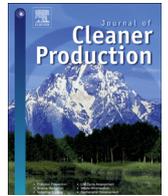




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# Rethinking deep renovation: The perspective of rental housing in Sweden

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## ABSTRACT

This study examines renovation strategies among owners of rental housing in Sweden in response to European energy policies that promote deep renovation as a means to reduce carbon emissions from residential buildings. Case studies of eleven housing companies, seven public and three private, were designed with the aim to examine housing owners' attitudes and renovation strategies, and how policies and objectives for energy efficiency become incorporated into these attitudes and strategies. Results are illustrated in typologies that distinguish between renovation strategies with either a more commercial or a more societal focus and spanning between deep and partial renovation. The typologies can be used to discuss how different aspects influence renovation, and illustrates how strategies change over time. The study identifies a trend in which housing owners are increasingly relying on partial or over-time renovation. Cost is one important driver, but social responsibility toward tenants and in some cases the protection of cultural heritage are also found to be important. A distrust of fixed models for renovation was observed. The paper questions the concept of deep renovation and suggests instead partial and over-time renovation as a way forward toward sustainable renovation. Partial renovation can bring together energy efficiency with environmental, financial, social, and cultural objectives of housing management. If managed properly, over-time renovation can reduce the risk of an investment, and has the advantage of allowing future technological advancements in energy efficiency to be included in current planning.

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## 1. Introduction

The European Energy Directive (2012/27/EU) has pointed out the existing housing stock as one target area for energy saving and carbon reduction. This policy directive coincides with a great need to renovate multi-residential buildings and particularly the large stock of housing from the post-war era. This coincidence is an opportunity to implement the European Strategic Energy Transformation Plan, which emphasises deep and comprehensive renovation (Saheb et al., 2015). A deep renovation reduces energy consumption compared to pre-renovation levels both in the short term and the long term, typically by more than 60% (Castellazzi et al., 2016). The European concept of deep renovation has been adopted by the Global Building Performance Network (GBPN, 2013).

From a practical point of view, the possibilities for achieving high levels of energy efficiency in multi-family housing through deep renovation, and at the same time improving indoor comfort, has been proven (Mjörnell et al., 2010; Wallbaum et al., 2013). The large stock of similar, industrially produced housing points to the potential for replicability and up-scaling of deep energy renovation. Several scenario studies support the need for deep energy renovation, rather than investing piecemeal in individual measures, in order to reach European goals for energy use and greenhouse gas emissions (Corrado and Ballarini, 2016; De Boeck et al., 2015).

Despite good examples and policy frameworks, a broader uptake of deep energy renovation is missing (Baek and Park, 2012a; Högberg, 2014; Tuominen et al., 2012). This "implementation gap" has been the focus of many studies. Previous studies have focused on the central role of the professional housing owner and manager to implement energy efficiency measures, particularly in regards to organisational aspects (Högberg et al., 2009; Kyrö et al., 2012), on business models (Smid and Nieboer, 2008), and on adoption behaviour (Egmond et al., 2005; Hoppe, 2012). However,

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previous research does not link the implementation of energy efficiency to the renovation process and to the complex context in which a renovation project is carried out, including environmental, economic, social and cultural aspects. The need to consider social objectives together with financial and environmental objectives in sustainable renovation has recently been emphasised (Corrado and Ballarini, 2016; De Boeck et al., 2015; Nielsen et al., 2016). Also, the heritage and cultural values of buildings have to be addressed, which adds to the complexity of sustainable renovation (Broström et al., 2014; Kovacic et al., 2013).

This paper explores housing owners' attitudes and renovation strategies, and how policies and objectives for energy efficiency become incorporated into these attitudes and strategies. The renovation process is defined as part of the long-term management of the housing stock. Research questions are: To what extent does contemporary policy for energy efficiency influence strategies for housing renovation? Can different renovation strategies be distinguished? What are the possibilities for implementing deep energy renovation? The emphasis in this study is on *how* renovation is carried out, bringing in the subject of time in renovation. Attention is given to the dialectic between deep and all-at-once renovation strategies on the one hand and gradual, sequential, or partial renovation strategies on the other. The long-term aim for the research is to define a framework and a communication tool for sustainable renovation that will contribute to the development of decision support tools and policy instruments.

## 2. Literature review: property owners' attitudes to energy efficiency

Housing renovation has often been in focus for political ambitions for societal changes. During the twentieth century, larger structural changes have been imposed on the housing stock in order to improve technical performance and living conditions (Baek and Park, 2012b), support social transformations (Van Gent, 2010), save energy, reach oil independency, and boost employment in the construction sector (2012/27/EU). Recently, housing renewal is also being pursued as means to achieve more sustainable societies across Europe (Sunikka, 2006; Turcu, 2012) including energy efficiency, improved accessibility, accommodating an aging population, and social integration (Baek and Park, 2012b). As a result of government withdrawal from housing production in many European countries, the implementation of energy efficiency policies will rely more on commercial mechanisms than on governmental financial support (Copiello, 2015; Gruis, 2008; Niebor et al., 2012).

Stakeholders' willingness to adopt energy efficiency measures in buildings has long been debated. Research has focused on "non-technical" barriers to seemingly cost-effective energy efficiency and on the importance of understanding technical-economic as well socio-technical mechanisms (Shove, 1998). Sorrell (2003) distinguished four categories of "non-technical" barriers to energy efficiency: rational behaviour, market failure, organisational failure, and limitations on decision-making. Rational behaviour barriers include aversion to risk (technical and business) and to hidden costs such as those in transactions for research and innovation. Among the market failures that limit energy efficiency in housing renovation are split incentives or market imperfections with respect to those who invest in and those who benefit from energy savings (Atkinson et al., 2009; Lutzenhisser, 1994).

The asymmetrical market between landlord and tenant will affect energy efficiency in renovation. This dilemma has previously been discussed mainly as a barrier to the implementation of seemingly cost-effective energy efficiency measures (Atkinson et al., 2009), but is increasingly discussed in terms of social

sustainability (Krysiński et al., 2017). Attempts to make tenants pay for energy-saving measures have also recently led to conflicts between property owners and tenants that can further jeopardize the improvement of energy efficiency (Ástmarsson et al., 2013). Rent increases resulting from energy renovation have fuelled a debate over gentrification caused by renovation, known as "renoviction" (Molina and Westin, 2012). In Sweden, for example, the problem for energy renovation is exacerbated by the fact that the households with the lowest incomes and most vulnerability to rent increases correspond to those areas with the largest need for energy efficiency and renovation (Mangold et al., 2016). The displacement of residents can in the long term have a considerable negative impact on community development, for example by accelerating segregation (Boverket, 2014). In fact social issues have been found to be increasingly influential in what is practically and politically feasible in renovation (Ástmarsson et al., 2013; Thuvander et al., 2017).

A number of previous studies have provided insights into organisational features among property owners and their influence on the adoption of energy efficiency measures. Sorrell (2003) defined the problem as a lack of available information on energy efficiency. Meijer et al. (2009) acknowledge the lack of available knowledge as a main barrier to energy efficiency in housing. Tuominen et al. (2012) confirm the poor training of property owners and their advisers as well as a lack of trusted information. McCormick and Neij (2009) confirm that information about energy renovation is not efficiently distributed among housing owners. Turcu (2012) points to a general lack of information and feedback from investments in energy efficiency and sustainable housing renewal where the positive outcomes of policy have either been studied or confirmed. Hoppe (2012) finds that Dutch housing associations seriously mistrust adoption of energy efficiency innovation in renovation after experiencing cost overruns in previous projects.

The adoption behaviour of energy efficiency has also been studied in relation to organisational differences. Hartmann et al. (2008) found that Dutch public property owners are likely to feel responsible as public actors and take the lead in sustainable innovation. On the contrary, Egmond et al. (2005) found Dutch housing associations rather risk averse, preferring to act as late movers in the market. Smid and Nieboer (2008) observed that some Dutch housing associations search for complementary arguments to invest in energy efficiency, for example by translating energy efficiency into the increased market value of a property or into lowered energy costs for tenants. The strategy of looking for synergistic motives for energy efficiency has also been proposed in Switzerland (Amstalden et al., 2007) and the United Kingdom (Greenough and Tosoratti, 2014). Kyrö et al. (2012) found that environmental ethics and other social arguments were important among Finnish housing owners when choosing renovation strategies.

The importance of other organisational factors such as ownership form, corporate policy, and company size have also been investigated. Brunklaus (2008, 2009) and Högberg et al. (2009) found no significant difference between public and private housing owners in Sweden in their willingness to invest in energy efficiency, although Högberg et al. (2009) say that private companies were more often found to be "commercially driven." The Swedish Association for Public Housing showed that in the ability to invest in energy efficient renovation there are large differences between housing owners working in a growth market with high cash flow and those working with smaller budgets (SABO, 2009). Högberg et al. (2009) and Lorbek et al. (2013) both state that the status and the size of the stock managed by a housing company will have an influence on their attitude to energy renovation. A company with a larger share of housing with considerable renovation needs may not be able to invest in the little extras that would be

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