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Adoption of innovative energy systems in social housing: Lessons from eight large-scale renovation projects in The Netherlands

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HIGHLIGHTS

- Attention to adoption of innovative energy systems in social housing.
- Several non-technical factors influence adoption.
- In-depth analysis of eight local-level renovation projects.
- Ambitions are lowered as projects progress.
- Barriers: financial feasibility, over-ambitious goals, delay, lack of trust.

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ABSTRACT

Thanks to new insights on the impacts that dwellings have throughout their life cycles, there has been increased attention to retrofitting innovative energy systems (IES) in existing housing. This paper uses an explorative case study design to gain more knowledge about the governance aspects of this under-researched topic. The central research question is: Which factors influence the adoption of innovative energy systems in social housing sites during renovation projects? To answer this question, eight large-scale renovation projects in The Netherlands were investigated. These case studies allowed the identification of barriers, enabling factors and perspectives from three main actors—housing associations, tenants and local authorities. It turns out that adopting IES encounters many barriers: lack of trust between project partners, delay in project progress, financial feasibility considerations, lack of support from tenants, lengthy legal permit procedures, over-ambitious project goals, poor experiences in previous projects, and IES ambitions that are not taken serious by key decision-makers. Furthermore, IES were only successfully fitted in three of the eight projects. Moreover, ambitions were lowered as the projects progressed in all the cases investigated. The study calls for further systematic, in-depth comparison of fitting IES in large-scale renovation projects in social housing.

1. Background and problem definition

In order to achieve substantial cuts in greenhouse gas emissions, governments are attempting to mitigate energy consumption in several major sectors of the economy. The built environment – which in The Netherlands is responsible for 19% of national greenhouse gas emissions (Compendium voor de Leefomgeving, 2010) – is one such man-made sector, one that theoretically provides ample opportunity for significant energy conservation, and hence reductions in greenhouse gas emissions. The adoption of such technical measures as insulation and innovative, high-yield heating systems mean that the energy efficiency levels of dwellings can be dramatically improved. However, this means that home owners need to be keen on adopting non-conventional technical measures, which is something few of them are eager to do. In this paper, we define those measures as 'innovative energy systems': renewable energy and energy efficiency technologies that clearly differ from conventional technologies.

The housing stock in The Netherlands is rather old. The energy quality of old houses is dramatically poorer than those that have been built more recently. To a large extent this is because legislation on energy efficiency was only implemented after 1975. Before that time, there were no standards that prescribed insulation and the installation of high-yield condensation boilers (Jong et al., 2005). Since 1975, regulation of the energy quality of new houses has gradually become more ambitious, even though it only affects

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houses in their construction phase. Legislative standards are largely responsible for both increased energy efficiency and the adoption of innovative energy systems in newly built houses. However, there is no such legislation for the current housing stock. Although IES are being fitted and used successfully in newly built houses, little effort has been made to fit IES in existing housing. This can be seen as a missed opportunity. Lengthening dwellings' life spans by proper refurbishment benefits the owner economically and it is better in terms of environmental impact. Furthermore, it makes sense given the fact that the annual turnover rate of housing in The Netherlands is rather low, at only 1% (CBS, 2008). From this perspective it makes sense to fit IES in existing housing. Technically speaking, adequate solutions are available that can lower domestic energy consumption by 90% (Trecodome, 2008).

In this paper, the central question is: Which factors influence the adoption of innovative energy systems in social housing sites during renovation projects? Drivers and barriers regarding the adoption of IES are analyzed in eight renovation projects in The Netherlands. The paper is structured as follows. Section 2 presents a literature review of IES adoption in residential areas. Next, Section 3 describes the institutional context. Section 4 addresses adoption of IES in buildings from a theoretical perspective. Section 5 addresses the research design. Section 6 presents narratives of eight case studies. Section 7 reports the lessons that are drawn from the case narratives. In the concluding section the main empirical study results are addressed, as well as the position of this research in the context of Dutch and European Union policies.

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2. Policy programs supporting the adoption of IES in social housing areas

Since the First Oil Crisis of 1973, policy programs have been implemented to attempt to conserve energy in the residential sector, including social housing. At the same time, experiments in The Netherlands started with the adoption of renewable energy technologies, such as wind and solar energy. Although the environmental and long-term economic benefits of renewable energy technologies are known, many uncertainty factors – such as long development times, uncertainty about market demand, social gains and the need for change at different levels of organizations and the wider social and institutional context – hamper large-scale adoption. In fact, there is a whole range of factors that work against the introduction and diffusion of alternative energy technologies. Conditions for new markets are not yet favorable and it is argued that they prevent the diffusion of environmentally preferable technologies (Kemp et al., 1998). This is also true of the built environment, especially existing residential areas with social housing.

When owners or occupiers consider renovating their homes they hardly prioritize energy efficiency, especially when energy costs are but a small part of the total cost of living (Sunnika, 2001; Lulofs and Lettinga, 2003; SenterNovem, 2005). Moreover, the owners and occupiers have needs in regard to other issues, such as comfort, health, and the return on their investment. Thus, owners and occupiers need to be encouraged toward those alternatives that benefit the climate. Government policy incentives may work in that respect. However, in local settings it is far from easy to implement policies to support IES being fitted in homes.

Renovation projects in residential areas give an opportunity to target the installation of IES in large numbers of houses. This implies that local stakeholders need to be persuaded to adopt IES. However, this is far from easy. Policy incentives are required due to the ineffectiveness of market-based incentives. Policy programs are set up, featuring multiple policy instruments: disseminating information to raise awareness, provision of monetary incentives (subsidies, levies, tax incentives) and legal standards for target group members (however, the latter only applies to new construction, and thus to home owners, not tenants) who do not catch up otherwise.

The impacts of policy programs on the take up of IES in social housing sites have been studied. Van der Waals et al. (2003) claim that they are considered of secondary importance by local stakeholders as compared to more pressing social and economic goals. Moreover, policy ambitions that are set at the start of a project are typically downscaled as projects progress. A lack of useful and adequate policy instruments is mentioned as the main reason (Van der Waals et al., 2003; Hoppe et al., 2010). For instance, in contrast to new building construction, there are no legal standards for the renovation and maintenance of the existing stock (Hoppe and Lulofs, 2008).This, however, is not just a Dutch problem, as it also applies to other Western European countries (Elle et al., 2002).

What makes things difficult is that residential areas with social housing in many cases also house other stakeholders, such as home owners, who are often former social housing tenants and have modest incomes. Other stakeholders concern shopkeepers, schools, health centers, social centers, and local government institutes. In this regard it is not surprising that covenants are implemented. However, with regard to energy goals – especially adoption of IES – covenants can be considered relatively ineffective, since only those parties are attracted who are already motivated and involved (Balthasar, 2000; Van der Waals et al., 2003).

Multi-level government coordination and support for local actors is also considered important. Evidence from Swiss program evaluation shows that close cooperation between different (levels of) government has a positive impact on program effectiveness (Balthasar, 2000). Intergovernmental schemes are also applied in The Netherlands. Given the number of policy instruments (output) adopted by local governments, these schemes are rather effective (Hoppe and Coenen, 2011). Nonetheless, indications of their local-level impact (outcome) are less optimistic (Arentsen, 2008; Hoppe and Lulofs, 2008).

3. The institutional context of renovation projects in The Netherlands

In order to understand the context of this study it is necessary to have an insight into the roles of the local actors, their interests, the resources they possess and exchange, the ways in which they interact, the social rules that apply, and key contextual characteristics. In that sense it is important to understand that residential areas in which IES may be adopted, are located in large-scale renovation projects in relatively old, post-War neighborhoods. The reason for choosing these type of sites has its origin in the reasoning that policy makers use: it is better to renovate 100 dwellings owned by one person (or legal entity) than try to renovate 100 dwellings which are all privately owned. Costs for administrative and legal effort are perceived lower in the former as compared to the latter.

In such neighborhoods, houses and their environments are characterized by poor-quality, obsolete physical construction. Moreover, these neighborhoods suffer from stigmatization due to spatial concentration of poverty, unemployment and lack of safety (Priemus, 2003). Renovation projects are meant to improve both social and physical structures in the neighborhoods.

The houses in the neighborhood are for the greater part typically owned by one or more former public or semi-public housing associations. They manage houses with the public objective of delivering quality housing for consumers who do not have the means to buy houses themselves. Until 1995, housing associations