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Facilitating Systemic Changes Towards Green Buildings: Developing Conceptual Frameworks of Socio-Technical Transitions

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Abstract

The building industry is a major contributor to various grand challenges e.g. climate change. Green buildings have been regarded by many as the solutions and opportunities to improve the environmental sustainability of the built environment. However, the development of green buildings in many countries is very slow, facing tremendous barriers technologically, culturally, economically and institutionally. How to understand and eliminate these barriers thereby effectively accelerating the development of green buildings presents a significant challenge for both researchers and practitioners. This paper aims to enrich the current efforts in promoting green buildings by proposing conceptual frameworks from a socio-technical transition perspective. The conceptual frameworks provide guidelines for analysing (1) factors affecting the socio-technical transition towards green buildings; (2) the transition phases towards green buildings; and (3) the actions of systemic changes to promote green buildings. The frameworks holistically demonstrate the complexity, struggles and potential strategies to effectively promote green buildings, which could offer references for policymakers, researchers and practitioners involved in green building development.

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Keywords: Sustainable development; Green building; Transition; Sustainability

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1. Introduction

Green buildings have received significant attentions worldwide as an effective approach to tackle climate change. Various studies (e.g. Zhang et al., 2011a; Shi et al., 2013) have investigated the drivers for and barriers to the popularization of green buildings. In these studies, although empirical information was collected, there is a lack of effort to explain the underlying theories. As a consequence, numerous factors have been identified for driving or impacting on, the uptake of green buildings, such as government policy, additional costs, awareness, stakeholder pressure and technology. However, few studies succeed in explaining how these factors interact with each other, thereby revealing the underlying mechanisms of transforming the construction industry towards green buildings. In response to the above gap of knowledge, this study adopts a unique transition approach, to propose conceptual frameworks of socio-technical transitions towards green buildings. Originating in the Netherlands, the research field of socio-technical transitions digs into historical transitions, such as that from horse-drawn carriages to automobiles, to explore how these shifts take place, thereby providing insights into contemporary sustainability issues. This approach highlights multi-dimensional interactions between the industry, technology, markets, policy and culture, capturing the complexity of systemic changes towards sustainability (Geels, 2012). The promotion of green buildings is indeed a transition process as it aims to substitute the existing conventional buildings with green buildings. It is imperative to understand, describe and promote this transition process, which is the aim of this study.

2. Conceptual frameworks of Socio-Technical Transitions towards Green Buildings

2.1. Factors affecting the socio-technical transition towards green buildings

The multi-level perspective on transitions (MLP) highlighted that the factors influencing transitions could be grouped into three levels, namely the niche, regime and landscape level. Specifically, niches are the locus of sustainability practices and innovations, i.e. the seeds for potential transitions such as renewable energy technologies. Regimes are the dominant rules and practices of socio-technical systems. These dominant rules stabilize the existing systems. The landscape level highlights the wider contexts, i.e. the stable long-term trend that influence niche and regime levels. For the building industry, a culture of mutual distrust and conservatism could be a landscape factor that is hardly be changed in a short period. The MLP emphasizes the transition is enabled by the dynamic interactions among the three levels. To transition the building industry towards sustainability, innovative sustainability practices and technologies at the niche level need to be empowered to gradually replace the existing unsustainable way of construction at the regime level, and the broader landscape level influences this process. The factors at each level could be further differentiated by their functions in transitions, i.e. being the drivers for or barriers to transitions. For instance, regarding the niche level, many factors could prohibit the formation of a shared vision for a green building industry, e.g. differences in subjective interpretations of values and responsibilities, few green leaders, lack of political vision and strategic planning, and sectorial fragmentation of building industry (Faber and Hoppe, 2013). However, there are also positive factors e.g. the effect of industry associations that could contribute to a shared vision for green buildings. Previous studies on MLP have highlighted that the interactions among the drivers for and barriers to sustainability at each level determined the potential of sustainability transitions.

However, even though the MLP conceptualize the three levels for analysing transitions, it does not provide many insights into the inner structure of the three levels. For instance, regarding the regime, Geels (2004) explained that "as the different groups share different rules, we may distinguish different regimes, e.g. technological or design regimes, policy regimes, science regimes, financial regimes and societal or user regimes." Similarly, the niche and landscape level could also be further differentiated into various components to provide a detailed understanding of the transitions dynamics. This work was not fully explored until Geels (2014), who proposed the Triple Embeddedness Framework (TEF) that indicates there are three main components in a transitioning system, namely the industry, the economic environment and the socio-political environment. The industry is interacted (co-evolved) with the economic environment, which consists of suppliers and clients selecting firms through economic competitiveness, and the socio-political environment, which consists of the government, media, NGOs and public selecting firms through social fitness. The industry itself consists of various related firms and their technology,