Environmental Innovation and Societal Transitions 24 (2017) 83–93

Contents lists available at ScienceDirect

Environmental Innovation and Societal Transitions

journal homepage: www.elsevier.com/locate/eist

A transition to green buildings in Norway

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ARTICLE INFO

Article history:
Received 29 January 2016
Received in revised form 5 October 2016
Accepted 12 October 2016
Available online 17 October 2016

Keywords:
Green building
Transition pathway
CoPS
Transformation
Project based industry

ABSTRACT

Energy use in buildings is a significant contributor to climate change. The purpose of this paper is to explore industrial changes towards sustainability in the Norwegian construction industry, adding to debates about transitions to sustainability and transition pathways in a traditional, low-tech sector. Empirically the paper reports a case of cumulative changes in the Norwegian construction industry over from 1998 to 2013. The case explores a complex innovation and diffusion process where technologies, visions, actors and policy co-evolve over time to transform an existing socio-technical regime. Findings indicate that the transition moved forward through interplay between innovations in niches, a growing constituency around green building and a string of regulative and market changes.

1. Introduction

In the past decade concerns about the environmental impact of the built environment have been raised. Green building has shifted from being a peripheral niche activity to having mainstream appeal. As a result building green is now considered strategically important to firms in the construction sector – a situation in stark contrast to prevailing industry attitudes ten – fifteen years ago. This promising change is the topic of this paper. There is a growing body of literature on transitions to sustainability in construction (Berry et al., 2013; Oneill and Gibbs, 2014; Rohracher, 2001; Smith et al., 2005). The literature on transitions is used to frame an investigation of innovation in green building in Norway. The aim is to explore the progress of industrial change and to answer the question: What are the main driving forces and characteristics of the transition towards green buildings in Norway?

The motives, development paths and possible consequences of this apparent shift have not been studied systematically. This is the main contribution of the paper. Understanding how the change towards sustainability has occurred can help create better policies for steering or scaling up change processes in a desirable direction. A series of regulatory changes, innovative demonstration projects and a shift in attitudes towards green buildings in combination were found to be the drivers of the transition.

The paper is structured as follows. Section 2 provides a theoretical perspective on transitions to sustainability and innovation in construction. Section 3 presents methods and data sources of the case study. Section 4 analyses the case by constructing a timeline of industrial change phases. Section 5 provides additional analysis and concludes the paper.

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http://dx.doi.org/10.1016/j.eist.2016.10.006
2210-4224/

2. Theoretical framework

2.1. Transitions to sustainability

A transition can be conceptualized as the process of moving from one stable socio-technical regime to another. Transition studies have successfully described historical industry transformations, and increasingly describe industrial transitions to sustainability (Geels, 2005, 2006; Smith et al., 2010; Verbong and Geels, 2007). Studies of technological innovation systems have focused on the emergence of new industries – the formative phase and the difficulties new technologies meet when introduced (Bergek and Jacobsson, 2003; Bergek et al., 2008a; Hekkert et al., 2007; Suurs et al., 2010). The multi-level perspective (MLP) was adopted in this paper because focusing on the stabilizing forces in a regime fits with the aim to explore a wider industry transformation and not a specific technology. In the MLP framework, transitions are explained by dynamics between three analytical levels: niches, regimes and landscapes. The niche level denotes a place where alternative technologies are developed, such as R&D laboratories or subsidized demonstration projects. A socio-technical regime is understood as a relatively stable structure consisting of established practices and institutional arrangements. The landscape is thought of as exogenous factors that can influence the regime-niche interaction, such as global political events and global markets (Geels, 2011).

2.2. Innovation in niches

Niches are described as bubbles or protected spaces in which innovations can develop, a place where new technologies can grow, relatively free from market pressure and institutionalizing forces of the construction regime (Kemp et al., 1998; Smith and Raven, 2012). As construction is project based, niches are also referred to as niche projects or innovation projects in the following.

Green buildings may vary in technological complexity, but generally they consist of well-known components combined to a new whole. This kind of innovation is in line with Schumpeter's (1934) definition of innovation as "new combinations" of new or existing knowledge, resources, or equipment. Buildings are understood as complex product systems (Dubois and Gadde, 2002; Hobday et al., 2000), and changes in the links between product parts can be understood as architectural innovations (Henderson and Clark, 1990); newness lies in successfully recombining known components to form a new whole. Environmental innovation in construction is often conceptual in nature and connected to sustainable design and design management practices (Berry et al., 2013; Herazo and Lizarralde, 2015; Koch and Buhl, 2013; Reed, 2009). Capacity to innovate in building projects, therefore depends not only on protection from time and market pressures, but also on freedom from prevailing organizational practices in the construction industry.

2.3. Regime

A regime is understood as a dynamically stable structure consisting of established practices and institutional arrangements that legitimize regulation and financing mechanisms that in turn help preserve the regime. Regimes are results of path dependency and lock-in mechanisms to technologies, practices and institutions, and are consequently hard to change (Turnheim and Geels, 2013; Unruh, 2000). Regime actors have vested interests in regime preservation and can resist and fight back pressures to change (Geels, 2014; Orstavik, 2014). Regime is used here interchangeably with mainstream or established industry.

Market and policy structures are regime elements, and regulatory changes and market conditions are considered regime changes. In a study of transitions in the energy sector in Germany, Jacobsson and Lauber (2006) argued that industrial change was primarily driven by changes in the regulatory framework. Change ultimately comes down to a *battle over institutions* (p.260). Institutions refer to changes in policy and the formation of a market, more specifically policy supporting market formation or correcting market failures as well as the minimum requirements in the building codes. Policy impacting on the energy performance of buildings is essential for sustainable transition in construction (Greenwood, 2012; Oneill and Gibbs, 2014; Smith et al., 2005). However a transition cannot be dictated by policy alone. As Berry et al. (2013) show, regulatory changes are closely linked to innovative experiments because they legitimize the new technology and provide policy makers with the confidence to revise regulation.

Social acceptance of technology, established practices and common frames of mind are important regime elements. Rohracher pointed out in 2001 that the main challenge with a transformation in construction is that it is social in nature, it is not primarily a technological problem, or even related to new technologies. Many sustainable building techniques exists, the major challenge is to persuade a risk-averse industry actors to try out green concepts.

2.4. Process of regime change

The MLP perspective has been criticized for not being sufficiently explicit about how niches and regimes interact (Smith, 2007). In historical examples, niches emerge on the outer margins of the established regime; subsequent niche-regime-landscape interaction patterns direct the process along different pathways. Four transition pathways are identified in the literature – *transformation, reconfiguration, substitution and de-alignment/re-alignment* (Geels and Kemp, 2007; Geels et al.,