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Local niche planning and its strategic implications for implementation of energy-efficient technology

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ABSTRACT

It is widely recognised that the world is facing climate challenges that necessitate transitions towards more energy-efficient buildings. A key challenge is that visions of energy efficient buildings in policies often fail to become aligned with existing local practices. In order to overcome such a gap between policy visions and their implementation in practice specific forms of strategic work is needed, according to new transformative ideas in spatial planning. The aim of this paper is to characterize the transformative capacities of this kind of strategic work at the spatial scale of the town in order to assess how such activities engage with sustainable transitions. The theoretical contribution of the paper is to compare strategic work performed in transformative forms of spatial planning with the strategic work intended in strategic niche management, which represent a change-management process for enabling transitions. The study outlines the proactive spatial planning of a Danish local authority in order to illustrate how the strategic work performed in this kind of local development project represents a special form of niche management that is able to create room for innovation and challenge existing socio-technical regimes in the building sector, but still different to typical strategic niche management processes. Based on this empirical study, the paper challenges the narrow focus on niches around technology development processes in strategic niche management by pointing towards niche planning in local development projects as another relevant context for niche management. However, as discussed in the paper, this assumes a more strategic form of planning than is often practised today, where more emphasis is put on how planning can contribute to promoting sustainable transitions.

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1. Introduction

Policy-makers in the European Union have set targets to reduce European energy consumption by 20% by 2020 [1]. In particular, the European Commission has committed Member States to address energy inefficiency in buildings, because 40% of the total energy consumption in the EU relates to the building sector [2]. To achieve such energy-saving targets, new and more energy-efficient building technology needs to be more radically implemented in the building sector targeting, for example, heat loss from building envelopes. However, it is not easy to increase the energy efficiency of mainstream buildings, since the necessary radical innovations challenge the dominant socio-technical regimes and lock-ins that may exist, like in the case of the building sector [3,4]. Policy-makers thus face the challenge of how to facilitate a wider distribution of more radical innovations and new energy-efficient technologies in the building sector.

Since the visions of energy efficient buildings in policies often fail to become aligned with existing local practices, a gap seemingly exists between policies and implementation in the promotion of new energy-efficient technologies in the building sector. As a result, policy efforts to promote sustainable development in the built environment have resulted in relatively modest rates of

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technology dissemination in practice [5]. Even in a pioneering country like Denmark, many of the past policy initiatives to promote energy-efficient solutions in the building sector, such as economic incentives, demonstration projects, and minimum energy requirements, have not succeeded in radically overcoming the inertia in the building sector with regard to sustainability [6]. Some policy decisions have led to new energy-efficient technologies being successfully implemented, e.g. in experimental projects, where these technologies have been further developed and matured, but it is extremely rare for such planning initiatives to succeed in implementing the mature technologies in mainstream building [7]. This gap between policy visions and their implementation in practice represents a key challenge in terms of ensuring a transition towards more sustainable and energy-efficient buildings.

Some researchers in spatial planning engages with this challenge of realising implementation of policy visions by arguing that new forms of strategic work are needed in order for spatial planning to become a vehicle for change [8,9]. This represents a break with current forms of strategic work in traditional land-use planning that are more passively aimed at controlling land use [9]. Such a shift in the character of strategic work in spatial planning is interesting to study in relation to sustainable transitions, since the forwarded forms of strategic work seem to have similarities with the strategic work intended in strategic niche management, which represent purposive contributions to steer a transition process towards sustainability [10]. For example, both forms of strategic work aim at establishing the necessary alignments and momentum for change [9,10]. This is especially interesting, since local policy-makers – who perform spatial planning – are believed to play a role in transition processes by developing local infrastructures or providing locations for experimentation [11]. The relevance of such a perspective is further enhanced by studies that have shown that local policy-makers may become engaged in purposive socio-technical transition at the level of the spatial scale of towns through strategic activities concerned with urban development [12,13]. This suggests that certain forms of spatial planning can play a role in relation to socio-technical transitions involving energy-efficient technology in the building sector.

The overall aim of this paper is to characterize the transformative capacities of strategic work performed by local policy-makers at the spatial scale of the town in order to assess how such activities engage with sustainable transitions. Specific emphasis is put on considering strategic work in local development projects, where the planning process is positioned as a vehicle of change, in accordance with transformative ideas of spatial planning. The theoretical contribution of the paper is to compare strategic work performed in transformative forms of spatial planning with the strategic work intended in strategic niche management, which represent a change-management process for enabling transitions. In addition, the empirical contribution of the paper is to analyse the extent to which the strategic work performed by the local policy-makers succeeds in mobilising changes among local stakeholders and in distributing and aggregating knowledge from the local development project.

The empirical part of the paper is based on a case study of a local authority in Denmark that worked out a planning strategy with transformative capacities for implementing low-energy buildings in a new residential development area. This case was chosen, because it is one of the most ambitious on-site local development projects in energy-efficient housing carried out in northern Europe, with an area of 76 ha and 750 new homes planned. The planning process in the local authority of Egedal, near Copenhagen, was special in the sense that the local policy-makers exploited the planning process to address the strategic issue of promoting more energy-efficient building technology in mainstream building projects. Our empirical data is based on work carried out in the European Concerto Plus project 'Class 1'.

The paper is structured as follows: In Section 2, we discuss how transformative ideas in spatial planning theories relate to and challenge the strategic niche management perspective in transition theory. In Section 3, we unfold an empirical analysis of how the local authority of Egedal made strategic use of the planning process as a lever to promote the implementation and wider distribution of low-energy technology in the large-scale development project. We particularly focus on characterizing the strategic work in the planning process in order to understand how their sustainability policies were translated into a viable local project, where extremely energy-efficient technologies were implemented. In Section 4, we look more critically at the planning process from a transition perspective by addressing issues of the distribution and aggregation of knowledge of this local development project in relation to existing socio-technical regimes. Finally, in the conclusion, we provide some critical reflections and recommendations on the transformative capacity of the strategic work in spatial planning, both in relation to the empirical study and our theoretical contribution.

2. Niche planning — a special form of strategic niche management

Inspired by other studies that deal with the idea of bridging the gap between the strategic niche management perspective and geographical studies [14,15], this paper contributes to the theoretical discussion about how local societal actors can help steer transition processes towards more energy-efficient buildings in a specific geographical context. This is explored more specifically by studying the relationship between a transformative perspective in spatial planning theories and the strategic niche management perspective. Firstly, we point out common features around the idea that certain stakeholders can strategically and actively take part in promoting sustainable transitions. Secondly, we look at the significance of policy-making in local development projects, where a transformative perspective in planning emphasises contextualisation more than strategic niche management. Thirdly, we introduce the concept of 'niche planning' that embraces the idea of strategic niche management of local projects within a transition trajectory, but at the same time recognises the spatial context and planning characteristics of this form of management process in local development projects.

Strategic niche management as well as transformative perspectives in spatial planning recognises that stakeholders are important in shaping development processes, especially if these stakeholders think strategically about how they can influence the

development process in some desired direction. The strategic niche management approach deals with how policy-makers involved in sustainable development processes can purposively contribute in steering transition processes towards sustainability (e.g. [10,16,17]). This reflects the way socio-technical developments in society are often patterned along certain technological trajectories (also labelled as regimes) rather than others, but that active efforts can be made to strengthen small and unstable communities at the so-called niche level to help them gain momentum and break with the communities at regime level that are otherwise large and stable [4]. The niche level is where radical novelties emerge, often with centre on a specific technological niche, and in order for a transition to occur institutional connections and adaptations is needed at different levels as well as stimulating learning processes for further development and use of the new technology [4]. Similarly, transformative perspectives in planning represents the idea that plans can produce more significant effects in urban systems, when planning becomes more actively a vehicle for change [8]. Rather than a passive form of planning that merely stipulates formal compliance to legislation, a more action-oriented form of planning is advertised, aimed at inducing necessary changes in urban fabrics [9,18,19]. This shift from passive to active forms of spatial planning is reflected in the Danish context, for example, in the shift from traditional local authority plans that merely outline territorial priorities to the more recently developed strategic plans that have more focus on formulating visions for the future development of the urban area with regard to issues like culture, physical environment, and social development [20].

Both perspectives emphasise strategic considerations in these kinds of change-management processes. Strategic niche management studies emphasise how policy-makers can support the development of new sustainable technology by establishing technological 'incubation rooms' and then phasing out these in a controlled way to help the technology disseminate through strategic policies [4,10,21]. In this regard, policy-makers are indicated as potential niche managers (although niche management is emphasised as a collective endeavour), since policy-makers have a history of deliberately initiating processes of technological change [10,16,22]. Similarly, transformative perspectives in planning promote a more development-oriented approach, in which imagination and visioning about the development direction of an urban area should be emphasised in a way that deliberately seeks to change existing urban paradigms [8,23]. One key issue is to develop a planning approach that deals more explicitly with project planning for the 'operational' level of such a planning process in order to intervene more directly, coherently and selectively in social reality and development [9]. This reflects a definition of planning as a kind of change-management process, much like strategic niche management. Although the notion of change-management is used in this regard, both perspectives recognise that these processes of change cannot be managed or planned in a linear way (from plan to action to outcome), but that alignment work needs to be carried out to find concurrence and coordinate between various stakeholder interests. Both perspectives recognise the heterogeneous character of the network in which planning (or technology) is enacted [9,10].

Although the two perspectives have common features, the strategic niche management perspective does not capture well the transformative initiatives that some policy-makers undertake that can challenge socio-technical regimes in local development projects. One important difference concerns the emphasis that strategic niche management places on supporting technological innovation from within the technological niche, as in the biogas case [21]. In contrast, transformative perspectives in planning are often not about supporting technological innovation per se, but rather about providing a supportive framework for the broader application of old or new technology that fits with the development strategies of the cities [24]. This reflects how focusing on planning entails a shift away from a focus on technological experimentation in order to refine the technology according to the practical context, to experimentation with the practical context in order to ensure application of specific technologies within a specific urban context. In the latter, emphasis is put on how the practical context can accommodate the new technology, rather than the other way around, since spatial planning represents methods that the public sector can use to influence how people and activities are distributed in spaces of various scales, e.g. cities.

Another important difference between the two perspectives is that the transformative perspectives in planning tend to focus on developing strategic plans for how a city should cope with challenges in terms of interurban competition or lack of growth or urban quality [8], and less about plans for the wider distribution of a specific technology. Planning of local development projects thus represent a special form of governance, where policy-makers are given a degree of autonomy in terms of how they will actually plan, manage and operate local structures [25]. So whereas many studies in strategic niche management emphasise transitions in terms of technological development processes, such a planning perspective involves a broader focus on transformation of the urban fabric. However, when local policy-makers engage in such strategic efforts to plan an urban transformation, an interconnection between planning and socio-technical regimes is established, according to [13]. This interconnection happens, since local policy-makers tend to attempt to gain a degree of control and influence over socio-technical regimes in order to achieve territorial priorities, although they may sit outside of these regimes [13]. This shows that planners do not strictly perform niche management of technological niches, but their planning activities in local development projects in different ways intersect with the development of technological niches.

The transformative perspectives in planning also have much greater emphasis on the operational context than the strategic niche management perspective. This is a result of the complex co-location of multiple webs of relations, which transect and intersect across an urban area, and which represent one of the key challenges in performing spatial planning [19]. Spatial planning in this way is very much about handling the many different interests and visions coupled to development of a specific urban context [23,26]. This contextual emphasis is reflected in more flexible forms of project planning in practice, in which planners concentrate to a greater extent on steering and regulating specific ad-hoc projects in collaboration with public and private stakeholders to find solutions to local problems [20]. The strategic niche management perspective, on the other hand, has a greater emphasis on aggregation of knowledge from experiences and findings on location to mobile, generic and translocal knowledge [27]. Much emphasis is thus put on the socio-cognitive activities that make it possible to transform tacit forms of knowledge

(often locally embedded) to more abstract and generic forms of knowledge, in order for a new regime to gain a foothold and, over time, replace the old regime [4,10].

In the following empirical analysis, we suggest 'niche planning' as a concept that bridges the two perspectives, enabling us to study this special form of niche management that – we argue – takes place in local development projects. Our first step is to emphasise the notion of 'niche' in terms of actively engaging with sustainable transitions. This notion reflects the strategic niche management perspective and thus adds a transition perspective to planning, since transformative perspectives in planning merely focus on how strategic reflections about visions, actions and means for implementation can shape and frame what a place is and might become from a spatial perspective [9]. This broadens our conceptualisation of the transformative capacities of local planners even further by adding an element of strategic niche management. Our second step is to emphasise the notion of 'planning' in terms of emphasising the process of facilitating change that characterises development processes of local projects. This notion reflects the contextually embedded process of providing momentum to the process of local change in planning, and in that way, adds a different kind of process facilitation, from that in strategic niche management, where aggregation of knowledge is emphasised [27]. These two steps are deployed in the specific analysis of the empirical material by highlighting how the concept of 'niche planning' may represent a way to closing the gap between policy visions and their implementation in terms of strategically facilitating processes towards sustainable transitions through local development projects.

3. Niche planning in a Danish local authority

In this section, we provide an empirical presentation of the local planning process that planners in the local authority of Egedal engaged in with the aim of developing the largest settlement of extremely energy-efficient buildings in Denmark. This empirical presentation is inspired by the notion of 'niche planning', since we highlight how the success of this initiative was strongly linked to the strategic efforts of the planners to create and nurture a technological niche for highly energy-efficient building technologies, while their work was performed in practice – not as a strategic niche management project – but as an integrated part of their spatial planning approach. The case characterizes the strategic work needed during the planning process in order to provide both the direction and momentum necessary to make a shift towards more sustainable building practices in the local project. The focus on Danish planning practices is relevant, since Denmark is generally renowned for having a proactive planning approach, in which local policy-makers play an important role [12].

The case is based on comprehensive data collection throughout the process over several years. Qualitative interviews were conducted with key stakeholders from the local authority, both planners and policy-makers, building companies, and private developers of one-family houses. Some key stakeholders were interviewed several times during the process. Moreover, a survey based on questionnaires was carried out to explore the backgrounds and perspectives of the group of private developers further [28]. Alongside the Danish case, work was carried out to analyse the planning frameworks and performance of planning processes in energy-efficient building projects in four other European countries [25].

The case illustrates strategic change-management work in the planning process. Through the case, we describe both the initial struggles to initiate such a strategic and transformative planning approach, and the creative work of aligning and translating sustainable policy objectives into concrete actions. The case provides an insight into the strategic efforts that the planners undertook in the process, and show how these efforts succeeded in mobilising changes in building practices among mainstream stakeholders at the local level. In the Discussion section, these changes in practice are further explored to show that they extend beyond the local development project and lead to aggregation of knowledge in terms of contributing to sustainable transitions.

3.1. Initiating a niche planning approach

The local authority of Egedal started with a traditional approach to planning, in which policy targets on sustainability were formulated in various plans, such as Agenda 21 plans, local authority plans and local plans. Through these plans, sustainable policies were put forward and various initiatives carried out; mainly on demonstrating sustainable building methods and distributing information to local stakeholders. In particular, one person in the local authority, the Agenda 21 coordinator, was dedicated and committed to these processes of promoting sustainable development both in the local authority's own institutions and among local stakeholders. He became the initial driver of the more transformative planning initiative, as he drew attention to the gap between the policy visions on sustainability and the implementation of new sustainable technology in practice. The coordinator was especially concerned about the lack of success in implementing actions that had endurable impact in local practice. Following from these frustrations and experiences, the Agenda 21 coordinator called for directing the sustainability policies towards issues where the local authority actually had formal responsibility and authority to develop concrete action plans. This illustrates well the paradigm shift in planning from regulative and bureaucratic forms towards more transformative forms, as laid out by [9], in an urban planning context.

During the planning process, these considerations gained momentum because political developments in the local authority created a window of opportunity for a specific local development project, in which more focused action plans could be implemented. Such windows of opportunity represent important moments in transition processes when certain opportunities for change in existing frameworks arise, as in the case of changing the water management of Rotterdam [29]. In the specific case of Egedal, the window of opportunity arose, because a new Mayor took office. This established a new political alliance in the local authority around the idea of developing a new sustainable urban development area south of the town of Stenløse. This window of opportunity was seized by the Agenda 21 coordinator, in strategic alliance with the chief of the planning department and the local

authority director, as a means to challenge the town council to develop a transformative local development project. The strategic work was anchored mainly in the Planning Department, which had good relations with the politicians in the town council.

An important step in the strategic planning process was to develop a combined Planning and Agenda 21 Strategy, in which concrete actions to implement sustainable initiatives in the prevailing local development project were strategically identified. During the preparation of this strategy, the planners actively sought to mobilise the politicians in the town council to think more strategically about how to implement action-oriented policy objectives on sustainability directly in the planning process of the new local development. The planners succeeded in convincing the politicians, using common-sense arguments about providing sound housing for future residents that would meet future requirements for energy and water savings, for instance, rather than radical ideology about sustainable development. As the Mayor at the time, Eliasen (pers. comm.)[1] said:

> "The team that Mona (the Head of Planning, red.) has assembled there; has been very good (…). And in fact, it is very important that they have been able to create an atmosphere of trust about what they have told us. So that we believe in it."

Although sustainable development has become one strategy for a local authority to establish a distinctive and appealing identity in a time of increased competition for inhabitants and businesses [30,31], such thoughts were not among the key arguments in Egedal. This illustrates that this local project had not just broader political considerations about local values and visions, but also strategic ideas about how to contribute to transforming specific socio-technical systems.

The transformative planning process of the new residential development area became focused on energy efficiency as a key sustainability aspect. This issue was raised because the mandatory Environmental Assessment report for the area showed that heavy extensions of the existing natural-gas heating system would be necessary for a traditional residential development [32]. The planners showed that such extensions would be unnecessary, if more energy-efficient buildings were developed that relied on individual heating of the houses. This represents somewhat of a break with existing socio-technical regimes of heating and construction in Denmark, since new houses in urban areas are usually connected to some kind of collective heating system and merely comply with the level of minimum energy requirements set in the Danish Building Regulations. For the buildings to rely on individual heating, the minimum energy requirements in the residential development project would have to be tightened compared to the national standards. This tightening would require the building sector to innovate in terms of e.g. insulation and energy systems. This illustrates the point that to achieve certain territorial priorities (in this case urban growth in an energy-efficient way), policy-makers were caught up in an attempt to gain a degree of control and influence over socio-technical regimes, as noted previously.

Although the planners in the local authority did want to create and nurture a niche for extremely energy-efficient technology in the residential project, their intention was not to develop a demonstration site. Rather, their intention was to carry out a traditional residential development project aimed at mainstream stakeholders.

> "We see our role as going in and defining the relationship (with the building company, red.) so that we pose some questions on behalf of the customer, and we get some responses that the building company would normally never give. Because, if the customer had just asked, they would have said: 'No we can't'. That's where we had to go in and translate somehow, and say:'Yes, that can be done' or 'That's just not true'. And that is where you could say that we become the driving force. We come in and get direct influence on the market, on market-based conditions. This is really crucial, because we have had plenty of demonstration projects. Demonstration projects and experiments are all very well, but they should be used for things that are still being tested. (…). They shouldn't be used to what is mature in the market." (Poulsen, pers. comm.)[2]

As a result, the planners initiated a traditional spatial planning process with the formulation of local plans in accordance with national regulations and a review of compliance of the individual building projects during the handling of building cases [33]. The planners expected to follow the typical planning procedure, based on a regulative and bureaucratic approach, where the minimum energy requirements would be tightened in the local plans, compared to the national building regulations. However, the planners discovered that it was not possible to enact their action plans for sustainability based on the existing planning framework. Instead, they were faced with the challenge of deviating from the traditional planning procedure, if they wished to succeed in implementing their action plans.

This deviation was deemed necessary by the planners, since the existing planning framework did not make it possible for the local authority to set up local energy efficiency requirements that were tighter than those defined in the Danish Building Regulations. The local authority could formulate objectives for the energy efficiency of the buildings in the local area, but these objectives would not be legally binding for the building industry due to the lack of reference to this aspect in the Planning Act. Instead, the planners worked out an alternative strategy that drew upon civil law on the rights of property. The Danish extensive property rights include the right to incorporate legally binding covenants that regulate specific elements of the area or buildings. By enacting covenants on each lot, the local authority was able to ensure that their energy efficiency requirements were legally binding for those buying a lot. However, to activate this planning instrument, the local authority had to acquire the whole building site. Such an acquisition represented somewhat of an investment risk, but because of the timing of the project in a period of building boom, the local authority was prepared to take the risk.

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[1] Interview with Willy Eliasen, Mayor of Stenløse Municipality (which is currently part of the Municipality of Egedal) on the 11th of July 2007.
[2] Interview with Jan Poulsen, energy coordinator in the Municipality of Egedal, on the 16th of November 2007.

The above illustrates how a planning approach was built up brick by brick that deviated from traditional planning approaches and instead enacted transformative ideas of planning as laid out in the theoretical section above. The planning approach was not at all structured from one end to the other, but rather a result of how planning practices formed along the way.

3.2. Performing niche planning

Once the planners in the local authority realised that they could not implement their action plans based on the regulations, they embarked on an ad-hoc and network-based planning approach with strategic reflections about how to implement new energy-efficient technology. This involved an on-going learning process, in which the planners became deeply involved in developing strategies to overcome reluctance from the local stakeholders involved and ensuring the project's momentum. This reflects how the planning strategy changed from applying singular instruments and formal planning processes towards a more transformative form of planning. In this way, the planners took a leading role in the planning process – as niche managers – and identified ways to make the sustainable policy objectives operational in the planning process and to mobilise the stakeholders involved in the project to innovate.

According to the Head of Planning, one of the most critical challenges that the planners faced in trying to implement energy-efficient technologies in the building project was the prevailing deadlock situation, in which the building industry has an economic and technical interest in maintaining well-known standards, whereas buyers usually do not have the necessary knowledge to demand highly energy-efficient buildings [34]. The experience of the planners was that it would be difficult to commit mainstream stakeholders in general to the visionary sustainable initiatives set out by the local authority. For this reason, the planners acknowledged that mobilisation of local stakeholders in the building sector would be crucial in their efforts to get highly energy-efficient technologies implemented in the building project. This involved both the implementation of covenants as described above, and the facilitation of alignment processes.

The planners had to facilitate the process of developing individual building projects. The usual pattern of development of such projects in Denmark is that an individual family would buy a lot and contract an entrepreneur or building company to develop the building project. This implies that the home-owner-to-be represents the developer of the building project in collaboration with the chosen building company. In the construction phase of the building project, the building company is responsible for realising the project, including how to comply with energy requirements. In this way, the building company acts as project manager in terms of ensuring the necessary documentation of the project, authorisations from policy-makers, and coordination of workmen and suppliers. During the facilitation, the planners were thus in contact with all these different stakeholders involved in the building projects.

The facilitation of the process took different forms at different stages of the development process. At the outset of the process, the planners were preoccupied with the production of sales literature to convince individual families to buy a building lot. During the development of this material, the planners strategically softened the barrier effect of the costs in the individual building projects, because the families did not represent a green segment of the population, but rather ordinary families in search of a new home [28]. This was done by pointing towards cheap methods for obtaining energy efficiency and clearly explaining the benefits of such initiatives in terms of operational costs. The planners were also involved in an on-going dialogue with the families to respond to questions and uncertainties about the tightened energy requirements. During the design phase of the individual building projects, the planners were involved in helping the building companies identify viable technical solutions to comply with the energy requirements. Even some of the large Danish home construction companies expressed reluctance to engage in the project, since the tightened energy efficiency requirements involved a large number of changes in the actual sketching of the house. For example, the technical director from one of the companies involved said:

> "When you need to go in and change the insulation, sectional views, and change your supplier of windows. And just changing the windows in a house has great implications, for how you lay bricks at the rabbet of the house. The measurements, the delivery of the windows, the sequence of work, surface treatment, etc. There is a whole lot of stuff. And being as big (company, red.) as we are, there are many of these things that run — and when things start running, then they run, and it is difficult to change these things on the way." (Hansen pers. comm.)[3]

A lot of negotiations took place between the planners and the building companies to find the best way for the companies to comply with the energy requirements. One example of a specific negotiation was that many families wanted floor heating, which was not possible due to the way the covenants were originally framed, and as a response to this, there were some negotiations about some of the requirements in the covenants, where the planners had to compromise, as the following citations from, respectively, one family and the planners clearly show:

> "There were several families – including us – who said that if we cannot have a modern house with underfloor heating, then we do not want to build out there at all. It has been – and is – a crucial point for those who have bought the building lots. And here, people have been ready to say that if we cannot have that, then the local authority can keep their building lot." (Andersen, pers. comm.)[4]

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[3] Interview with Jan Hansen, Technical Director of the building company 'Lind & Risør', on the 29th of October 2007.
[4] Interview with Bo and Katrine Andersen, a family building in Stenløse South, on the 28th of June 2007.

> *"We don't need a headline in the newspaper that says: 'People get cold feet in low-energy houses'. (…). So we obviously have to change direction and say that – OK – of course you can have underfloor heating." (Poulsen pers. comm.)*[5]

Finally, during the final stages of the process, the planners followed up on each of the building projects to check the energy efficiency of the buildings actually realised. This illustrates how the planners had to put a lot of facilitative efforts into mobilising the stakeholders to get involved and maintain their involvement. This was especially challenging, since the stakeholders involved from the building industry and the developers found it difficult to work out viable solutions, and during the entire development of the new area there was a risk of collapse due to lack of involvement from both building companies and developers.

The facilitation that the planners carried out during this process does not reflect a traditional strategic niche management process; especially since the residential project was neither a local experimental zone nor the application of specific instruments for the wider diffusion of specific technologies. Rather, the planners developed a more incremental strategy focusing on specific energy objectives and mainstream market practices with the aim of involving mainstream segments of families and building companies. This involved taking advantage of the intermediary role that planners have during the planning process, which reflects a new and more proactive local authority role with emphasis on facilitating broader urban changes [35]. This represents a transformative form of the planning process, in which planners attempt to steer the complex processes in a desired direction [8,26]. In undertaking this facilitative process, the planners were drawn into considering and challenging existing frameworks and regimes at various levels of society, thus supporting the point that through this kind of local planning attempts are made to gain a degree of control and influence over socio-technical regimes, as argued in [13].

4. Transformative capacity of niche planning

The empirical study showed how the performance of niche planning in the local development project had transformative capacity in terms of changing building practices. An important question to understand in relation to transition is what degree of aggregation of knowledge has been obtained through the local project, since an important element of strategic niche management relate to stimulation of learning processes [27]. In this section, we discuss the importance of considering aggregation of knowledge in the performance of niche planning. Firstly, the degree of aggregation of knowledge that actually took place in the case study is discussed, and secondly, this is used as a basis for discussing how the planners strategically considered this aspect during the planning process. We end the section by discussing the transformative capacity of niche planning in a transition perspective, based on considerations about aggregations of knowledge.

One important achievement in the local development project in Egedal is that extremely energy-efficient technologies have actually been implemented on mainstream market terms. This means that ordinary stakeholders in both households and the building industry have implemented new technologies and developed new practices as a result of this implementation. The case shows that the process in Egedal succeeded in establishing a technological niche for extremely energy-efficient technology in this area. However, we would also argue, that the strategic efforts in the planning process led to several derivations in existing systems that reflect some degree of aggregation of knowledge. In the following, we indicate some signs of aggregation of knowledge, although we realise that it is difficult to say how much such a planning initiative has de-stabilized existing regimes; representing an on-going transition, as noted by [29].

One important outcome of this local project was that it formed part of changing the existing planning framework at landscape level, which represents an exogenous environment that is beyond direct influence of niche and regime actors [4]. Concurrently with the process in Egedal, reform work was going on with regard to the Danish Building Regulations and the Planning Act. The experiences from the local project contributed to pressure for changes in this reform, since the planners in Egedal showed that the existing planning instruments failed to support the building of more energy-efficient buildings. As an outcome of the project, the planners asked the national authorities to make it possible for local policy-makers to implement energy efficiency requirements through the planning framework, without having to impose actual covenants on the lots. A recent reform implements such a change, since the new Planning Act has made it easier for local policy-makers to implement energy efficiency. However, other sustainability requirements can still not be implemented through ordinary planning instruments. This shows how tacit knowledge obtained in the local project about the ineffectiveness of existing regulation instruments was aggregated into more abstract and generic knowledge in the form of new formulations and instruments in the Planning Act, resulting in new guidelines and rules within the existing regime.

Another important outcome that indicates aggregation of knowledge is that the technological innovations developed in the local project were taken up by mainstream building companies involved in the project. One of the companies has chosen to implement an energy-efficient house similar to those built in Stenløse South in their standard range. The company has even become the first standard house building company to build a passive house that looks like an ordinary terraced house [36]. This indicates that the building companies involved in the local project, in spite of early reluctance, did learn from the process and changed certain internal routines by implementing more energy-efficient solutions in their building programmes. These impacts have also had a spill-over effect on the suppliers involved, since several of the building companies involved their suppliers in the design of the highly energy-efficient houses in the local project. E.g. one company asked their window suppliers to deliver more energy-efficient windows. This indicates that the knowledge and lessons from the local project have diffused out into the supply chain of

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[5] Interview with Jan Poulsen, energy coordinator in the Municipality of Egedal, on the 26th of June 2007.

the businesses involved. Finally several of the families talk in the interviews very positively about their experience of building an energy-efficient house and say that they tell their friends and families about the project. These examples of aggregation of knowledge illustrate that an increased circulation of technological knowledge within project-related networks and alliances have been obtained through the local project [27].

Local niche planning represents a different entry point than niche management in general, because local conditions can permit radical innovations in house-building, and because local policy-makers are involved that have a close relationship to local actors and are concerned about social transformations [4,16]. The local development project provided space for developing more energy-efficient buildings in a way that more directly involved mainstream networks and alliances, compared to more typical experimental or demonstration projects. This provided a constructive space for the building of social networks, for learning and articulating processes, and for the articulation of expectations and visions, which represent an important phase in strategic niche management [21]. In the specific case, the local project was largely defined by the local planning process, in which the local policy-makers successfully established more stringent building regulations than the national standards and the lessons and knowledge from this learning-by-doing project was diffused into related networks and alliances.

The case study shows that niche planning is more strategically concerned about facilitating local alignment in order to ensure implementation of the local project in practice, as opposed to a traditional strategic niche management study, in which aggregation of knowledge represents the strategic focal point. This focus on local alignments is connected with the fact that spatial planning involves a large number of challenges in terms of mobilising and aligning various interests during the planning. This is a result of a network-oriented governance approach, which involves a great deal of collaboration with different types of local stakeholders in the planning process [20]. Such a perspective highlights the struggles of aligning the planning visions, e.g. in relation to energy-efficient buildings, with the preferences and needs of local stakeholders involved in the process. This challenge of aligning heterogeneous resources is also present in strategic niche management, where it is acknowledged that a space is needed to incorporate the artefact dimension of technology and bricolage activities to make 'configurations that work' [27]. The process described in the local development project supports this idea that transitions are not linear, but involve the alignment of multiple developments, and it shows how planners had continuously to align different elements in the local planning context to move towards the desired vision. One key challenge in niche planning is thus to find the strategic issues that are considered to be real problems or challenges and that are concrete, appropriate for the production of agreements between stakeholders, or contain the possibility of a win–win situation [37]. At the same time, the process also showed how planners had continuously to adjust to shifting conditions, being reliant on a number of factors external to the control of the local authority, e.g. the involvement of certain building firms was reliant on a decline in the on-going building boom.

These considerations illustrate how a great deal of the strategic effort in the process focused on how the planning could be configured to close the gap between policy visions and their implementation. One key challenge in this regard was to mobilise the local stakeholders to comply with the sustainable policy objectives. Such mobilisation is an important strategic challenge, which requires some understanding of the practical context in which this process is embedded. Such understanding can be obtained through a fine-grained analysis of what actually takes place in the formal decision-making process, in the implementation process, in the transition from plan to formal adoption of the plan, and finally in the actual implementation of the plan [9]. In the specific planning process in Egedal, the planners involved demonstrated a high degree of tacit knowledge and empathy in terms of understanding the local context of change and an ability to use this understanding actively to develop strategies for change. This reflects how transformative planning necessitates a specific form of knowledge base, in which general knowledge about urban development is combined with specific information about politics, economics and collaboration processes [20], which imply tacit knowledge about how these elements work in the local context. Engaging in this kind of planning involves carefully tailoring a set of concepts, procedures and tools to whatever situation are at hand, if desirable outcomes are to be achieved [9]. This emphasises that niche planning takes a lot of man-hours to keep on top of things during the process. The challenge for the niche planner working on the level of local projects is to become a knowledge mediator and a facilitator of dialogical processes [20].

Whereas the local authority used a great deal of effort to carry out planning that could turn policy visions into implementable initiatives, less effort was put into aggregation of knowledge. The local policy-makers focused mainly on developing the new residential area, and not so much on supporting a more general transition towards extremely energy-efficient buildings in Denmark. This is probably a result of the local anchorage of local policy-makers. Although many local authorities do participate in national and international networks of various kinds, the process of local planning often emphasises the spatiality of the local authority, the city, or the region. Such a narrow focus on the local context represents a challenge in terms of facilitating transitions through niche planning. A wider and more strategic focus on aggregation of knowledge is necessary if niche planning is to strategically support transition processes, since the knowledge developed in local projects tends to be variable and place-specific (hands-on-experience and skills), whereas more globally shared knowledge needs to be more abstract and generic [38]. To create generic knowledge that can circulate more globally, a dedicated socio-cognitive exercise is needed to transform local knowledge into robust knowledge which is sufficiently general, abstracted and packaged, so that it is no longer tied to specific contexts [27]. The case showed that the local authority only to a small extent comprised strategic considerations about distributing the knowledge from the project more widely.

Although it is difficult to say to what extent experiences from the local project will be distributed more widely, we argue that niche planning represents an interesting form of niche management to consider. This form of niche management is especially interesting, since local policy-makers are constantly involved in planning processes in which sustainable transitions could be helped on the way. The study furthermore emphasises that the establishment of local projects with transformative capacity

represents somewhat of a challenge in terms of planning skills, since planners become engaged in a network-based process, where heterogeneous bits and pieces need to be developed and aligned on location. One important question is then, how such niche planning could be supported to a greater extent in order to further strengthen the aggregation of knowledge, and hence, contribute more strongly to on-going transition developments.

Another key challenge reported in this study relates to the dependence of local policy-makers on national policies, regulations and planning frameworks, since these provide important tools and instruments for the local policy-makers to apply in niche planning. It seems to be a tendency that these national frameworks of planning represent a traditional regulative planning paradigm, where the potential of local policy-makers as agents of change is not recognised [25]. This highlights the need to work on a transition in planning regimes that can challenge existing planning practices; the case study reflects the establishment of an important niche in this regard, showing how planning can be performed in a more strategic way that challenges existing regimes more actively. To distribute niche planning which challenges established socio-technical regimes at the local level more widely, the planning system needs to prepare the ground to an increasing extent for more active and intermediary roles among local authorities in spatial planning.

5. Conclusion

The overall aim of this paper is to characterize the transformative capacities of strategic work performed by local policy-makers at the spatial scale of the town in order to assess how such activities engage with sustainable transitions. The transformative capacities of strategic work has been pursued throughout the paper by showing and arguing that local policy-makers, when carrying out planning, often become actively engaged in sustainable transitions; but that the success of such initiatives depend very much on strategic considerations about alignment and aggregation of knowledge.

The study has shown that strategic work in spatial planning can take a form very similar to strategic work intended in strategic niche management. Planners make strategic efforts to create and nurture technological niches, but where the strategic work is performed – not as a strategic niche management process – but as an integrated part of the spatial planning approach. This represents a broadening of the niche management concept, which tends to emphasise technological development processes more narrowly. The case study showed that niche management can to a greater or lesser extent be practised as an integrated part of local planning processes. In the case of niche planning in the local authority of Egedal, the planners worked with the strategic idea of promoting extremely energy-efficient technologies as an integrated element of handling a residential development project aimed at providing urban growth in an energy-efficient way. During this planning process, the planners succeeded in challenging established socio-technical regimes in heating and construction in the local project. This was a result of dedicated alignment processes in the local project, leading to a mobilisation of mainstream stakeholders in the building sector to build houses that were more energy-efficient than prescribed by the national building regulations. Through this study, we have argued that local policy-makers can use their role as a planning authority as a lever to challenge socio-technical regimes. This is supported by the observation that local policy-makers are well placed to engage in local affairs, such as network management [10]. The empirical evidence shows that such a local initiative has transformative capacities, since the initiative succeeded in moving local stakeholders in the building sector in a more energy-efficient direction.

The study has shown that the niche planning carried out by the planners in the local authority of Egedal succeeded in closing the gap between policy visions and their implementation in the sense that the planners did successfully change local building practices. However, the study also points towards some important deficiencies to consider in terms of further strengthening the aggregation of knowledge in such planning processes. Although we argue that niche planning entails a broader impact than e.g. experimental projects, due to its rooting in mainstream processes, we recognise that the aggregation of knowledge of such processes could be greatly strengthened. The local authority in the case study was not sufficiently aware of its role as niche manager in terms of strategically contributing to support a transition. This role needs to be acknowledged in the planning framework and further developed if niche planning initiatives in local development projects are to play a stronger role in on-going transitions.

In relation to its theoretical contribution, the comparison between strategic work performed in transformative forms of spatial planning and the strategic work intended in strategic niche management has pointed towards the potential for further broadening the scope of niche management. This broadening is especially relevant with regard to embedding this concept in practices other than those connected directly with technology development. Through the comparison, we have shown how many similarities exist between the planning of transformation processes in relation to local areas and strategic niche management. But we have also indicated that the concept of strategic niche management cannot be directly transferred to such planning processes, since the practice of planning represents a different kind of context, in which technological development is not at centre stage in the process. Through our analysis and our discussion, we have indicated how strategic niche management and transformative planning can benefit from each other. In relation to the further development of strategic niche management, we have suggested that further development should be carried out in terms of specifying how contextualised processes, like that of spatial planning in local development projects, may be interpreted in light of niche management.

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