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# Tenants Acceptance or Rejection of Major Energy Renovation of Block of Flats – IEA Annex 56

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## Abstract

To meet EU energy and climate targets, energy efficiency of the existing building stock must be drastically improved. Within IEA ECB Annex 56 one of the best practice energy renovations is a group of multi-family buildings in Sweden, recently thoroughly renovated. Residents' perception of renovations and appraisal of implemented measures were captured by interviews with tenants and a literature review. Residents' possible acceptance of energy renovations are related to improvements that are directly experienced and visible. Resident participation is beneficial. Crucial is the collaboration between all stakeholders. Long-term environmental benefits or financial gains are arguments that might not be sufficient.

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*Keywords:* block of flats, energy retrofit; renovation; tenants; user acceptance

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## 1. Introduction

To fulfil the EU energy and climate objectives for year 2020 and year 2050 demand major initiatives from the building sector. The objectives will not be met if only in new construction. Therefore energy and climate renovations of the existing building stock must be realized. User acceptance is then of great relevance for the success of all major renovations. It is important to characterize and understand motivation, needs, obstacles and drivers of owners, investors, planners and contractors with respect to the renovation process in order to further strengthen motivation and overcome obstacles. A sometimes neglected group consists of people living in multi-family buildings. These are tenants that rent their dwellings, have access to a dwelling by being members in a cooperative housing association

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(partly tenants and partly owners), or have full ownership of their dwelling. The different modes of ownership lead to different rights and obligations in terms of energy efficiency and renovations. Tenants are dependent on the management of the housing company. Owners of a cooperative flat are responsible for the renovation needed inside their flat, but not the technical systems important to the energy use. Full owners have extended responsibilities, but depend on the intentions of other owners of the building. Despite mode of ownership, these three groups are the end-users of energy renovations, and have to live with the results, possibly for a long time. They are furthermore those who are most exposed to the hassles that arise during the renovation process. From the view of the housing company or housing association, the residents' acceptance of the renovation measures and of the outcome of these measures, is essential for a successful renovation process, which also ensures that the residents do not move [1, 2]. A substantial part of multi-family buildings in Europe built in the 1950s to 1970s are worn down and need renovation due to wear and tear. These renovations will possibly increase the comfort for the residents. However, more knowledge about how renovations are perceived and contribute to residents' quality of life is necessary to secure that the renovation is sustainable, not only from an environmental and economic view, but also from a social view [3].

The aim of this project was therefore to assess how residents in multi-family housing perceive and are influenced by renovations where an important objective is to increase energy efficiency. A *case study*, comprising group interviews in houses that had undergone extensive energy renovation, was carried out with the objective to capture residents' appraisal of measures taken in these renovations and perception of the renovation process. A complementing *literature review* deepened the results. The study focuses on residents in multifamily houses that have no or little control over renovations, i.e. tenants and those living in housing cooperatives, but the results are for some parts applicable also to full owners. The complete study is presented in a separate report [4].

The Human-Environment-Interaction model [5] was used as a theoretical framework (Figure 1). Following the model, tenant's appraisal of large energy renovations in multi-family houses (action) could be predicted to depend on how the renovated building and its surroundings are perceived after the renovation (physical environment). Relationships with the landlord and the constructors, experiences of participation in the renovation process and feeling of security will additionally rule the outcome (social climate). People are also diverse and are in dissimilar stages of life. Their resources and needs therefore vary (individual resources).

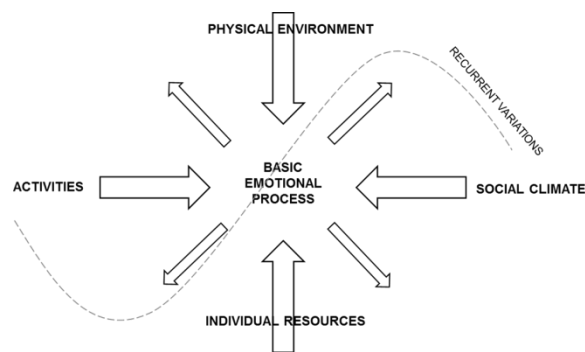


Figure 1. The Human-Environment-Interaction model [5].

Within IEA ECB Annex 56 (Cost effective energy and carbon emissions optimization in building renovation) one of the main objectives was to provide best practice examples. One example is the renovation of an area with rental multi-family buildings in Sweden, where an important part was a substantial reduction of the energy use. This area was used for the interview study. The studied buildings were built in 1963-1965 and are representative of the Swedish "million homes program", most of them with rented flats. The programme resulted in a million homes being built in ten years, from 1965 to 1975, most of them without considering energy use. Many of these homes are currently in major need of renovation. The extensive renovations provide an excellent opportunity to make these houses more energy-efficient. The buildings in this study had been thoroughly renovated in 2010-2013.

## 2. Method

### 2.1. Case study

In the study area, the buildings were owned and managed by the municipal housing company. Tenants pay a monthly rent which includes heating and domestic hot water, but not household electricity. The population is socio-economic stable with most tenants paying for themselves. The tenants lived in their dwellings during the renovation. Energy renovation measures carried out were e.g. new washing machines, additional insulation in the attic and behind the balconies, new low energy windows, new thermostatic radiator valves, and installation of heat recovery on ventilation. Non-energy renovation measures were e.g. new safety entrance doors to the flats, new surface finish of staircases, glazing of balconies, and improved outdoor environment. The bathrooms had been renovated earlier.

Tenants of the area were invited to the study; a total of 17 tenants participated. Their ages varied from 23 to 80 years old (mean: 51 years; 80% female, 20% male). Some interviewees had lived long in their current dwellings or in other flats in the area, while others (mainly young persons) were newcomers. The interviews started with an introductory question (“What came to your mind when you became aware about the upcoming renovation?”) and after that comprised five themes of questions: (i) recalled feelings and thoughts before the renovation started, (ii) the impact of the renovation during the time it took place, (iii) the results of the renovation and its impact on quality of life, (iv) thoughts about the impact of the renovation on energy use, and (v) recommendations for future renovations. Interviewees were interviewed in groups of 2-5 people for approximately one hour. The interview guide was only loosely followed; the interviewees were encouraged to talk freely. The interviews were taped and transcribed. The text was coded and the codes organized into themes corresponding to the HEI-model.

### 2.2. Literature review

A terminology describing those who rent flats in buildings (subject), the buildings being studied (object), the renovation (action) and its purpose (aim), and the results of the refurbishment as tenants’ experience (outcome) was found in a preliminary review of literature. The terms were used in a search string along with the Boolean operators OR for terms within the same category, and AND between categories. Nine scientific databases were searched. No papers that totally agreed with the research question were found. One or more terms were therefore excluded so that relevant literature would not be missed. This gave an excess of literature that dealt mainly with technical issues, not taking tenants’ view into account. A first screening based on the titles of the articles was therefore necessary. Only few papers were found to actually be within the interest of this paper, and of those only a hand full reported empirical data. The results presented here are therefore a mixture of actual research findings and indications of factors of interest in studies of tenant’s view on large renovations.

## 3. Results

### 3.1. Activity

The interviewed tenants thought that it had been difficult to picture how the renovation would impact daily life before it took place. For most interviewees, the renovation meant greater intrusion while it lasted than they had imagined. Storage rooms and balconies must be emptied and the contents kept in the flat, as some interviewees remembered it, for up to six months. This confined the living space. The renovation also meant that craftsmen from various subcontracts needed to come into the dwellings or worked on scaffolding just outside the windows. This limited privacy and it was unclear when the craftsmen would be there. Several activities during the renovation generated noise that penetrated the flats, perceived as very annoying while it lasted. A common remark from the interviewees was that the renovation took far too long time. They called for compensation for being without a storage room and balcony for so long, and for the general extra load with noise and dust.

It is well known from the literature that residents are highly influenced by the renovation work, which could be unpleasant for people who remain in the building while work goes on around them [6]. During the renovation phase, residents and workers share a restricted space, i.e. the dwelling and stairwell. The number of participants in

construction projects is high but probably even higher in refurbishments which require specialized subcontractors [7]. Residents' most private spaces, their homes, become workplaces for the contractors. In a UK case study were the construction phase of an energy efficiency renovation took 9 weeks, the main inconveniences described by the tenants were lack of private space for the family and high noise levels [8]. The tenants would in this case have preferred to be moved somewhere else during the most intensive work; the authors remark that this would also have provided more space for workers and accelerated the construction process.

### 3.2. *The physical environment*

The common view among the interviewees was that several of the renovation measures were to the better, though some were strongly criticized. The new windows were prized by most interviewees as they were less draughty and easier to clean. The new doors and windows kept out external noise better than the old ones, which were perceived as an extra bonus (though some experiences external noise via outdoor air vents). Lowered temperature in the flats and the new ventilation system were emphasised as problematic. Most interviewees, but not all, experienced that the indoor climate was too cold for activities such as reading or watching television. It was also no longer possible to regulate the thermostats on the radiators. The new ventilation was described as too draughty, also contributing to experience of cold. Kitchen ventilators were discussed as problematic, perceived as not efficient enough. The indoor temperature and the ventilation seem to be the main causes for some interviewees perceiving that the energy renovation had lowered their quality of life. Few interviewees mentioned energy savings if not directly asked about it. The awareness of energy savings as one of the objectives of the renovation seemed low. The experienced cold in the flats were perceived as a way for the housing company to save money, rather than an environmental friendly action. Some interviewees recalled having read something about the energy saving measures and some could list part of them, but they did not seem to have any meaning.

In the literature, both examples of that the indoor climate after energy renovation is perceived as improved or made worse can be found [9, 10]. Specific advantages are more even temperatures at summer and winter time, good light and improved air quality, though residents experiencing a feeling of confinement in their dwellings, possibly due to unsuccessful ventilation, are also reported [11]. Most to gain have those who live in houses with poor indoor climate, for example insufficient heating in the winter, where refurbishments with energy efficiency objective lead to a better indoor climate for the tenants and therewith better health [12, 13]. Energy efficiency measures may though, if not performed properly, generate new symptoms related to the respiratory system, skin and eyes [14]. Measures that are taken to improve the energy efficiency sometimes give the tenants less control of the indoor climate. Property owners and constructors could have a simplified understanding of indoor comfort, leading to installed technical systems that are not adjustable to the needs of the individual resident [15].

### 3.3. *The social environment*

Most appreciated among the interviewees was the increased security and safety in the flats and the stairwell. Security doors were installed and a new system for access to the buildings and laundry was introduced. The social interaction with the housing company was in the interviews often mentioned as important and problematic. At an early stage, a futuristic vision in which some of the buildings would be demolished and skyscrapers erected was presented by the housing company at a meeting for the tenants. This idea was later abandoned. From the interviewees' perspective, it was difficult to after that get an overview of the plans. They were confused about what exactly should be done and what it meant for them. After the renovation, there was sometimes a gap between what the tenants had been told and what they could see with their own eyes. To get the information that the change increased energy efficiency, but then observe the changes and perceive them as if nothing was gained, created a distrust of the housing company.

Improved security is one of the most important aspects, from the tenants' perspective, when a residential area is renovated described in literature [16, 17]. Also the more general social climate has been found to be a significant factor affecting residential satisfaction [18] and is important for well-being. Energy renovations typically do not affect the social climate, but could provide an opportunity for improvements. A sustainable refurbishment requires the involvement of tenants. Lack of involvement could lead to low acceptance of the time that the refurbishment

takes [10] and of inconveniences that the tenants have to put up with [7]. Participation can mean being involved to different degrees from being informed to being part of decision-making [2]. It is important for the housing company to think through how to deal with tenants' proposals; it could be experienced as unfair to raise people's expectations by asking them about options that cannot be realized for financial or technical reasons [6]. If tenants are truly empowered and in control of the process, then the landlord must also take into account different requirements in different parts of a residential area [3, 19]. Diverse groups of tenants might have dissimilar interests [20].

### *3.4. Individual resources*

Several of the interviewees worried already initially about how much the renovation would increase the rent. How much the rent would rise was due to what was considered standard raise (and thus eligible for the rent increase) and what was maintenance (not entitled to rent increase). After the renovation, the increased rent was perceived as unfair among some of the interviewees, referring to their low incomes, or more often, to other tenants' low income.

Refurbishment costs are typically partly transferred to rents [3]. Tenants not accepting renovations can do so with the motive that they are sensitive to increased costs. Some renovations being done solely to increase energy efficiency may be particularly problematic because they do not directly contribute to increasing the quality of the dwelling or the surrounding environment. Investments that are visible may be accepted, but non-visual measures are rejected as unnecessary costs [17]. Tenants with concern about the rent increase might move [21], though people prefer to stay if possible [22]. Also, communicating to the tenants that the energy efficiency will lead to less likelihood that the rent has to be risen in the future possibly gives an incitement to stay [21].

### *3.5. Recommendations for future renovations*

The interviewees had clear thoughts on how the renovation process could be improved for the tenants. The housing company should involve the residents and make them into partners in decisions of which renovations that are needed and in the planning of the process. Continuous information about the overall intention, reasons and planning, as well as daily activities is essential. Craftsmen's activities should be announced well in advance and with as precise time schedule as possible. All craftsmen should be professionals. The residents should be given some compensation during the renovation phase.

## **4. Discussion**

Many of the results presented here concerns major renovations in general, and are not specific for energy renovations. However, most major renovations due to wear and tear also include some measures related to energy use. Furthermore, energy renovations are often large renovations that could be expected to influence tenants in similar ways as more general renovations do. It was in this study obvious that from the tenants' perspective, no sharp line could be drawn between renovations with different main objectives. The results of this study are therefore highly relevant in the context of IEA ECB Annex 56 and the intention to improve energy renovations.

Residents' acceptance of energy renovations increase if the measures are directly experienced and visible, and appraised as beneficial for well-being and quality of life, e.g. increased security and safety. Such improvements are often the non-energy parts of a renovation. Energy renovation measures with the potential to increase acceptance are also those who are directly sensed, e.g. improved thermal comfort as a result of additional insulation, or improved indoor air quality as a result of new ventilation system with heat recovery. Differences in opinion of what constitutes a good indoor environment between housing company and residents could however lead to low satisfaction. Long-term environmental benefits or financial gains are arguments that might not be sufficient in these cases.

Crucial for the acceptance of a major renovation, the process and the result, is the relationship between the renovation stakeholders, in particular the housing company and the residents. Involvements from both sides are important. To begin with, stakeholder roles should be clear and visible in order to increase the understanding of the needs of those involved from all parties, including the residents. Residents' needs must be highlighted, but tenants should also be given the opportunity to understand the housing company's interests and subcontractors' situation in a

renovation. Though residents are likely to have dissimilar interests regarding a major renovation and it is not possible to get full acceptance from everyone, the aim should be to satisfy the majority.

## 5. Implications

Insight gained into residents' view of major renovations including energy saving measures should be taken into account in planning of future renovations. However, energy renovations are complex processes and the understanding of how residents are influenced by the measures taken and the interactions between stakeholders are not fully understood. There seem to be a lack of more comprehensive empirical studies, with some exceptions, and especially of studies based on theories of human perception and acceptance of uncontrollable changes in the home.

## References

- [1] Straub, A., & Vijberg, G. (2004). New strategies for housing quality improvement by dutch landlords. *Open House International*, 29(3), 38-44.
- [2] Hiller, C., Odegren, I.-M., Bengtsson, J., Winkels, Z., Hasselaar, E., Lizarzaburu, V., Puechavy, J.-M. (2013). Tenant involvement for a successful renovation. In: *Proceedings of The 6th Passive House Conference in the Nordic countries, Passivhus Norden*, 15 – 17 October, Gothenburg, Sweden.
- [3] Engberg, L. A. & Haugbølle, K. (2005). Sustainable renovation in Danish social housing? In: *Proceedings of The 2005 World Sustainable Building Conference, Tokyo*, 27-29 September, pp. 3206-3213.
- [4] Blomsterberg, Å., Pedersen, E., Baptista, N. (2015). User acceptance of cost effective energy and carbon emissions optimization in building renovation. IEA ECB Annex 56 report.
- [5] Küller, R. (1991). Rethinking Environmental assessment from a neuropsychological perspective. In: T. Gärling and G.W. Evans (Eds.) *Environment, Cognition, and Action* (pp. 111 – 147). New York: Oxford University Press.
- [6] Derbyshire, B. C. (1992). Tenant participation: Talking it over. *Architects' Journal*, 195(5), 46-48.
- [7] Holm, M.G. (2000) Service management in housing refurbishment: a theoretical approach. *Construction Management and Economics*, 18, 525-533.
- [8] Sunikka-Blank, M., Chen, J., Britnell, J., & Dantsiou, D. (2012). Improving energy efficiency of social housing areas: A case study of a retrofit achieving an “A” energy performance rating in the UK. *European Planning Studies*, 20(1), 131-145.
- [9] Khatib, J. M., Chileshe, N., & Mohammed, F. (31). Achieving sustainability through refurbishment of tower blocks: Tenants perspective. In: *Proceedings 6th Built Environment Conference 31 July - 2 August 2011*.
- [10] Chileshe, N., Khatib, J. M., & Farah, M. (2013). The perceptions of tenants in the refurbishment of tower blocks. *Facilities*, 31(3-4), 119-37.
- [11] Huber, A., Mayer, I., Beillan, V., Goater, A., Trotignon, R., & Battaglini, E. (2011). Refurbishing residential buildings: A socio-economic analysis of retrofitting projects in five European countries. Presented at *World Sustainable Energy Days, Wels, Austria, March 2 – 4*.
- [12] Iversen, M., Bach, E., & Lundqvist, G. R. (1986). Health and comfort changes among tenants after retrofitting of their housing. *Environment International*, 12(1-4), 161-166.
- [13] Howden-Chapman, P., Crane, J., Matheson, A., Viggers, H., Cunningham, M., Blakely, T., . . . Waipara, N. (2005). Retrofitting houses with insulation to reduce health inequalities: Aims and methods of a clustered, randomised community-based trial. *Social Science & Medicine*, 61(12), 2600-2610.
- [14] Engvall, K., Norrby, C., Norbäck, D. (2003). Ocular, nasal, dermal and respiratory symptoms in relation to heating, ventilation, energy conservation, and reconstruction of older multi-family houses. *Indoor Air*, 13, 206-211.
- [15] Liu, L., & Thoresson, J. (2013). Exploring indoor climate and comfort effects in refurbished multi-family dwellings with improved energy performance. *Smart Innovation, Systems and Technologies*, 22, 463-478.
- [16] Vale, L. J. (1996). Public housing redevelopment: Seven kinds of success. *Housing Policy Debate*, 7(3), 491-534.
- [17] Gerdin, C., Hammarberg, L. (2010). Varför genomförs inte lönsamma energieffektiva investeringar? [Why are profitable energy efficiency investments not executed?]. Report 202. Lund: Lund University.
- [18] Dinç, P., Özbilen, E., & Bilir, M. B. (2013). A multi-dimensional scale for measuring residential satisfaction (rs) in mass housing projects. *Indoor and Built Environment*, published online 8 May.
- [19] Slavid, R. (1996). Radical housing initiative puts tenants in control. *Architects' Journal*, 7(17), 28-30.
- [20] Turkington, R., & Wheelaghan, S. (1995). The refurbishment of high-rise local authority housing blocks: Involving the tenants: Lessons from the U.K. *Urban Izziv*, (28-29), 40-45.
- [21] Friesen, C., Malbert, B., & Nolmark, H. (2012). Renovating to passive housing in the Swedish million programme. *Planning Theory and Practice*, 13(1), 115-131.
- [22] Walker, B., Marsh, A., Wardman, M., & Niner, P. (2002). Modelling tenants' choices in the public rented sector: A stated preference approach. *Urban Studies*, 39(4), 665-688.