Energy efficiency in renovation processes with focus on time and timing

Palm, J¹, Reidl, K²

¹ Linköping University, Linköping, Sweden
² Linköping University, Linköping, Sweden

Abstract: In this paper we focus on incremental decision-making during the planning phase of a renovation process. The aim is to analyse how time and timing influence how energy efficiency is discussed and which energy efficiency measures that are included or excluded in the planning phase. We have followed three energy-efficient housing renovation processes of a municipal housing company called Stånågstaden. Stånågstaden has decided to reduce the amount of purchased energy by 25% to 2025.

We have done participatory observation and interviewed all involved actors, including consultants and co-workers at Stånågstaden. The results show that limited time contributes to both lack of introduction of new consultants in the process and that Stånågstaden’s energy goals never were discussed in the planning phase. The same issues are on the agenda in all three renovation processes and innovative ideas are not introduced. Lack of time contributes to that all experts involved during the planning phase are not used as much as they could.

Key words: Energy efficiency, renovation, time, apartment building

Introduction

Energy efficiency is a central political objective in the EU. The EU member states have agreed that they must achieve a 20% reduction in their primary energy consumption by 2020. Sweden has the objective of reducing its total energy consumption per heated area unit in homes and premises by 20% by 2020 and by 50% by 2050 relative to consumption in 1995 (SOU 2008:10). The domestic and service sectors represent approximately 40% of total energy use in Sweden (SEA, 2013). Thus, there is substantial potential for energy savings, particularly in the housing sector (SOU 2008:10; Palm 2013a). When discussing energy efficiency in the housing sector, it is important to look at the existing buildings as, in most western countries, they will continue in coming decades to represent most of the buildings people live in. (Palm 2013a).

In Sweden there are 2.5 millions apartments in multi-dwellings and 2 millions single family homes. In 2011 there were 6085 new apartments completed and ready to be rented (SCB 2013, pp 161-62). This small amount of new buildings makes it necessary to include energy efficiency in the renovation of the existing stock. The Swedish national strategy for energy efficient renovation in buildings (a result of EU’s energy efficiency directive) states that 75% of the existing buildings will need to face comprehensive measures until 2050, i.e. 1.875.000 apartments will have to be renovated (The Swedish National Board of Housing, Building and Planning (Boverket) and the Swedish Energy Agency (SEA), 2013). This means that every
year 52,000 apartments will have to be renovated in Sweden. Statistics over what kind of energy efficient measures that have been implemented in the existing building stock are hard to find. But when it comes to multi-dwellings 44 % have done some kind of measures according to Boverket and SEA (2013). Adjustment and optimization of control system as well as improvement of electricity efficiency have been the dominated measures.

This escalating need for mass renovation of these buildings gives an exceptional window of opportunity to improve energy efficiency and approach the national energy and climate goals as well as to create and sustain a modern, comfortable accommodation.

Sweden has a large share of public managed and built houses. Public housing companies are mainly owned by local municipalities or public utilities. One in five people do rent such a housing unit. The principle behind the public housing units is to provide access for everyone without profit. There is no upper limit in income for those who rent an accommodation.

In this article we will analyse the renovation process of the public housing company Stångåstaden in Linköping, Sweden. Linköping is Sweden’s fifth biggest municipality with around 150,000 inhabitants. Stångåstaden is owned by the municipality Linköping and has a dominant market position with about 60% owning about 18,600 apartments (about 14,000 apartments and the rest student accommodations).

**Aim**

In this study we have a process perspective, meaning that focus is on how the work should be done rather than on what will be done. The main interest is not on the result, but on the activities preceding the results. Our focus is on incremental decision-making during the planning phase of a renovation process. The planning phase in the renovation process is like an action plan where goals are broken down to sub-goals and details are clarified or just deleted from the agenda. It is that prioritizing process that we are interested in studying and understanding why in the end a procurement document is designed as it is. The idea is that when the understanding of the process increase, it is possible to also improve the outcome.

Our research interest concerns how energy efficient renovations are planned and framed. In this paper we have chosen to focus on the design and planning phase of renovation processes. We have also chosen to focus on how time and timing influence how energy efficiency is discussed and what energy efficiency measures are included or excluded.

We have followed three energy-efficient housing renovation processes of Stångåstaden, who have the goal to reduce their energy use in the entire housing stock, namely by 25% of purchased energy to 2025 (compared with 2011 figures). A renovation process is characterised of the involvement of many diverse actors. There are a lot of consultants involved from the initiation of a renovation to the realisation. By participatory observations and interviews with actors involved in the planning phase we can study which energy efficient goals that are entering the agenda, how these goals are negotiated and interpreted and which measures that is put forward as solutions and why.
Method and material
The analytical approach we apply is based on a bottom-up actor oriented interpretative method. We have done participatory observation of all project meetings during the planning phase of three renovation processes, until the start of the public procurement of a building contractor. All together we have observed 25 meetings.

We have also interviewed all involved actors, including consultants and co-workers at Stångåstaden. We have labeled all actors participating in the projects but not employed by Stångåstaden “consultants” when discussing them as a group. The following consultants have been involved in the projects: Architects, Fire consultants, Construction consultants, VVS-consultants, Building engineers, Energy audit consultants and Electricity controller.

All together we have interviewed 28 people. Three of these we have interviewed twice. All interviews have been recorded and transcribed.

The renovation process – a general overview of different phases
The simple model of a renovation process looks like:

PLANNING AND DESIGN  →  PROCUREMENT  →  RECONSTRUCTION

In this project we have focused on the planning and design phase of the renovation which ends with a public procurement. The planning phase is performed by the property developer and the consultants and decisions about the renovation measures are made in this phase.

Stångåstaden’s planning and design phase is divided in:

i. **Preliminary investigation** is done before the first project meeting. Inspections are conducted where data concerning the outdoor environment, the building’s context, technical status and maintenance status is gathered. Documents are collected such as property data, drawings and photographs.

ii. **Working meetings** are held where documents and drawings are negotiated which are produced and prepared for the procurement process

iii. **Decisions in the investment group** comprise two major steps. The first time the group decides on a strategic level what to do and not do in the building. The second time the group decides on the budget for the whole renovation in relation to a more or less finished suggestion plan for the renovation measures put forward by the working group.

Institutions frame the renovation processes
Institutions make interaction between people possible, but also restrict or constrain how a person can act in a given situation (March and Olsen 1995). Institutions can be both formal (e.g., rules and laws) or informal (e.g., conventions and behavioural norms, such as routines and roles). Institutional identity and standard procedures determine what is seen as acceptable and reasonable behaviour (March and Olsen 1995). Further, institutions influence individual modes of thought. “Institutions are collections of interrelated rules and routines that define appropriate actions in terms of relationships between roles and situations. The process involves determining what the situation is, what role is being fulfilled, and what the
obligations of that role in that situation are” (March and Olsen 1989, p. 160). This means, for example, that goals are not exogenously given, but can be discovered during a decision or renovation process.

Institutions are at the same time also socially constructed and shaped by us (Brunsson 1998). They are a set of imaginations and ideas that we share with other people; in that way, they both create conditions for and set restrictions on our actions and interactions.

Although individuals might try to behave rationally, they are not always aware of all the alternatives on the market. They may be unable to collect and process all the relevant information (March 1994), so they focus on a smaller number of alternatives and consequences while ignoring others. They construct simplified “frames” that help them delineate the situation and come to decisions. Rationality is limited and framing is a device or technique used to simplify reality when one is confronted with complex choices (Simon 1957). The goal is often to achieve a result that is satisfactory, rather than to calculate the expected results and risks and thereafter make the most rational and optimal choice (March 1994).

**Time in the renovation process**

Timing is of great importance for the achievement of energy efficiency goals in the renovation process. All requirements need to be included in the procurement document, otherwise it will not be implemented. There are very limited opportunities for the property owner to involve new suggestions when the procurement process has started. Time is also important in another aspect. Involved actors need to make decision regarding their time efforts and how much to engage and how much to engage actors in Stångåstaden’s energy goal. Research on decision-making is established and rather well-developed and researchers have analyzed decision-making in relation to communication, democracy, networking, organizational cultures, institutions etc. But to use time as an analytical variable is not so common (Schelder and Santiso 1998). Hansson (2008) find in her study that time is present in many studies but time is not problematized or made a relevant analytic perspective.

**The case: Stångåstaden and the ongoing renovation processes**

We have participated in the planning meetings and have also been members of the projects meeting place on the web, where documents and information are shared between involved actors. Furthermore, we followed to the first site-visit to get a better understanding of the building.

The planning meetings are organized in similar ways. The project leader from Stångåstaden is chairing the meetings and follows more or less the same agenda, where the following issues are included: Administration; Authority issues (building permits etc); Documents (e.g. drawings); Quality/Environment and work environment; Time-plan; Architect; HVAC; Electricity; Other installation issues; Economy; Energy; Other issues. This agenda structure the meetings and very much decides how the discussions are formed. Most of the time is spent on three issues: architect, HVAC and, Electricity.
Below we will give examples on how time frames how energy efficiency is discussed and what measures that are introduced into the process.

**Lack of time frames the process**

In our project the time-plan has been that the design phase will take around 3 months then the procurement process should start. This gives time for around 4-5 meetings, each taking 3 hours. The structure is built on that everyone is familiar with this process, know each other and suggested measures. By that the process as such has an inertia to change and to include new ideas.

One of the architects was new and had not cooperated with Stångåstaden earlier. He also entered one of the projects late. He said that he really lacked an introduction to the process, to the other actors in the process and also information about in what phase they were in when he became involved. He said “I would have needed that to function properly, because I did some design work in the project. But their work just kept on and they just assumed that I was informed by my consultant company. And it doesn’t work like that”.

Stångåstaden is a big company that has internal employed project leaders. One problem with that might be that they are so involved in the company’s structure that everything becomes so obvious. If they had hired a project leader he/she would have asked for more documents and investigation. Now the project leaders have a lot of tacit knowledge and just expect that their consultants will have the same knowledge as they have. They never set off time to really introduce everyone to Stångåstaden and their processes and goals.

We quickly noticed that not in any of the three projects Stångåstaden introduced their energy goal and initiated a discussion about possible strategies to reach it. Their energy goal came up from time to time at the meetings, but without relation to the individual renovation project and information about the idea of the goal. When we asked the representatives from Stångåstaden about this, they meant that their consultants knew about the goal already and worked with it and that they informed about this all the time. We asked the involved consultants about Stångåstaden’s energy goal during the interviews. Around half of them knew that a goal exists and around half of them were not aware of the goal.

“No, I have not heard about it /…/ I have no idea what it is” (Fire consultant)

Interviewer: Have you heard about Stångåstaden’s 25-25 goal?
Construction consultant: No, I don’t think so.
Interviewer: [Explains the goal] But they haven’t told you about this on the meetings?
Construction consultant: I don’t know. It…it is possible
Interviewer: /…/ But you don’t work with this goal in the building project. The project leader hasn’t told you that you need to look into 25 % or something like that?
Construction consultant: No, it is more like you try to do as much as possible in relation to the preconditions
Two consultants working with HVAC, the electricity consultant and one architect knew about the goal. Further, they talked about the goal and its importance – for them it was a sort of obvious implicitness. However, they had time to learn about it as they worked with Stångåstaden for many years.

Does it matter then, if not all know and work with Stångåstaden’s goals? Yes, it does matter, because it benefits existing structures and established routines. The consultants familiar with the energy goals had their expertise in technologies obvious influencing energy consumption in buildings. As mentioned above most of the time on the meetings was spend on discussions related to the architect, HVAC and electricity. Architectural issues only concerned how the drawings were made, positioning of doors, basin dimensions and their relations to shafts in the building. To a large extent HVAC discussions focused on the positioning of the shafts. Also ventilation was discussed, whether to install a supply air ventilation or not. In one of the projects the heating system became a major issue, because what started as an obvious replacement of the system, ended with a decision on relining. Discussions around electricity were quite practical, e.g. where to put the sockets or if the cables should be visible.

Missing in these discussions are other relevant issues such as how you design a room to best make use of solar radiation or how to design an apartment for an optimal airflow. These would be typical architectural questions. The resident perspective was also very seldom on the agenda. For example how to design an apartment in a way that encourage tenants to use less energy?

The process was not designed for brainstorming or developing new solutions. It was made for developing a base for a public procurement document where issues as requirements of energy classified appliances, number of sockets, thickness of insulation etc. The time pressure also benefit suggestions of established and well-known technology.

**Conclusions**

Time and timing is one factor framing the planning and design phase. The actors have limited time to decide on all the issues that will be included in the procurement document and what measures that should be prioritized. The limited time probably contribute to the lack of introduction of new consultants in the process.

The project leaders have been in this role for several years and for them this design phase is more or less carried out in routine, which benefit actors that have been involved before and issues that have been tried out and suggested in earlier processes. The building sector is often described as conservative and the time pressure in these processes contribute to conservatism. The same issues are on the agenda in all three renovation processes that we have studied and similar measures and solutions are discussed. Innovations and alternative ways to do a renovation are difficult to raise when the time is limited.

There was also a lack of discussion about the energy efficiency goal that Stångåstaden has decided on and how that should be dealt with in the individual projects. The renovation could
be an opportunity to try out new ideas and benefit from the different expertises that are gathered to develop a suitable procurement document.

References


Palm, J (2013b), Energy efficiency in tenant-owners’ residences – the process of going from objective to implementation. Housing Studies, vol 28 no 1, pp 57-73.


