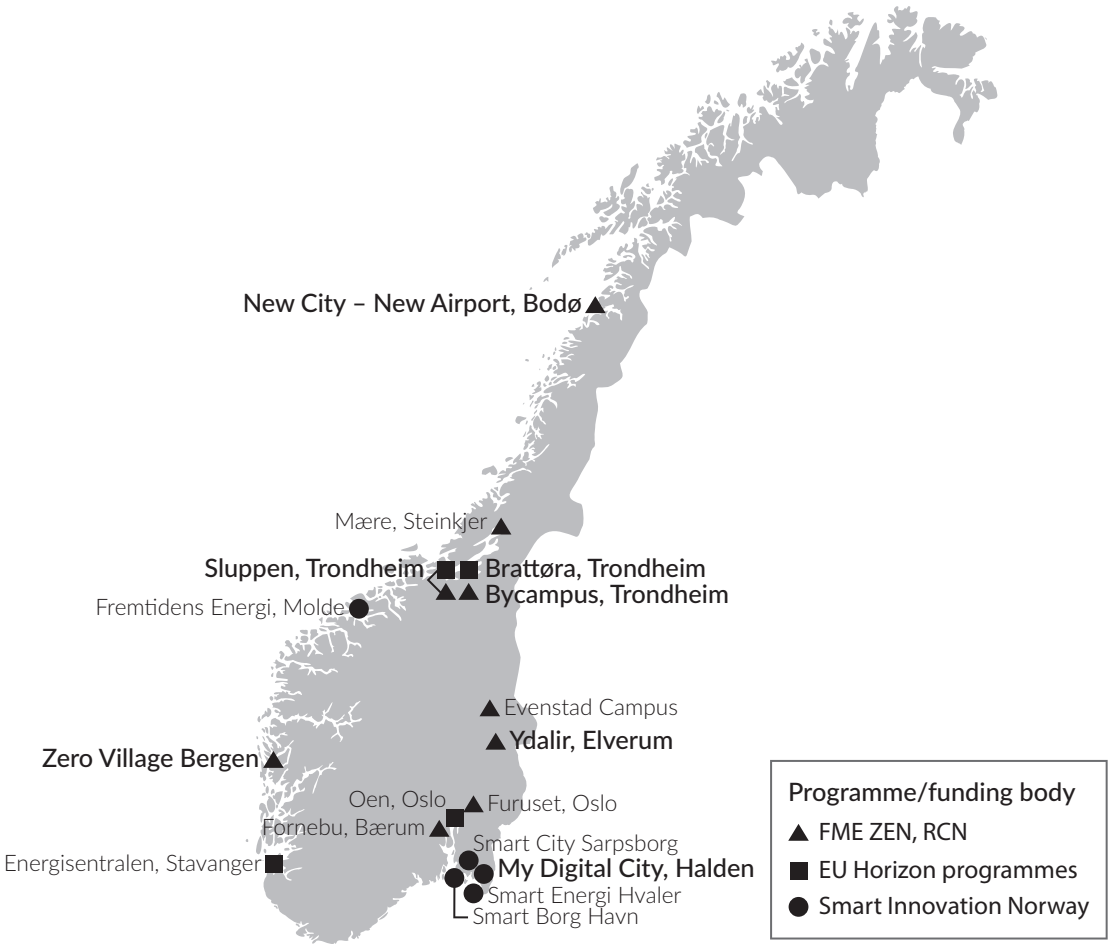

Figure 1. Geographical distribution of urban energy projects considered for the study, with selected sites emphasised in bold. Source: Author's work, adapted from Baer et al. (2021) with open map files from Kartverket.

trailblazing new sustainability initiatives within the bounds of the Planning and Building Act (Kommunal- og distriktsdepartementet, 2008) and the Energy Act (Energidepartementet, 2024)—is taken as a starting point for the inquiry.

3.2. Method

To pursue the aims of this study, the method joins 12 semi-structured interviews with planners and informants from planning adjacent roles, conducted under conditions of anonymity and confidentiality. For each potential case, the official contact persons of individual projects (pilot and demonstration sites) were approached to determine the most appropriate informant. While a municipal planner was usually identified, this sometimes led to a consultant or project manager primarily involved in the planning process, depending on the owner and type of project. This variation was acceptable for investigating the planning perspective, as it was jointly determined that the nominated individuals were the most knowledgeable as experts and first-hand informants for the interview topics.

While 15 potential projects were identified for inclusion from the relevant RCN, EU, and Smart Innovation Norway programmes, it follows that an informant could not be located from every eligible case. This was attributed to either the closure of a project and engagement of relevant informants in new activities, research fatigue at a particular site, or a lack of response from the official contact persons. Several cases additionally involved multiple informants, on the recommendation of the initial informant (i.e., snowballing), or when individual informants had experiences to report on multiple sites. These were the cases for informants in Bodø and Trondheim, respectively, where the projects followed long-term courses of development involving multiple stages of planning and implementation. The resulting set can therefore be seen as a purposeful sample of convenience, nonetheless representing the intended breadth of projects for the purposes of the study.

Even though social barriers were explicitly understood to be the topic of the study, the interviews were framed by the informants' professional roles and experiences in the cases. In this way, social barriers were addressed indirectly according to the timeframes and stages of the projects. The semi-structured interviews followed an interview guide designed to establish the informant's professional background and role as a planner, map stakeholder power and interests, discuss barriers encountered and strategies used to overcome them, and reflect on the planning process, stakeholder interactions (between public/state, private/market, and community sectors), and tools for participation. Due to the different stages of projects, strategies to overcome barriers, and tools for participation were not applicable for all cases. The informants as planners were positioned between the public (state) and community sectors due to their formal obligations, most often as state actors, alongside their professional interests in serving the public good. While public academic institutions and private research institutions form part of the stakeholder constellations, the author of this study had no prior formal or direct relations with the informants or projects under investigation.

Interviews of approximately one hour were conducted both physically and digitally, according to the informant's preference. The interviews were recorded, transcribed and analysed thematically with the aid of written interview notes, and specialist software for analysis was not required. The discussion of social barriers in each project reflected a learning and adaptation process, according to the timeframe and stage of the project, that deepened with accumulated national experience and increasing ambitions for energy

transition, stakeholder involvement, and societal transformation over time. Here forth, the analysis does not intend to be descriptive nor to unpack the cases themselves. Rather, a deeper discussion around understanding and working with social barriers when planning transitions is generated for the benefit of planning practice.

Table 1. Overview of selected projects.

Name of pilot and demonstration site(s), municipality	Project or programme, funding agency, years funded	Type of development	Geographical area, urban settlement size *	Interview
New City—New Airport and Master Plan for Port of Bodø, Bodø	FME ZEN, RCN, 2017–2024	Urban greenfield, airport redevelopment, port redevelopment	Northern coastal regional centre; 42,831 urban inhabitants (2023)	Interviews 10, 11, and 12
Brattøra, Trondheim	Positive City Exchange, EU H2020, 2018–2023	Urban brownfield, port redevelopment	Mid-Norway coastal regional centre; 196,948 urban inhabitants (2023)	Interviews 6, 7, and 8
Sluppen (part of "Knowledge Axis"), Trondheim	Positive City Exchange, EU H2020, 2018–2023 FME ZEN, RCN, 2017–2024	Urban brownfield, mixed-use development	Mid-Norway coastal regional centre; 196,948 urban inhabitants (2023)	Interviews 4, 6, 7, and 8
Bycampus (part of "Knowledge Axis"), Trondheim	FME ZEN, RCN, 2017–2024	Urban brownfield, university campus, and mixed-use development	Mid-Norway coastal regional centre; 196,948 urban inhabitants (2023)	Interviews 1 and 2
ZeroVillage Bergen, Bergen	FME ZEN, RCN, 2017–2024	Urban greenfield, residential district	Western Norway coastal regional centre; 269,548 urban inhabitants (2023)	Interview 9
My Digital City, Halden	Smart Cities and Communities, Smart Innovation Norway, 11 years ongoing	Urban brownfield, building retrofits, and mobility solutions	Southeastern Norway coastal small centre; 26,126 urban inhabitants (2023)	Interview 5
Byplan (Ydalir), Elverum	FME ZEN, RCN, 2017–2024	(Sub-)urban brownfield, residential district	Eastern Norway inland small centre; 15,632 urban inhabitants (2023)	Interview 3

Source: * Statistics Norway (2023).

4. Results

The interviews revealed several themes that can aid researchers and policymakers in understanding and addressing social barriers in energy transition projects. These emergent themes are elaborated below: (a) a lack of understanding or shared goal amongst stakeholders, (b) lowered ambitions over the course of a project than originally planned, (c) a lack of user involvement despite ambitions for a high degree of participation in the planning process, and (d) institutional and/or structural constraints upon the target of the project or planning practice.

The results communicate a range of opinions and experiences of planners involved in concrete energy pilot and demonstration sites in Norway, speaking of mid- to long-term funded projects in small- and medium-sized cities with similarly operating planning departments. Following the themes of the interview guide, it can be seen that the projects tended to engage with a similar range of stakeholders including national, regional, and local level actors from state, industry, and community sectors. Hence, as expected, there was a degree of homogeneity amongst planners in their professional roles, contexts, and activities in the energy transition projects, which can be accepted as reflective of an "ordinary" planning context in Norway.

4.1. Lack of Understanding (Knowledge) or Shared Goal

This first theme relates to a common challenge of both planning and sustainability transitions, that is, the vision of what is trying to be achieved. In urban energy transition projects, a lack of understanding and lack of knowledge about energy transitions amongst all relevant stakeholders, and more generally about the socio-technical implications of bridging urban and energy planning, poses a barrier to achieving the shared vision or goal. This can unfold in multiple ways according to ambition and ability. One informant stated, "Agreeing on the ambitions is very important…that you understand the consequences of it at an early stage" (Interview 4), while according to another, "We have the knowledge to do it, but it is hard to agree on the goal conflicts" (Interview 2). Yet, another was halted by ambition: "We have ambitions…but right now we don't really have a direction, and we don't really know what it involves other than being part of some networks" (Interview 11).

Related challenges for the planner are to navigate different interpretations of the vision by different stakeholders, to build consensus through a common understanding of the goal, and to match the goal to specific work programmes. To complicate this, as ambitions rise for energy transitions, strategies shift from project-specific towards paradigmatic change, which can put planners in an uncertain role leading an open-ended process of experimentation: "It's very easy to agree that you have high ambitions for things, but when you get to the practicalities, you're not quite aware that it meant you have to do things in a different way" (Interview 4).

Learning the implications of having high ambitions along the way forces a confrontation in the planner, as planning tools and processes present incompatibilities between ambitious goals and practical plans to be achieved through concrete investments. This is especially important for reconciling sectoral differences between urban planning and energy planning. According to one informant: "Planning and the energy sector need to understand each other better. But we also need to work at an early phase together to sort of plan how an area should look" (Interview 12). As another informant opined, a feasibility study does not

necessarily follow through to the detailed regulation (e.g., for a municipality) or to implementation through the cooperation of multiple stakeholders (e.g., for a real estate developer).

Furthermore, another informant reflected that as ambitions rise and spread with experience, the focus of attention shifts from convincing a core set of committed actors, to behavioural change amongst the general public to shift demand, which both need coordination to justify investments from commercial actors. While experience potentially improves the planner's ability to get things done, it can also lead to the next theme, which is an adjustment of the ambitions to suit the process.

4.2. Lowered Ambitions

Partly as a result of the former, planners' experiences indicate a lowering of ambitions to put plans into practice. In projects related to FME ZEN, for example, where multiple pilots are progressing towards similar ambitions, municipalities, and developers have the potential to generate competition and "show off" their achievements, but at the same time, practical success may depend on picking the "low hanging fruit" of technological solutions (Interview 9). Despite setting high ambitions for energy transition projects, the ambitions tend to be lowered when put into practice due to, for example, a lack of incentives for the involved stakeholders and a lack of regulatory conditions clarifying the way toward implementation. Informants from ZEN pilots, including some of the earliest examples in Norway, reflected on having few incentives to get private developers to relate to higher ambitions. On the system level, technological aspects controlled by private actors or monopolies have been resistant to change without political direction (Interview 8). On the local level, planners have been uncertain whether guidelines brought through planning processes would become voluntary for private developers (Interview 3). Working with relatively conventional processes, planners could initially use zoning and detailed regulations to achieve their energy ambitions in public buildings like schools and health centres, offering possibilities for energy exchange (Interview 4).

With growing knowledge and experience, there was a general belief that public actors such as public real estate companies could influence private actors to raise their ambitions, a notion confirmed by the growing commercialisation of ZEN and PED projects over time (Baer et al., 2021).

4.3. Lack of User Involvement

User involvement through participatory planning is a standard element of the planning process but continues to be seen as lacking. Traditional methods relying on planning tools have potential but mixed results, as they struggle to communicate complex challenges like energy transition. To overcome the resource limitations of planners, research institutes have a role as project participants to support planners by facilitating user involvement and communicating complex challenges. A range of strategies and planning tools are needed to reach different types of users according to the local conditions, and the scope of users targeted could be widened to cross sectors. The informants related testing a variety of methods for user involvement in the local context through urban experimentation, which requires the support of research institutes and commercial (technical) actors. Living labs were named as one possibility for municipalities to garner user interactions and involvement in the planning process. Used in the larger cities hosting multiple pilots, notably Trondheim, the digital and democratising activities aimed at user involvement could be seen as "planting seeds" for ideas around local energy (Interview 6).

There may be different challenges and strategies needed, however, for involving users in sites that are more remote and have fewer inhabitants to give input, or for involving users according to the functional social structure of an area, for example, instead of inhabitants, to involve employers and people who work and pass through those areas. Additionally, potentials and implications for user involvement may differ between greenfield and brownfield developments. For the former, there is a need to align planning processes (planners) with energy transition (energy experts) from the earliest stages, i.e., in setting the vision and master plan. While this requires detailed foresight to plan investments—both financial and technological—it was thought to be easier to plan ambitious goals in greenfield areas than to transform brownfield areas (Interviews 1, 10, and 12), partly due to the stakeholders involved.

From the smart cities perspective, user involvement can be a means of generating consensus around an ambitious vision through information sharing. One informant related their experiences with smart sensors to energy and mobility, believing that making information available to users on consumption and costs could impact behaviour (Interview 5). Nevertheless, the informant highlighted the uncertain regulatory restrictions on the uses of such data, requiring political attention.

4.4. Institutional and/or Organisational Structural Constraints

Despite intentions, planners face a range of structural limitations, for example, to go beyond basic regulatory requirements and the (public) resources afforded to them, with respect to their role within institutional and organisational constraints (financial, regulatory), the local culture around innovativeness and risk-taking, and the individual personalities in key roles who may be influential in setting local ambitions, navigating practical processes, and bridging networks. Of particular importance for planning, the Planning and Building Act as the most relevant regulation does not enable placing limitations on energy sustainability, for example, to require a zero-emission building or neighbourhood, which creates uncertainty for planners translating ambitious master plans to detailed local plans (Interview 10). Aside from public engagement through user involvement, there is a need for political engagement at the national level to develop the space for effective urban experimentation from both urban planning and energy planning perspectives (Interviews 6 and 12). While the designation of an area for urban experimentation has been successful in seeking project-specific dispensations, there is a need for national alignment in legislation that would set "parameters to follow" or "some equal treatment" for pilots to enable and streamline their possibilities to develop and test solutions (Interview 12). In detailing how one project attained the necessary dispensations to enable energy exchange between buildings, strategies of anchoring municipalities' positions, aligning positions on the county level, and building coalitions and partnerships to influence the national level were seen to be effective (Interview 8), in addition to direct channels to the national level (Interview 12). Thus, there has been an essential role of networking to navigate institutional and organisational constraints that operate on a system level.

Further to the structural constraints characterising the system, the informants relayed dependencies within institutions, as stakeholders, that vary in size and culture with respect to decision-making processes, affecting speed and agility, and with respect to risk aversion, affecting innovation and uncertainty. On an interpersonal level, they also relayed dependencies on the role of personalities affecting project ambition, initiative, cooperation, and networks. These were particularly important for dealing with regulatory constraints and re-ordering conventional workflows to account for longer horizons in planning investments and technical infrastructure (Interviews 6, 8, and 12).

5. Discussion and Conclusions

As potential categories of social barriers, the themes recall aspects of strategic planning, including visioning and participation, set amidst the challenging and often contentious context of planning for sustainability. Nevertheless, for energy transitions, the social barriers do not merely pose an inconvenience to the realisation of planning goals that could otherwise be pushed through a planning process, threatening legitimacy. Moreso, social barriers have the potential to cripple projects that are otherwise technically feasible, funded and have also gathered political support (on controversies around wind farm installations, see, e.g., Korsnes et al., 2023; Saglie et al., 2020), leading to potential cancellation and public backlash against further measures. Planning researchers, practitioners, and policymakers need a framework for the deeper and more reflective consideration of social barriers in practice.

The categories identified could be seen as a first step towards a way of working with social barriers, centred on the actor tasked to overcome them, when aiming for a planning practice that supports transformation. Going further, the next step is to consider a framework that puts the categories in relation to each other while being open to the addition of further categories over time. Given the inherent tension between the planner's inner role to serve the public good and the outer role structured by the institutional setting (Plüschke-Altof et al., 2023), it is proposed to orient the categories of social barriers on the planner and on the context in which the planner is situated and therefore practising.

Figure 2 demonstrates the categories on two axes to enable deeper reflection in relation to transformative agency: one representing the internal (i.e., personal) and external (i.e., public) arenas in which the barriers play out and the other relating to the formality or institutionalisation (i.e., formal or informal) of the social process associated with barriers.

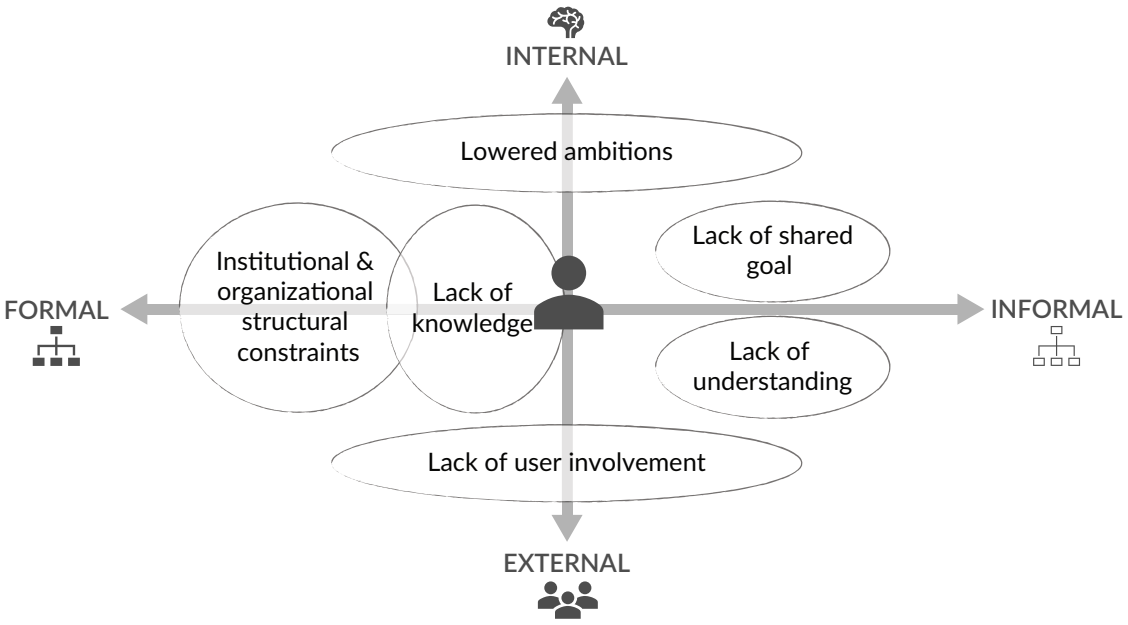

Figure 2. Towards a framework for analysing social barriers.

Through the use of the framework, the researcher would be able to orient challenges upon the inner and outer worlds of the planner and support a more structured approach to thinking about the strategies and specific measures that could be used to address social barriers in relation to "activity system transformation" (Virkkunen, 2006), from the planner to the field of planning. This is currently a theoretical and reflective exercise for the planner to strive toward a practice of transformative planning. For energy transitions, this supports a more active critical reflection on experimentation for transformative change (Isaksson et al., 2022). More practically, the potential transformative change can be traced through the actions and outcomes of the planner as they work through social barriers, requiring a more active role of the researcher in following the planning process. Accordingly, one direction for future research is the continued study of planners' strategies, activities, and outcomes to overcome the named barriers as they navigate the unfinished processes of transition in the examined cases. This study has provided a starting point for such investigation.

A limitation of the approach regards the size and depth of the cases studied, as the interviews represent snapshots in time of a limited number of ongoing projects and the partial perspectives of planners amidst a range of stakeholders. Although the current analysis is based solely on Norwegian planners' experiences of energy transition, the framework can be enriched with experiences from other planning contexts and applications to other fields of sustainability transitions. The recognised institutional aspect opens further potentials for enrichment through alignment with scales, as suggested by the importance of networks at local, regional, national, and international levels. The treatment of the institutional context has been limited in the current analysis to the immediate local but sometimes national contexts in which the planners situated themselves. This was not investigated in further detail here, but Lund et al. (2017) structure formal and informal enablers and barriers according to macro, meso, and micro levels, which could take the institutional aspect of future analyses further. The consideration of scales also points to potential connections with transition frameworks for the analysis of socio-technical systems, like the multi-level framework (Geels & Schot, 2007) or transition management (Kemp et al., 2007). This remains an area for future research.

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Conflict of Interests

The author declares no conflict of interests.

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