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The strictest energy requirements in the world: An analysis of the path dependencies of a self-proclaimed success

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HIGHLIGHTS

- We analyze the role of the building code energy strategy as an incumbent regime.
- Regime independent development activities such as passive houses are retained.
- Industry is characterized by adaptive capacity to support radical development.
- Adaptive capacity needs to be mobilized and configure by regime problematizations.
- Governance capabilities to achieve such a mobilization are presently in short supply.

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ABSTRACT

50 years of progressively strengthened energy requirements in the Danish building code appear to be a success, as the energy consumption has remained constant despite an increase in the total area in requirement of heating. This article however argues that the building code mechanism is heavily influenced by path dependent regime structuration processes, and that the mechanism constitutes a barrier to more radical developments within low energy housing. Few and poorly organized frontrunner activities within low energy housing have accordingly taken place in a Danish context during the past decades. Finally it is proposed that the current development within the energy system provides opportunities for cultivating an improved transitional awareness and for carrying out experimental activities that may challenge the path dependencies of prevailing regime structuration processes.

1. Introduction

The construction sector and the built environment are important objects of policy in relation to energy saving strategies. The built environment has an immense overall impact on energy consumption as more than 40% of the total EU energy consumption is related to heating, cooling and ventilation of residential houses and commercial buildings (Dyrbol et al., 2008).

This energy consumption is targeted by the EU Action Plan for Energy Efficiency and the EU Energy Performance of Buildings Directive (EC, 2002) which requires for member states to set requirements for minimum energy performance. This strategy is supported by much academic literature. The importance of building codes with strict requirements to energy consumption is accordingly often recommended in studies of barriers to an increased uptake of low-energy solutions in the construction sector. This is the case in studies based on economic incentives, individual choice and rational agents where improved standards are perceived as a tool to level out the playing field and support symmetrical knowledge structures (Eberhard, 2009, Nelson et al., 2010; Vermeulen and Hovens, 2006). Also studies that point to the structure of the innovation systems in the sector and the importance of the tenant/owner asymmetry (Beerepoot and Beerepoot, 2007, Gann et al., 1998) as well as the diffusion of knowledge in relation to design standards and labeling systems (Lent and Walsh, 2008; Mlecknik et al., 2010; Strand and Fossdal, 2003) stress the importance of building codes.

Scholars with background in science and technology studies have pointed to the complexity of the interlinked socio-technical relations as crucial to technology diffusion in the building sector (Berker, 2001, Guy, 2006, Ryghaug and Sørensen, 2009, Shove and Moezzi, 2002). They argue that the energy performance of buildings is an outcome of interdependencies among component technologies, craftsmen's practices, scientific calculations and modeling as well as political and cultural issues and user behavior. These studies suggest that building codes play an important role in mediating this complexity in order to align occupiers, house-owners, architects and system designers to apply low-energy solutions.

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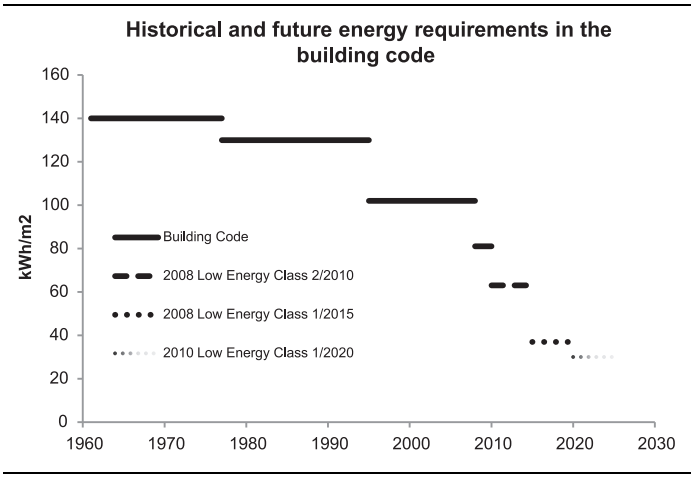
Table 1
Energy requirements of previous Danish building codes.
Source: Adapted from Regeringen (2009).



The EU directive and the above mentioned literature is well in line with the policy of the Danish building regime where energy requirements stipulated in building codes have been gradually tightened throughout a period of more than 40 years. Today, the energy requirements of new buildings are somewhat (Table 1) self-satisfied described as "The strictest energy requirements in the world" (Regeringen, 2009, p. 3). The gradual tightening of the building code has as a mechanism been successful in promoting a relatively high energy standard of the overall Danish built environment (Emtairah et al., 2008, Gram-Hanssen and Jensen, 2004, Marsh et al., 2010). While the building code primarily applies to new buildings that annually account for only 1%–2% of the complete building mass, it also influences the energy performance of older buildings through formal requirements to major renovations and indirectly through establishing new standards of performance and comfort.

While this mechanism has been successful historically, recent developments have demonstrated a remarkable lack of ability to enable more radical niche experiments and ensure the implementation of more radical low-energy technologies such as the German passive house design standard. The purpose of this article is accordingly to discuss these limitations and side effects that we argue to be linked to path dependencies of the Danish energy saving strategy, which relies heavily on general energy requirements, specified in the national building code. The Danish experience is interesting as a critical case in the ongoing discussion on the relation between regulation and innovation, as Danish regulation is relatively stronger than in other European countries. While other scholars have stressed the importance of further regulation to bring down the energy consumption of buildings, this case contributes with a deeper understanding of how innovative processes can be influenced by strong regulation.

Our analysis is based on previous research projects concerning innovation (Jensen et al., 2012) and industrial development strategies (Jensen, 2011) in the building sector. We have performed in total more than 50 semi-structured interviews with a wide range of key players in the Danish construction sector including users, architects, consultants, municipal planners and other policy-makers, building owners and construction companies. The semi-structured interviews typically lasted about one hour. Most interviews have been recorded and central passages from these transcribed. There were two strands of interviews that followed different themes. The one theme concerned with mapping the networks that have implemented new sustainable innovations in recent Danish building projects. We asked questions in order to identify regime patterns related to involvement, choice of technology, experiences, possibilities and challenges with outset in specific construction cases. The other theme concerned the development of strategic agendas in the building sector in the past 40 years. Here questions helped identify regime patterns related to how historical strategies as modularization, flexibility and digitization have emerged and developed into institutional agendas. As part of the interviews, new stakeholders were identified and subsequently contacted. Elements of this analysis have previously been presented to and discussed with the interview persons in closed workshops. Both themes were investigated through written material as reports and strategies also.

The argument of the paper is organized as follows. Section 2 presents the theoretical argument of this article. We introduce the regime concept as an analytical tool to describe the widespread influence of the building code. This section draws on the idea that industrial activities tend to become institutionalized in regimes which influence the speed and direction of development activities by establishing path dependencies. Section 3 presents an analysis of the building code mechanism in relation to energy saving in the Danish construction industry. It highlights two examples of how the development of the mechanism is influenced by the path dependencies of broader regime structuration processes, which prevent solutions with radical consequences for established regime interdependencies to be pursued and developed. Section 4 discusses how the path dependencies of prevailing regime structuration processes may be recognized and challenged by situated actors. Finally, Section 5 suggests that developments within the energy system may provide opportunities for challenging the current path dependencies within the current energy saving agenda.

2. Regimes, path dependencies and strategic agency

In this section we explore the concept of regimes as an interpretative backbone for discussing the implications of the building code strategy for the energy efficiency of the Danish built environment. This concept suggests that the production and consumption of societal functions – such as housing – tends to evolve into so-called socio-technical regimes. Our choice of the somewhat broad notion of regimes as analytical approach thus follows from studying path dependencies as related to housing as societal function rather than for example construction as a business economic sector. We employ the regime notion because it