Implementing energy measures in renovations for multi-family dwellings

Influence and practice of professionals

Katharina Reindl

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To Torgny, Monti and Tina.

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CHAPTER 1

1. Introduction – approaching energy efficiency in building renovations

To begin with ... the reason why we are renovating is pretty much that the house is getting old and unmodern. We have some damage in the house, the main pipes (Swedish: stammarna) are bad and all that. So first and foremost, it is to secure the function of the house. That is the primary thing. Then we should always think ahead. This house will be here in another fifty years. So we should think about and look at the layout so it works for the next fifty years or so [...] and then we have the energy goal 25-25 [...] we also need to include it and see how we will ensure that we reduce the energy consumption. (Interview, IC-6)

As buildings age, sooner or later they need renovation. Then opportunities open up to not only improve and modernise the buildings' functions or improve indoor environmental quality, but also to implement measures to reduce energy consumption¹ and improve energy efficiency² and achieve a more sustainable built environment.

This dissertation is about the way energy efficiency and reduction measures or technologies³ are integrated in building renovations. My study is first and foremost about the work of the professionals doing the planning and design of renovations, and it concentrates on their meeting practice as they make decisions about the inclusion or rejection of energy measures.⁴ For this purpose, I followed three renovation projects initiated by the municipal housing company Stångåstaden in Linköping, Sweden.

¹ I am using the term “energy consumption” as it is commonly used. However, I am well aware of the first law of thermodynamics and the fact that energy, strictly speaking, cannot be consumed. The total amount of energy stays constant; it changes from one form to another. Thus, according to the first law of thermodynamics, energy can neither be consumed nor produced; it simply changes form.

² Various terms are used more or less interchangeably throughout the thesis, for example, in references to “energy,” “energy issues” and “energy questions.” Terms such as “energy efficiency,” “energy reduction” and “energy saving” (measures) all refer to measures that reduce energy consumption, which may be achieved through increased efficiency or saving energy.

³ Also, in relation to the first footnote, for simplicity, energy efficiency and reduction measures as well as technologies will be referred to as “energy measures.” These could include better insulation (windows, walls or roof), the installation of energy efficient appliances or new ventilation (e.g., heat recovery with mechanical ventilation) or a new heating system (e.g., a heat pump).

⁴ However, other relevant actors are also included, such as the tenants, the Swedish Union of Tenants and the investment group. More detailed information will follow.

1.1 The building sector as agent in mitigating climate change

The building sector is the second-largest energy consumer in Europe as a whole, after the transport sector. In order to meet climate change mitigation targets, energy efficiency needs to be increased.⁵ Thus, energy use by the built environment must change dramatically,⁶ and the building sector is seen as one crucial change agent for the reduction of greenhouse gas emissions.⁷

During the period from 1950 to 1975, many buildings were constructed in Sweden and throughout Europe, and the building stock grew rapidly. Now these buildings are aging, becoming outdated, and problems are appearing, such as water damage and other indoor quality issues, and there might be a need to replace the plumbing equipment, ventilation, windows or roofs. Therefore, buildings from this period are in need of renovations. In addition to modernising the building or improving the indoor environmental quality, a renovation is an opportunity to improve energy efficiency and implement energy measures in the buildings.⁸ There are global agreements on the need to mitigate climate change, and since the building sector is a major consumer of energy, actions should be taken to drastically reduce the energy use and CO₂ emissions from buildings.⁹ As Nässén et al. state: “*Energy efficiency is a key element in the global effort to mitigate future climate change.*”¹⁰

The built environment currently constitutes about 40% of the total energy consumption in the EU, as well as in Sweden specifically. This shows that the potential for energy saving actions taken in this area can have major impacts.¹¹ Energy efficiency is a central political objective in the EU, and the member states have agreed on the EU’s 2030 climate and energy framework, building on the 20/20/20 targets, with the goals of reducing greenhouse gas emissions from 1990 levels by 40%, achieving a renewable energy share of at least 27% in the final energy demand, and increasing energy

⁵ See also, Daniel K. Jonsson et al., “Energy at your service: highlighting energy usage systems in the context of energy efficiency analysis”, *Energy Efficiency*, vol. 4, no. 3, Aug. 2011, p. 355.

⁶ See also Kathryn B. Janda, Gavin Killip & Tina Fawcett, “Reducing carbon from the ‘middle-out’: the role of builders in domestic refurbishment”, *Buildings*, vol. 4, 2014, p. 912.

⁷ See also Wiktorina Glad, “Housing renovation and energy systems: the need for social learning”, *Building Research & Information*, vol. 40, 2012, p. 274.

⁸ See also Mikael Mangold, et al., “Socio-economic impact of renovation and energy retrofitting of the Gothenburg building stock”, *Energy and Buildings*, vol. 123, 2016, p. 41; Stefan Olsson, Tove Malmqvist & Mauritz Glaumann, “Managing sustainability aspects in renovation processes: interview study and outline of a process model”, *Sustainability*, vol. 7, 2015, pp. 6336, 6337; Frits Meijer, Laure Itard & Minna Sunikka-Blank, “Comparing European residential building stocks: performance, renovation and policy opportunities”, *Building Research & Information*, vol. 37, no. 5-6, 2009, p. 548.

⁹ See also Frank Klinckenberg, Mia Forbes Pirie, & Laure McAndrew, *Renovation roadmaps for buildings*, A report by The Policy Partners for Eurima, London, *The Policy Partners*, 2013, pp. 1, 4.

¹⁰ Jonas Nässén, Frances Sprei & John Holmberg, “Stagnating energy efficiency in the Swedish building sector: economic and organisational explanations”, *Energy Policy* vol. 36, 2008, p. 3814.

¹¹ e.g., Liane Thuvander et al., “Unveiling the process of sustainable renovation”, *Sustainability*, vol. 4, 2012; Anne N. Nielsen et al., “Early stage decision support for sustainable building renovation: a review”, *Building and Environment*, vol. 103, 2016, p. 165.

efficiency by 27% (with 2007 as the reference level).¹² The targets are binding, except for the energy efficiency goal, which is to be reviewed in 2020 with a 30% target in mind. Sweden has also set objectives to reduce the total energy consumption per heated area unit in homes and premises, aiming for a 20% reduction by 2020 and a 50% reduction by 2050 relative to consumption in 1995.¹³ In addition, the energy performance directive within the EU27 (EU/2010/31) is supposed to support energy reduction goals, and this directive also includes targets for buildings that undergo major renovations, especially since the already built environment represents the bulk of the energy used today in the building sector.

The total energy consumption in the residential sector in the EU has been relatively stable since the 1990s, and the Swedish building sector follows this trend. In 2014, the total energy consumption of the residential sector in Sweden was 140 TWh,¹⁴ about 90% of it used in residential buildings. According to Meijer et al., it is estimated that water and space heating account for most of the energy consumption in the residential sector, about 60% of which is used for space heating and 25% for domestic hot water. In most Swedish apartments, heating and hot water are included in the rent, which means that the tenants have no direct economic incentives to reduce indoor temperature or hot-water use.¹⁵ Between the 1970s and 1990s, electricity use in Sweden was constantly rising; since then it has become relatively stable. Technology has become more efficient but usage has increased, resulting in this stability, and it is now at about 70 TWh.¹⁶

Regarding developments for improved energy efficiency, many energy efficiency measures were implemented in the 1970s and early 1980s in the Swedish building sector. This trend stagnated in the late 1980s and 1990s. Consequently, energy efficiency is stagnating and there has been a slow adoption of energy efficient technology in the Swedish building sector.¹⁷ As the trend looks now, Sweden will not be able to reach the energy efficiency target to reduce energy consumption by 20% by 2020.¹⁸ Thus, in order to meet the national or international goals for reduction of energy

¹² See also EU, 2030 Energy Strategy, <<https://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy>>, accessed 2016-11-10.

¹³ See also SOU 2008:110 (Statens offentliga utredningar), *Vägen till ett energieffektivare Sverige*. Slutbetänkande av Energieffektiviseringsutredningen, Stockholm: Fritzes, 2008, p. 10.

¹⁴ See also Statens energimyndighet: Energiläge 2015, *Statens energimyndighet: Energiläget, 2015*, <https://www.energimyndigheten.se/contentassets/50a0c7046ce54aa88e0151796950ba0a/energilaget-2015_webb.pdf>, accessed 2016-11-10, p. 12.

¹⁵ See also Mangold et al., op. cit., p. 42.

¹⁶ See also Statens energimyndighet: Energiläge 2013, <https://energimyndigheten.a-w2m.se/ResourceComment.mvc?resourceId=2785> >, accessed 2016-11-10.

pp. 15ff, Statens energimyndighet: Energiläge 2015, op. cit. pp. 12ff.

¹⁷ See also Nässén, Sprei & Holmberg, loc. cit.

¹⁸ See also Maria Xylia, "Is energy efficiency the forgotten key to successful energy policy? Investigating the Swedish case", Licentiate thesis, KTH Royal Institute of Technology Industrial Engineering and Management, Department of Energy Technology Energy and Climate Studies unit, Stockholm, (TRITA-ECS Report, 16/01), 2016.

consumption and greenhouse gas emissions, it is necessary to make radical changes when it comes to housing renovation and housing supply.¹⁹ Extensive energy retrofitting is required to reach the Swedish national target to achieve a 50% reduction of the energy usage in the building stock by 2050.²⁰

As buildings are a main source of energy consumption in Europe and since new construction constitutes a small proportion of all buildings, with about 1% annual addition, it is important to underline that the majority of the current building stock will still exist in 2050, and the major potential for reducing the energy demand can be seen in upgrading this already existing stock.²¹ Therefore “[g]reater potential energy savings can be achieved in the large stock of existing dwellings than in the relatively small proportion of newly built dwellings.”²² Consequently, it is important to look not only at newly constructed buildings but also the existing ones when discussing energy efficiency in the building sector. Refurbishing the existing housing stock also means reducing often escalating household energy bills and being able to make a real difference regarding climate change.²³

The importance of renovating existing buildings is obvious since renovation opens a window of opportunity to increase energy efficiency and reduce energy consumption. Thereby, the national energy and climate goals are approached at the same time as modern, updated and more comfortable accommodations are created.²⁴ However, when it comes to retrofitting, even though new energy efficiency measures have been developed, the building industry has been rather slow to adopt them.²⁵ Earlier studies have concluded that if relevant technical means for energy reduction are available, even if they are economically feasible, they are not sufficiently used in building renovations. Both policy documents and the academic literature state that cost-effective energy measures are not always implemented. Thus, there is a gap between the potential for improving energy efficiency and the actual achievements. This kind of discrepancy between optimal and actual implementation is often referred to as the energy efficiency gap or the energy paradox.²⁶

¹⁹ See also Janda, Killip & Fawcett, loc. cit.; Glad, loc. cit.

²⁰ See also Mangold et al., loc. cit.

²¹ See also Carmel Lindkvist et al., “Barriers and challenges in nZEB projects in Sweden and Norway”, *Energy Procedia*, vol. 58, 2014, p. 199; Meijer, Itard & Sunikka-Blank, op. cit., p. 533; Thuvander et al., op. cit.; Olsson, Malmqvist & Glaumann, op. cit.

²² Meijer, Itard & Sunikka-Blank, loc. cit.

²³ See also Kathryn B. Janda & Gavin Killip, “Building expertise: renovation as professional innovation”, in Rebecca L. Henn, Andrew J. Hoffman & Nicole Woolsey Biggart eds., *Constructing green: the social structures of sustainability*, MIT Press, Cambridge & London, 2013, p. 39.

²⁴ See also Mangold et al., loc. cit.

²⁵ See also Lindkvist et al., loc. cit.

²⁶ See also, e.g., Kirsten Gram-Hanssen, “Existing buildings – users, renovations and energy policy”, *Renewable Energy*, vol. 61, 2014; Glad, op. cit., p. 275; Lovisa Högberg, Hans Lind & Kristina Grange, “Incentives for improving energy efficiency when renovating large-scale housing estates: a case study of the Swedish Million Homes programme”, *Sustainability*, vol. 1, 2009; Eoin Ó. Broin et al., “Quantification of the energy efficiency gap in the Swedish residential sector”, *Energy Efficiency*, 2015; Eric Hirst & Marilyn Brown, “Closing the efficiency gap: barriers to the efficient use of energy”, *Resources, Conservation and Recycling*, vol. 3, no. 4, 1990; Edeldgard

“To capture this potential and radically reduce energy demand from buildings, a holistic and long-term strategy for building renovation is needed [...]”²⁷

1.2 Inspiration, contribution, aim and research questions

1.2.1 Inspiration for and contribution of my research

An increasing number of renovations are needed to meet energy targets, but even though there are several energy measures available, they are not implemented often enough. Why is it difficult to enable measures leading to energy efficiency and energy reduction in renovation projects? This overarching problem has inspired my research, and with my study I want to contribute knowledge which can encourage implementation of energy measures in building renovations.

Transforming existing building stocks to be more energy efficient and thereby meeting various energy reduction goals will entail a large number of refurbishment projects, and many professionals will be engaged in the process. Professionals in the building sector are important actors when it comes to the initiation, delivery and promotion of changes in infrastructure, according to Janda and Parag,²⁸ and Parag and Janda,²⁹ who define building professionals³⁰ as middle actors. *“Building professionals and practitioners neither produce nor consume energy, but through their work they shape and can alter the ways in which it is used. Building professionals are a critical part of the system needed to create zero-carbon homes, buildings and refurbishments.”³¹* They argue that there is a need to study the influence of these middle

Gruber & Michael Brand, “Promoting energy conservation in small and medium-sized companies,” 1991, *Energy Policy*, vol. 19, no. 3, 1991; P. C. Stern, “What psychology knows about energy conservation,” *American Psychologist*, vol. 47, no. 10, 1992; Stephen J. Decanio, “The efficiency paradox: bureaucratic and organizational barriers to profitable energy-saving investments”, *Energy Policy*, vol. 26, no. 5, 1998; Adam B. Jaffe & Robert N. Stavins, “The energy efficiency gap: what does it mean?”, *Energy Policy*, vol. 22, no. 10, 1994; Alan H. Sanstad, & Richard B. Howarth, “Normal markets, market imperfections and energy efficiency”. *Energy Policy*, vol. 22 no. 10, 1994; Lukas Weber, “Some reflections on barriers to the efficient use of energy,” *Energy Policy*, vol. 25, no. 10, 1997; Steve Sorrell, *The economics of energy efficiency: barriers to cost-effective investment*. Edward Elgar, Cheltenham, 2004; Henri L.F. de Groot, Erik T. Verhoef & Peter Nijkamp, “Energy saving by firms: decision-making, barriers and policies”, *Energy Economics*, vol. 23, no. 6, 2001; Joachim Schleich & Edelgard Gruber, “Beyond case studies: Barriers to energy efficiency in commerce and the services sector”, *Energy Economics*, vol. 30, no. 2, 2008; Sandra Backlund et al., “Extending the energy efficiency gap”. *Energy Policy*, vol. 51, 2012.

²⁷ Klinckenberg, Forbes Pirie & McAndrew, op. cit., p. 1.

²⁸ Kathryn B. Janda & Yael Parag, “A middle-out approach for improving energy efficiency in existing buildings”, *ECEEE Proceedings Summer Study*, 2011; Kathryn B. Janda & Yael Parag, “A middle-out approach for improving energy performance in buildings”, *Building Research & Information*, vol. 41, no. 1, 2013.

²⁹ Yael Parag & Kathryn B. Janda, “Midstream and sideways: considering a middle-out approach to changing energy demand”, Paper presented at the Energy Transitions in an Interdependent World, February 25–26, Brighton, University of Sussex, Brighton, 2010; Yael Parag & Kathryn B. Janda, “More than filler: middle actors and socio-technical change in the energy system from the ‘middle-out’”, *Energy Research & Social Science*, vol. 3, 2014.

³⁰ See description of building professionals in section 2.1.1 and a description of the building professionals and other relevant actors for my case can be found in section 3.3.1.

³¹ Janda & Parag, “A middle-out approach for improving energy performance”, op. cit., p. 42.

actors from their position in the middle and outwards, taking a “middle-out” perspective instead of the otherwise more common top-down or bottom-up approaches. The middle actors can be regarded as important when it comes to greening the housing sector in new construction and renovations, but to be successful in these efforts radical changes in technology and work practices are needed.³² My study is about the meeting practices of the middle professionals as they handle energy measures in renovations.

1.2.2 Aim, study objects and research questions

The aim of my study is to investigate the enabling or disabling³³ of energy measures leading to energy efficiency and reduction³⁴ by building professionals and other actors in renovation projects, specifically in the planning and design phase. A renovation project is divided into several phases and, from an energy retrofit perspective, many of these can influence the actual outcome of a renovation project. However, it is the early phase of the whole process, the planning and design phase, which lays the ground for energy efficiency and reduction as³⁵ “*[t]he decisions taken in the early stages of the design determine the final result [...]*.”³⁶ In order to better understand the uptake of energy measures in renovations, I investigate the planning and design phase and its meeting practice. Then, the focus is on how and why energy measures are enabled or disabled³⁷ rather than on what kinds of measures are implemented in the projects. The study is process oriented, which means that not only the goals and results are of interest, but so are the activities performed. The point is to understand why a specific measure is enabled or disabled rather than to judge whether the suggestions regarding energy measures are good or bad.

My study objects are the building professionals and other relevant actors involved in and related to the planning and design phase meetings of renovation projects initiated by the municipal housing company Stångåstaden. In the planning and design phase, several meetings take place where employees of the housing company³⁸ and external

³² See also Janda & Parag, “A middle-out approach for improving energy efficiency”, op. cit.; Janda & Parag, “A middle-out approach for improving energy performance”, op. cit.; Parag & Janda, “Midstream and sideways”, op. cit.; Parag & Janda, “More than filler”, op. cit.

³³ Inclusion, promotion and rejection, exclusion.

³⁴ For simplicity, when I write about “energy” or “energy issues” I include both considerations on energy efficiency and energy saving or reduction.

³⁵ See also Amory B. Lovins, *Energy-efficient buildings: institutional barriers and opportunities – Strategic issues paper*, E Source, Inc., Boulder, CO, 1992; Kathryn B. Janda, “Building change: effects of professional culture and organizational context on energy efficiency adoption in buildings”, PhD dissertation, Energy and Resources Group, University of California, Berkeley, 1998.

³⁶ Thaleia Konstantinou & Ulrich Knaack, “Refurbishment of residential buildings: a design approach to energy-efficiency upgrades”, *Procedia Engineering*, vol. 21, 2011, p. 666.

³⁷ From here on I will refer to enabling and disabling energy measures. By “enable” I mean include, promote or take up; by “disable” I mean exclude, reject or leave out. I have chosen to use “enable” and “disable”, which are also terms used by Janda and Parag.

³⁸ From now on referred to as “internal employees”.

consultants³⁹ come together to form a temporary project group in order to decide how the project will proceed, which includes energy-related decisions, such as what energy measures should be enabled or disabled for the upcoming renovation. It is important to study how the building professionals in the middle handle energy issues in their meeting practices. This leads to questions concerning how these meeting practices can be changed in a more sustainable direction with a greater focus on energy. To argue for changing a practice, it is first essential to study the current meeting practice. Furthermore, other actors, who do not take part in the meeting practice, such as the investment group of the housing company, the Swedish Union of Tenants, and the tenants themselves, might play important roles during the course of the planning and design phase. Thus not only the middle actors are of importance, but so are actors above and below the middle in the renovation projects, which I include in my investigation as well.

Stångåstaden's goal is to reduce the use of purchased energy in their housing stock by 25% by 2025 (compared with 2011 figures), and it says that energy has become a part of the housing company's work. This energy reduction is to be achieved in different ways, one of these being renovation of their building stock. The company seems to be on the verge of taking energy issues more into consideration, and I will investigate whether and how this is happening. This study represents a snapshot of the efforts made in renovation projects where the company initiates an inclusion of energy efficiency considerations in their business-as-usual renovation process. I have followed the planning and design phases of three housing renovation projects that had a stated goal of being energy efficient renovations. The following three research questions will guide my analysis:

- How are energy measures discussed and transformed into plans and decisions by professionals in the middle?
- Is the housing company's 25-25 energy goal translated into the planning and design practice, and if so, how?
- Why do the middle professionals decide to enable or disable energy measures in the planning and design of renovation projects?

I also aim to study how the relations and influences between the middle and the other levels affect the enabling or disabling of energy measures. Another aim of my study is to test the usefulness and applicability of my analytical framework, the middle-out perspective, for analysing the project combined with a practice theory approach for investigating the meeting practice and how energy is handled at the meetings.

³⁹ Electricians, architects, HVAC, heating engineers, fire security, construction or building engineers and others.

1.3 Situating my thesis in previous research on energy and buildings

The construction industry can be seen as a key player regarding climate change mitigation. In order to investigate the enabling and disabling of energy measures in the early phase of renovation projects, I frame my study with previous research related to energy and buildings (the built environment) and especially to studies on renovation.

There are many different research contexts or fields as well as scientific disciplines researching energy issues in the built environment. Many studies about the built environment are of a technical and economic nature, dealing with different technical solutions or economically cost-effective ways to work with energy issues.⁴⁰ Such studies do not directly relate to my study. I focus solely on research concerning the non-technical dimension, and I therefore primarily refer to social science and interdisciplinary studies.

I also look at studies that focus on low-carbon housing or on environmental or sustainability aspects in relation to renovations. In these studies, energy usually plays a role too, and the common goal of all of them is to mitigate climate change. This is relevant for me as I believe that the ultimate goal of enabling more energy in

⁴⁰ See, for example, Vytautas Martinaitis, Eduardas Kazakevičius, & Aloyzas Vitkauskas, “A two-factor method for appraising building renovation and energy efficiency improvement projects”, *Energy Policy*, vol. 35, 2007; Ulla Janson, Björn Berggren & Henrik Sundqvist, “Energieffektivisering vid renovering av rekordårens flerbostadshus. Rapport nummer EBD-R 08/22, Lund: Lunds universitet, Avdelningen för energi och byggnadsdesign & Skanska Teknik FoU, 2008; Ulla Janson, “Passive houses in Sweden: experiences from design and construction phase,” Lunds universitet: Institutionen för arkitektur och byggd miljö, Energi och byggnadsdesign (lic), 2008; Ulla Janson, “Passive houses in Sweden: from design to evaluation of four demonstration projects”, Lunds universitet: Institutionen för arkitektur och byggd miljö, Energi och byggnadsdesign (diss), 2010; Marcel Schweiker & Masanori Shukuya, “Comparative effects of building envelope improvements and occupant behavioural changes on the energy consumption for heating and cooling”, *Energy Policy*, vol. 38, 2010; Ambrose Dodoo, Leif Gustavsson & Roger Sathre, “Life cycle primary energy implication of retrofitting a wood-framed apartment building to passive house standard”, *Resources, Conservation and Recycling*, vol. 54, 2010; Jesper Kragh & Jørgen Rose, “Energy renovation of single-family houses in Denmark utilising long-term financing based on equity”, *Applied Energy*, vol. 88, 2011; Fanny Pernodet Chantrelle et al., “Development of a multicriteria tool for optimizing the renovation of buildings”, *Applied Energy*, vol. 88, 2011; Darius Biekša et al., “Energy efficiency challenges in multi-apartment building renovation in Lithuania”, *Journal of Civil Engineering and Management*, vol. 17, no. 4, 2011; Hans Lind et al., “Sustainable renovation strategy in the Swedish Million Homes programme: a case study”, Working Paper, Section for Building and Real Estate Economics. Department of Real Estate and Construction Management. Centre for Banking and Finance (Cefin), School of Architecture and the Built Environment. Royal Institute of Technology, 2014; A.M. Rysanek & R. Choudhary, “Optimum building energy retrofits under technical and economic uncertainty”, *Energy and Buildings*, vol. 57, 2013; Krushna Mahapatra et al., “Business models for full service energy renovation of single-family houses in Nordic countries”, *Applied Energy*, vol. 112, 2013; Birgit Risholt, Berit Time & Anne Grete Hestnes, “Sustainability assessment of nearly zero energy renovation of dwellings based on energy, economy and home quality indicators”, *Energy and Buildings*, vol. 60, 2013; Jurgis Zagorskas et al., “Thermal insulation alternatives of historic brick buildings in Baltic Sea region”, *Energy and Buildings*, vol. 78, 2014; Üllar Alev et al., “Renovation alternatives to improve energy performance of historic rural houses in the Baltic Sea region”, *Energy and Buildings*, vol. 77, 2014; Endrik Arumägi & Targo Kalamees, “Analysis of energy economic renovation for historic wooden apartment buildings in cold climates”, *Applied Energy*, vol. 115, 2014; Qian Wang, Rafael Laurenti & Sture Holmberg, “A novel hybrid methodology to evaluate sustainable retrofitting in existing Swedish residential buildings”, *Sustainable Cities and Society*, vol. 16, 2015; and others.

renovations is to achieve energy goals that will help to mitigate climate change and global warming in the long run.

In my research I use the term “renovation”. Thuvander et al. say that there exists no general definition describing building changes; however, many different, partly overlapping terms are used. A selection of the most common terms are alteration, adaptation, renovation, rehabilitation, refurbishment, retrofitting, restoration, reconstruction, retro-commissioning, modernisation, transformation and tune-up. The reason for this diversity of terms is that there exist many different types and scales of buildings. Additionally, there is a large range of actions that can potentially be taken as well as a plurality of reasons to renovate.⁴¹ Changes to a building can be simply minor repairs or refits that require little intervention, but they can also be major renovations that include large changes to the building. Changes can entail anything from, on one hand, preservation and conservation work in order to halt and address deterioration to, on the other hand, and partial to total demolition and reconstruction or replacement. There is general agreement about the use and definition of terms such as preservation, conservation, modernisation or rehabilitation; however, other terms are less unanimously used and have a wide span of interpretations. The term “renovation”, for example, is used by some to describe work involving minimal intervention, while others use it to refer to more extensive upgrading. Some authors use the term “retrofit” to emphasise the act of improving a building to a higher standard (e.g., even with respect to sustainable building objectives).⁴² I follow Meijer et al.’s definition of renovation; they used “renovation” to refer to modernisations, retrofitting, restoration, rehabilitation, and other such actions that go beyond maintenance.⁴³

My renovation research takes place in a Swedish context, but I also want to refer to a broader Northern European context, as my analytical approach is also relevant outside Sweden. In this section on previous research, I also chose to include countries in Northern Europe, as these countries’ energy and housing sectors are similar to Sweden’s.

The renovation projects I have studied involve rental apartments in multi-family dwellings. The renovation of properties differs in many respects depending on the ownership and type of tenure and also on policy and legal factors. Studies focusing on homeowners’ or occupants’ behaviour are less interesting for me as my study is focused not on the occupants or their behaviour but rather on building professionals. However, even though housing forms can vary in terms of social, economic, political and technical conditions and issues, relevant insights can be gained from, for example, structural, organisational, process or policy-related issues studied. I have entirely excluded studies

⁴¹ See also Thuvander et al., *op. cit.*, p. 1191.

⁴² See also *ibid.*

⁴³ See also Meijer, Itard & Sunikka-Blank, *op. cit.*, p. 534.

on historic buildings and commercial buildings, as both have very different preconditions compared with the types of buildings I am concerned with.⁴⁴

I begin this section by presenting research on energy and building⁴⁵ on a general level, the approaches or perspectives that exist, what has been studied so far and how it could be changed to improve understanding of how to reduce energy consumption and improve sustainability in the built environment. I want to situate my research in a broader context and explain the approach my research takes.

In the following section I will give a short overview of studies on energy and renovation since my empirical material concerns renovations. This is not an extensive literature review, but I show different areas, empirical fields and theoretical approaches previously used for studies on renovation and energy issues. I aim to show how complex this type of research can be and in how many different ways this can be approached – all with the intention of contributing to making the built environment more energy efficient and sustainable. After that I present a selection of research that is directly related to my research.

This should provide important insights into some of the difficulties regarding the adoption of energy efficiency. Thus, at the end of this section the reader should have gained a deeper understanding of current research on energy, buildings and renovation. In this section on previous research, I also chose I also discuss possible ways to complement research on renovation and how renovations with the aim of increased energy efficiency could be studied.

1.3.1. Energy and building research in the non-technical perspective

From positivist to interpretivist research in energy and building research

Schweber and Leiringer did a literature review about research on energy and buildings focusing especially on construction research and the analysis of non-technical dimensions. They investigate what the research objects are and different methodological approaches.⁴⁶ They argue that even though there is widespread recognition of the importance of non-technical dimensions, research is limited to more individualistic studies focusing on occupants and occupant behaviour. When it comes to mainstream social science literature, then broader interests can be observed such as

⁴⁴ e.g., Georg Traska, “Designing renovation: the building as planning material”, *Building Research & Information*, vol. 35, no. 1, 2007; Albena Yaneva, “How buildings ‘surprise’: the renovation of the Alte Aula in Vienna”, *Science Studies*, vol. 21, no. 1, 2008; Zagorskis et al., op. cit.; Niccolò Aste & Claudio Del Pero, “Energy retrofit of commercial buildings: case study and applied methodology”, *Energy Efficiency*, vol. 6, no. 2, 2013; Livio Mazzearella, “Energy retrofit of historic and existing buildings: the legislative and regulatory point of view”, *Energy and Buildings*, vol. 95, 2015.

⁴⁵ The studies presented here have a general focus on the built environment, including studies on renovation.

⁴⁶ See also Libby Schweber & Roine Leiringer, “Beyond the technical: a snapshot of energy and buildings research”, *Building Research & Information*, vol. 40, no. 4, 2012, p. 482.

policy developments, structural constraints on diffusion, the use of new technologies or the construction process itself. *“The growing interest of more generalist scholars in energy and buildings provides an opportunity for construction research to engage a wider audience.”*⁴⁷ According to Schweber and Leiringer, key findings are that (1) there has been an increased interest in energy and building research and especially in the non-technical dimensions over the last decade; (2) there is a disproportionate focus on occupants and, thus, a neglect of policy, organisational and implementation challenges; and (3) there are mostly positivist methodology approaches (comprising around 80%), and a focus on more interpretivist methodologies (comprising around 20%) could possibly contribute to the low-carbon and low-energy agenda in order to achieve greater engagement between construction research and mainstream social science research.⁴⁸

Over the last half-century the positivist research approaches (as they refer to the “engineering paradigm”) made important contributions regarding significant advances in engineered systems, with highly relevant and critical work.⁴⁹ Schweber and Leiringer argue for the need for more construction research with an interpretivist approach to complement the other research orientations. For a more interpretivist approach, they give various examples of what this kind of research could pay attention to, including investigating how to explain and thus support the uptake, diffusion, and use of new technologies, materials, systems and processes. Other examples are research into how meaning, practices and institutional environments shape the supply and demand for energy as well as different characteristics of the built environment. Further, there is a need for studies about social and economic conditions locking the user into patterns of energy use. Schweber and Leiringer conclude also that there is a need for studies to better understand the obstacles and opportunities for more integrated whole-life and whole-system approaches. Another argument that Schweber and Leiringer bring forward is that it would be beneficial to persuade industry partners of the benefits of more long-sighted research:⁵⁰ *“[...] interpretivist approaches direct attention to research into variations in the response of actors and firms to seemingly similar pressures, to case studies comparing the configuration of similar types of factors in different contexts and towards generalization on processes rather than outcomes. Much more importantly, however, it will mean that construction research will have much to contribute to the future development of a sustainable built environment.”*⁵¹ My dissertation will contribute by presenting a rather long-sighted study which takes a more interpretive than positivist approach. Furthermore, I am doing a case study that has a process focus rather than an outcome focus, as emphasised by Schweber and Leiringer.

⁴⁷ Ibid., p. 481.

⁴⁸ See also *ibid.*, pp. 482, 490.

⁴⁹ See also *ibid.*, p. 490.

⁵⁰ See also *ibid.* p. 491.

⁵¹ *Ibid.*, p. 491.

From hero stories to learning and caring stories in energy and building research

The theme of the paper by Janda and Topouzi is the relationship between research, the interpretation of data and storytelling. They refer to both renovation and new building construction. The argument is that stories, just like theories, offer a lens to focus and shape data interpretation. Thus, it is relevant to focus on the presence, absence and use of narrative structures which surround data. The authors recommend a more balanced approach using different kinds of tales by policy makers, researchers, implementers and users. They speak about a narrative turn, a turn towards conscious storytelling in energy research. According to them, it is important to recognise the relationship between stories and energy research, and it is possible to describe different types of stories (hero, horror, learning and caring) and how these stories are used.⁵²

In their literature review on energy and buildings, Schweber and Leiringer found that around 80% of the literature has a “positivist” approach. The *hero stories* and those taking a positivist approach share an alignment, as both aim for generalisable theories out of their context. The hero story can be seen as inspiring, positive and familiar, where technologies are harnessed in order to “save” society. Thus, in this type of story people do not need to change as technology will make all the necessary changes instead. In contrast to the hero story, the *horror story* would be something that no one wants to tell, as it is about failure, technologies that are not performing the way they should, equipment that is malfunctioning, a model failing to fully anticipate occupants’ behaviour and so on.⁵³

A *learning story*, on the other hand, searches more for meaning in a specific time and place, contrary to the universality approach of the hero story. The “interpretivist” approach comprises only a minor part, comprising around 20% of the reviewed literature by Schweber and Leiringer, which is similar to the learning story. In this story things might not be as simple as they initially seem to be, and the protagonists are normal people who need to overcome a challenge. Concerning energy policy, it could be this kind of learning story that approaches the gap between technical potential and what is actually achieved in practice. There is no universal pattern, no heroes and no villains either. The protagonists can be viewed as normal people responding to a challenge and they are not going to be saved by a hero and thus have to rely on their own actions. Compared to the hero story, the learning story can be more difficult; it is not as soothing, needs participation and reflection, and there is no single truth.

Another approach to explore is one that adds ideas of ethics to the built environment.⁵⁴ All participants could actually be included in the built environment and

⁵² See also Kathryn B. Janda & Marina Topouzi, “Telling tales: using stories to remake energy policy”, *Building Research & Information*, vol. 43, no. 4, 2015, pp. 516-518.

⁵³ See also *ibid.*, pp. 519, 520.

⁵⁴ See Stephen Hill & David Lorenz, “Rethinking professionalism: guardianship of land and resources”, *Building Research & Information*, vol. 39, no. 3, 2011; Stephen Hill et al., “Professionalism and ethics in a changing economy”, *Building Research & Information*, vol. 41, no. 1, 2013; Bill Bordass & Adrian Leaman, “A new

come to more *caring stories*. The learning story shows more how the socio-technical system of the built environment actually behaves, while the hero story is more a description of how building physicists or energy analysts would like it to work. Since policy regimes generally fail to recognise the socio-technical nature of building performance, the caring story could help move things in this direction. There are often merely implicit objectives to get people to care about the environment as well as energy in order to moderate their behaviour. Public policies could support ethical caring, and regulatory regimes shape driving habits and practices. Regarding building performance, the regulatory regime is dependent on building physics and not as much on the skill of their operators or “drivers”. What if people had to take lessons and a test in order to demonstrate their ability to “drive” a building just as with cars? With this shift it would be more recognised that the built environment, just as with transportation, is a socio-technical system and not just a technical one.⁵⁵

With the introduction of additional story types it is possible to enable greater flexibility for researchers, implementers and policy makers. The authors argue that, by focusing more on learning stories, one can move beyond the hero and horror or success and failure binaries. This allows a researcher to turn a hero story or a horror story (failure) into a learning story instead. The learning story should be seen as a complement to the hero stories. Often when researchers evaluate their research projects, different kinds of pressures might lead them to prove the hero story instead of challenging or changing it. But by adding a learning story, a “failure” can be seen instead as an educational opportunity that has broader possible outcomes.⁵⁶ *“Building performance is a situated learning opportunity that is currently underutilized. If these opportunities are to be grasped, then the use of hero stories will need to change, develop and alter into a myriad of learning stories, perhaps augmented by caring stories to establish new social norms of ethical conduct.”*⁵⁷ What this needs is a significant change in the current energy policy regime, which tends to view buildings as physical systems rather than as social technical assemblages, and thus imagination is favoured over reality and technical potential is favoured over social potential.⁵⁸ *“Harnessing the learning story and developing a ‘caring story’ could motivate policy-makers and the public to invest effort in building performance.”*⁵⁹ I agree with this and my dissertation is in line with a learning focus rather than a hero or horror story.

professionalism: remedy or fantasy?” *Building Research & Information*, vol. 41, no. 1, 2013: in Janda & Topouzi, op. cit., p. 530.

⁵⁵ See also Janda & Topouzi, op. cit., p. 530.

⁵⁶ See also *ibid.*, pp. 516, 520, 521, 531.

⁵⁷ *Ibid.*, p. 531.

⁵⁸ See also *ibid.*, op. cit., p. 531.

⁵⁹ *Ibid.*, op. cit., p. 516.

From a focus on the individual's behaviour to the professionals

Janda and Killip criticise the claims that issues concerning energy and buildings can be addressed by technology instead of by changes in people's behaviour. Such a claim is based on a determinist view where technology and people can be easily separated from each other (it is also related to the positivist approach and the hero story, as mentioned above). Another issue is that the task of social sciences is limited to investigating individuals who operate and behave as consumers or citizens, and there is little focus on the practitioners and professionals providing the services. Thus, social scientists are assumed to work only with changing homeowner behaviours. Exactly this assumption and its implications are challenged by Janda and Killip.⁶⁰ I relate to this, as I also study professionals and the decisions they make concerning renovations.

Socio-technical perspective for energy, building and renovation research

In relation to the learning story, I also see a building as a socio-technical assemblage and take inspiration from science and technology studies (STS). It can be concluded from different studies that energy efficiency policies were criticised as they appear to be too simplistic and believe in a rational and fully informed actor that can choose the best available technologies. Moezzi and Janda, for instance, argue that when it comes to energy efficiency decision situations, the social potential is as important as the technical potential.⁶¹ My analysis will focus on the social rather than the technical potential. Economic factors can play an important role in the analysis of energy efficiency and the choice of different measures to be taken during a renovation process. It is also crucial, however, not to overemphasise the economic incentives, and similarly, not to disregard other decisive factors such as culture, knowledge and routines. The latter are of importance in a renovation process when it comes to the negotiation and choice of technological solutions, measures or appliances. Guy and Shove, for instance, emphasise how important it is to understand cultural and social engagement when deciding on energy efficiency in building projects. Thus, it is important to understand the context in which choices are made in a renovation process.⁶² In that context, technology and society are interdependent and society as well as individuals are able to shape the technologies surrounding them, which has been studied in STS for a long time.⁶³ The idea is to see that both the context and action are important, where context

⁶⁰ See also Janda & Killip, op. cit., p. 40.

⁶¹ See also Mithra Moezzi & Kathryn B. Janda, "From 'if only' to 'social potential' in schemes to reduce building energy use", *Energy Research & Social Science*, vol. 1, 2014.

⁶² Simon Guy & Elizabeth Shove, "A sociology of energy, buildings, and the environment: constructing knowledge, designing practice", in Routledge Research Global Environmental Change Series, Routledge, London, 2000.

⁶³ See also Trevor J. Pinch & Wiebe E. Bijker, "The social construction of facts and artifacts: or how the sociology of science and the sociology of technology might benefit each other", in Wiebe E. Bijker, Thomas Parke Hughes & Trevor J. Pinch eds., *The social construction of technological systems: new directions in the sociology and history of*

means, for instance, available technologies and provision systems, and action means, for example, energy-related choices that are made during a renovation process.⁶⁴ Energy efficiency is affected by socio-technical factors and relationships of social actors with material and semiotic aspects that are embedded in the built environment.⁶⁵

With this I can summarise that my dissertation is an interpretative study, a learning story that is placed in the broad framing of science and technology studies (STS) and thus relates to this type of research. Further, it is a social science study on energy issues and renovation that does not focus on individuals and their behaviour but rather on the professionals who make decisions that will shape the behaviour of people later on.

1.3.2 Renovation research and energy issues

In the general research on the built environment and energy issues, studies on renovation and energy are less common but are becoming more and more recognised.⁶⁶ Janda and Killip note that many studies focus on new housing and highlight that in fact for many years researchers and policy makers have paid less attention to renovations. It is often assumed that interesting innovations in housing design and the more radical technologies, such as passive solar, cannot be applied to existing housing – at least not easily. This is slowly changing, however. Large emissions come from the already existing buildings.⁶⁷ Taking a demand perspective, it can be stated that newly built 100% carbon-free homes would simply not have that great an impact on current carbon emissions, since emissions can primarily be cut down by renovating the existing building stock, as Janda and Killip emphasise.⁶⁸ Also, Dodoo et al. state that “[t]he construction of new low energy buildings is important in the long term, but has little effect on the building sector’s overall energy use in the short term, as the rate of addition of new buildings to the building stock is low.”⁶⁹ In recent years there was also

technology, MIT Press, Cambridge & London, 1987; Michel Callon, “Society in the making: the study of technology as a tool for sociological analysis”, In Wiebe E. Bijker, Thomas Parke Hughes & Trevor J. Pinch eds., *The social construction of technological systems: new directions in the sociology and history of technology*, MIT Press, Cambridge & London, 1987.

⁶⁴ See also Jenny Palm, “The building process of single-family houses and the embeddedness (or disembeddedness) of energy”, *Energy Policy*, vol. 62, 2013.

⁶⁵ See also Steve Woolgar, “The turn to technology in social studies of science”, *Science, Technology, & Human Values*, vol. 16, no. 1, 1991; Susan Leigh Star, Power, “Technology and the phenomenology of conventions: on being allergic to onions”. *The Sociological Review* vol. 38 no. S1, 1990; Thomas F. Gieryn, “What buildings do” *Theory and Society*, vol. 31, no. 1, 2002.

⁶⁶ See also Tina Fawcett & Gavin Killip, “Anatomy of low carbon retrofits: evidence from owner-occupied superhomes”, *Building Research & Information*, vol. 42, no. 4, 2014, p. 434.

⁶⁷ See also Janda & Killip, op. cit., p. 38.

⁶⁸ See also ibid.

⁶⁹ Dodoo, Gustavsson & Sathre op. cit., p. 1152 referring to Malcolm Bell, “Energy efficiency in existing buildings: the role of building regulations”, in *COBRA proceedings of the RICS Foundation Construction and Building Research Conference*, 2004.

a growth in the refurbishment industry, which is expected to grow even more, especially due to the emphasis on sustainable development and economic conditions.⁷⁰ It is assumed that building professions will change focus from new construction to maintenance or refurbishment of the existing building stock.⁷¹

Even though renovation studies are not as common as studies of new buildings, various studies on renovation in the non-technical dimension can nevertheless be found. The studies address renovation and issues concerning how to meet different kinds of energy or CO₂ reduction targets or how to set up and handle changes in renovation strategies to include increased energy efficiency. The studies address different issues and problems related to energy efficiency, low-carbon or sustainable renovation.

The following two sections present different studies related to renovations. The first section shows a few examples of what studies on renovation are about. I present some examples of studies with different focus areas on energy and renovation from a non-technical dimension. This is followed by a section presenting some previous studies directly related to my research, where I discuss a few studies in more detail to exemplify how these have influenced my analysis, even if they are more peripheral.

Examples of renovation research and energy issues

The overview is not extensive but shows the complexity of research on renovation in the non-technical dimension. Some authors are mentioned twice or more, as their research fits into more than one of the categories defined below. This does not represent an extensive literature review, neither is it an extensive and complete categorisation of research on renovation; these examples are simply intended to illustrate some different areas of focus.

The studies on renovation focus on different kinds of actors, including professions and professionals in and around the renovation process,⁷² tenants or homeowners,⁷³ and

⁷⁰ See also Janda & Killip, loc. cit.

⁷¹ Niklaus Kohler & Uta Hassler, "The building stock as a research object", *Building Research and Information*, vol. 30, no. 4, 2002, p. 226.

⁷² See also, e.g., Janda, op. cit.; Janda & Killip, op. cit.; Parag & Janda, "Midstream and sideways", op. cit.; Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit.; Janda & Parag, "A middle-out approach for improving energy performance", op. cit.; Parag & Janda, "More than filler", op. cit.; Janda, Killip & Fawcett, op. cit.; Murray Goulden & Alexa Spence, "Caught in the middle: the role of the facilities manager in organisational energy use", *Energy Policy*, vol. 85, 2015.

⁷³ See also, e.g., Glad, op. cit.; Kirsten Gram-Hanssen, "Households' Energy Use—Which Is the More Important: Efficient Technologies or User Practices", *Proceedings of the World Renewable Energy Congress*, Linköping, 8-13 May 2011.; Björn Astmarsson, Per Anker Jensen & Esmir Maslesa, "Sustainable renovation of residential buildings and the landlord/tenant dilemma", *Energy Policy*, vol. 63, 2013; Gram-Hanssen, "Existing buildings", op. cit.; Liudmila Vlasova & Kirsten Gram-Hanssen, "Incorporating inhabitants' everyday practices into domestic retrofits", *Building Research & Information*, vol. 42, no. 4, 2014; Fawcett & Killip, op. cit.; Marlene Stenberg Hagen Eriksen, Carsten Rode & Søren Peter Bjarløv, "Method for developing and assessing holistic energy renovation of multi-storey buildings", Paper presented at Sustainable Building, Munich, Germany, 2013; C. Wilson, L. Cranea & G.

housing companies (private or public), and some also do a stakeholder analysis or examine the involvement of different stakeholders.⁷⁴ With respect to theory, one can find, for example, STS (science and technology studies) framed studies⁷⁵ (e.g., with an actor network theory [ANT] focus), or practice theory framed studies on homeowners and others.⁷⁶ Study topics include policy and regulations,⁷⁷ the renovation process, lessons for renovation projects,⁷⁸ or economic or societal challenges involved in renovating an aging building stock⁷⁹ or using solar energy in renovation.⁸⁰ There is also a broad range of studies investigating different environmental assessment tools for renovations⁸¹ or building performance. Additionally, many studies evaluate different aspects, for instance, different decision-making tools for renovations.⁸²

Chryssochoidis, "Why do homeowners renovate energy efficiently? Contrasting perspectives and implications for policy", *Energy Research & Social Science*, vol. 7, 2015.

⁷⁴ See also, e.g., Aki Aapaoja, Harri Haapasalo & Pia Söderström, "Early stakeholder involvement in the project definition phase: case renovation", *ISRN Industrial Engineering*, 2013; Robert Newcombe, "From client to project stakeholders: a stakeholder mapping approach", *Construction Management and Economics*, vol. 21, no. 8, 2003;; Stefan Olander, "*External stakeholder analysis in construction project management*", Doctoral dissertation; Construction Management, Lund University, 2006; Stefan Olander & Anne Landin, "Evaluation of stakeholder influence in the implementation of construction projects", *International Journal of Project Management*, vol. 23, 2005.

⁷⁵ e.g., Glad, op. cit.; Malcolm Eames et al. "City futures: exploring urban retrofit and sustainable transitions." *Building Research and Information*, vol. 41, no. 5, 2013; Thomas Berker, "The politics of 'actor-network theory'. What can 'actor-network theory' do to make buildings more energy efficient?" *Science, Technology & Innovation Studies*, vol. 1, no. 1, 2006; Thomas Berker, "Domesticating spaces sociotechnical studies and the built environment", *Space and Culture*, vol. 14, no. 3, 2011; Gavin Killip, "Products, practices and processes: exploring the innovation potential for low-carbon housing refurbishment among small and medium-sized enterprises (SMEs) in the UK construction industry", *Energy Policy*, vol. 62, 2013; Ralph Horne & Tony Dalton, "Transition to low carbon? An analysis of socio-technical change in housing renovation", *Urban Studies*, vol. 51, no. 16, 2014, (Australian perspective); e.g., Josefín Thoresson, Omställning – Tillväxt – Effektivisering. Energifrågor vid renovering av flerbostadshus. Tema Teknik och social förändring. Linköping Studies in Arts and Science No. 665, Dissertation, 2015.

⁷⁶ See also, e.g., Francoise Bartiaux et al. "A practice theory approach to homeowners' energy retrofits in four European areas", *Building Research & Information*, vol. 42, no. 4, 2014.

⁷⁷ See also, e.g., Meijer, Itard & Sunikka-Blank, op. cit.; Marianne Ryghaug & Knut H. Sørensen, "How energy efficiency fails in the building industry", *Energy Policy*, vol. 37, 2009; Gram-Hanssen, "Households' Energy Use", op. cit.; Ray Galvin, "German federal policy on thermal renovation of existing homes: a policy evaluation", *Sustainable Cities and Society*, vol. 4, 2012; Andrew Karvonen, "Towards systemic domestic retrofit: a social practices approach", *Building Research & Information*, vol. 41, 2013; Gram-Hanssen, "Existing buildings", op. cit.

⁷⁸ e.g., Erwin Mlecinka et al., "Collaboration opportunities in advanced housing renovation", *Energy Procedia*, vol. 30, 2012; Marja Naaranoja & Lorna Uden, "Major problems in renovation projects in Finland", *Building and Environment*, vol. 42, 2007; Nielsen et al., op. cit.; Olsson, Malmqvist & Glaumann, op. cit.

⁷⁹ e.g., Mangold et al., op. cit.

⁸⁰ e.g., Jan-Olof Dalenbäck, "Solar energy in building renovation". *Energy and Buildings*, vol. 24, no. 1, 1996; Karsten Voss, "Solar energy in building renovation: results and experience of international demonstration buildings", *Energy and Buildings*, vol. 32, 2000.

⁸¹ e.g., Nils Brown et al., "Sustainability assessment of renovation packages for increased energy efficiency for multi-family buildings in Sweden", *Building and Environment*, vol. 61, 2013; Nielsen et al., op. cit.

⁸² e.g., Joaquim Ferreira, Manuel Duarte Pinheiro & Jorge de Brito, "Refurbishment decision support tools review: energy and life cycle as key aspects to sustainable refurbishment projects", *Energy Policy*, vol. 62, 2013; Nielsen et al., op. cit.; Liane Thuvander & Paula Femenías, "Rebo - Strategier för hållbar renovering – fokus på perioden 'folkhemmet'", Chalmers, Kortrapport om forskning, no. 1, 2014; Liane Thuvander & Paula Femenías, "Rebo -

Further, the studies can differ regarding their scale and ownership; for instance, they can be about renovation and urban development,⁸³ different types of buildings and tenure, such as multi-family dwellings and rental apartments⁸⁴ or privately owned single-family homes.⁸⁵ It is also possible to investigate different time periods of buildings; in Sweden, many studies are about the Million Programme home renovation and special challenges related to that.⁸⁶ The Million Programme buildings are multi-family dwellings built between 1965 and 1975, which are often referred to as the “record years”. These buildings make up about 20% of the total building stock, according to Olsson et al. Now 40 to 50 years old, they are in need of extensive renovations, such as replacing the plumbing, ventilation, windows, roofs and so on.⁸⁷

Many studies have a broader approach than energy efficiency, focusing instead on sustainable renovation in one way or another.⁸⁸ Sustainable renovation is referred to as handling renovation needs and also contributing to fulfilling central societal targets. Interpretations of what sustainable renovation entails vary to a high degree.⁸⁹ For example, on one hand, Olsson et al. use sustainable renovation to indicate how energy, environmental and indoor environmental quality aspects during a renovation process are dealt with.⁹⁰ On the other hand, according to Thuvander et al. sustainable renovation aims to fulfil the dimensions of environmental, social and economic sustainability when making changes to buildings. Debates around sustainability typically focus on energy savings and environmental issues. However, in relation to existing housing, the social dimension, which refers to the residents and their connection to the site, also becomes important.⁹¹

Strategies for sustainable renovation – Focus on the period “Folkhemmet”, Chalmers. Brief Report on Research, no. 1, 2014; Konstantinou & Knaack, op. cit.

⁸³ e.g., Eames et al., op. cit.; Thoresson, op. cit.

⁸⁴ e.g., Martin Morellia et al., “Energy retrofitting of a typical old Danish multi-family building to a ‘nearly-zero’ energy building based on experiences from a test apartment”, *Energy and Buildings*, vol. 54, 2012; Eriksen, Rode & Bjarløv, op. cit.; e.g., Thoresson, op. cit.; Mangold et al., op. cit.; see also Linn Liu & Josefin Thoresson, “Exploring indoor climate and comfort effects in refurbished multi-family dwellings with improved energy performance”, *Smart Innovation, Systems and Technologies*, vol. 22, 2013; Olsson, Malmqvist & Glaumann, op. cit.

⁸⁵ See also, e.g., Gram-Hanssen, “Households’ Energy Use”, op. cit.; Vlasova and Gram-Hanssen, op. cit.; Fawcett & Killip, op. cit.; Gram-Hanssen, “Existing buildings”, op. cit.; e.g., Wilson, Cranea & Chryssochoidis, op. cit.

⁸⁶ e.g., Thomas Hall & Sonja Vidén, “The Million Homes programme: a review of the great Swedish planning project”, *Planning Perspectives*, vol. 20, no. 3, 2005; Högberg, Lind & Grange, op. cit.; Lars Steiner & Zahra Ahmadi, “Renewal of the Swedish Million Dwelling program, the public housing company and the local community, hindrances and mutual aid”, *World Academy of Science, Engineering and Technology, International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering* vol. 7, no.4, 2013; Lind et al., op. cit.; Thoresson, op. cit.; Olsson, Malmqvist & Glaumann, op. cit.

⁸⁷ See also Olsson, Malmqvist & Glaumann, op. cit., p. 3667.

⁸⁸ e.g., Tarja Häkkinen & Kaisa Belloni, “Barriers and drivers for sustainable building”, *Building Research & Information*, vol. 39, no. 3, 2011; Thuvander et al., op. cit.; Ferreira Pinheiro & deBrito, op. cit.; Brown et al., op. cit.; Lind et al., op. cit.; Olsson, Malmqvist & Glaumann, op. cit.; Nielsen et al., op. cit.

⁸⁹ See also Olsson, Malmqvist & Glaumann, op. cit., p. 6338.

⁹⁰ See also Olsson, Malmqvist & Glaumann, op. cit.

⁹¹ See also Thuvander et al., op. cit., p. 1192.

There are many studies dealing with barriers hindering the implementation and adoption of energy efficiency measures in renovation, including in a Swedish context. Thereby, different authors have defined different barriers impeding the implementation of various measures that would result in more sustainable or energy efficient buildings.⁹² Barriers should be minimised in order for sustainable practices and energy efficiency to be developed and integrated in the built environment. The identification of various barriers is important since it helps construction professionals to get a better understanding of how to successfully handle sustainable and energy efficient design and building construction. The identification of factors that can hinder the uptake of energy efficiency measures or sustainability aspects can be a way to understand them better and overcome them in the long run. In my study I want to focus on what hinders the uptake of energy efficiency, even if I do not explicitly regard these as barriers. As Palm states, it can be regarded as important to define and redefine identified energy efficiency barriers to challenge existing solutions and then to be able to develop new ways to approach companies as well as other actors.⁹³

Examples of established barriers include the fear of high investment costs and problems with profitability, lack of knowledge about sustainability aspects, lack of simplified evaluation tools (for decision making), insufficient knowledge of building stocks, and lack of coordination between energy saving and other measures. It can also be said that few property owners are able to address sustainability aspects of a renovation project. Consequently, very few property owners manage to address sustainability aspects throughout a renovation project in a suitable way.

One can argue that it is important to find ways to overcome these and other barriers in order to develop sustainability management procedures for the built environment.⁹⁴

None of these articles in the built environment applied barrier theory as theoretical framing.⁹⁵ The barrier theory approach is often chosen to find explanations for the

⁹² e.g., Philip Davies & Mohamed Osmani, "Low carbon housing refurbishment challenges and incentives: architects' perspectives", *Building and Environment*, vol. 46, 2011; Immanuel Stieß & Elisa Dunkelberg, "Objectives, barriers and occasions for energy efficient refurbishment by private homeowners", *Journal of Cleaner Production*, vol. 48, 2013; Elin Wihlborg & Kristina Laurell, "Including and representing end-user's needs when building houses of culture: a time-geographical perspective on stakeholders", *Public Works Management & Policy*, vol. 17, no. 4, 2012; Jing Yang et al., "Exploring critical success factors for stakeholder management in construction projects", *Journal of Civil Engineering and Management*, vol. 15, no. 4, 2009; Johannes Persson & Stefan Grönkvist, "Drivers for and barriers to low-energy buildings in Sweden", *Journal of Cleaner Production*, vol. 109, 2014; e.g., Thuvander et al., op. cit.; Olsson, Malmqvist & Glaumann, op. cit.

⁹³ Jenny Palm, "Placing barriers to industrial energy efficiency in a social context: a discussion of lifestyle categorization", *Energy Efficiency*, vol. 2, 2009.

⁹⁴ See also Olsson, Malmqvist & Glaumann, op. cit., p. 3667

⁹⁵ Weber, op. cit.; Hirst and Brown, op. cit.; Jenny Palm & Patrik Thollander, "An interdisciplinary perspective on industrial energy efficiency", *Applied Energy*, vol. 87, 2010; Jaffe & Stavins, op. cit.; Patrik Thollander & Jenny Palm, *Improving energy efficiency in industrial energy systems: an interdisciplinary perspective on barriers, energy audits, energy management, policies, and programs*. Springer, London, 2013; Steve Sorrell et al., "Reducing barriers to energy efficiency in public and private organizations", 2000, <<http://www.sussex.ac.uk/Units/spru/publications/reports/barriers/final.html>>; Sorrell, op. cit.; Patrik Thollander,

energy efficiency gap (often in relation to industrial energy systems), but it has limitations as, for instance, discussed by Shove or Palm.⁹⁶

Renovation research and energy issues - where I situate my research

My research has to do with the early parts of a renovation process, with a focus on the middle professionals and their meeting practice during the planning and design phase which leads to enabling or disabling energy measures. Therefore, studies that are particularly relevant for me are (1) those concerning renovation processes, specifically the early phase, which I call the planning and design phase; (2) research on professionals and (3) research with a practice theory framing.

Additionally it can be mentioned that the buildings I studied were built in the post-war period. According to Thuvander et al., homes built in the Million Programme period are getting considerable attention today, but there is a lack of knowledge about the specific challenges and opportunities for the renovation of the somewhat older stocks. Around 26% of apartment buildings in Sweden were constructed during the Folkhemmet period, stretching from 1941 to 1960, according to Thuvander et al.⁹⁷ The homes from the Folkhemmet period were built with inspiration from political and architectural ideological programmes aiming to ensure good housing for all citizens.⁹⁸ The idea was that citizens have a right to good, affordable housing and it was a keystone in the construction of the Swedish welfare state. To achieve the goal, generous loans were established for housing linked to demands that certain standards be met (e.g., with regard to central heating and to bathroom and kitchen fittings).⁹⁹ The political idea of a good home for everyone was first presented in the late 1920s and debated and formalised in the 1930s, but it was not implemented until after World War II. Apartment buildings from this period (1941 to 1960) are now in need of extensive renovations due to wear and tear, high energy consumption, and poor indoor climate. Despite their age, there are still large numbers of dwellings from the Folkhemmet period which have not yet undergone any major renovations.¹⁰⁰ The buildings renovated in my case come from this time period before the Million Programme homes.

Jenny Palm & Patrik Rohdin, "Categorizing barriers to energy efficiency-an interdisciplinary perspective", in Jenny Palm ed., *Energy Efficiency*. INTECH Open Access Publisher, Croatia, 2010.

⁹⁶ Elizabeth Shove, "Beyond the ABC: climate change policy and theories of social change", *Environment and Planning A*, vol. 42, 2010; Palm, "Placing barriers to industrial energy efficiency", op. cit.

⁹⁷ e.g., Thuvander and Femenias, "Rebo - Strategier för hållbar renovering", op. cit.; Thuvander and Femenias, "Rebo - Strategies for sustainable renovation", op. cit.

⁹⁸ Liane Thuvander, Paula Femenias & Leif Andersson, "Strategier för renovering och ombyggnad av flerbostadshus från 1940-1960-talet: Strategimatrix - ett exempel", *Bygg & teknik*, vol. 2, 2014, p. 12.

⁹⁹ Ibid., p. 13.

¹⁰⁰ Ibid., p. 12.

(1) The early phase in the renovation projects

There are various studies arguing for the importance of the early phases in renovation projects. However, in relation to all the areas that are studied, the studies on early phases are (still) few. When it comes to energy efficiency, it is exactly in this phase that decisions are taken on what kind of energy efficiency or saving measures are to be implemented. Thus, I find it interesting to investigate the planning and design phase in a renovation process. In this phase, professionals meet, discuss and decide what energy efficiency measures should be included (enabled) in the renovation process and, thus, be in the procurement document.¹⁰¹ When it comes to negotiations regarding which energy efficiency measures to implement, the role of the building professionals in this phase is fundamental for the final decisions.

Nielsen et al. did a study on decision support tools for building renovation as an important source of assistance when setting goals, in this case for sustainability, and for making sure that objectives are met throughout the process. They argue that the process of renovations and of constructing new buildings are quite alike. The main difference is that with a renovation there is the big constraint of having an already existing building as well as a building site and existing users (tenants). The overall phases can be described as “pre-design”, “design”, “(re-) construction” and “building operation”.¹⁰² The phases of “pre-design” and “design” are iterative, and “sub-iteration” occurs over the process as, for instance, there is a constant evaluation of the design proposals by the architects or engineers. They focus on what they refer to as “pre-design” and “design” phases. Based on their descriptions, this is more or less similar to what I refer to as the planning and design phase – or simply, the early stages of a renovation project. Their study is about the use of decision-making tools in making decisions, especially during the early phases of a renovation process. I will present some interesting insights for my study concerning what should be considered when making decisions about how to carry out a sustainable renovation. With this description of their work I do not do justice to the work Nielsen et al. have done concerning decision support tools, but it is described in their article and can be found there. I want to take one important lesson from their work for my research, which is that it is important to define a problem, set the right goals (weighing criteria and having alternatives etc.) and also to evaluate alternatives.¹⁰³ *“The first key step in the renovation process is defining the goals, objectives, and criteria since all the following phases are adapted to these strategic and important aspects. This strategic area can, in fact, be seen as the rational heart of the entire*

¹⁰¹ Konstantinou & Knaack, op. cit., p. 666.

¹⁰² The renovation process, according to Nielsen et al. (op. cit.), looks like this: “pre-design” (choose criteria and sub-criteria, define measures, weight criteria, building diagnosis), “design” (generate design alternatives, estimate performance, evaluate alternatives, choose design alternative), “detailed project design”, “construction” and “building operation”. (See also a more detailed figure in Nielsen et al., op. cit., p. 167).

¹⁰³ See also Nielsen et al., op. cit. p. 166.

process.”¹⁰⁴ It is important to set the right goals which solve the right problems and then find the best alternatives for that.¹⁰⁵

Thuvander et al. present a description of the renovation process, stating that the process of a renovation or new construction has rather similar phases which can be summarised as “pre-design/preliminary investigation or programming”, “design”, “(re-) construction”, “commissioning”, and “occupancy or use”.¹⁰⁶ They argue that more emphasis (time and resources) should be placed on the preliminary investigation phase in order to be able to achieve good results in the whole process (i.e., from pre-design through to occupancy/use). According to Thuvander et al., it is common for renovation processes to begin with poor documentation of building conditions. Thus, they focus their research on this early phase. It is in this phase, the main directions and goals for the renovation are identified and crucial decisions are taken.¹⁰⁷ *“When a property owner or construction client has identified a need for a major renovation, usually a preliminary investigation is carried out in order to survey and investigate special issues and to establish a relevant documentation. The preliminary investigation is an important part of renovation and alteration projects.”*¹⁰⁸ The local planning and building committee can ask for a preliminary investigation if the property owner does not conduct one. A thorough preliminary investigation is broad and can refer to the collection of different types of information, including a building inventory status, establishing the documentation of the building before the alteration is begun. Thuvander et al. refer to Nordling and Reppen, who state that in Sweden such a preliminary investigation is required by law. This preliminary investigation should, according to Nordling and Reppen, contain surveys of the building as well as its environment (for instance, the local context, general impressions, technical status, maintenance status); user requirements documentation; documentation of property data, contracts concerning the building; history, such as the building year, previous renovations, users or even previous colour schemes; and, additionally, drawings and pictures (construction drawings, historical drawings, sketches, and photographs).¹⁰⁹ They state further that this information – and the preliminary investigation itself – should be objective, without any subjective evaluations. Like Thuvander et al., I have also studied an earlier phase of a renovation project. In the planning and design phase I studied, inspections were also included, even though they did not play a major role.¹¹⁰

¹⁰⁴ Nielsen et al., loc. cit., based on Ferreira, Pinheiro & deBrito, op. cit.

¹⁰⁵ See also Nielsen et al., loc. cit.

¹⁰⁶ See also Thuvander et al., op. cit., p. 1192.

¹⁰⁷ See also ibid.

¹⁰⁸ Ibid.

¹⁰⁹ See also ibid.; L. Nordling & L. Reppen, *Ombyggnad: Varsamhet vid Ändring. En Handbok i Anslutning Till Boverkets Allmänna råd om Ändring av Byggnad*, Solna, Svensk byggtjänst, 2000.

¹¹⁰ See also Thuvander et al., op. cit.

Olsson et al. conducted a study focusing on the entire renovation process, and thus also include results on the early phases. They examined how sustainability aspects are handled by Swedish property owner organisations and what barriers they encounter. Thus, they studied what they refer to as sustainable renovation, which, for them, focuses on energy, environmental aspects and indoor environmental quality aspects. Far-reaching renovation projects that focus on reducing energy demand together with enhancing the indoor environment are still mainly regarded as pilot cases, contrary to the production of new buildings, and in Sweden they are only done on a small scale.¹¹¹ They conducted semi-structured interviews with six Swedish property owner organisations selected with a view to having a representative sample of the housing industry (small and medium-sized private companies, housing cooperatives and large publicly owned companies; the latter is the kind of housing company I studied).¹¹² The results were presented in six areas of interest and in different phases of the process related to sustainability aspects. I will come back to this in more detail in section 4.1.2. They also identified important barriers and wanted to show further developments of a process model that aims at systematising the integration of energy, environment, and indoor environmental quality as aspects as well as addressing these properly throughout the entire renovation process. In summary, some key points for this kind of process model are “*to suggest routines, provide checklists and tools, and offer guidance for formulating sustainability targets.*”¹¹³ Also, in order to achieve a more sustainable built environment, government subsidies and other incentives are required, as well as new kinds of business models which give environmental considerations a higher priority.¹¹⁴

Boudeau studied the design phase with a focus on the design team of construction projects and the coordination of expertise; although this case did not have an energy focus, it still offers interesting results.¹¹⁵ She concluded, “*The coordination of work and expertise in construction projects is often treated in terms of models or formal rules. However, much is to be gained, if we are to understand it, by examining actual coordination practices.*”¹¹⁶ This is a call for thorough empirically grounded contributions on how to better understand what happens in the early phases of construction projects, which I want to do with my research. I can conclude that there is a need for thorough empirically grounded contributions that can provide a better understanding of what actually happens in the early phases of construction projects.

¹¹¹ See also Liu & Thoreson, op. cit. no page number (p. 1); Olsson, Malmqvist & Glaumann, op. cit., p. 3667.

¹¹² See also Olsson, Malmqvist & Glaumann, op. cit., p. 3668.

¹¹³ Ibid., p. 6336.

¹¹⁴ See also ibid.

¹¹⁵ Carole Boudeau, “Design team meetings and the coordination of expertise: the roof garden of a hospital”, *Construction Management and Economics*, vol. 31, 2013, p. 78.

¹¹⁶ Ibid., p. 78.

(2) Professions, professionals, intermediaries and middle professionals

There is a recognition of the need to change the structure of professional practice,¹¹⁷ even though this might be a minority view, as Janda and Killip claim.¹¹⁸ To optimise the available technical and social strategies for each building in order to achieve the best results possible is a challenging task for the fragmented construction industry. For housing refurbishment, usually small and medium-sized enterprises are involved, including general builders, specialist subcontractors (e.g., roofing contractors), plumbers, heating engineers, electricians, architects, design engineers, project managers, building control inspectors and others. These people and groups are often regarded as “intermediaries” when it comes to the technology adoption process since they are in a position between the technologies and the end users. Further, in their position they are expected to deliver low-carbon or energy efficient refurbishment at the client’s request.¹¹⁹ Janda and Killip argue that expertise matters, but it is not equally distributed. If low-carbon refurbishment is to be successful, then quality design as well as highly skilled installations are needed, especially regarding insulation, thermal bridging and airtightness.¹²⁰ It may be the case that some intermediaries have more expertise than others and as a result the supply of low-carbon refurbishment does not respond perfectly to the demand.¹²¹ Considering that intermediaries have their own practices, ways of thinking about problems and ways of working, Janda and Parag, and Parag and Janda¹²² argue for a middle-out perspective instead of one that focuses on intermediaries. I will discuss this more below and in the theoretical chapter, in chapter 2. In their work on professions, Janda and Killip wonder, *“How might the need for low carbon refurbishment change the roles of professions, and their interactions? How are existing professions developing to meet the challenge? Which professions will gain control over the new activities involved in low carbon refurbishment?”*¹²³ With this endeavour, they aim to change the discussion from “what needs to be done” in order to manage a reduction in carbon emissions and energy consumption in the existing building stock and rather ask questions concerning “who will do it and how”. What ability might the professionals have in order to promote or reject the implementation of sustainable strategies in the existing housing stock? They introduce and suggest a so-called socio-technical “system of professions” approach.¹²⁴ This approach addresses the

¹¹⁷ It is called practice but does not refer to practice theory.

¹¹⁸ See also Janda & Killip, op. cit., p. 39.

¹¹⁹ See also ibid p. 36.

¹²⁰ See also Robert Lowe & Malcolm Bell, “Building regulation and sustainable housing. Part 2: Technical issues”, *Structural Survey*, vol. 18, no. 2, 2000: in Janda & Killip, op. cit., p. 36

¹²¹ See also Janda & Killip, op. cit., p. 36.

¹²² Janda & Parag, “A middle-out approach for improving energy efficiency”, op. cit.; Janda & Parag, “A middle-out approach for improving energy performance”, op. cit., p. 42.; Parag & Janda, “Midstream and sideways”, op. cit.; Parag & Janda, “More than filler”, op. cit.

¹²³ Janda & Killip, op. cit., p.36

¹²⁴ See also ibid.

role of experts as well as expertise regarding refurbishments. Furthermore, this approach is an intersection of two already existing theoretical approaches, namely, innovation in socio-technical systems (STs) and the system of professions by Abbott 1988.¹²⁵ I also study professionals in the early phase of renovations and the meeting practice in the planning and design phase to gain insights on why energy measures are enabled or disabled. I therefore do not use their system of professions approach, as the focus on professions would be a slightly different research focus than mine. This could be added or incorporated in future research, however.

There are only a few studies on the role of middle actors in renovations applying a middle-out perspective, while there are many studies on buildings or there are many studies on buildings or the construction industry with a focus on specific professions, such as architects, viewing their roles as intermediaries. Studies on intermediaries in the building sector lean on an assumption that they play a role in spreading innovations or facilitating the transition to sustainability/energy efficiency. For instance, architects play a role as intermediaries in the transition to sustainable building projects¹²⁶ and in the dissemination of passive houses. Intermediary organisations may have the same function as the individual professionals serving as intermediary.¹²⁷ Also, intermediaries play roles in the general transition to more sustainability with systematic intermediary organisations,¹²⁸ and building operators have a mediating role between end users and technological systems aimed at improving energy efficiency.¹²⁹

Janda and Parag, and Parag and Janda¹³⁰ developed the middle-out perspective as an alternative to the intermediary approach. Parag and Janda say that it is important to focus on the middle of a system, which plays a more important role than is usually recognised. This middle-out perspective can be seen in relation to the growing literature on intermediaries. In the intermediary literature it is recognised that these actors have the potential to create change in different areas and ways. What the literatures on intermediaries and the middle have in common is their view of the middle as being more than just a filler. Middle actors have their own functions and qualities, which are both unique and crucial when it comes to effective and durable systematic change. The middle-out perspective, however, is not a duplication of the intermediary approach;

¹²⁵ Andrew Abbott, *"The system of professions: an essay on the division of expert labor"*, University of Chicago Press, Chicago, 1988; see also Janda & Killip op. cit., p. 37.

¹²⁶ Simon Guy, "Designing fluid futures: Hybrid transitions to sustainable architectures", *Environmental Innovation and Societal Transitions*, vol. 1, 2011.

¹²⁷ See Michael Ornetzeder & Harald Rohrer, "Passive houses in Austria: the role of intermediary organisations for the successful transformation of a socio-technical system", *ECEEE Proceedings Summer Study*, 2009.

¹²⁸ See Harro Van Lente et al., "Roles of systemic intermediaries in transition processes", *International Journal of Innovation Management*, vol. 7, no. 3, 2003.

¹²⁹ See Margrethe Aune, Thomas Berker & Robert Bye, "The missing link which was already there: building operators and energy management in non-residential buildings", *Facilities*, vol. 27 no. 1/2, 2009.

¹³⁰ Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit.; Janda & Parag, "A middle-out approach for improving energy performance", op. cit., p. 42.; Parag & Janda, "Midstream and sideways", op. cit.; Parag & Janda, "More than filler", op. cit.

rather, there are overlaps. Parag and Janda conclude that even though middle actors and intermediaries might operate in the same space, it is the conception of the influence and abilities that sets these approaches apart. Parag and Janda's perspective makes it possible to highlight and point to new and unique qualities and functions of the middle as well as strategies for action,¹³¹ and it emphasises that middle actors are more than intermediaries situated between energy consumers and governments or end users and technology, the bottom and the top. Rather, the middle agents are active participants in systems, and they have the capability to create or prevent change at the top or bottom, and from the middle out.¹³²

Janda et al. applied the middle-out perspective and researched low-carbon housing refurbishment in the UK and France in relation to building expertise.¹³³ Another example is Goulden and Spence's study of the role of facility management (FM), a middle-level key actor in organisations regarding energy use. According to Goulden and Spence, a recurrent theme in organisational middle management literature concerns their exclusion from the exercise of power. However, some other authors within this type of literature stress that the power of the middle management on the performance of an organisation shows that the middle management has agency, for example, when resisting the implementation of strategies decided upon from above.¹³⁴ Goulden and Spence also highlight the middle-out perspective to energy transition suggested for energy research by Janda and Parag, and Parag and Janda.¹³⁵ The middle shapes the supply and consumption of energy within buildings and thus is crucial for the energy in transition processes. Similar to Goulden and Spence, I will apply this approach in relation to an organisation.

Within energy research there is much literature on intermediaries which describes what is done at various general levels of a system, including the middle. However, the work practice of the middle actors is not much researched, and my research will contribute to knowledge in this area. Janda and Parag argue that there is a need to study the middle actors, for instance, building professionals, and follow their influence from the middle out. They are important actors when it comes to greening the housing sector in new buildings and in renovations. According to Janda and Parag, the middle is more unfamiliar territory, even though building professionals are rather crucial agents when it comes to initiating, delivering and promoting changes in infrastructure.¹³⁶ The middle-out perspective is one theoretical approach I chose for my research, inspired by the middle-out perspective developed by Parag and Janda. However, I apply it

¹³¹ See also Parag & Janda, "More than filler", op. cit., p. 103.

¹³² See also *ibid.*

¹³³ See also Janda, Killip & Fawcett, op. cit., p. 911.

¹³⁴ See also Goulden & Spence, op. cit.

¹³⁵ Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit.; Janda & Parag, "A middle-out approach for improving energy performance", op. cit., p. 42.; Parag & Janda, "Midstream and sideways", op. cit.; Parag & Janda, "More than filler", op. cit.

¹³⁶ See also Janda & Parag, "A middle-out approach for improving energy performance", op. cit., p. 42.

differently than, for instance, Janda et al.¹³⁷ did, since I do not aim to focus on the industry as a whole or the national policy makers' level. In my study I investigate middle professionals at a company level. The middle-out perspective will be further discussed in the theoretical chapter, in chapter 2.

(3) Practice theory for studies on renovation

Social relations and discussions, negotiations and agreements between the involved professionals in the planning and design phase are decisive for the result, meaning how energy efficient a given building will become. The planned and implemented energy measures are determined and influenced by the experience, routines and habits that exist in a group. A renovation process can be enabled or disabled by negotiated agreements. The focus on social negotiations and agreements can be a way to understand why energy measures and technologies are enabled or disabled.¹³⁸ Karvonen argues that a social practice approach can be useful to gain an understanding of the complexity of retrofitting an area in which it is difficult to find a “one-size-fits-all” approach. The complexity stems in part from the diversity of the housing stock, the gap between modelled and actual performance, and the continuous introduction of new and improved building products.¹³⁹ Many elements must be considered, and I want to understand what happens at meetings when energy measures are discussed, thus I have chosen a practice theory approach to combine actors and structures in the analysis. The practice theory approach helps me to dig deeper into the meeting practice of the planning and design phase and examine how energy measures are dealt with. Finally, with my research I want to contribute to the work practice of middle actors, as this has not yet been much researched. Research on building and practice theory is usually focused on homeowners and their energy use practice. Bartiaux et al. did a study on renovation applying a practice theory approach; however, it was related to homeowners' renovation practice and Palm and Reindl applied the practice theory approach for professionals in renovation projects.¹⁴⁰

1.4 Disposition of my thesis on energy efficiency in building renovations

In this first chapter, *Introduction – approaching energy efficiency in building renovations*, I have introduced the topic of study and the problem that inspired me to do my research. I have presented the aim of the study and its research questions. Further,

¹³⁷ See also Janda, Killip & Fawcett, op. cit.

¹³⁸ See also Thollander & Palm, op. cit.

¹³⁹ See also Karvonen, op. cit.

¹⁴⁰ See also Bartiaux et al. op.cit.; Jenny Palm & Katharina Reindl, “Understanding Energy Efficiency in Swedish Residential Building Renovation: A Practice Theory Approach.” *Energy Research & Social Science*, vol. 11, 2016.

I have situated my thesis among previous studies on energy research related to buildings and renovation.

In chapter 2, *Middle-out perspective and practice theory – analytical framework*, I present my theoretical framework and analytical tools. I introduce the two main theoretical approaches for my study, first separately, describing how they were intended to be used, and then I present how I use these approaches in combination in my analytical framework.

In chapter 3, *Methodology and material*, I develop the methodological approach for my thesis. I explain my research design, process, fieldwork period, the case study approaches and the methods used, which include semi-structured interviews, observations and document analysis. I also give an overview of my material. Furthermore, I present reflections on the possible influence of the researchers in the projects. I end the chapter by elaborating on the case study approach and issues of generalisation.

Chapter 4, *Setting the scene for renovation projects*, gives an overview of background information related to energy efficient renovations in Europe, and especially in Sweden. I present my case and material, comprising an overview of Stångåstaden, their goals, the process of the planning and design phase, the participants in that process, and an overview of the renovation objects.

In chapter 5, *Locating the middle in the planning and design phase*, I explain how I apply the middle-out perspective to my material and who the middle professionals are in my study, what they think is important to achieve with a renovation, and their views on energy efficiency in renovations. Further, I show what kind of energy measures were included in the actual tender documents as a result of the planning and design phase.

Chapter 6, *Energy efficiency in the project groups' meeting practice*, focuses on the middle professionals and the meeting practice of the planning and design phase. The analysis is guided by practice theory.

In chapter 7, *Where there is a middle, there is a the top and a bottom*, I explore all actors involved in the planning and design phase and thus expand my focus on the middle to also include the top and bottom and their role. I also explore influences between the top and the middle, the bottom and the middle, and the sideways influence from the middle out.

In chapter 8, *Discussion and conclusions*, I relate to the aim of my study and summarise what I found regarding how energy is dealt with in renovation projects by different actors and why energy measures are enabled or disabled.

CHAPTER 2

2. Middle-out perspective and social practice theory – analytical framework

In this chapter I situate my thesis theoretically by presenting the two main theoretical approaches employed for my analysis: first, the “middle-out” perspective developed by Janda and Parag, and Parag and Janda¹⁴¹, and second, a practice theory approach, mainly as developed by Gram-Hanssen.¹⁴²

Section 2.1 focuses on the professionals in construction, and specifically in renovation, from a middle-out perspective. Section 2.2 presents practice theory approaches and concepts, where I take inspiration from Schatzki¹⁴³ and focus mainly on the furthering of the practice theory approach used by Gram-Hanssen.¹⁴⁴ The two theoretical perspectives and approaches are presented separately, describing how they were intended to be used. In section 2.3 I describe in more detail *how I use* these theoretical perspectives and approaches in my analytical framework created in an abductive process. I discuss how I combine them and apply them somewhat differently from what was originally intended.

2.1 Professionals from the middle-out perspective: top-down, bottom up and the missing middle-out

In my analysis of how energy and energy measures are dealt with in renovation projects, I will focus on the middle in the planning and design phase, which is not as common as utilising a top-down and bottom-up approach. Janda and Parag have emphasised the importance of the middle and argue that the middle should be seen as something more than a “filler” between the top and the bottom. They show how the middle-out perspective can be used to study building professionals as well as other groups (such as congregations and commercial real estate companies). Their research shows that the middle has its own characteristics, logic and influence in contrast to much of the literature on what is labelled “intermediaries.”¹⁴⁵

¹⁴¹ See also Janda & Parag, “A middle-out approach for improving energy efficiency”, op. cit.; Janda & Parag, “A middle-out approach for improving energy performance”, op. cit., p. 42.; Parag & Janda, “Midstream and sideways”, op. cit.; Parag & Janda, “More than filler”, op. cit.

¹⁴² See also Kirsten Gram-Hanssen, “Residential heat comfort practices: understanding users”, *Building Research & Information*, vol. 38, no. 2, 2010; Kirsten Gram-Hanssen, “Standby consumption in households analysed with a practice theory approach”, *Journal of Industrial Ecology*, vol. 14, no. 1, 2010; Kirsten Gram-Hanssen, “Understanding change and continuity in residential energy consumption”, *Journal of Consumer Culture*, vol. 11, no. 1, 2011

¹⁴³ See also Theodore R. Schatzki, “The sites of organizations”, *Organization Studies*, vol. 26, no. 3, 2005; Theodore R. Schatzki, “On organizations as they happen”, *Organization Studies*, vol. 27, no. 12, 2006.

¹⁴⁴ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.

¹⁴⁵ See more on intermediaries in previous research, section 1.3.

With my investigation I will deviate from the middle-out perspective's original between-organisations focus and instead focus on one project phase in renovation projects initiated by a housing company, thus I have a within-organisation view. However, since external consultants are contracted for the planning and design, and the Swedish Union of Tenants (and the tenants) also play roles, the between-organisations focus comes in too. Therefore, my case setting is not purely within organisations; instead, my starting point is within one company, which, however, brings in different building professionals through insourcing of consultants, thereby combining elements of a within- and between-organisations view. I will elaborate on this adaptation in more detail in section 2.3.

I chose the middle-out perspective because of its focus on the roles of building professionals and practitioners in the middle levels for improving energy performance in buildings and for exploring their potential to enable (or disable)¹⁴⁶ more energy efficient buildings. Janda and Parag¹⁴⁷ argue that further research is needed about how the middle can be activated and encouraged to play a more important role for improving energy efficiency in buildings, and with my research I want to contribute to this, but with a slightly altered focus.

2.1.1. Who is the middle in the building sector and renovation projects?

My interest concerns the middle actors in renovations, which are the building professionals and practitioners in the construction sector. Janda and Parag note that building professionals and practitioners (referred to as building professionals) are broadly defined as individuals or groups working in construction, refurbishment, management, letting and valuation of buildings or supplying materials or technology for such services. These building professionals perform various tasks as individuals or groups (e.g., architects or engineers), practitioners (e.g., builders) and retailers (e.g., "do-it-yourself" stores and their employees).¹⁴⁸ I am interested in the work of such building professionals and how and why they decide to enable or disable energy measures during the planning and design phase of a renovation project.

2.1.2 Agency and capacity from the top-down and bottom-up to the middle-out

The middle, with its own unique functions and qualities crucial for energy transitions, is more than just a filler.¹⁴⁹ When the middle is regarded solely as a rule follower it is simply overlooked and, as a consequence, the middle is an unfamiliar

¹⁴⁶ Original: encourage (or discourage)

¹⁴⁷ Janda & Parag, "A middle-out approach for improving energy performance", op. cit.

¹⁴⁸ Janda & Parag, "A middle-out approach for improving energy performance", op. cit., p. 42.

¹⁴⁹ See also Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit, p. 1204.

territory. Parag and Janda emphasise that a focus on the middle should not be seen as an alternative to a focus on the top or bottom; rather, it should be regarded as a means to support a different way to elaborate on change. In this sense the middle-out perspective is complementary to the top-down and bottom-up perspectives.¹⁵⁰ The middle-out perspective argues that the middle professionals are vital actors as regards social and technological innovations.

In the middle-out perspective, the middle actors' *agency and capacity* are elaborated upon.¹⁵¹ In short, agency means that actors are able to make choices, while capacity, which relates to individual capacity as well as to structure, refers to actors' ability to act and perform according to their choices. Parag and Janda "[...] argue that the middle is well situated to make change, particularly in terms of agency and capacity."¹⁵² Crucial questions regarding societal transformations are "Who has the capacity?" and "Where does the agency lie?" In theory, the more that agency and capacity overlap, the more potential there is for long-lasting change. Actors' agency and capacity are crucial for their ability to influence other actors' agency and/or capacity.¹⁵³

Janda and Parag have a sociological basis for their agency and capacity considerations, where individual actions, behaviour or behavioural change can be explained with reference to structure and agency. The term "agency" describes the capability of individuals to act independently and the ability to make choices. In contrast, the term "structure" refers to factors shaping and limiting opportunities for individuals; examples include religion, social class, ethnicity, and gender. Agency and structure have long been regarded as alternative ways to explain behaviour. For structuralists, the agency of individuals is explained by the operation of structures, while theories focused on agency say that the individual "agents" have the capacity to (re)construct their own world. There are other, more integrative, options introduced by modern social theory that emphasise a balance between structure and agency and see structure and agency as complementary forces. They argue that human behaviour is influenced by structure, but that it is also possible for humans to change the social structure they live in.¹⁵⁴ Hence, one can say that usually individuals have agency to some degree regarding their behaviour. However, it has to be noted that this agency is influenced and shaped by social norms and orders as well as established practices, that is, by structures (which resemble capacity in the middle-out perspective).

¹⁵⁰ See also Parag & Janda, "Midstream and sideways", op. cit, pp. 1, 6; and see also Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit., p. 1203.

¹⁵¹ See also Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit, p. 1203.

¹⁵² Parag & Janda, "Midstream and sideways", op. cit., p. 10.

¹⁵³ See also Parag & Janda, "More than filler", op. cit., pp. 102, 103, 104; Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit., pp. 1203, 1204; Parag & Janda, "Midstream and sideways", op. cit. p. 10.

¹⁵⁴ See also Parag & Janda, "More than filler", op. cit., pp. 103, 104; Parag & Janda, "Midstream and sideways", op. cit, p. 10; Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit., p. 1204.

A durable and effective behavioural change may be created when individuals are capable of changing their behaviour and when this is supported by structural factors and elements. Communities, organisations and networks that individuals are embedded in or affiliated with bring such social norms, order and practices during different parts and phases in life. It can be argued that these mediating entities possess and harness more resources and have greater capacity to bring about change than individuals do. This is shown in figure 2.1.¹⁵⁵

Figure 2.1: Capacity and agency of the top, middle and bottom¹⁵⁶

As regards energy transitions, actors in the middle are commonly overlooked by policy makers, who usually focus either on the so-called big actors on the top, for example, energy utilities, which are capable of bringing change but usually lack the ability to affect individuals' behaviour, or on the bottom, for example, the energy consumers, who have the agency to bring change but often lack the capacity to do so.¹⁵⁷ The bottom has agency since they repeatedly take energy-related decisions, such as which appliances to buy, whether to travel by air or by car and so on. What shapes, limits and influences this agency are things like social norms, income, knowledge, available technology or established practices. Top actors, for instance, managers of energy utilities or of governments' own infrastructures, have control over technology, political power and money. However, they have limited agency concerning the decisions made by the bottom group, but even if the top's agency to influence individual behaviours is relatively low, they have a high capacity to do so.¹⁵⁸ The middle is situated

¹⁵⁵ See also Parag & Janda, "More than filler", op. cit., pp. 103, 104; Parag & Janda, 2010, p. 10; Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit., p. 1204.

¹⁵⁶ Based on Parag & Janda, "Midstream and sideways", op. cit.; p.11

¹⁵⁷ See also Parag & Janda, "More than filler", op. cit., p. 103; Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit., p. 1204.

¹⁵⁸ See also Janda & Parag, "A middle-out approach for improving energy efficiency", op. cit., p. 1204.

in a position where they can create change: *“As agents, these middle actors might be better ‘equipped’ with qualities the top lacks, such as trustworthiness, legitimacy, and ability to shape social norms. At the same time they might have resources that the bottom lacks, such as established procedures; information channels; the ability to coordinate activities, time, tools, expertise; and the ability to shape practices.”*¹⁵⁹ Thus, it is possible for the middle actors to influence and support new behaviours both at the top and bottom levels. The middle actors have agency over behaviour that is not as high as the bottom’s, but higher than the top’s. In turn, their capacity is higher than the bottom’s and lower than the top’s.¹⁶⁰

Parag and Janda argue that because of their position, and their agency and capacity qualities, the middle actors can enhance the levels of agency and capacity of other actors. Also, the overlap between these two levels of agency and capacity might increase. They argue further that middle actors could also be important agents of change, performing vital functions in transition processes which other actors are not able to do easily or at all, and thus durable change can be achieved.¹⁶¹

2.1.3 Direction and mode of influence of the middle in building research

By focusing on the middle professionals in building renovations, it is possible to discuss whether the middle-out perspective can assist in understanding the process of change towards increased energy efficiency.

The middle has influence and is able to promote change in different directions; upstream, to the top, for instance, to governments or energy utilities; downstream, to the bottom, such as to customers or clients; and sideways, between groups working in the same area or level. This illustrates that the influence goes from the middle out.¹⁶² Figure 2.2 shows the directions of influence of the middle according to Janda and Parag.¹⁶³

¹⁵⁹ Ibid.

¹⁶⁰ See also *ibid.*

¹⁶¹ See also Parag & Janda, “More than filler”, *op. cit.*, p. 103.

¹⁶² See also Janda & Parag, “A middle-out approach for improving energy efficiency”, *op. cit.*; Janda & Parag, “A middle-out approach for improving energy performance”, *op. cit.*; Parag & Janda, “Midstream and sideways”, *op. cit.*; Parag & Janda, “More than filler”, *op. cit.*

¹⁶³ Janda & Parag, “A middle-out approach for improving energy performance”, *op. cit.*

Figure 2.2: Direction of influence of the top-down, bottom-up and middle-out¹⁶⁴

The middle, besides having influence in different directions, also has different ways to exert this influence, and thus different modes of influence can be distinguished. Three types of influence are suggested by Janda and Parag: (1) enabling, (2) mediating and (3) aggregating.¹⁶⁵

(1) Enabling (with its opposite disabling) is related to technology adoption. Enabling means that a technology or strategy is allowed to be taken up and used in a project. The professionals adopt a strategy that can work with minor changes in the environment where it should be implemented. The technology or strategy as such does not have to change in order to fit in the context. Disabling means that a technology or strategy is not admitted to a project.¹⁶⁶ Janda and Parag give as an example of enabling professionals who install cavity wall insulation to the level required by building regulations. Disabling is exemplified by professionals rejecting or refusing an available technology or strategy.

(2) Mediating is about participation, change and alteration. A professional who has adopted a technology, strategy or process mediates it by changing it to some extent

¹⁶⁴ Ibid., p.43

¹⁶⁵ See also *ibid.*, p.44: "For simplicity, each mode is named for its positive aspect, but most of these modes are bidirectional. For instance, if professionals can enable adoption, they can also disable it."

¹⁶⁶ See also *ibid.*, p. 45.

in order to adapt it to better suit the specific situation or project in which the professional is involved. For example, professionals mediate a strategy to relate the specific situation to the law. Mediation can be seen as a participatory mode, a process of iterative discussion, like that involved in collaborative design. Janda and Parag give as an example professionals who adjust an energy efficiency measure to a specific situation, like installing cavity wall insulation to a higher performance level than required by law, or installing a lower level of insulation, for example, if the cavity depth does not accommodate the legal level.¹⁶⁷

(3) Over time, building professionals collect and accumulate expertise and experience from work with a large number of buildings, which results in their aggregating knowledge. Professionals involved in many projects (concurrently or sequentially) then utilise what they learn from one project in the next. The ability of professionals is thus based on their work experience as they see and act upon patterns across the building stock. Janda and Parag give as an example a professional who can see that a building is in need of a combination of strategies based on his previous experience, or who knows what type of insulation will fit which building in order to meet the required level of thermal insulation.¹⁶⁸

Middle actors are regarded as important when it comes to improving energy efficiency in new as well as existing buildings, and since they can enable technology adoption, mediate policy goals and aggregate technical opportunities, they manifest their influence.¹⁶⁹ Janda and Parag emphasise, also in relation to the mode of influence, that they are not as distinct as the direction of influence (upstream, downstream, and sideways). There are in fact blurred lines between the different modes of influence, for instance, between enabling and mediating an innovation. Replacing a triple-glazed window in a building renovation, for example, might require some adaptations to fit it in the existing window frame.¹⁷⁰

2.1.4 Difficulties with the middle agents and the middle-out perspective

Some difficulties with the middle-out perspective are addressed by Janda and Parag¹⁷¹, and Parag and Janda¹⁷². First, Janda and Parag argue that it is hard to give a strict definition of what, who and where the middle is; it might even be problematic and regarded as relative or subjective. Hence, the term is vague and lacks a clear definition. Generally, it is easier to define the two ends of a dimension (the bottom and top) than

¹⁶⁷ See also Janda & Parag, “A middle-out approach for improving energy performance”, *op. cit.*, p. 45. See also *ibid.*

¹⁶⁸ See also *ibid.*

¹⁶⁹ See also *ibid.*, p. 40; Parag & Janda, “More than filler”, *op. cit.*, p. 103.

¹⁷⁰ See also Janda & Parag, “A middle-out approach for improving energy performance”, *op. cit.*, p. 47.

¹⁷¹ Janda & Parag, “A middle-out approach for improving energy efficiency”, *op. cit.*; Janda & Parag, “A middle-out approach for improving energy performance”, *op. cit.*

¹⁷² Parag & Janda, “Midstream and sideways”, *op. cit.*

the area that lies in between (the middle).¹⁷³ Therefore, they argue that a finer definition of the middle is needed, especially in relation to energy and climate policy.

Second, Janda and Parag argue that middle actors, in order to exert influence, need links to the top and bottom. But they also say that not all middle actors have such links. It is a challenge to find and recognise the right actors for specific tasks.¹⁷⁴

Third, Janda and Parag also note that the middle actors have their own agenda and interests which are not necessarily in line with the change that the top has told them to drive. Further, middle agents could be in a powerful position where they can manipulate the top and/or the bottom and thereby shift goals to fit their own interests.¹⁷⁵

Fourth, regarding the question of who the middle is, Janda and Parag say there is no cohesive group definition. In general, within energy research, who, what and where the middle is might be conceptualised in several ways. Looking at the energy system more generally, one can refer to the interface of supply and demand (e.g., including transmission and distribution systems). In the energy demand field, other examples of the middle could be the role of actors in the supply chains, for example, property agents, builders, architects or engineers.¹⁷⁶ I will elaborate on my definition of the middle in section 2.3.

2.2 A practice theory approach to study the planning and design meetings

There are many researchers who argue that practice theories are promising for raising policy and research questions as regards the agenda of achieving more sustainability.¹⁷⁷ I use an approach drawn from social practice theories for my analysis to study the meetings of project groups in the planning and design phase for three renovation projects. I look closely at how energy questions, goals and energy measures are handled during the meetings with the aim of understanding how decisions concerning which energy measure to enable or disable are prepared. To analyse negotiations among the middle actors in the project groups, I argue that it is possible to conceptualise the planning and design phase meetings as a practice in itself.¹⁷⁸ There are many different practice theories, and I will apply Gram-Hanssen's¹⁷⁹ developments

¹⁷³ See also *ibid.*, pp. 11, 13.

¹⁷⁴ See also Janda & Parag, “A middle-out approach for improving energy efficiency”, *op. cit.*, p. 1205.

¹⁷⁵ See also *ibid.*

¹⁷⁶ See also *ibid.*

¹⁷⁷ See also Gram-Hanssen, “Understanding change and continuity”, *op. cit.*; Shove, *op. cit.*; Elizabeth Shove, Mika Pantzar & Matt Watson, *The dynamics of social practice: everyday life and how it changes*, Sage, London, 2012; Bartiaux et al., *op. cit.*, 2014.

¹⁷⁸ This argument is mainly based on Schatzki helping me to ground my work in thoughts on work, organisation and practice. Schatzki, “The sites of organizations”, *op. cit.*; Schatzki, “On organizations as they happen”, *op. cit.*

¹⁷⁹ See also Gram-Hanssen, “Residential heat comfort practices”, *op. cit.*; Gram-Hanssen, “Standby consumption in households”, *op. cit.*; Gram-Hanssen, “Understanding change and continuity”, *op. cit.*

of practice theory, but I am also inspired by Schatzki's¹⁸⁰ work on practice and organisations. Thus, I use Gram-Hanssen's¹⁸¹ practice theory approach in a work setting rather than a household setting as she does in her research.

From a building energy efficiency perspective, there are elements holding a practice together which affect end-use efficiency, life-cycle efficiency and environmental impact (different elements will be presented below). Practice theory and the analysis of practices provide promising tools for understanding how best to improve these.¹⁸² I do not investigate everyday household practice in relation to energy use but instead the practice of the professionals as they prepare for and take decisions on what energy measures to install in an apartment when doing a renovation. As Janda and Killip¹⁸³ ask with regard to technology, people and buildings: Who are the people that matter the most? This is certainly difficult to answer, but, for example, Janda and Killip¹⁸⁴, Janda and Parag, and Parag and Janda¹⁸⁵ and I pay attention to the people deciding on the choice of technology to be installed rather than to the people using the technology. I look at the practices of the professionals choosing the technology and how they act and negotiate during the planning and design of building renovations.

2.2.1 Different approaches within practice theory

There is no unified theory of practice; rather, it is a fragmented body of theories. There are different scholarly traditions for what is described as the practice turn in social science.¹⁸⁶ As Nicolini says, practice theory is a broad family of theoretical approaches that have historical and conceptual similarities. Practice theory “*can only be approached as plurality*”.¹⁸⁷

Nicolini gives a broad historic overview of the different scholars using a practice theory approach or an approach related to practice theory, and he emphasises that there are many authors in social theory who use elements or parts of a practice theory approach or relate to practice theory. Practice theory claims its roots in a number of diverse approaches and traditions, from the Greek classics to Marx, Heidegger and

¹⁸⁰ Schatzki, “The sites of organizations”, op. cit.; Schatzki, “On organizations as they happen”, op. cit.

¹⁸¹ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.

¹⁸² See also Jenny Palm & Sarah Darby, “The meanings of practices for energy consumption: a comparison of homes and workplaces”, *Science & Technology Studies*, vol. 27, no. 2, 2014, p. 75.

¹⁸³ See also Janda & Killip, op. cit.

¹⁸⁴ See also *ibid.*

¹⁸⁵ See also Janda & Parag, “A middle-out approach for improving energy efficiency”, op. cit.; Janda & Parag, “A middle-out approach for improving energy performance”, op. cit., p. 42.; Parag & Janda, “Midstream and sideways”, op. cit.; Parag & Janda, “More than filler”, op. cit.

¹⁸⁶ See also Andreas Reckwitz, “Toward a theory of social practices”, *European Journal of Social Theory*, vol. 5, no. 2, 2002, p. 243; Gram-Hanssen, “Residential heat comfort practices”, op. cit., p. 176; Kirsten Gram-Hanssen, “Consuming Technologies – Developing Routines”, *Journal of Cleaner Production*, vol. 16, 2008.

¹⁸⁷ Davide Nicolini, *Practice theory, work, and organization: an introduction*, Oxford University Press, Oxford 2012, p. 1.

Wittgenstein, to Giddens and Bourdieu and on to contemporary developments.¹⁸⁸ Reckwitz also gives an overview of social theory and the position of practice theory within social theory and describes the development from the homo-economicus to the homo-sociologicus to the homo-practicus.¹⁸⁹ Nicolini shows approaches within practice theory mainly dealing with work and organisational matters.¹⁹⁰ Also, Schatzki elaborates on the use of practice theory for the study of organisations.¹⁹¹ There are also many researchers using social practice theories in order to understand everyday practices in relation to energy consumption.¹⁹² These studies all refer to and use the practice theory formulated by Schatzki, then further developed by Reckwitz.¹⁹³ For consumer studies, practice theory was (re)introduced mainly in the 2000s (Shove and Pantzar¹⁹⁴, Warde¹⁹⁵). These approaches follow from Giddens' structuration theory (Giddens) and the outline of a theory of practice by Bourdieu.¹⁹⁶ For the energy consumption studies, the contributions from, for instance, Shove and Gram-Hanssen, are referred to in many other studies.¹⁹⁷

Gram-Hanssen¹⁹⁸ writes about practice theory that highlights socio-technical structures in order to do an analysis on the stability of consumer practice and discusses possibilities for change. There are studies that use practice theory for analysing renovations of buildings.¹⁹⁹ However, these studies usually focus on private

¹⁸⁸ Nicolini, op. cit.

¹⁸⁹ Andreas Reckwitz, "The status of the 'material' in theories of culture. From 'social structure' to 'artefact'", *Journal for the Theory of Social Behaviour*, vol. 32, 2002.

¹⁹⁰ Nicolini, op. cit.

¹⁹¹ See also Schatzki, "The sites of organizations", op. cit.; Schatzki, "On organizations as they happen", op. cit.

¹⁹² See e.g., Françoise Bartiaux & Luis Reátegui Salmón, "Are there domino effects between consumers' ordinary and 'green' practices? An analysis of quantitative data from a sensitisation campaign on personal carbon footprint", *International Review of Sociology*, vol. 22, no. 3, 2012; Gram-Hanssen, "Standby consumption in households", op. cit.; Tom Hargreaves, "Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change", *Journal of Consumer Culture*, vol. 11, no. 1, 2011; Inge Røpke & Toke Haunstrup Christensen, "Energy impacts of ICT: Insights from an everyday life perspective", *Telematics and Informatics*, vol. 29, 2012; Yolande Strengers, "Air-conditioning Australian households: the impact of dynamic peak pricing", *Energy Policy*, vol. 38, no. 11, 2010; Yolande Strengers, "Beyond demand management: co-managing energy and water practices with Australian households", *Policy Studies*, vol. 32, no.1, 2011; Bartiaux et al., op. cit., p. 526.

¹⁹³ Theodor R. Schatzki, *Social practices: a Wittgensteinian approach to human activity and the social*, Cambridge University Press, Cambridge, 1996; Reckwitz "The status of the 'material' in theories of culture", op. cit.

¹⁹⁴ Elizabeth Shove, & Mika Pantzar, "Consumers, producers and practices. Understanding the invention and reinvention of Nordic walking", *Journal of Consumer Culture*, vol. 5, no. 1, 2005.

¹⁹⁵ Alan Warde, 'Consumption and theories of practice', *Journal of Consumer Culture*, vol. 5, no. 2, 2005.

¹⁹⁶ See also Anthony Giddens, *The Constitution of Society*. Polity Press, Cambridge, 1984; Pierre Bourdieu, *Outline of a theory of practice*. Cambridge University Press, Cambridge, 1977[1972]; Pierre Bourdieu, *The logic of practice*, Polity Press, Cambridge, 1990[1980] In: See also Bartiaux et al., op. cit., p. 526.

¹⁹⁷ See also Elizabeth Shove, *Comfort, cleanliness and convenience. The social organization of normality*, Berg, Oxford and New York, 2003; Gram-Hanssen, "Residential heat comfort practices", op. cit.; Gram-Hanssen, "Standby consumption in households", op. cit.; Gram-Hanssen, "Understanding change and continuity", op. cit.; Palm & Darby, op. cit., p. 74.

¹⁹⁸ See also Gram-Hanssen, "Residential heat comfort practices", op. cit.; Gram-Hanssen, "Standby consumption in household", op. cit.; Gram-Hanssen, "Understanding change and continuity", op. cit.

¹⁹⁹ See overview by Vlasova and Gram-Hanssen, op. cit.

homeowners and their energy- and retrofitting-related practices,²⁰⁰ and not the professionals involved in renovations of multi-unit dwellings.

My contribution will be to apply the practice theory approach to a study of professionals' planning and design meeting practice for renovation projects with a focus on their considerations of energy.

2.2.2 What is a practice?

There is no common agreement on practice theory, and practice can be understood as a dynamic concept.²⁰¹ Practice theory is changing and developing and can be interpreted in different ways. However, one rather general understanding within practice theory is about what a practice is: “[a] practice is [...] a routinized behaviour in which bodies are moved, objects are handled, subjects are treated, things are described and the world is understood.”²⁰² Both structures and agents are considered in a practice and they depend on each other, and thereby constitute a duality in a practice context. It can be noted that in everyday activities a social actor falls back on, as well as reproduces, societal structures.²⁰³ Furthermore, a practice is not described as a set of individual actions but rather comprises modes or social relations and mutual actions.²⁰⁴

The idea with practice theory and the study of everyday practices is to focus on activities in a social context and not solely from either a psychological, behavioural or technological perspective. This also includes the constant negotiation with time constraints, financial resources and the needs of others. It means placing things people do in their everyday lives in the perspective of cultural as well as social networks. The idea within practice theory is that clusters of activities can be identified in the performances of everyday life. Their coordination and interdependence make it meaningful for the practitioners to see them as entities, like cooking or cleaning, for instance. This kind of organised set of activities can be regarded as a coordinated entity, or cluster, and can be seen as recognisable across time and space. A practice is an enduring entity and a set of doings and sayings. Further, practices are social, and when a practice is performed the actor connects not only with those s/he interacts with, there is also a connection with everyone else performing the practice. Practices are performed by people in ways that make sense for them and, further, they are expressions of the distributed agency of people and things. A practice can involve the use of different

²⁰⁰ See also See also Gram-Hanssen, “Residential heat comfort practices”, loc. cit.; Gram-Hanssen, “Standby consumption in households analysed with a practice theory approach”, loc. cit.; Gram-Hanssen, “Understanding change and continuity”, loc. cit.

²⁰¹ See also *ibid.*

²⁰² Reckwitz, “Toward a theory of social practices”, op. cit. p. 250.

²⁰³ See also Giddens, *The Constitution of Society*. op. cit.

²⁰⁴ See also Shove, Pantzar & Watson, op. cit.

kinds of materials and technologies, even though people might not be aware of all the resources that are involved.²⁰⁵

Bartiaux et al. emphasise that a practice must also be enacted regularly at the aggregated level and not necessarily by each individual.²⁰⁶ Thus, this is an additional argument for studying planning and design meetings as practice since it is not always the same people participating in each meeting. A study of planning and design meeting practice involves and assembles different doings. Examples of other practices assembling different doings could be a farming practice or business practice, which Shove et al. call “complexes of practices”. Schatzki²⁰⁷ and Shove et al. talk about bundles of practices,²⁰⁸ which are “*loose-knit patterns based on the co-location and co-existence of practice*”.²⁰⁹ Shove et al. argue and hypothesise that these bundles and complexes can appear and disappear as a result and consequence of collaboration and competition that occur between practices.²¹⁰

2.2.3 Schatzki on the study of organisations with a practice theory approach

The possibility of using a practice theory approach for the study of organisations is discussed by Schatzki.²¹¹ Since I study professionals and their meeting practice in the planning and design phase of building renovations, it has to be acknowledged that it takes place in an organisational setting. The renovation is initiated by one organisation, the housing company, but it also brings in other organisations during the planning and design phase by contracting external consultants, hence forming a temporary coalition of internal employees and external consultants. It is this temporary coalition of employees and consultants who conduct the meetings.

As a new approach, Schatzki defines site ontology²¹², where social life is connected and tied to a context, which is the site. Thus, in his site ontology concept he implies that social life or human coexistence is tied and related to a context. He sees the type of context as central to the analysis of social phenomena as well as an explanation for it. For him, the site of the social is built upon nexuses of practices and material

²⁰⁵ See also Palm & Darby, op. cit., pp. 74, 75.

²⁰⁶ Bartiaux et al., op. cit., 2014.

²⁰⁷ Schatzki, “The sites of organizations”, op. cit.; Schatzki, “On organizations as they happen”, op. cit.

²⁰⁸ See also Elizabeth Shove et al., *The Design of Everyday Life*, Berg, Oxford, 2007; Schatzki, “Social practices: a Wittgensteinian approach to human activity and the social”, op. cit.

²⁰⁹ Shove, Pantzar & Watson, op. cit., p. 81.

²¹⁰ Shove, Pantzar & Watson, op. cit.

²¹¹ See also Schatzki, “The sites of organizations”, op. cit.; Schatzki, “On organizations as they happen”, op. cit.

Schatzki describes the origin and perpetuation of an organisation related to but slightly different from organisational theory (for instance, rational organisations, neo-institutionalism system theories and selection theories). He clarifies that his remarks on organisations are rather general and programmatic since he is neither an organisational theorist nor a sociologist or economist but a philosopher (see Schatzki, “The sites of organizations”, op. cit., p. 465).

²¹² Since the beginning of social theory, it has been divided into two social ontological camps, namely, individualism and societism.

arrangements, thus social life inherently transpires as a part of these nexuses. Not only human coexistence but also material arrangements play a role in a practice.²¹³ To Schatzki, “practice” refers to organised human activities (such as political practices, cooking practices, educational practices, management practices, meeting practices, design practices and so on);²¹⁴ a practice is “*an organized, open-ended spatial-temporal manifold of actions*”²¹⁵. Further, Schatzki argues that an organisation has these two basic components, first, the performance of constituent actions and practices, and second, material arrangements supporting activities, thus an organisation is a bundle of practices and material arrangements.²¹⁶ The structure or organisation of a practice, in turn, has four principal phenomena or elements, according to Schatzki.²¹⁷

The first element consists of (*practical*) *understandings and complexes of know-how* for actions making out a certain practice. Examples would be knowing how to email and to identify emailing. The second element refers to *rules*, which concern clear directives, admonishments, or instructions which can be observed or disregarded by the practice participants. The third element, *teleological-affective structuring*, comprises various different ends, projects, actions and perhaps emotions as well as end-project-action combinations (teleological orderings) which the participants regard as acceptable or valuable and enjoy or see as worth pursuing and realising. The fourth and final element of a practice is *general understandings*, which, for instance, might be a general insight about the nature of work or a proper student-teacher relationship.²¹⁸

For material arrangements, Schatzki refers to set-ups of material objects which have four types of entities, namely, human beings, artefacts, organisms and things. He points out examples such as a classroom, a manufacturing plant, a call centre, a boardroom, or a forest. If someone acts, s/he carries on a practice; this is also done in a setting of material entities.²¹⁹ These active nonhuman components have the ability to shape activity, redirect practices and induce decisions. Nowadays, however, many organisational theorists are emphasising the dependency of an organisation’s behaviour on its environment.²²⁰

Schatzki writes about what it means to do a site analysis of an organisation, which constitutes a bundle of practices and material arrangements.²²¹ “[A]ll the interactions, coordinated actions, routines, collective activities, formal structures, rules and hierarchies, forms of communication, technologies, organizational ‘cultures’

²¹³ See also Schatzki, “The sites of organizations”, op. cit., pp. 465, 467, 473.

²¹⁴ See also *ibid.*, p. 471.

²¹⁵ *Ibid.*

²¹⁶ See also Schatzki, “On organizations as they happen”, op. cit., pp. 1863, 1864.

²¹⁷ See also Schatzki, “The sites of organizations”, op. cit.; Schatzki, “On organizations as they happen”, op. cit.

²¹⁸ See also Schatzki, “The sites of organizations”, op. cit., pp. 471, 472; Schatzki, “On organizations as they happen”, op. cit., p. 1864.

²¹⁹ See also Schatzki, “On organizations as they happen”, op. cit., p. 1864, and Schatzki, “The sites of organizations”, op. cit., p. 472.

²²⁰ See also Schatzki, “The sites of organizations”, op. cit., pp. 478, 479.

²²¹ See also *ibid.*, p. 474.

(including moral cultures), shifting coalitions of members, and the like that investigators of organizations study are features, often complicated features, of the interconnected practice-arrangement bundles that compose the organization."²²² The organisation integrates different practices; for instance, an academic department would include grading practices, research practices, advising practices, governance practices, administrative practices, meeting practices, community-building practices and consultation practices. The material arrangements it comprises include layouts and material connections between people's offices, meeting rooms, hallways, front offices, lounges and so on.²²³

The perpetuation of practice structure can be understood as organisational memory.²²⁴ Regarding the performance of actions of an organisation and those dimensions of the structure that are not part of a performance, Schatzki argues that they are held in organisational memory. The elements of an organization's practice structure, namely, the performance of different organisation actions, continue to exist even between the performances. This is also valid for the elements of the organisation's arrangements, and this is what Schatzki calls practice memory, which is the persistence of structure from the past into the present. Therefore, the sum of the practice memories is also the organisation's memory. We can see that an organisation has an accumulated knowledge about the organisation's past.²²⁵ By "practice memory" Schatzki is referring to a persistent structure of a practice. Thus, the content, or structure, of the practice memory is comprised of a complex of practical understandings, rules, teleological orderings and general understandings. Further, it should be noted that practice memory does not mean that these versions continuously exist; a practice can be changed.²²⁶

When it comes to perpetuation, it can be noted that a practice component of a practice-arrangement bundle is continued when individuals carry them forward. It also has to be noted that practices are not static, which means that they can evolve when circumstances change, opportunities or problems appear, personnel change, new ideas develop and so on. Thus, it is possible that changes in practice-arrangement bundles are intentional or unintentional and, further, they can be known or unknown to the participants. Moreover, changes are usually fragmentary and gradual. It is also possible for practices to be changed completely if conscious interventions (from the inside or outside) rework goals, alter rules and redesign projects.²²⁷

²²² Ibid., p. 478.

²²³ See also *ibid.*, p. 474.

²²⁴ See also Schatzki, "On organizations as they happen", *op. cit.*, pp. 1863, 1864.

²²⁵ See also *ibid.*, pp. 1867, 1868.

²²⁶ See also *ibid.*, p. 1869.

²²⁷ See also Schatzki, "The sites of organizations", *op. cit.*, pp. 475, 476.

2.2.4 Elements holding a practice together according to Gram-Hanssen

*“Practices are coordinated entities of sayings and doings that are held together by different elements and that are also what make practices collectively shared across time and space.”*²²⁸ Researchers’ opinions vary regarding which elements hold a practice together. Gram-Hanssen reviews different authors and describes what, according to them, holds a practice together. An overview of key elements is shown in table 2.1.²²⁹

Table 2.1: Key elements in the understanding of practice²³⁰

Schatzki (1996, 2002, 2005, 2006)	Warde (2005)	Shove, Pantzar (2005)	Reckwitz (2002b)	Gram-Hanssen (2010a)	Gram-Hanssen (2010b), 2011)
Practical Understanding	Understandings	Competences	Body	Practical understanding, embodied habits, know-how	Know-how and embodied habits
			Mind		
			The agent		
			Structure/ process		
Rules	Procedures	Meanings	Knowledge	Rules, knowledge, language	Institutionalised knowledge and explicit rules (only on 2011)
Teleo-affective structures	Engagement meanings		Engagements		
General understandings (from 2005, 2006)					
	Items of consumption	Products	Things	Products, 'things', technology	Technologies

As seen in the table, the different practice theory approaches mentioned here use different numbers of elements that link the “sayings and doings” in order to constitute a practice. Schatzki initially suggests three different elements holding a practice

²²⁸ Gram-Hanssen, “Understanding change and continuity”, op. cit., p. 64

²²⁹ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households analysed with a practice theory approach”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.

²³⁰ Based on see also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.; additional information: Palm & Darby, op. cit.

together: understandings, rules and teleo-affective structures.²³¹ In his later work, Schatzki adds the fourth element of general understandings.²³² Warde²³³ refers to them as understandings, procedures, engagements and items of consumption. Also, Shove and Pantzar take these, but combine understandings and rules into the element competences; furthermore, they rename teleo-affective structures and call them “meanings”, and they add another element, products.²³⁴ This “product” element is based on and inspired by the work of Reckwitz²³⁵ on trying to include the material.²³⁶

For my analysis of the meeting practice of project groups’ handling of energy issues, however, the most relevant formulation of how a practice is held together is the developments made by Gram-Hanssen.²³⁷ The main difference between the often used approach by Shove and Pantzar²³⁸ and Gram-Hanssen’s²³⁹ approach is that Gram-Hanssen follows Schatzki. Therefore, the single element “competences” in the Shove and Pantzar approach, in Gram-Hanssen’s approach consists of two elements: (1) know-how and habits, and (2) institutionalised knowledge and explicit rules.²⁴⁰ During the project groups’ meetings, know-how and habits play a crucial role compared to institutionalised knowledge and explicit rules, and this is one reason why I chose Gram-Hanssen’s approach.

Gram-Hanssen states that one disagreement within practice theory has to do with how to incorporate materiality, things and technology. She highlights that different positions can be distinguished; for example, technologies can be viewed as products of practices and also as a crucial element that holds practices together.²⁴¹ Gram-Hanssen sees technology as a necessary element that holds practices together, which is decisive when it comes to bringing change into practices.²⁴² Thus, another reason for following her approach is that she explicitly includes the element technology, which is also important in my analysis.

²³¹ Schatzki, “*Social practices: a Wittgensteinian approach to human activity and the social*”, op. cit.; Theodore R. Schatzki, *The site of the social: a philosophical account of the constitution of social life and change*, Pennsylvania State University Press, Pennsylvania, 2002.

²³² See also Schatzki, “The sites of organizations”, op. cit.; Schatzki, “On organizations as they happen”, op. cit.

²³³ See also Alan Warde, op. cit.

²³⁴ Shove, & Pantzar, op. cit.

²³⁵ See also Reckwitz, “Toward a theory of social practices”, op. cit.

²³⁶ See also Kirsten Gram-Hanssen, “Standby consumption in households”, op. cit. pp.154-155; see also Gram-Hanssen, “Understanding change and continuity”, op. cit., pp. 64-65; Bartiaux et al., op. cit., p. 527.

²³⁷ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.

²³⁸ Shove, & Mika Pantzar, “Consumers, producers and practices”, op. cit.

²³⁹ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households analysed with a practice theory approach”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.

²⁴⁰ See also Bartiaux et al., loc. cit.

²⁴¹ Gram-Hanssen, “Understanding change and continuity”, op. cit. p. 62.

²⁴² See Theodore R. Schatzki, Karin Knorr Cetina & Eike von Savigny, *The practice turn in contemporary theory*, Routledge, London, 2001, in Gram-Hanssen, “Understanding change and continuity”, op. cit. p. 62.

I will use the elements defined by Gram-Hanssen for understanding the meeting practice of the project groups with a special focus on how energy is treated.²⁴³ This still goes together with Schatzki's discussions on practice theory and organisation studies. The elements holding a practice together developed by Gram-Hanssen are based on and related to Schatzki (as can be seen in the description below and table 2.1). Also, Schatzki highlights materiality as important to consider when studying practice and organisations; however, he does not see technology as central for holding a practice together in itself.²⁴⁴

Here, I briefly describe what the elements presented by Gram-Hanssen stand for and how they relate to those of other practice theory researchers.²⁴⁵ As seen in table 2.1, these elements are also slightly differently defined by Gram-Hanssen.²⁴⁶ The elements chosen from Gram-Hanssen for analysis by Bartiaux et al. (Gram-Hanssen is also one of the authors of this work) are relevant, as their study is on renovation and homeowners.²⁴⁷ Thus, in the following, I will start by describing each element based on the descriptions by Gram-Hanssen²⁴⁸, and for each element I add the perspective of Bartiaux et al.²⁴⁹ for studying homeowner renovation.²⁵⁰

(1) *“Practical understanding, embodied habits, know-how”* refers to embodied knowledge. This is about knowing what to do, and how to identify and react to various phenomena. Further, this means that there are routinised activities that are bodily and mentally²⁵¹ *“carried out by (or in Reckwitz’s term, ‘carried by’) practitioners who at the same time respond to the patterns that constitute this practice and contribute to sustaining and developing the practice. This is also what relates to Bourdieu’s ‘habitus’.”*²⁵²

In line with Bartiaux et al., for this element I will investigate *“know-how and embodied habits”*, referring to the different kinds of skills and know-how which must be obtained by craftsmen, building professionals and practitioners or DIY homeowners.²⁵³ Know-how and habits can be regarded as crucial elements of what constitutes and holds a practice together. It refers to routines that are taken for granted

²⁴³ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.

²⁴⁴ See also Schatzki, “The sites of organizations”, op. cit.; Schatzki, “On organizations as they happen”, op. cit.

²⁴⁵ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.

²⁴⁶ See also *ibid.*

²⁴⁷ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.; Bartiaux et al., op. cit., 2014.

²⁴⁸ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.

²⁴⁹ See also Bartiaux et al., op. cit., 2014.

²⁵⁰ In my analytical framework (2.3) I will then describe the elements relevant for my analysis that I have selected in an abductive process.

²⁵¹ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit., p. 177.

²⁵² *Ibid.*

²⁵³ See also Bartiaux et al., op. cit., p. 528.

– things people do without first reflecting on them. Further, this element represents the routinised part of a practice.²⁵⁴

(2) When it comes to the element “*rules, knowledge, language*”, different researchers offer different ideas. Schatzki includes in his concept of “rules” explicit rules of how to do things, what is allowed and what is not allowed; however, he does not include in this concept either tacit knowledge or implicit rules. Problems may occur when one assigns other types of knowledge, such as tacit knowledge or cultural myth, to the other elements. Warde²⁵⁵ calls the rules “procedures”. The issue here is that it might be problematic to separate procedures from practical understandings. Another approach has been taken by Shove and Pantzar²⁵⁶, who label this element “competences”. Their approach, however, does not differentiate between tacit and verbal/theoretical knowledge. According to Gram-Hanssen, this is not satisfactory when it comes to energy consumption and comfort. Reckwitz²⁵⁷ refers to this element as “knowledge and language/ discourse”. Gram-Hanssen, especially for the context of her paper on residential heat comfort practices, also includes technical knowledge and cultural myths of heating systems and energy consumption, as well as rules on how to regulate the system.²⁵⁸

As Bartiaux et al.²⁵⁹ do, I will focus my analysis on “*institutionalised knowledge and explicit rules*”, which are decided and influenced through different kinds of policies or rules and regulations. This would include, for instance, procedures for applying energy-related subsidies, explicit rules on house insulation, and advice on energy assessment.

(3) Gram-Hanssen’s element “*engagements, meanings*” relates to Schatzki, who writes about the concept “teleo-affective structures”, which means “ends, projects, tasks, purpose, beliefs, emotions or moods”²⁶⁰. It is a combination of teleological and affective and refers to being goal oriented, and it has to be stated that the goal here is directed by normative views or moods.²⁶¹ Gram-Hanssen claims that “*This is complicated compared with engagements or meanings used by Warde (2005) and Shove and Pantzar (2005), respectively. Practitioners are engaged and meaning accumulates through their actions. This must be an important element of holding a practice together.*”²⁶²

Bartiaux et al.²⁶³ highlights that engagements and meanings do include reasons to renovate a building, but they are not reduced to that, which I will investigate.

²⁵⁴ See also *ibid.*, p. 530.

²⁵⁵ See also Warde, *op. cit.*

²⁵⁶ Shove, & Pantzar, “Consumers, producers and practices”, *op. cit.*

²⁵⁷ See also Reckwitz “The status of the ‘material’ in theories of culture.”, *op. cit.*

²⁵⁸ See also Gram-Hanssen, “Residential heat comfort practices”, *op. cit.*

²⁵⁹ See also Bartiaux et al., *op. cit.*, 2014.

²⁶⁰ See also Gram-Hanssen, “Residential heat comfort practices”, *op. cit.*

²⁶¹ See also Bartiaux et al., *op. cit.*, 2014.

²⁶² See also Gram-Hanssen, “Residential heat comfort practices”, *op. cit.*, p.177

²⁶³ See also Bartiaux et al., *op. cit.*, 2014.

(4) Regarding “*products, ‘things’, technologies*”, Schatzki does not take into account the material structure, “things” or technologies as factors that hold a practice together; he sees them instead as a result of social practice. Gram-Hanssen²⁶⁴ argues that this could be problematic. However, there are many socio-technical studies that have emphasised and presented how technology is a crucial part when it comes to structure practices. Warde²⁶⁵ uses “things” such as items of consumption when participating in a practice, and Reckwitz²⁶⁶ as well as Shove and Pantzar²⁶⁷ take in the concept of “things” and technologies as a more crucial element that holds a practice together.²⁶⁸

For my analysis “*technologies*” can be regarded as crucial aspects for a renovation-related practice according to Bartiaux et al.²⁶⁹ What it refers to is the physical features of the house, its materials, and available products on the market for conducting the renovation.²⁷⁰

The perpetuation and change of practices do not spring from rational argumentation, as the practice, the actual doing, is a combination and assemblage of what can be seen as easy or straightforward, obtained knowledge and the technology at hand as well as engagements and meaning, which are also associated with the knowledge.²⁷¹

²⁶⁴ Kirsten Gram-Hanssen, “Practice theory and the green energy consumer”, Paper presented at the Annual Conference of the European Sociological Association, “Conflict, Citizenship and Civil Society”, Glasgow, UK, 3–6 September, 2007; Kirsten Gram-Hanssen, “Consuming technologies – developing routines”, op. cit.

²⁶⁵ See also Warde, op. cit.

²⁶⁶ See also Reckwitz “The status of the ‘material’ in theories of culture, op. cit.; Reckwitz, “Toward a theory of social practices”, op. cit.

²⁶⁷ Shove, & Pantzar, op. cit.

²⁶⁸ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit., p.177

²⁶⁹ See also Bartiaux et al., op. cit., 2014.

²⁷⁰ See also Bartiaux et al., op. cit., p. 528.

²⁷¹ See also Gram-Hanssen, “Standby consumption in households”, op. cit., p. 158.

2.3 Investigating energy efficient middle-out practices – analytical framework

In this section I briefly summarise the theoretical perspectives and approaches discussed in the previous sections and present the analytical framework I have developed for my analysis. I will test a combination of the middle-out and practice theory approaches and utilise the developed framework to analyse the planning and design phase of renovation projects. I have adapted the two theoretical approaches in an abductive process to the needs of my case study, and I have therefore made some alterations compared to the original works.

2.3.1 Locating and defining the middle professionals in my case study

With the middle-out perspective I aim to investigate the planning and design phase of renovation projects and how and why energy measures are enabled or disabled. I focus on the professionals involved in the planning and design phase and explore their roles regarding energy reduction and increased energy efficiency in buildings. Thus, in my analysis, I regard the members of the renovation project groups as professionals in the middle. The middle actors are not simply “fillers”, according to Janda and Parag, and Parag and Janda²⁷², but have their own characteristics, logic and influence on renovation projects.

The middle-out perspective acknowledges that change opportunities are actively driven (or impeded) by professionals in the middle. They operate in a system where change is commonly seen as flowing from the top and downwards (e.g., from government policy) or from the bottom and upwards (e.g., from consumer demand). The middle professionals can exert their influence upstream to the top actors, downstream to the bottom actors and also sideways to other professionals in the middle. The middle-out perspective is originally designed to describe the work between organisations. However, I apply the middle-out perspective on a project level in a municipal housing company in order to investigate the planning and design phase within renovation projects.

This transformation of the middle-out perspective is shown in the following three figures (figures 2.3 – 2.5), where the use of the middle-out perspective from the original use is consequently transformed from the original use into a project application. These figures show a step-by-step zooming in and narrowing down of different analysis foci or levels for the middle-out perspective, namely, from the between-organisations focus to the organisational focus, exemplified with the municipal housing company, and

²⁷² See also Janda & Parag, “A middle-out approach for improving energy efficiency”, op. cit.; Janda & Parag, “A middle-out approach for improving energy performance”, op. cit., p. 42.; Parag & Janda, “Midstream and sideways”, op. cit.; Parag & Janda, “More than filler”, op. cit.

finally the focus on one single phase in a renovation project initiated and hosted by the municipal housing company. These figures additionally illustrate the middle actors' influence in different directions in renovation projects, upwards, downwards and sideways.

Figure 2.3: Step 1: From between-organisations to a focus within a company

In section A of figure 2.3, the blue lines describe the original intention of the middle-out perspective, showing the middle as in a society and between organisations. Another application is to use the middle-out perspective for a company analysis, as the purple figure, section B in figure 2.3, shows (e.g., similar to Goulden and Spence²⁷³).

My investigation of the planning and design phase of renovation projects in a municipal housing company is not a pure company analysis, but rather an analysis of one phase in renovation projects initiated by the company. It is thus possible to zoom in even further on the company, and then I focus solely on the planning and design phase of renovation projects.²⁷⁴ Thereby the element of between organisations comes in again, since building professionals from different external consultant firms are contracted to perform planning and design tasks. At the bottom, the tenants and the Swedish Union of Tenants play a role in renovation projects, but they are not part of

²⁷³ See also Goulden & Spence, op. cit.

²⁷⁴ From a company perspective, the renovation projects are only a piece in the big mosaic comprising the operations of the company as a whole, since the company has many other projects ongoing simultaneously, for instance, construction of new dwellings.

the housing company per se either. This step from a company analysis to an analysis on a project level is shown in figure 2.4.

Figure 2.4: Step 2: From one company to a project phase with between-organisation elements

Section B, the purple figure, in figure 2.4 is equal to section B in figure 2.3, while section C (green in figure 2.4) zooms in and focuses on the planning and design phase of renovation projects in the municipal housing company Stångåstaden.

In section C alone, the focus on the planning and design phase in a renovation process is graphically shown in figure 2.5. I consider the professionals who are directly involved in the project groups during the renovation planning and design phase as the middle. This includes internal employees as well as the external consultants working together in the project groups' meetings and working on the planning and design of a renovation in between the meetings. I further define the head of the company, the CEO and the investment group, as the top, while the tenants and the Swedish Union of Tenants are found at the bottom. Figure 2.5 shows that the middle has an influence upstream to the investment group at the top, downstream to the tenants at the bottom, and sideways to colleagues in their own company or in the external consultant companies. Thus, the influence goes *from the middle and out* in all directions.

The formal and final decision power over renovation projects resides at the top of the company. That said, it is crucial to note that it is in the hands of the professionals in the middle to create and prepare the basis for the top's decisions. The middle actors thus have power to influence the decisions taken by the top and it is of interest to understand

how the middle professionals use this agency and capacity in energy efficiency renovation processes.

The planning and design phase of a project is performed within the municipal housing company, which is the building owner and purchaser. A project group is a temporary coalition within the municipal housing company, however, one that also engages consultants from external organisations and firms that are contracted to take part in the planning and design phase. This brings back in the between-organisations elements of the middle-out perspective by Janda and Parag. Thus, the projects stretch beyond the borders of the housing company. The external consultants, tenants and tenant association, since they come in from outside the housing company, bring the between-organisations perspective. This is also why they reach outside the triangle in figures 2.4 and 2.5, as they are not employed by the housing company and come, so to speak, from the outside in.

The tenants as well as the local Union of Tenants also play crucial roles for this phase of a renovation project, and they come to the project from the “outside-in” but are not insourced in the way the external consultants are and do not participate in the project group’s planning and design meetings. Nevertheless, their role and agency shape and influence the planning and design meetings and thus the enabling or disabling of energy measures. The current tenants, for instance, can be seen as individuals who influence the process when they express specific wishes regarding their apartments. The Swedish Union of Tenants serves as a communication channel for the tenants, especially regarding rents, in the planning and design phase. They can, in this specific situation, be seen as a collective tenant, representing their general interests.

Figure 2.5: Middle-out perspective for the project phase between organisations within the housing company

The middle-out perspective inspired me to direct attention to the middle professionals involved in renovation projects. With this approach I put the focus on the influence exerted by professionals in the middle on energy efficiency or energy saving measures in the planning and design phase, but I also investigate the middle's role in relation to the role of the top and bottom. Since the middle is a relational phenomenon it is important to investigate the influence that the three levels (top, middle and bottom) have on each other and thereby on energy efficiency issues. Thus, in order to give a more complete picture of the planning and design phase, it will also be shown how these relate to the middle.

In summary, figure 2.6 shows the development of my model.

Figure 2.6: Summary of the use of middle-out perspective from the original use to a project application in a municipal housing company

This model is a simplification which allows me to discuss how different groups of professionals and other actors influence different energy efficiency issues in the planning and design phase of renovation projects.

Who is included in the middle, at the bottom and at the top, respectively, is a construction and depends on the focus of the analysis, the context and research question. Thus, I argue that there are no strict definitions of either the middle nor the top or bottom. Instead, the definitions may shift depending on the particular context and situation.

2.3.2 Practices of middle professionals in performing renovation projects

In addition to applying the middle-out perspective, I investigate the meeting practice of the middle professionals as they handle energy measures in the project groups by using a practice theory approach. I investigate the negotiations held during the meetings of the middle professionals preparing for and taking decisions on what energy measures to install in an apartment during a renovation. Even though energy efficiency is just one of many aspects of this planning and design meeting practice, I have chosen to delimit my study to it.

It is also important to note that the studied practice is that of the project groups' meetings in the planning and design phase for renovations of multi-family apartment

dwellings within Stångåstaden, in Linköping, which means that it concerns a specific time and place.

Studying an organisation means identifying its actions and the practice-arrangement bundle(s) these actions belong to. Different practices are integrated in one and the same organisation. In a housing company these might include customer service practice, advising practice, administrative practice, meeting practice and consultation practice. In the planning and design phase of renovation projects, I have chosen to study the meeting practice of the project groups and the relation between these groups and the top and bottom of the housing company. There is a structural dimension, an organisational memory, which guides the professionals' performance of actions.²⁷⁵ The practice memory refers to the persistence of structure from the past into the present. Thus, the various practice memories build up the organisation's memory.²⁷⁶ Practice memory refers to the endurance of a practice's structure. Schatzki emphasises that practice memory does not mean that these versions will always exist, and that there is also no assurance that practice memory will continuously exist. There is room for practices to change, intentionally as well as unintentionally.²⁷⁷

Building on Schatzki²⁷⁸, Gram-Hanssen²⁷⁹, described four elements establishing the structure of a practice, this is described in detail in section 2.2.4. The four elements based on Gram-Hanssen²⁸⁰ holding a practice relevant for my analysis are illustrated in figure 2.7. In an abductive research process I selected those four elements as relevant for my case study. These four elements are (1) engagement and meaning, (2) technology, (3) explicit rules and (4) know-how and habit.

Figure 2.7: The elements holding a practice together in my case study

²⁷⁵ See also Schatzki, "On organizations as they happen", op. cit., p. 1867.

²⁷⁶ See also *ibid.*, p. 1868.

²⁷⁷ See also Schatzki, "The sites of organizations", op. cit., pp. 475, 476.

²⁷⁸ See also Schatzki, "The sites of organizations", op. cit.; Schatzki, "On organizations as they happen", op. cit.

²⁷⁹ See also Gram-Hanssen, "Residential heat comfort practices", op. cit., p. 177; Gram-Hanssen, "Standby consumption in households", op. cit.; Gram-Hanssen, "Understanding change and continuity", op. cit.

²⁸⁰ See also Gram-Hanssen, "Residential heat comfort practices", op. cit., p. 177; Gram-Hanssen, "Standby consumption in households", op. cit.; Gram-Hanssen, "Understanding change and continuity", op. cit.

With the help of the four elements holding a practice together, I investigate whether and how these elements define the practice of planning and design meetings in relation to energy questions, goals and measures for building renovations. This helps me to understand how energy measures and goals are dealt with and then why energy measures are enabled or disabled. For my analysis of the meeting practice of the project group, I follow the elements producing and reproducing a practice and divide my analysis according to them.

(1) *Engagements and meaning*: Questions of interest for the engagement element are: What are the reasons to renovate? What is seen as important by whom? Is energy important? What role does the 25-25 energy goal play?

(2) *Technologies*: Technologies referred to include the physical layout and construction of the house, the energy measures decided upon and the products and materials used in the renovation process. Examples of energy measures would be to change windows and frames or add insulation. The materiality of the house influences the energy-related renovations and what can or should be done.

(3) *Explicit rules*: I investigate the role of explicit rules, such as building rules, regulations and codes. These also include rules and goals defined by the housing company to be followed during the renovation.

(4) *Know-how and habits*: I look at the know-how and habits of the involved professionals in relation to suggesting energy measures.

It is important to note that I am studying a specific setting in time and space wherein I follow the specific meetings of the renovation project groups. My empirical material, then, is a snapshot of things appearing in the specific moments of the meetings, where discussions are held between different professionals, who bring their own set of practices into the processes. The project group members perform their tasks in various ways in the meetings of the three project groups, but they also perform important work between the meetings. For these tasks I depend on the interviews, while I also have observations from the meetings. At the same time, the meetings represent a practice of their own, namely the professionals' practice of planning and design meetings. A meeting serves as an occasion for interactions of different professional practices related to building renovation, which can help illuminate differences and similarities between professional practices. The whole professional practice of planning and design is complex and related to partly overlapping practices brought in by the various professionals.

The professionals carry with them different professional practices from their formal educational backgrounds and work experiences, which are also incorporated and become part of organisations. Different kinds of professionals, for instance, electricians, architects, and HVAC experts, bring different professional practices or bundles from the organisations where they work. At the planning and design meetings the professionals get together, and there their work practices overlap. Different practices are brought together at the meetings, and the various professionals work and create

opportunities for collaborating, arguing, and furthering the renovation project. This is shown graphically in figure 2.8.

Figure 2.8: The project groups' meeting practice – a combination of different professional work practices

In figure 2.8, four different practices brought together by different professionals are exemplified by P1, P2, P3 and P4. Together they form the planning and design practice at the meetings. Different numbers of internal employees and external consultants are involved in each project.²⁸¹ The project group meetings are moments of doings, where elements of the different practices come together. The professionals coming together in their meetings can be regarded as carriers of a planning and design practice, which endures because it is repeatedly enacted by more or less the same professionals. A practice around energy measures can exist and endure because of repeated enactments.

My analytical framework as a whole is a combination of the middle-out and practice theory approaches, which is illustrated in figure 2.9. I will use this combination of the middle-out perspective and practice theory approaches to investigate how energy measures and energy efficiency goals are discussed and transformed into plans and decisions by the project groups (middle) as well as in the interactions between the project groups and other levels (top and bottom).

²⁸¹ For simplicity and for the purpose of illustration, the figures show only four different professionals bringing in their four different work practices, which provide the grounds for the project groups' meeting practice.

Figure 2.9: Middle-out perspective and practice of the meetings

The concepts from practice theory help us understand why some energy measures come up while others are rejected by the middle professionals. This has to do with practical understandings or embodied habits, what meaning the professionals attach to energy renovations, what technology is seen to work for a certain building and what knowledge the professionals have.

Figure 2.10 is a summary of the combination of the middle professionals and their practices in the meetings of project groups in renovation processes.

Figure 2.10: The middle professionals and their meeting practice in the project groups

The project groups in the middle have the capacity and agency to enable, disable, mediate or aggregate different kinds of energy measures or practices, which will also be investigated.

CHAPTER 3

3. Methodology and material

In this chapter I will describe the methodology for my study. I begin by presenting the research project of which my work is part, since it has influenced my research design, process and fieldwork. Regarding methods, I present and discuss the case study approach, semi-structured interviews, participant observations and a document analysis, and I also briefly describe my material. Then I elaborate on how I analysed the material, and I continue by reflecting on language issues and my role as a researcher together with the other researchers that took part in the project. I end the chapter with discussions on opportunities for generalisation of a case study.

3.1 Research design, process and fieldwork in the context of a collaboration project

3.1.1 CAREER – Collaborative Research Programme on Energy Efficiency in Renovation

My research is part of a bigger research project called CAREER,²⁸² which was a collaborative, interdisciplinary research programme on energy efficiency in renovation engaging researchers at Linköping University and Stångåstaden, the municipal housing company in Linköping. The project was financed by Formas (a national funding agency)²⁸³ and partly also by Stångåstaden.²⁸⁴

The CAREER project had a double objective, on one hand, to explore how to include energy measures effectively in building renovations, and on the other, to create a model for integrated knowledge development, both in business and academia. Further, the project took an interdisciplinary research approach with researchers from two different departments at Linköping University, namely, one social science and one engineering science department, with three researchers from each department.²⁸⁵ The three studied renovation projects were post-war multi-family dwellings with a stated goal of being energy efficiency renovations. We did our research in different ways and from different perspectives, and each one of us contributed knowledge and expertise to the bigger project.

All participants in the CAREER project strove to improve the collaboration between the municipal housing company employees and researchers at the university.

²⁸² Collaborative Research Program on Energy Efficiency in Renovation.

²⁸³ Formas, Swedish Research Council.

²⁸⁴ *CAREER projektet - ett samarbete mellan Stångåstaden och Linköpings universitet (CAREER project – a collaboration between Stångåstaden and Linköping university)*, <<https://www.youtube.com/watch?v=E81dj9sXrkM>, <https://www.youtube.com/watch?v=0qcBht3Tv4w>>, accessed 2017-05-15.

²⁸⁵ Engineering department, 'Energy Systems': Bahram Moshfegh, Patrik Rohdin, Lina La Fleur .Social Science department, 'Tema T': Kajsa Ellegård, Jenny Palm, Katharina Reindl

The project aims to create better knowledge concerning each other's conditions and objectives, which might improve collaboration on energy issues in the future. One idea with the CAREER project was to bring research on energy efficiency closer to application and to increase understanding among researchers about how energy efficiency is handled in industry in practice. For the company it was a timely project because they will soon perform major renovations of Million Programme buildings and here they could learn about energy efficiency actions in renovations. As part of the CAREER project, in order to improve communication between the researchers at the university and the employees of the housing company, regular meetings were held. Representatives of the housing company and the university researchers met in the steering group twice a year from 2012 until 2016. Moreover, two excursions were arranged in order to learn from other renovation projects and to help us get to know each other. In the fall of 2013, we took a two-day excursion to Gävle in Sweden to find out more about the experiences gained during renovation projects performed by the municipal housing company Gavlegårdarna. In the fall of 2014, I arranged an excursion to Salzburg, Austria, where we visited renovation projects and learned from renovations in contexts other than the Swedish, which we did in collaboration with the Salzburg Institute for Regional Planning and Housing (SIR).²⁸⁶

3.1.2 Research design and process

In the following section I will describe what I focused on within the CAREER project, setting out my research design and process. When I entered the project it was very broad and open in terms of what research I could do, and there were few restrictions on the scope and direction my research could take. Thus, within the CAREER project context I had the opportunity to define my project rather freely. The only framing was that the project should be about energy efficient renovation of post-war buildings.

The choice of methodological approach was guided by the knowledge that research has seldom focused on the planning and design phase of renovation projects. To map the subject, I started with an explorative approach combined with an increasingly abductive approach. During the process of data collection I developed my research interest and research design further. This stands in contrast to an approach that is rigidly planned in advance, from the beginning to the end of the data collection phase. I collected rather large amounts of empirical material for my analysis, which guided the choices of analytical tools, which in turn has shaped the study and the issues investigated. It was a constant iterative process between empirical material and theoretical approach.

²⁸⁶ Salzburger Institut für Raumordnung & Wohnen, <<https://www.salzburg.gv.at>>, accessed 2017-05-15.

I followed (almost) all the meetings during the planning and design phase of the three renovation projects. Additionally, I and some of the other researchers also followed a few of the meetings for the reconstruction phase that directly followed the planning and design phase. However, I set my boundaries around the planning and design phase because this is where most of the important decisions regarding how a building will be renovated are (and were) taken. In this phase, the choices about what energy measures to implement are discussed and decided upon. Energy measures are promoted or rejected for the renovation and the result of the planned and designed renovation is then presented in the tender document. My participation in some of the meetings for the reconstruction phase showed that even in the design- [and-] build (DB) contract, no new decisions were made, and that the involved actors more or less followed the tender documents and the “big” decisions from the planning and design phase. This also supports my understanding that the most relevant decisions regarding the implementation of energy measures were taken during this phase.

3.1.3 Fieldwork period and access to the field

My main fieldwork period was from December 2012 until October 2014 and I spent a very intensive time in the field from the end of December 2012 to June 2013. The fieldwork, however, continued to October 2014, mainly because the third renovation project was delayed. Additionally, I conducted two short follow-up interviews in the spring of 2016.

Although it might be expected that access to the field should be simple and automatically given to me due to the collaboration agreement for the CAREER project, this was not always the case when considering it in more detail. At the beginning of the renovation projects it was quite difficult to get information about when meetings would take place, and I had to send several emails and phone people in order to receive updates on this kind of information. It seemed and felt like I was not a natural part of their process and they were not used to having other people there. However, I was in constant contact with the housing company through these emails and phone calls and all the different kinds of meetings. Apart from the planning and design meetings, I also participated in regular collaboration meetings with members of the housing company and us the researchers in order to inform each other on things that were going on at the moment. My (and the other researchers’) persistent participation in meetings and the excursions we took together created more trust and understanding towards each other. But I did not have a steady flow of information about the projects’ day-to-day activities until the end. All these little difficulties aside, I was granted full access to relevant internal documents, and people were very helpful, and no one refused to be interviewed.

3.2 Case study

According to Yin, case studies are commonly used for analysing research questions regarding “when”, “how” and “why” and with the focus on contemporary phenomena in a real-life context.²⁸⁷ As Schramm says: “*The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions; why they were taken, how they were implemented, and with what result.*”²⁸⁸ My motive for choosing a case study approach is that I am investigating decisions regarding how and why energy measures are promoted or rejected in renovation planning and design meetings. Furthermore, my case is a contemporary phenomenon with a real-life context.

For case studies, many variables are of interest from different data sources. Thus, multiple sources of evidence are recommended and usually combined.²⁸⁹ I combine interviews, observations and documents to reinforce findings across different data sources and reduce any potential bias.²⁹⁰

Since the three renovation projects in my study take place within one housing company, I decided to regard this company as one case. Alternatively, I could have regarded the three renovation projects as separate cases under the umbrella of one company. My decision to see the company as a single case makes it easier to discuss the role of the company’s strategies as regards energy issues in relation to the renovation projects. Also important to note is that the company does not just constitute an umbrella, but the context in which the employees might bring influences from one project to another.

3.3 Methods and material for data collection for my case study

I applied semi-structured personal and telephone interviews, I did participant observations and I gathered documents for my analysis. In the following section I will describe these methods and materials in more detail. I start with a short description of the material, which includes a brief overview of the projects and an introduction to the participants in the interviews as well as the participant observations. Then I present methods of semi-structured interviews, the participant observations and the document analysis. I finish the section with a summary and overview of the methods, material and participants.

²⁸⁷ See also Robert Yin, *Case study research: design and methods*. Sage, London, 2009, pp. 2, 18.

²⁸⁸ Schramm 1971, emphasis added: In Yin, *Case study research*, (2009) op. cit., p. 17, and in R.K. Yin. *Case study research: design and methods*. Applied Social Research Series, Vol. 5, Sage, London, 1989, pp. 22–23.

²⁸⁹ See also Yin, *Case study research*, (2009) op. cit., p. 2.

²⁹⁰ See also Glenn A. Bowen, “Document analysis as a qualitative research method”, *Qualitative Research Journal*, vol. 9, no. 2, 2009, p. 28.

3.3.1 Overview of the material: Planning and design phase meetings and participants

I followed the planning and design phase of three renovation projects (also abbreviated RP(s), RP1, RP2 and RP3) of the municipal housing company Stångåstaden, from their initiation until their completion. The planning and design phase meetings of these renovation projects took place from winter 2012/2013 until winter/spring 2013/2014. RP1 and RP2 started around the same time, with RP1 beginning in November 2012 and RP2 in January 2013, while RP3 began with a pre-planning meeting in the late spring of 2013 and with its planning and design phase in the winter/spring 2013/2014. The renovation concerns four multi-family dwellings; RP1 and RP2 each include one building while RP3 comprises two neighbouring buildings. Renovations for RP1 were completed in 2014, and RP2 and RP3 were completed in 2015. The time frame for the planning and design phase was around three months, after which the procurement process should have started. However, all three projects were delayed due to financial discussions.

For the planning and design, there are many different relevant actors on different levels. Each project has a *project group* comprising the middle building professionals doing the planning and design for the renovation. The *investment group*, at the top, makes budget decisions for the renovation in the planning and design phase. Also, there are the *tenants* themselves, who have the opportunity to participate at two *tenant meetings* during the planning and design phase, where they get information about the upcoming renovations and can fill in a survey in which they have a chance to express their wishes regarding the renovation and report damage. Additionally, there is the *Swedish Union of Tenants*, as a kind of collective tenant representing the tenants, negotiating new rents during this phase.

Project groups – the middle

A project group is formed to work on the planning and design of each renovation project. This group is a temporary coalition and includes professionals with different areas of expertise. The group comprises internal employees as well as external consultants contracted for the planning and design phase.

The *external consultants* are chosen from a list of consultants contracted through public procurement. A new procurement of consultants is conducted every three years. The professions of the external consultants involved in the projects are: architect, building engineer, electricity consultant, energy audit consultant, fire security consultant and HVAC consultant. Occasionally, depending on the needs of the specific project, additional consultants may be involved, such as construction consultants, sound consultants and energy consultants. The number of external consultants can range from four to 10 or more. RP1 and RP2 each engaged six external consultants whereas RP3

engaged four. There were also a few overlaps of individuals being involved in more than one of the three RPs. One architect was engaged in two projects, the same electricity consultant worked on all three RPs, and one HVAC consultant was involved in two RPs.²⁹¹

The internal employees participating in the project groups included a project leader, renovation coordinator, rent negotiator, area manager and HVAC and electricity experts. Additionally, there were trainees, an energy manager and a manager of renovation projects. Internally, eight people were involved in RP1, while in RP2 there were nine and in RP3 four. Two HVAC and electricity professionals were involved, both internal and external. The internal experts have the same role as the external consultants and they collaborated closely. This is the only overlap between the internal and external professions involved. (There was, for instance, no internal architect and so on.) Since there are several competences needed for renovation projects, and the projects have different needs, the expertise involved and the number of people engaged might vary in different projects. Figure 3.1 gives an overview of the three different renovation projects (R1, R2 and R3) and the participants and professions involved in each project group.

²⁹¹ Appendix E presents detailed tables showing who was interviewed and when, the code name for the analysis, who was present at the interviews (the first name indicating the interviewer) and the number of interviews.

I: stands for internal employee and E: stands for external consultant.

Figure 3.1: Summary of the involved internal employees and external consultants.

Figure 3.1 shows that the number of participants in the projects varied. The purple circle is RP1, the green circle is RP2, and the turquoise circle is RP3, and the intersections indicate middle professionals working on various projects.

There are similarities between RP1 and RP2 regarding the number of people involved, while RP3 included fewer people. The project leader A for RP1 was also involved in RP3. To a large extent, the same people were involved for RP1 and RP3 (same fire consultant, architect, HVAC consultant, and area manager), and all three projects had the same electricity consultant. Many architects were involved in RP1. The housing company replaced architect A with architects B and C. Due to scheduling conflicts in the architecture company, architect B was replaced by architect D towards the end of the process, who then also continued with the work for RP3. Compared to

the other projects, RP2 had an additional building engineer and a construction consultant as part of the project group since the initial plan was to do major rebuilding, including adding loft apartments (which in the end did not take place). In RP2, a different HVAC consultant was involved than in RP1 and RP3, however, both consultants were from the same company.

Initially there were three different project leaders, one for each renovation project. Project leader C had never before led a renovation project on such a big scale alone, and therefore project leader A functioned as mentor during the process. However, during the planning and design phase, project leader C moved into a different position within the housing company, and project leader A took over.

The number of participants in the meetings of the three projects varied over time. The number of participants decreased in the course of the planning and design phase of RP1 and RP2. Towards the end of the planning and design phase, for instance, the rent negotiator was not involved, and the internally responsible persons for HVAC and electricity, respectively, participated in only a few meetings at the beginning; however, the person internally in charge of electricity was present only a few times. The same could be observed for the member of the energy group and the real estate development manager. In comparison to RP1 and RP2, RP3 had fewer participants right from the start. Only the core group of the included external consultants plus the project leader and sometimes a trainee and the area manager took part. Also, the fire security consultant participated in the meetings of the project group just towards the end of RP3, while in RP1 and RP2 the fire consultants were involved earlier on.

One of the external consultants reflected that the core group of participants present in RP3 is what usually comprises a project group. Then, the question arises as to whether the increased number of participants was for our (the researchers') benefit.

[...] this was a little special then, of course, because you were there, then everyone wanted to be there too. (Interview, EC-9)

Investment group – the top

The investment group is an internal part of the housing company and consists of the CEO, business area manager, economist, administrative manager, tenant manager and real estate manager. The real estate development manager (representing planned maintenance) also participates in the meetings of the investment group but with an advisory role and no decision-making power. The project leader of the renovation project presents the possible solutions suggested by the project group to the investment group.

This investment group plays a crucial role in the planning and design phase as this group takes financial decisions for the project and thereby decides to a large extent

which energy measures are possible to implement. At the beginning of the planning and design phase the investment group takes an initial orientation decision for each project, and towards the end of the phase they take the final investment decision.

The orientation decision means that the investment group checks and evaluates whether the suggested solutions and ideas are reasonable from a financial perspective. The project leader presents the first draft of suggested solutions that is worked out by the project group, including a first cost assessment. Based on financial considerations, the investment group accepts or rejects the suggested solutions and measures. If the suggestions are accepted, the project group continues with their work. However, if they are rejected, the process starts all over again and the project group comes back to the investment group with new suggestions for solutions and measures. The work in the project group after the orientation decision is taken is to prepare for the final investment decision. The orientation decision, then, is a tool to make the investment decision smoother in order not to change too much in the end. At the end of the planning and design phase there is the final investment decision on what is to be included in the tender document for the specific renovation.

The individual tenants and the Swedish Union of Tenants as collective tenant – the bottom

The tenants living in the apartments in the buildings are affected by the renovation projects. For RP1 there were 12 apartments, for RP2, there were 33, and for RP3, there were 36 apartments in the two buildings combined (32 in one and 4 in the other).

The buildings in my case were at relatively central locations in the city, with RP1 and RP3 in the city centre, and RP2 outside the city centre. According to Stångåstaden, the inner city area is characterised by comparatively high rent levels and very low vacancy rates (nearly 0%). The age distribution is rather similar in the two districts. Most people are between 25 and 64 years old, in both areas over 50%, however, there is a slightly higher number of older people living in the city centre.²⁹²

For each renovation project, the housing company arranges two meetings with the tenants living in the buildings to be renovated for information purposes, getting some feedback on tenants' preferences and their reports on possible damage and also getting their consent for the renovation. These meetings are formally called tenant meetings.

The Swedish Union of Tenants is a democratic member-driven association of tenants. The association represents all tenants and has over 500 000 members. The members receive advice and support in dealing with their landlord. The Swedish Union of Tenants works on different housing issues on behalf of tenants. Its main activity today is to negotiate the rent both with the public housing companies and private

²⁹² City centre: age group 0-24=23%, 25-64=53%, 65+=24%. District adjacent to the city centre: 0-24=26%, 25-64=57%, 65+=17%. See: Linköping Municipality, <www.linköping.se>, accessed 2015-05-26; Linköpings stadsdelar/ Linköping districts, <<http://app.linköping.se/statdok/gpf/stadsdelframe.htm>>, accessed 2017-03-30.

property owners. The association's work is basically guided and decided by the members.²⁹³

In the course of the planning and design phase of a renovation project, the rent negotiations between Stångåstaden and the Swedish Union of Tenants also take place and the new rent levels for the renovated buildings are decided upon. The Swedish Union of Tenants usually also attends the two tenant meetings during each planning and design phase.

3.3.2 Semi-structured interviews with the actors in and around the planning and design phase

*"If you want to know how people understand their world and their life, why not talk with them? Conversation is a basic mode of human interaction."*²⁹⁴

I chose to do qualitative semi-structured interviews in order to gain an overview and a more in-depth understanding of the current incorporation of energy aspects into renovation projects of multi-family buildings. This type of interview has a less standardised approach and procedure compared to quantitative approaches such as surveys or questionnaires.²⁹⁵ It is possible to discover and explore opinions and perceptions of the interviewees more in-depth. Therefore, semi-structured interviews are a suitable method with which to explore people's perceptions or opinions about complex or sensitive issues, and they also allow the interviewer to probe for more information as well as clarification.²⁹⁶ One goal with semi-structured interviews is to come as close as possible to an open conversation by letting the interviewee talk freely. However, a structured outline or interview guide is prepared before the interview focusing on certain topics in relation to the research aim and questions, which help steer the conversation and get the information needed.²⁹⁷ The semi-structured interview offers freedom and flexibility,²⁹⁸ yet the guide includes certain questions, probes and support during the interview so as not to lose focus. Due to the flexible character of the interview, there is no strict order in which the questions need to be asked.²⁹⁹ Furthermore, there is no set of rules prescribed for the interview; it is, as Kvale and Brinkmann call it, an *"open-ended field of opportunities"*.³⁰⁰

²⁹³ Find more detailed information on the Swedish Union of Tenants and their work at Hyresgästförening, Swedish Union of Tenants <<https://www.hyresgastforeningen.se>>, accessed 2017-05-16.

²⁹⁴ Steinar Kvale & Svend Brinkmann, *Learning the craft of qualitative research interviewing*, Sage, Thousand Oaks, CA, 2009, p. xvii.

²⁹⁵ See also *ibid.*, p. 100.

²⁹⁶ See also Louise K. Barriball & Alison While, "Collecting data using a semi-structured interview: a discussion paper", *Journal of Advanced Nursing*, vol. 19, no. 2, 1994, p. 330.

²⁹⁷ See also Philipp Mayring, *Einführung in die qualitative Sozialforschung*, Weinheim und Basel, Beltz, 2002, p. 67.

²⁹⁸ See also Kvale & Brinkmann, *op. cit.*, p. 100; Denis Howitt, *Introduction to qualitative methods in psychology*, Pearson Education Limited, Edinburgh, 2010, p. 57.

²⁹⁹ See also Kvale & Brinkmann, *loc. cit.*

³⁰⁰ *Ibid.*

I conducted semi-structured interviews with everyone who played a role for the outcome of the planning and design phase. Thus, I did interviews with the entire project group, the investment group, the Swedish Union of Tenants and some of the tenants themselves.

For the project group members, I designed an interview guide³⁰¹ with topics including the respondents' background, role in the project, how they perceived the ongoing processes, influence of various project actors and professions, different questions on energy efficiency in the renovation projects, tenant questions and specific questions arising in each observed process. Three employees of the housing company participating in the project group were interviewed twice. One of them, however, had a double role, as a member of both the project group and the investment group.

For the interviews with the members of the investment group, I prepared a slightly different interview guide.³⁰² There the focus was on the work of the investment group, including who was involved, what the function of the group was, when in the process the group came in, its influence, and the members' opinions about what happened for one of the projects regarding a disagreement over the replacement of the heating system.

The representative of the Swedish Union of Tenants was asked questions regarding the organisation's role, and also the tenants' role, in the renovation process.

In 24 of the 33 interviews, two or three researchers were present. There was Jenny Palm, who is also involved in the project, Mattias Nyman, a research assistant for the CAREER project at that time, and me. For 25 interviews I was the lead interviewer. In seven interviews Jenny Palm was the lead interviewer, and occasionally I and Mattias asked additional questions and took notes. In the interview with a member of the investment group, I could not be present and it was conducted by Jenny Palm alone. In 16 out of the 25 interviews where I was the lead interviewer, Mattias was present as a second interviewer to ask additional questions and take notes. The remaining nine interviews I did by myself. Mattias did not play a major role during the interviews; he mainly took notes and asked one or two questions. However, it was important to have him there during the interviews at the beginning as I did all material collection in Swedish and he, as a native speaker, ensured that I understood everything correctly (and could help if needed). I am from Austria, and Swedish is my third language. At the beginning of the project it was good to have this support to make sure I understood the local dialect correctly.

To allow other relevant topics to emerge during the interviews, I kept a certain flexibility.³⁰³ The specific sequences of questions and how much attention I paid to different topics during the interviews depended on the interviewee as well as when during the process the interview was done. The interview lengths also varied depending on the interviewee. The interviews commonly took around one hour, but there were a

³⁰¹ An example of the interview guides can be found in appendix C.

³⁰² The interview guide can be found in appendix B.

³⁰³ See also Kvale & Brinkmann, *op. cit.*, p. 100; Howitt, *op. cit.*, p. 57.

few that lasted around half an hour and a few that took an hour and a half; one even lasted two hours. All the interviewees agreed on being recorded,³⁰⁴ and the interviews were all transcribed.

Short *semi-structured phone interviews* were conducted with tenants in order to investigate their perspective on the renovation process. These phone interviews were conducted by one student and two employees from my department, Tema T. I prepared the interview guide.³⁰⁵ One of the interviewers was instructed by Jenny Palm (RP2), the other two were instructed by me. The tenant interviews were rather short, lasting on average 15 minutes, and because of this, we did not record them. The interviewers instead took notes for each interviewed tenant, including age and gender. Additionally, the interviewers made a summary of the interviews. I received both the summaries and the notes, which I used for my analysis.

All in all, the three renovation projects had 77 apartments. In total, I have notes for 39 interviews with tenants living in these apartments. For RP1, I only have interviews from after the renovation due to issues with timing, and for the other two projects, tenants were interviewed both before and after; however, it was not always the same tenants who were interviewed. It might be seen as problematic that different people conducted the interviews and that it was not always the same tenants that were interviewed before and after the renovation. I argue, however, that these interviews still provide a rich source of information that can give an overview of the tenants' perspective. Issues brought up by the tenants were also discussed in other interviews with the project group or could be seen in the observations. The interviews give the tenants a voice directly and therefore I do not have to rely solely on other people's opinions about the tenants.

3.3.3 Participant observation of meetings in the planning and design phase – “you had to be there”

*“Participant observation is in some ways both the most natural and the most challenging of qualitative data collection methods. It connects the researcher to the most basic of human experiences, discovering through immersion and participation the hows and whys of human behavior in a particular context.”*³⁰⁶

Participant observation aims to understand human experience. Roles and norms that can be taken for granted are investigated as well as routine actions and social calculations below the conscious thought level. Interviews alone risk missing some of these aspects because people might not mention them or consider it silly to bring them up. Participant observation makes it possible to integrate any observed behaviour into

³⁰⁴ Also, notes were taken during the interview by a second person, if present.

³⁰⁵ See also Kvale & Brinkmann, loc. cit.; Howitt, loc. cit.

³⁰⁶ Greg Guest, Emily E. Namey & Marilyn L. Mitchell, *Collecting qualitative data: a field manual for applied research*, Chap. 3, Sage, London, 2013, p. 75.

its context and to more or less see the behaviour as it happens. Basically, any setting can be investigated with participant observation; it could be any kind of interaction, with people, objects or the environment. When applying participant observation, the researcher is embedded in the social setting, namely, in the actions and context of the researched phenomenon.³⁰⁷ I try to discover social scenes – norms or behaviours that are not explicitly talked about, but rather operated on routinely and taken for granted, especially in relation to how energy measures are dealt with.

For my case I did participant observations at 18 meetings during the planning and design phase for three renovation projects, and additionally, five out of six meetings with the tenants that took place during the same phase. I took continuous notes for all the meetings and observations, which I organised and added reflections to as soon as possible afterwards.

We also had collaboration meetings in the CAREER project between the researchers and representatives of the housing company to discuss the ongoing work. The two excursions, to Gävle, Sweden, and Salzburg, Austria, with members of the housing company (and project group) were other unique opportunities to talk to members of the housing company about the projects and get to know and understand the housing company (their work and ambitions) better. This was an important part of my work and gave insights into the housing company's world.

As part of the bigger CAREER project, and parallel to my fieldwork, the researchers of the engineering department also participated in the project groups' meetings. The housing company and some external consultants expected that the researchers in the engineering department would give direct input to the meetings, to calculate the effects of different suggestions or measures and give insights on developments of new solutions and so on. Even though this was not their role,³⁰⁸ they did that in one or two instances, and then I treat them as participants of the project group and analyse how their suggestions were handled during the process.

It is the task and purpose of the investment group to consider and decide upon financial aspects of a renovation. It took some time for me to learn about and understand the role of the investment group and its importance and influence. Thus, I realised too late that I also should have participated in the meetings of the investment group when they decided on the orientation of the projects and, additionally, when the final investment decisions were taken. I wanted to get deeper insight into the reasoning of the investment group regarding the renovation projects and their decisions about which measures to implement, but for this I have had to rely solely on the interviews I conducted.

³⁰⁷ Ibid., pp. 75-81.

³⁰⁸ From our perspective, we were participating as researchers and not consultants. This was an ongoing conflict of expectations of each other.

3.3.4 Documents related to the planning and design phase of renovation projects

Documents have different places and functions in research, and I will describe what documents I used for my study and how. Document analysis is commonly combined with other research methods in case study research.³⁰⁹ *“Document analysis is a systematic procedure for reviewing or evaluating documents [...]. Like other analytical methods in qualitative research, document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge.”*³¹⁰ Bowen states that the analysis involves skimming (superficial examination), reading (thorough examination) as well as interpretation of documents combining elements from content analysis and thematic analysis.³¹¹ My analysis is a thematic analysis, which mainly involves skimming through the material and searching for particular aspects, such as mentions of energy issues.

I have used different kinds of documents provided by the housing company for my analysis. For the planning and design meetings, the project group shared documents on a cloud storage service. These documents included descriptions of the buildings, protocols of the meetings, drawings and sketches of the buildings, photos and all other information provided for the renovation. The cloud storage not only contained all the documents for the renovation projects, but also the tender documents for RP1 and RP3. The tender document for RP2 was sent to me by email.³¹² Additionally, on the cloud storage I had access to documents related to the planning and design of an earlier renovation project done in 2009 in buildings neighbouring the RP2 building, in an area adjacent to the city centre.

Additionally, I looked at the annual reports that are available online. I also received some documents via email from the housing company which included PowerPoint presentations, Excel sheets with information on energy use of the buildings and a process document that Stångåstaden was using as a guide for how to conduct a renovation (which was, however, said to be still under development).

I did not do an in-depth study of all the material but, taken together, it helped me to get a deeper understanding of the process. Some of the documents I only read in order to get a better understanding of the renovations, meetings and content of the interviews. Others I analysed more in depth as the protocols, the process document received by the company and the tender documents. For the one previous renovation that I had

³⁰⁹ See also Bowen, op. cit., pp. 28, 29.

³¹⁰ Ibid., p. 27 (Bowen referring to Juliet M. Corbin & Anselm L. Strauss, *Basics of qualitative research: techniques and procedures for developing grounded theory*, (3rd ed.) Sage, Thousand Oaks, CA, 2008; Tim Rapley, *Doing conversation, discourse and document analysis*, Sage, London, 2007.)

³¹¹ See also Bowen, op. cit., p. 32.

³¹² The tender document for RP2 was not on the cloud storage when I needed it and wanted to download it. I asked the housing company if there was a longer version that they could send to me. For some reason all they could find was this short version. In any event, through the public procurement process, they realized that it would be too costly to conduct the renovation as planned. In the end it was decided that the whole planning and design phase would start all over again with partnering instead of DB. We were not involved in this process.

access to, done in 2009, I looked through this material and then focused on the protocols.³¹³

3.3.5 Summary and overview of the methods and material

Table 3.1 shows an overview of the methods applied and the number of interviews or participant observations.

Table 3.1: Overview of applied methods, purpose and number

Investment group	Planning and design phase meetings	Tenants/ Swedish Union of Tenants
Semi-structured interviews (5)	Semi-structured interviews (28)	Semi-structured interview (Swedish Union of Tenants) (1) Phone Interviews (39)
	Observations (16 out of 18) ³¹⁴	Observation (tenant meetings) (5 out of 6)

Additionally, I had access to documents provided by the housing company (Appendix G).

To summarise, the data material covers observation field notes, interviews and documents provided by the housing company. However, many casual conversations took place too, and I took many photos of the renovation objects, all of which influenced my understanding of the process and of the housing company and thus had an impact on my analysis.

3.4 From data to text: Analysis of my material

The interviews were analysed with the help of the qualitative content analysis approach outlined by Mayring.³¹⁵ Literature on qualitative interviews shows that there is no single way or “recipe” for analysing interviews or doing any content analysis. On

³¹³ An extensive overview of all the documents I had access to can be found in appendix G.

³¹⁴ For one of the missing meeting I have notes and information from Mattias Nyman, the research assistant at the CAREER project, as well as the official protocol. For the other missing meeting I have to rely solely on the official protocol. This meeting we missed because we had not yet received the information from the housing company that the planning and design had already started.

³¹⁵ See also Mayring, *Einführung in die qualitative Sozialforschung*, op. cit.; Philipp Mayring, *Qualitative Inhaltsanalyse. Grundlagen und Techniken*, Weinheim und Basel, Beltz, 2008.

the contrary, a content analysis should be adapted to each specific case and should refer to the specific research aim and questions.³¹⁶ Mayring emphasises that just as a research question needs to be developed, so does the procedure of a content analysis need to be developed and constructed in line with the research aim and questions.³¹⁷ Besides its flexibility, a content analysis is still controlled, which means that it follows a process of analysis.³¹⁸

Mayring differentiates between three main procedures – the summary, the explication and the structuring. Those are applicable in a flexible way regarding the research aim and questions.³¹⁹ For this analysis the structuring content analysis has been selected as a basis. The structuring analysis is then again split into a content, a formal, a typifying and a scaling structuring. For this case I chose content structuring.³²⁰ Content structuring focuses on filtering out certain parts in order to find a structure and then, as a final step, summarising certain topics or aspects of the material.³²¹ Following Mayring's³²² procedure, I filtered and structured the material, but I never summarised all of the material in the end due to its sheer volume, and I did not see it as necessary to do so for the analysis but tried to handle it in other ways instead.

The centre of the analysis is the category or code system.³²³ According to the code system the material is filtered, structured and summarised;³²⁴ “[...] it is essential to develop the aspects on interpretation – the categories – as closely as possible to the material, and to formulate them in terms of the material.”³²⁵ A pre-test is done in order to ensure the code system's reliability, and in this process codes can be easily revised. Yet, the code system can still be adapted during the analysis if disputable codes are discovered. For the creation of a code system within the content structuring, Mayring suggests a deductive or top-down approach. As a final step, the data material is summarised in relation to the codes and research aim as well as questions.³²⁶ For this code system creation, however, I selected an abductive approach, as Mayring and Früh say there is no single recipe for a content analysis and, rather, that guidelines need to

³¹⁶ See also Werner Früh, *Inhaltsanalyse: Theorie und Praxis*, Stuttgart, UTB GmbH, 2007, pp. 9, 143; and Mayring, *Qualitative Inhaltsanalyse*, op. cit. p. 43.

³¹⁷ Mayring, *Qualitative Inhaltsanalyse*, loc. cit., p. 43.

³¹⁸ See also Florian Kohlbacher, *The use of qualitative content analysis in case study research* [89 paragraphs]. Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, vol. 7, no. 1, 2007, p. 6; Mayring, *Einführung in die qualitative*, op. cit., p. 114.

³¹⁹ See also Mayring, *Qualitative Inhaltsanalyse*, op. cit.; Mayring, *Einführung in die qualitative*, op. cit., p. 115; Kohlbacher, op. cit., p. 11.

³²⁰ See also Mayring, *Qualitative Inhaltsanalyse*, op. cit., pp. 58f, 82f; Mayring, *Einführung in die qualitative*, op. cit., pp. 118ff.

³²¹ See also Mayring, *Qualitative Inhaltsanalyse*, op. cit., p. 89; Kohlbacher, op. cit., p. 12.

³²² See also Mayring, *Einführung in die qualitative Sozialforschung*, op. cit.; Mayring, *Qualitative Inhaltsanalyse*, op. cit.,

³²³ Here referred to as code system.

³²⁴ See also Kohlbacher, op. cit. p. 6.

³²⁵ Ibid. p. 13.

³²⁶ See also Mayring, *Einführung in die qualitative*, op. cit. pp. 118ff.

be adopted for certain cases and research questions. My whole methodological approach was abductive in nature.³²⁷

Since the interview material is rather extensive I decided to use Atlas.ti in order to do a computer-aided content analysis. This made it much easier to keep an overview of the interviews and all the codes in the long run as there are around 500 pages of interview transcripts altogether. In my opinion, it would have been too complicated to quickly find codes in so many pages if it had to be done manually. The program allowed me, for instance, to click on any code and receive all the quotations for that code from all the interviews. Using a computer-aided analysis does not mean that the program did the coding and the analysis. The coding was done by me. The program is just a tool to simplify working with a large amount of data.

I started to develop the codes during the first reading of the interviews and they are partly also a reflection of the topics in the interview guide, and energy-related codes were of the greatest interest. The coding took me a few months since there was a large amount of data and almost all of the material is in Swedish (one interview was done in German). It took time for me to ensure that I had properly understood and translated each word and that I had a clear understanding of the content. Also, to do a proper coding, I did one round of finding codes and themes manually. Thus, at the beginning, I read through the material on paper and did the first coding manually. This first reading (without the help of Atlas.ti) helped me to create a first draft of codes and then served also as a pre-test in a sense together with coding again in Atlas.ti. Then I did another round of coding (with the help of the codes defined during the first round) on the computer with the help of Atlas.ti. In this step, I was faced with a so-called “code swamp”. This brings me straight to one difficulty that arises with doing computer-aided coding. When sitting in front of the computer, reading and being so close to the material, it is easy to drown in the huge amount of data and it is rather simple to create so many codes as to be “swamped” by them. I soon found myself confronted with a rather long and overwhelming list of codes. I then took time to look through my codes and realised how many similar codes I had created and that there were similar codes with different formulations. Therefore an advantage of the program is that it makes it easy to merge codes and create new ones out of the existing list. I had to revise my codes several times to get a more manageable list. I had many sub-codes and codes that were not relevant for the analysis, but I kept them in the program in case I want to go back to them for a different analysis. Also, I kept a version of my detailed code list since I wanted to do an analysis that is a rather detailed description of the planning and design process.

For the analysis, I ended up with 23 main codes, each of which has different sub-codes for potential detailed investigations. The analysis was simplified using the program as a tool since it is easy to select one or more codes and then get the relevant quotations of the interviewees as output. I could thus easily play with my material and go back and forth between codes and see which people said what. This was an iterative

³²⁷ Mayring, *Qualitative Inhaltsanalyse*, op. cit.; Fröh, op. cit.

process, and throughout the analysis and writing of the text I always had my program open, looking through the codes and quotations. Also, for the analysis, I had to translate many words and read the Swedish material several times in order to make sure that I understood it correctly. This took extra time, but it brought me, in my opinion, very close to the material.

3.5 Reflections on methodology

3.5.1 Reflections on language issues and transcription

The project meetings and interviews were conducted in Swedish. I want to reflect on this fact since Swedish is my third language (German is my mother tongue, English my second language), and while I'm now largely fluent, I may not pick up the language to the same extent as a native speaker would. With respect to the transcription, this has been mitigated by using a professional service for transcribing the interviews, saving time and effort as well as avoiding the risk of misunderstanding in the transcription process as I usually do not write in Swedish. One might argue that a third person transcribing might not hear, or might mishear, things due to the lack of context. I did not encounter any problems like that when reading the interviews, and I also even re-listened to parts of the interviews and I found no out-of-line transcriptions.

One can say that the act of transcribing the material brings the researcher to a deeper understanding. Even though I had help with the transcription, I spent a lot of time very close to the material. When starting with the interview analysis I realised that there are many words I understand in the context but I do not have an exact translation. Since the interviews are an important part of my material, I spent a great deal of time going through them, re-listening to them and simply using a dictionary and translating parts of them myself to make sure I really understood everything. This was all done before I did the coding. When I did the coding I once again read and went through the material and also re-listened to parts of the recordings. So I can say that I do know my material very well.

As I entered the field, my Swedish was good and I could express myself well and follow any conversation; however, the language spoken in the meetings was a challenge, especially at the beginning. First, I was not familiar with the professional language and terms used in the building sector, and second, I had to learn to understand the local dialect, which some people spoke quite strongly. Therefore, the fieldwork phase was a challenge at the beginning and was sometimes rather tiresome, but now I can safely say I understand the local dialect well. However, comprehension during the interviews and meetings was usually not a problem since context and body language offer a lot of clues that help with understanding in such interpersonal exchanges. I also felt that people were patient, open and helpful and did not mind my asking what a certain word meant when I did not understand it. Also, at most of the meetings there

was always at least one more researcher present who I could ask for clarifications, and we always discussed the meetings and their content afterwards, which was also very good for adding reflections to my observation notes.

I would argue that my lack of Swedish at times worked to my advantage during interviews. I could ask “stupid” questions and the interviewees took their time to explain everything to me in great detail, and I got the feeling that many interviewees wanted to explain a lot to me. At 16 of the interviews at the beginning of my fieldwork, Mattias Nyman provided support in case I might not understand – or might in fact misunderstand – something an interviewee said.

Also, I think I might have seen things differently as a non-Swedish person observing this process and I would be more likely to question things that might be taken for granted by a Swedish person.

3.5.2 Reflections on researchers’ role in the renovation projects

Following Maxwell, I argue that the validity of my study is supported by a combination of data from different sources. I used multiple data sources and numerous respondents and participated over a long time in the studied planning and design phase.³²⁸ Maxwell says that there might be a risk that a researcher’s influence on the research environment could threaten the validity of a study.³²⁹ I conducted participant observations and interacted closely with my respondents, thus the studied process is most likely influenced. During the process I took notes and described situations where I could have had an influence. Also, my expertise is not in technology, thus it was not possible for me to influence the negotiations in that respect nor to influence which measures or solutions were suggested. Overall, I think that my presence during the meetings was mainly noticed when I interrupted the process to ask for clarification or when the other participants got curious about what I was writing down. Sometimes the project group members were obviously confused about my presence and did not know what to make of me: I never gave input, and they did not understand why I was sitting there listening and taking notes. Sometimes I got comments like “*What are you typing all the time?*” or “*Be careful, Katharina is watching our behaviour*” (connected to laughter and jokes). It was at times a bit awkward. However, I do not have the feeling that our presence as researchers influenced what happened during the planning and design meetings. I see no indication that my or the other researchers’ presence influenced central aspects during the meetings of what we were interested in, such as meeting agendas, suggested measures, time frames and prioritisations.

³²⁸ See also Joseph A. Maxwell, *Qualitative Research Design: An Interactive Approach*, Sage, Thousand Oaks, CA., 2005.

³²⁹ See also *ibid.*

My aim with the observation was not to influence the process, which makes my participation different from that of the engineering researchers. However, of course, my presence and that of the other researchers did influence the process overall in one way or another. One issue that I became aware of concerns the participation of various employees of the housing company at the meetings. When the first two renovation projects started, our research was new and employees may have been curious about us and what we were doing at the project meetings. Several employees of the housing company who were said to usually not participate in the project groups' meetings attended them (in RP1 and RP2, although not in RP3). There was a drastic decrease in the number of participants from the housing company in the third renovation project. Also, one of the external consultants said (EC-9) that usually there was only a small group of participants in the meetings (like in RP3) and he thought that the internal employees were there for our benefit, or maybe it was because it was supposed to be an energy renovation – or possibly for both reasons. The presence of these additional people, however, influenced the meetings and I included them in my analysis.

Our presence at the meetings of the housing company as well as the excursions we took together and all the collaboration meetings certainly also shaped the work. The collaboration meetings and excursions certainly improved the communication and information flow between the housing company and the researchers. When we did these things together in a neutral arena in the same conditions, we became more approachable to them.

I often felt that my status as a young female, and moreover, one without technical expertise, made me seem unusual and made my presence seem puzzling. I had the strong feeling that, during the interviews, the presence of Mattias, a male student, gave me more credibility in the male-dominated construction industry.

3.6 Opportunities for generalisation from a case study?

Case studies are often criticised for not allowing generalisations from the results.³³⁰ My aim is not generalisation in itself but rather to present a relevant phenomenon that might be useful for similar contexts and actors. Flyvbjerg says, moreover, that case studies are commonly criticised for being oversimplified as they study one specific phenomenon or one example, and that therefore it is not possible to make any broader statements based on case studies.³³¹ This is also often claimed in sociological or social science textbooks, as observed by Flyvbjerg. Furthermore, case studies are often referred to as a pilot method to develop hypotheses, which he argues is a misconception. He emphasises the value of case studies and especially criticises

³³⁰ See also Yin, *Case study research*, (2009) op. cit., p. 15.

³³¹ See also Bent Flyvbjerg, *Making social science matter: why social inquiry fails and how it can succeed again*, Cambridge University Press, Cambridge, 2001.

how case studies are presented in relation to creating (scientific) knowledge. Namely, that general, theoretical (context-independent) knowledge should be regarded as more valuable than practical (context-dependent) knowledge, since it is difficult to make generalisations from one case.³³² Case studies are also seen as more biased towards the notions held by the researcher and, finally, it is argued that it is difficult to actually come to general propositions or theory based on case studies. These misunderstandings are common and question the reliability, validity and the scientific method of a case study.³³³

Flyvbjerg argues that an advantage of the case study is that it develops concrete context-dependent knowledge. He argues that it is not right to say that one cannot generalise from one single case, and, for instance, that a critical case can be quite influential (as also often seen in the history of natural science). The generalisability of a case study is influenced by the strategic choice of a case.³³⁴ *“That knowledge cannot be formally generalizable does not mean that it cannot enter into the collective process of knowledge accumulation in a given field or society. A purely descriptive, phenomenological case study without any attempt to generalize can certainly be of value on this process and has often helped cut a path toward scientific innovation.”*³³⁵ Formal generalisation, in his opinion, should not be the only legitimate method of scientific inquiry. Often the power of the good example is underestimated and the strength of the case study can be increased by studying a critical case. A critical case can thus be defined as an atypical or extreme case which might reveal more information since multiple actors and mechanisms are activated in such a situation.³³⁶ Often, case studies are criticised based on the notion that researchers verify their preconceived notions, but experience shows that more often than not with in-depth case studies, preconceived views, assumptions or hypotheses were wrong.³³⁷ Further, one can argue that issues regarding subjectivism and bias towards verification can be a problem of all methods, not only the case study.³³⁸

Applying a case study method, I have the opportunity to conduct a detailed study where it is possible to analyse the complexity of a whole process, which allows me, in turn, to analyse many aspects of this complex problem. It might not be desirable to summarise and generalise a case study but rather read it in its entirety.³³⁹

This critiques about not being generalisable and about the conclusions and findings only applying to the studied case are not necessarily a problem. A critical case and good example can contribute to the development of scientific knowledge. For

³³² See also *ibid.*, p. 66.

³³³ See also *ibid.*

³³⁴ See also *ibid.*, pp. 72, 74, 75.

³³⁵ *Ibid.*, p. 76.

³³⁶ See also *ibid.*, pp. 76, 77, 78.

³³⁷ See also *ibid.*, p. 82.

³³⁸ See also *ibid.*, p. 83.

³³⁹ See also *ibid.*, p. 86.

instance, interesting patterns can be shown that can serve as a basis for other studies, or they can be practically applicable for, in my case, other housing companies. I argue that a lot can be learned from my case as it is about a housing company on the verge of becoming more energy efficient. A process is followed as regards what happens in the company practice after the strategic decision is made about working with an energy reduction goal.

CHAPTER 4

4. Setting the scene for renovation projects

Buildings need continuous maintenance and intermittent renovations, which opens windows of opportunity to take energy saving actions in the buildings. I have followed three renovation projects in the Swedish municipal housing company Stångåstaden, which recently decided upon a goal of 25% energy savings by 2025, the so called 25-25 energy goal. In this chapter, I will set the scene within which these renovation projects were carried out. As a background, the overall situation in Sweden in terms of Swedish housing companies and their striving for energy efficiency or sustainability, tenure types, public housing, building stock, age and need for renovation is also presented. Then I describe how building renovations are performed, both in principle and within Stångåstaden. The renovation project is a social process, and the matter of which actors are involved is of importance for the project's outcome. Also, the technical setting of the buildings is fundamental for what can be done when renovating. Therefore, I also give a glimpse of technical factors that are of importance for driving the renovation process.³⁴⁰

The aim with this chapter is to give the reader background information relevant to the case study and thereby to provide a background to the analysis that follows. In chapters 5 to 7, the focus will be on the middle professionals in the project groups' meetings, the meeting practice and the role of the middle, the top and bottom in the planning and design phase in relation to enabling and disabling energy measures.

4.1 Real estate companies in Sweden and energy efficiency

4.1.1 Energy efficiency in renovations by Swedish real estate companies

Högberg et al. investigated the inclusion of energy efficiency in the renovation work of real estate companies in Sweden. Sweden has formulated ambitious energy saving objectives, but, as Högberg et al. argue, the current rate of energy efficiency investments is not sufficient to reach these goals. They investigate how real estate owners reason and act when it comes to decisions on energy efficiency investment. As a result, they suggest a “company typology” as regards ambitions and strategies concerning energy efficiency. According to this typology, there are four types of companies: the Strict Profit Maximising Company, the Little Extra Company, the Policy Led Ambitious Company and the Administration Led Ambitious Company. Högberg et al. argue that a company's choice among these different strategies defines how it will react to investment incentives regarding energy efficiency and thereby influences the overall result in the energy efficiency work. Furthermore, these ideal

³⁴⁰ I focus in my background presentation on the measures the municipal housing company talked about during the planning and design phase considering the renovation. This might be a combination of measures solely for renovation or could also include maintenance; however, all were discussed at the planning and design meetings.

types should be kept in mind when developing policies for increased energy efficiency.³⁴¹

The Strict Profit Maximising Company is a risk-averse real estate owner, and energy efficiency measures are only installed if they are strictly profitable in the short or medium run. Only measures with a low investment cost and short pay-off time in relation to energy consumption and operating costs are implemented. If such a company decides to install more extensive energy efficiency measures it implies that a significantly lower operating cost, or that the investment cost, will be covered in about five years. This type of company will not easily be affected by policy measures, unless there are large subsidies given for investments because their aim is to be profitable in the short run.³⁴²

The Little Extra Company does more than the strict profitability limit calls for. Such a company wants to show environmental responsibility and regards energy efficiency as more valuable than the profit maximising firm does. For those companies, cost estimates are usually optimistic towards energy efficiency measures, yet it is not regarded as a trade-off between energy efficiency and economic goals. These companies have energy efficiency goals, but they are not given priority. Companies of this type might be affected by policy measures and interventions, but there is a risk that they could postpone energy efficiency measures while waiting for expected subsidies.³⁴³

The Policy Led Ambitious Company has ambitious energy efficiency goals that mainly come from owner directives. Energy efficiency is prioritised highly and it is viewed as necessary in the long run. Other goals might be related to energy efficiency, for instance, the owner might want to combat social decline with energy efficient renovations. Since the energy efficiency priority comes from the owner, this company is able to use measures that are not immediately profitable. Even though profitability is seen as the ideal, it is possible to argue for economic loss in the sense that the damages of greenhouse gas emissions are internalised. Companies of this type do a lot to achieve an energy efficient building stock, but the strategy might be affected by changes at the company or government level.³⁴⁴

The Administration Led Ambitious Company has ambitious energy goals, but these come to a large extent from company employees, mainly from the managerial body. Also, in this company, economic profitability is not the most important issue, but very expensive measures would be hard to find acceptance for. The owners are not the drivers here, and conflicts may arise. Companies of this type also do a lot for energy efficiency in their building stock, but the strategy is vulnerable to changes in the administrative staff.³⁴⁵

³⁴¹ See also Högberg, Lind & Grange, op. cit.

³⁴² See also *ibid.*, p. 1357.

³⁴³ See also *ibid.*, p. 1358.

³⁴⁴ See also *ibid.*, pp. 1358, 1359.

³⁴⁵ See also *ibid.*, p. 1358.

In my last chapter *Discussions and conclusions* I will come back to this and discuss which typology Stångåstaden's resembles.

4.1.2 Sustainability aspects in renovations of Swedish property owner organisations

As discussed earlier, in section 1.3.2, Olsson et al. did a study on how sustainability and energy aspects are handled by Swedish property owner organisations for renovation projects. They present six areas of interest at different stages in the process of renovation projects. I will present the main points that are interesting for my case and indicate how they refer to my analysis.³⁴⁶

1. *Economic Aspects of Decision Making (prior to the project and continuing up until follow-up)*. Both in publicly and privately owned companies, there are indications based on the interviews that there is little funding for renovation purposes, maintenance or modernisation, according to Olsson et al. The reason for the limited funding is related to an agreement between the Swedish Property Federation and the Swedish Union of Tenants to avoid high taxation. As a result, renovations are funded by a rent increase and a reduction in operating costs, thus costs are to be kept low. Another crucial aspect influencing decisions to enable or disable (energy) measures is related to expected return on investments. Achieving high return rates (being profitable) means taking fewer (energy) measures. The interviewed organisations in Olsson et al. showed a return rate of 4% to 7%. Regarding the estimation of profitability, the organisations indicated that they usually had some kind of LCC (Life Cycle Cost) approach; however, the method used actually depended a lot on the specific project managers, and some just estimated simple payback times. The lack of overarching guidelines for economic evaluation and what numbers to actually use was one apparent problem. To estimate profitability, different numbers for the same parameters were used (e.g., yearly energy price increase), even within one organisation. The parameters used largely depended on the project manager, which could result in different evaluations of the same measure in similar projects. Thus, there were big differences regarding potential renovation measures, even within one company.³⁴⁷ In the analysis I will come back to this, looking at economic considerations made in relation to the projects I studied.

2. *Property Management*. Three organisations in the study by Olsson et al. said they had a more or less comprehensive maintenance plan for their properties, but none of these included sustainability goals (smaller organisations had a facility manager with tacit knowledge about the buildings). Three large organisations had overarching sustainability goals for renovations, aiming to reduce the energy demand by 20% when a major renovation project is performed. One even stated its goal as a 50% reduction

³⁴⁶ See also Olsson, Malmqvist & Glaumann, op. cit.

³⁴⁷ See also *ibid.*, pp. 3640 - 3641.

for major renovations. Regarding monitoring and follow-up of energy use and domestic hot water use in the management process, five out of six organisations indicated that they had some kind of monitoring for energy use, but the analysis of this data was more limited. None of the organisations had detailed energy use data. Rather, they had only the total energy use data for each of heating, electricity, and domestic hot water use for the operation of each building. Further, indoor environmental quality investigations while the buildings were occupied were limited. To summarise, there was an absence of sustainability objectives in maintenance plans and rather modest overarching sustainability targets, if they existed at all. Another thing missing was detailed as well as gathered information for analysis related to the buildings' environmental performance.³⁴⁸ The goal setting and the use of energy data will be discussed in relation to my analysis.

3. *Renovation Process in General.* There was no model for managing sustainability aspects in most of the organisations studied by Olsson et al. Only one had a model, called “environmental descriptions”, which could be used for renovations. Another used the Swedish environmental rating tool “Miljöbyggnad” as a steering tool. Usually there were no environmental programmes and plans, and how these aspects were to be addressed depended to a large extent on the dedication and skill of each project manager. Also, project managers were not given internal support with respect to these issues and they often did not even know what to ask for. Concerning individual metering and billing (IMB), there was also no consistent view among the studied organisations. New construction and renovation projects seemed to be rather similar from an organisational perspective. Two organisations had internal project managers and the others used consultants. Also, two used a “renovation coordinator” as a link between the project group and the tenants. Regarding how to promote better management of sustainability aspects during a renovation project, suggestions included disseminating information about sustainability to actors such as project managers, consultants, contractors and tenants; involving environmental experts to support the project manager; having sustainability aspects on the agenda at design team and construction site meetings; and introducing a checklist as a support for the project manager in addressing these aspects. Another suggestion was to start using environmental rating tools as well as the analysis of tenant behaviour, as this affects energy demand and the indoor environment. There were limited routines and processes regarding the management of sustainability aspects in projects.³⁴⁹ My case study company was in an early stage of implementing routines for energy efficiency, and my analysis is also about how these issues were handled in the studied renovation projects.

4. *Building Inspection Stage.* The decision about which buildings to prioritise for renovation is not a simple one for organisations with a large building stock. The issue at hand is that most buildings are in excessive need of renovations with extensive

³⁴⁸ See also *ibid.*, pp. 3641 - 3642.

³⁴⁹ See also *ibid.*, p. 3642.

measures. However, it is not possible to renovate all of them at the same time. Five organisations said they based their decision on the status of the construction and technical supply system and might also take into account security aspects and tenants' opinions. One organisation did the prioritisation based on the age of the buildings. Most said that they did building inspections if necessary before beginning any renovation. The inspections were conducted on a rather general level. What was not included was an analysis regarding energy use and possible energy saving measures, nor were there indoor environment evaluations (e.g., thermal comfort, moisture, noise or daylight). When it comes to measures such as replacing windows versus renovating windows, this was decided with the help of LCC analysis or simply based on experience with previous projects. The tenants' perspectives and opinions on upcoming renovations or the possible involvement of the tenants could affect the outcome and the tenants' satisfaction. Four organisations said they had tenant involvement meetings where the Swedish Union of Tenants played an important role. These were mainly information sharing meetings, although the tenants were asked for their opinions and could influence decisions to some degree. However, no tenant surveys were conducted before the renovations that could help identify certain issues, such as indoor environmental problems.³⁵⁰ The involvement of tenants will be discussed in relation to my projects. I also study how decisions were made regarding which measures were to be undertaken.

5. *Construction Stage*. Regarding the incorporation of sustainability aspects for renovations, two especially important factors are the contract type and the project manager's skill and commitment. The studied organisations mainly used turnkey contracts.³⁵¹ *"Turnkey contracts are often defined as if a single contractor, procured by a client, acquires and sets up all necessary premises, equipment, supplies and operating personnel to bring the project to an operational stage. All that the client needs to do is 'turn the key' to begin full and effective usage of the new (in this case renovated) facility."*³⁵² Some also used partnering at times. But the main reason mentioned for the use of turnkey contracts was that they require fewer personnel. The procurement document itself often consists of standard templates that do not include sustainability aspects to a satisfactory degree. It is seen as time-consuming and as more costly to make changes in the construction phase. The type of contract impacts the handling of sustainability issues. For example, the contract places restrictions on materials used, as there are limited procurement routines. The project managers have a key role and thus their skill and engagement influence various aspects of the project.³⁵³ I did not investigate the role of the contracting form extensively, nor the construction stage (or as I call it, the late "reconstruction phase"), but the role of the project manager is relevant.

³⁵⁰ See also *ibid.*, p. 3643.

³⁵¹ See also *ibid.*, p. 3644.

³⁵² See A. Merna & N.J. Smith, "Project managers and the use of turnkey contracts", *International Journal of Project Management*, vol. 8, 1990: in Olsson, Malmqvist & Glaumann, loc. Cit. p. 3644.

³⁵³ See also Olsson, Malmqvist & Glaumann, *op. cit.*, p. 3644.

6. Follow-up Stage. After a renovation there should be a follow-up period in order to verify the outcome of the implemented measures. This should take place before continuing with the regular property management process. However, the studied organisation only did limited follow-ups. Energy use was said to be monitored with monthly readings of operational energy use. Indoor environmental aspects were usually not followed up. Thorough investigations of specific parameters were performed if there was something wrong. Also, there was an attempt to preserve and propagate the experiences of the project team during and after the completion of a project, yet this mainly concerned the employees of the organisation rather than consultants or contractors. There was a limited analysis of energy use after a renovation project. Also, there was no survey to check on the tenants' satisfaction.³⁵⁴ This will be discussed in relation to Stångåstaden's renovation processes.

4.2 Types of tenure and ownership structure in Sweden

The housing company in my case study is a municipal housing company in Linköping. In this section, I relate the housing company to background information about type of tenure in the multi-family building stock and public housing in Sweden, in order to better understand the role of the municipal housing company Stångåstaden. There are primarily three different tenure types in the Swedish multi-family building stock: municipality owned rental apartments, privately owned apartments and resident-owned apartments (in Swedish *Bostadsrätt*).³⁵⁵ Thus, rented buildings can be public housing units (owned by housing companies) or privately rented units (owned by property/real estate investors or private owners).³⁵⁶ The different types of tenure also present different opportunities and barriers for renovation, which thus influence possibilities for reaching a sustainable and energy efficient building stock.³⁵⁷ My study focuses on rental apartments in public housing units, which is the focus of the following presentation.

4.2.1 The public housing sector

The public housing sector is very large in Sweden compared to other countries in Europe, and comprises as much as 68% of the multi-family dwellings.³⁵⁸ (The share of multi-family and single dwellings is about the same, with each being 50%.³⁵⁹) Yet, there

³⁵⁴ See also *ibid.*, p. 3645.

³⁵⁵ See also Mangold et al., *op. cit.*, p. 42.

³⁵⁶ See also Meijer, Itard & Sunikka-Blank, *op. cit.*, p. 536.

³⁵⁷ See also *ibid.*, p. 539.

³⁵⁸ See also Boverket, *Teknisk status i den svenska bebyggelsen – resultat från projektet BETSI*, Karlskrona, Myndigheten för samhällsplanering, byggande och boende, 2010; Meijer, Itard & Sunikka-Blank, *op. cit.*, p. 539.

³⁵⁹ See also Meijer, Itard & Sunikka-Blank, *op. cit.*, p. 538

are no exact statistics on tenure in Sweden since 1990.³⁶⁰ Since then, Statistics Sweden (SCB)³⁶¹ has estimated the housing stock by keeping track of registered new projects as well as demolitions, but statistics on different types of tenure are vague.³⁶² *“Although these figures may give a fair idea of how many houses and dwellings there are, they do not show whether the dwellings are rented or owned by the residents.”*³⁶³ However, a yearly questionnaire conducted in Sweden by SCB reveals that one-third of the Swedish population lives in public housing. This figure has been stable since the mid-1980s.³⁶⁴

The public housing sector in Sweden is not only larger than in the rest of Europe, it also has special properties. Public housing companies are primarily owned by local municipalities or public utilities. The principle behind public housing is to provide access for everyone and without profit. There are similar concepts in Europe, such as “social housing” in the UK, “logement sociale” in France, and “Sozialwohnung” in Germany and Austria. However, in Sweden, there is no upper income limit for those who rent public housing units as there is for those kinds of accommodations in the rest of Europe. In Sweden, the public housing companies usually have no responsibility to take care of people who have problems affording housing, and there are no special buildings or areas assigned for people with low income. Instead, people with low income get social support and economic support for rent and, within this frame, they can live where they want. The economic support is based on their income and decided upon by the National Insurance Office. The rent is set in negotiations and not by the housing market. The Swedish Union of Tenants negotiates rents on behalf of the tenants, on a yearly basis, with the landlords.³⁶⁵

One of the many Swedish municipal housing companies is Stångåstaden in Linköping, which shall be described in the next section.

4.3 Linköping and its municipal housing company Stångåstaden

Linköping is Sweden’s fifth-largest municipality, and in 2013 the number of inhabitants surpassed 150 000. Since the 1950s there has been strong population growth, and it is growing faster than the national average. Linköping has in total about

³⁶⁰ As there was a discontinuation of the collection of this type of statistics in 1990.

³⁶¹ Statistics Sweden, <<http://www.scb.se/>; <http://www.scb.se/en/>>

³⁶² See also Pål Castell, “The Swedish suburb as myth and reality”, Published as “Thematic Paper” in Pål Castell, *Managing yard and togetherness: living conditions and social robustness through tenant involvement in open space management*, Göteborg, Chalmers University of Technology, 2010, p. 1; Statistics Sweden, *Så bor vi i Sverige – bostäder, boendemiljö och transporter 1975–2002*, Statistiska centralbyrån, Stockholm. (The way we live in Sweden: homes, the living environment and transportation 1975–2002), 2004, in Castell, op. cit., p. 1.

³⁶³ Statistics Sweden, *Bostads- och byggnadsstatistik årsbok 2009*, Statistiska centralbyrån, Stockholm (Yearbook of Housing and Building Statistics 2009), 2009, in Castell, op. cit., p. 1.

³⁶⁴ See also Statistics Sweden, *Så bor vi i Sverige*, op. cit., in Castell, op. cit., p. 1.

³⁶⁵ See also *Rented accommodation in Sweden – a unique set-up*, <http://www.iut.nu/Facts%20and%20figures/A%20unique%20set%20up_2005.pdf>, accessed 2016-02-24.

74 000 homes.³⁶⁶ For decades there has been a strong demand for apartments, long waiting lists and in fact a shortage, as there were not enough residential developments to meet the rising population. The housing demand is expected to increase continuously in line with the population increase.³⁶⁷

Table 4.1 gives an overview of the types of houses there are in Linköping and in Sweden as a whole. There is a larger share of rental apartments in Linköping compared to the country overall. Additionally, there are slightly more co-op apartments and fewer small houses (owner-occupied houses) in Linköping compared to the nation in general.³⁶⁸

Table 4.1: Types of houses in Linköping and Sweden³⁶⁹

	Linköping	Sweden
Small houses	33,0%	44,3%
Rental apartments	43,0%	33,4%
Co-op apartments	24,0%	22,3%

Stångåstaden, the municipal housing company, is owned by Linköping municipality and was established over 70 years ago. It is the largest housing company in Linköping and the biggest landlord in the city, owning about 18 500 rental apartments, around 4200 of which are student accommodations. Its share of the housing market is around 26% of all homes, which includes co-op apartments and houses.³⁷⁰ The total turnover was 1 369 MSEK and the occupancy rate for dwellings was 99, 9% in 2015.³⁷¹

³⁶⁶ Stångåstaden, Annual report 2014, <<https://www.stangastaden.se/Documents/ekonomi/Annual-report-2014.pdf>>, accessed 2016-02-03.

³⁶⁷ See also Stångåstaden AB, summary, <http://www.alacrastore.com/research/s-and-p-credit-research-Summary_Stangastaden_AB-591580>, accessed 2016-02-03.

³⁶⁸ Stångåstaden, Annual report 2014, op. cit.

³⁶⁹ Based on https://www.stangastaden.se/Documents/ekonomi/Annual-report-2014.pdf_p.56, accessed 2016-02-03

³⁷⁰ Stångåstaden has around 84 831 m² of commercial premises, approximately 33 000 tenants and around 1 600 000 m² of heated area. The housing company also has 34 residential units with historical value. Overall, this means that Stångåstaden owns about 26% of the homes in the municipality (see Stångåstaden, Årsredovisning 2014, Del 3 Ekonomi, <<https://www.stangastaden.se/Documents/ekonomi/%C3%85rsredovisning-2014-Del-3-Ekonomi.pdf>>, accessed 2016-02-03; Stångåstaden; see also Stångåstaden AB, Om oss (about us), <<https://www.stangastaden.se/omoss>>, accessed 2016-02-03; Stångåstaden AB, summary, op. cit.

³⁷¹ Stångåstaden AB, Om oss (about us), op. cit.

4.3.1 Stångåstaden – ownership relations

All municipally owned companies in Linköping are part of Linköping's Stadshus AB.³⁷² The single shareholder, Linköping municipality, exerts its governance by exercising its voting rights at the Annual General Meeting, which is Stångåstaden's highest level of decision making.³⁷³ Stångåstaden is owned 100% by Linköping Stadshus AB. All Swedish municipal housing companies' operations are governed by the Swedish Local Government Act and by the law of the Limited Companies Act.³⁷⁴

4.3.2 Renovation developments, investment and costs in the municipal housing company

Within the next 15 to 20 years Stångåstaden plans to undertake extensive renovations, including plumbing stack replacement. This comprises around 7000 to 7500 apartments. There are major challenges regarding reconstruction since a large portion of their properties are in need of extensive renovation to bring them up to today's standards. Therefore, Stångåstaden has to increase its reconstruction rate to 300-500 renovated apartments per year, student accommodations excluded. There are different levels of renovation activities. The investment for those buildings is estimated to be between 4000-5000 MSEK over the next 15-20 years. In 2014 the result of the renovation activities was 206 upgraded homes.³⁷⁵ In 2015 the result was 313 apartments, and a total of 1005 MSEK was spent on maintaining and renovating properties owned by Stångåstaden.³⁷⁶ The plan for 2016 was to renovate 340-350 apartments, mainly properties built during the 1950s and 1960s.³⁷⁷

According to Stångåstaden's annual report, most of the renovation measures to be done are replacement of plumbing stacks, remodelling of kitchens and bathrooms and renovation of façades. Additionally, in some buildings where it was technically feasible, they also installed HRV (heat recovery ventilation) in order to achieve better comfort and environmental performance.³⁷⁸

³⁷² For instance, different types of housing companies are part of Linköpings stadshus AB as well as Tekniska Verken i Linköping AB, which is the municipally owned energy company. Most of Stångåstaden's houses are provided with districted heating from Tekniska Verken i Linköping AB.

³⁷³ Stångåstaden, Annual report 2014, op. cit.

³⁷⁴ See also Stångåstaden, Årsredovisning 2014, op. cit.; Stångåstaden AB, Om oss (about us), op. cit.

³⁷⁵ Stångåstaden, Annual report 2014, op. cit.

³⁷⁶ Stångåstaden, Årsredovisning 2014, Del 1 Verksamhet, <https://www.stangastaden.se/Documents/ekonomi/arsredovisning_2015_del_1_verksamhet.pdf>, accessed 2016-10-10, p. 77.

³⁷⁷ Ibid.

³⁷⁸ Annual report 2014, op. cit.

4.3.3 Energy goals and the energy group of the housing company

In order to act with care for the environment, Stångåstaden has adopted an energy goal whereby the amount of purchased energy per square metre – electricity, heating and cooling – shall be reduced by 25% from 2011 to 2025.³⁷⁹

To achieve this 25-25 energy goal, Stångåstaden has developed strategies for new construction, renovation projects, and various other kinds of energy projects. Individual metering and billing (IMB) or solar energy projects are specifically energy oriented. In 2014, Stångåstaden started to include the energy goal and plans for how to achieve it in their annual report.

In 2014, both “new technology” and “behaviour change of the tenants” were included in the annual reports as factors influencing the energy reduction.³⁸⁰ The idea of taking these two factors into consideration was again dropped in 2015 as it would be too difficult to properly measure them separately.³⁸¹ Now the factors separately measured and represented in the annual report are “new construction”, “renovation” and “energy projects”. According to the annual report in 2015,³⁸² there was a total energy reduction of 1, 2% in 2012 (compared to 2011), it was 3% in 2013, it was 6, 2% in 2014 and 7, 2% in 2015. For this total energy reduction, renovation played a minor role in relation to “energy projects”³⁸³ and also “new construction”.

According to interviewed employees of the municipal housing company, the 25-25 energy goal is very important and they strive to reach it and thus also consider this overall energy goal for the renovation projects. Many of the housing company interviewees said that this will be especially crucial when entering the renovation phase of the houses built in the Million Programme building renovations.

Energy group

Within the housing company a new speciality group with a focus on energy savings and energy efficiency was established in 2011/2012, called the energy group. Their mission is to ensure that energy issues are included in new construction and renovation, and also to take action towards increasing energy efficiency in general, by working with IMB and solar panel installations, for example. The energy group is a concrete result of setting the 25-25 energy goal to save energy within the housing stock of the company.

³⁷⁹ See also Stångåstaden AB, Om oss (about us), op. cit.

³⁸⁰ See also Stångåstaden, Annual report 2014, op. cit.

³⁸¹ See also Stångåstaden, Annual report 2015, part 2 Sustainability https://www.stangastaden.se/Documents/ekonomi/ANNUAL_REPORT_2015_SUSTAINABILITY.pdf, accessed 2016-02-03, p. 19.

³⁸² Ibid.

³⁸³ Such as individual metering and billing (IMB) or solar energy projects.

The energy group has five members, including a manager, one so-called ‘energy strategist’ (*energistrateg* in Swedish), an energy controller and the so-called energy hunters who are supposed to work more on-site with the tenants. They have overall responsibility for the energy savings and efficiency actions in the company, and they should also inspire other employees to take actions towards meeting the energy goal.

The energy group’s work, then, is partly to influence the renovation projects and bring more energy awareness and efficiency to project development. Yet, the roles of the energy group members are still in the making as an “energy group” is quite new. Therefore, their exact role in relation to renovation projects is not clearly defined. Overall, the work of the energy group is to operate and work towards the 25-25 energy goal, according to the energy manager.

The strategic energy employee works with strategic issues such as IMB, solar energy and wind power and is involved in the collaboration projects with the university. The energy controller works with statistics and collaborates with Tekniska Verken AB, the main energy supplier of heat and water in Linköping, around general energy issues as well as renovation projects. The two energy hunters work closely with the area managers of the housing company. When it comes to renovations, the energy hunters are involved with the buildings on-site, working with technical services and with contractors. Also, the energy manager said that their task is to find “energy thieves” (which means, for example, heat and water leakages) and this is why they are called “energy hunters”.

The plan is that the energy manager should be included in the planning and design phase of future renovations and then an energy hunter will be involved in the reconstruction phase to check that the energy measures have been included and to sort out energy-related questions on-site. The idea is that, in the long run, the energy group will not be needed anymore since the goal is to reach a point where including energy efficiency in renovation will become the new normal:

Well then there is the hope that in a few years we will not have to participate. It should become a natural part of... that it is as natural to think about energy ... that thinking about it [would be as natural as] thinking that there should be electricity, water and heat in the houses, I hope. (Interview, IC-9)

4.4 The renovation process in general and in my case study

Building construction (new construction and renovation) is described as a complex and multidisciplinary process.³⁸⁴ In order for a project to be a success, various skills are required (e.g., architects, engineers, designers, contractors, sub-contractors and suppliers). For a project to be successful the various actors involved must use different

³⁸⁴ See also Naaranoja & Uden, op. cit., p. 852.

ways to communicate, and they must work together in the course of the construction project, which may last for many months or even years.³⁸⁵ *“There is a high level of skills and knowledge required to translate a client’s version or list of requirements into plans and specifications and then into a real building that functions well for the people who will live or work there.”*³⁸⁶ Not only technical skills are needed for construction projects but also skills to coordinate different efforts from the various professionals involved. Also different kinds of rules and regulations need to be followed which are presented in Appendix A.

Most processes for renovation projects consist broadly of four phases which can be summarised as (1) analysis and prioritising, which is the decision to conduct a renovation; (2) planning and design for the renovation of a building; (3) reconstruction and, (4) commissioning, occupancy or use of the building. This is a simplified model of renovation processes,³⁸⁷ in which sub-phases are included and overlaps might occur. Hence, the process is not necessarily as linear and simple as described here, but it gives an overview and idea of it. How the whole renovation looks in every detail is not of importance here. What is important is to get a general idea of what the major steps are. I followed the earlier phases, which I refer to as the “planning and design phase”, in more detail as this is where decisions were made regarding energy measures, budgets and tenants.

It is difficult to define exactly when a specific project starts, but it definitely ends with the tenants moving into a building and starting to live there.³⁸⁸ So, does a project start with the selection of an object or when a project group is appointed and starts meeting? What happens before the project group is assigned for a specific project might also influence the course of the project.³⁸⁹ However, in general, a construction project usually begins when someone (an individual, a company or an organisation) identifies a need for a new or altered building. Construction projects can be implemented in different ways, depending on how the cooperation between the involved parties is organised. The cooperation depends on how the client purchases (buys) the planning and design and the production of a particular construction project.³⁹⁰ Different types of contracts exist, the most common ones being design bid build (DBB) and design- [and-] build (DB).³⁹¹ In the case of the renovation projects I followed, the contracting type

³⁸⁵ See also *ibid.*

³⁸⁶ *Ibid.*

³⁸⁷ See also Uno Nordstrand, *Byggprocess*, Liber AB, Stockholm, 2008, p. 7; Thuvander et al., *op. cit.*, Sveriges Byggtjänst, byggprocess (building process), <http://www.moodle2.tfe.umu.se/pluginfile.php/54691/mod_resource/content/2/byggprocessen_handledning_studenter.pdf> accessed 2016-02-27; Nielsen et al., *op. cit.*

³⁸⁸ It should be mentioned here that of course it is also possible for tenants to live in a building during the renovation.

³⁸⁹ See also Albert B. Charns & Donald T. Bryant, “Studying the client’s role in construction management”, *Construction Management and Economics*, vol. 2, 1984, p. 179.

³⁹⁰ Nordstrand, *op. cit.*, p. 1.

³⁹¹ See also Lena Borg & Hans Lind, “Framework for Structuring Procurement Contracts”, Working Paper 2014:09, Stockholm, Section for Building and Real Estate Economics, 2014; J. Nystrom, J.-E. Nilsson & H. Lind, “Beyond

was DB (Swedish: totalentreprenad). Nystrom et al. state that there is an overwhelming taxonomy of contracting forms in construction since there are many different terms describing and categorising different types of contracts. The reason is that the construction industry is still nation specific, each one with its own traditions and legal frameworks. Different countries have many features of contracts that are the same or very similar; however, the underlying regulations may differ or they might not be explicitly set out.³⁹² I argue that independent of the different contract types, most decisions regarding the measures to be implemented are decided upon in this planning and design phase, as I could especially see in my case.³⁹³

Figure 4.1 illustrates *the whole renovation process* of an RP as conducted by Stångåstaden. This is based on their process document (an Excel sheet) of how to conduct a renovation. In this spreadsheet, planning and design each have a separate sheet. In practice, both take place simultaneously, and for simplicity I have combined it to “planning and design” and view it as one phase. In the planning and design phase there is mutual influence as the planning decisions influence the design, and vice versa. Thus, in the figure I present the overall renovation process with five phases. The circle in the figure highlights the planning *and* design phase, which I am focusing on in my study. The decision to concentrate on the planning and design phase is motivated by the fact that it is commonly in this phase measures and solutions to be implemented in a renovation are decided upon. Further, as shown in previous research, there are studies that highlight the importance of studying this phase and that call for more research in this area.

The overall categorisation of these five phases in a renovation project could also be empirically confirmed with the interviews and observations. Each phase has also its own sub-phases. There might be iterations and overlaps between the phases, so there is not necessarily a strict linearity in the process.

Figure 4.1: Overview of the renovation process of the housing company

terminology-which contracting features promote innovation”, in *Proceedings of the International Conference on Construction in a Changing World*, The 2014 CIB W55/65/89/92/96/102/117 & TG72/81/83, 2014.

³⁹² See also Nystrom, Nilsson & Lind, op. cit., p. 2.

³⁹³ It would be interesting to study what type of contract offers the most flexibility or is the most likely to be used when energy decisions are made. Nystrom, Nilsson & Lind, op. cit. say that, theoretically, there is more possibility for innovation in a DB contract than DBB, but they add that this is under-researched. Although this could be an interesting area for future study, I have not pursued it in this study.

In the first step, “*analysis*”, the maintenance plan and its list of buildings in need of renovation are studied in order to decide which buildings to prioritise. Next follows the phase when a “*prioritisation*” is done among these buildings. The prioritisation criteria are based on the age of the buildings and general need for renovation as well as whether a building is considered to be out of date or worn out. After the prioritisation there is a result showing which building to renovate first. Within Stångåstaden, a renovation process for a specific building starts with mapping and selecting buildings in need of renovations. In principle, anyone employed within the municipal housing company can suggest and argue for certain buildings to be renovated. Most often, the first decision as regards renovation is taken by the real estate manager or real estate development manager.³⁹⁴

Energy efficiency as a reason for renovations was not part of the decision in the two first phases in the three projects I followed. These projects were initiated because the buildings were in need of renovations due to age and being out of date and worn out, and there was also water damage. But they were still considered to be energy renovations. Next is the “*planning and design*”, which I shall describe in more detail below. After that, the “*reconstruction*” phase is conducted, and finally the tenants live (again) in the building. The building is checked by “*monitoring and follow-up checks*” in the long run.

The planning and design phase in the renovation project

The planning and design phase is conducted by the property developer Stångåstaden. The work in this phase is done by its internal employees together with external consultants contracted for the course of this phase. The planning and design phase can be regarded as the creation of an action plan where goals are broken down into sub-goals and details are clarified or deleted from the agenda. For all three renovation projects the procurement contract was design- [and-] build (DB).

Looking more in detail at the planning and design phase, it can be observed that there are several sub-phases. Figure 4.2 graphically shows the sub-phases and the actions performed within the planning and design phase. In the figure I show in principle when the different meetings, processes and decisions that took place were performed during the planning and design phase along the time axis (here time is shown on the vertical line).

³⁹⁴ The housing company’s document for renovations

Figure 4.2: A description in principle of meetings and processes during the planning and design phase³⁹⁵

The preliminary investigation concerns the initiation of the planning and design phase, which includes inspections of the building(s) to be renovated; the collection of further information and documents regarding the outdoor environment; the building's context, technical status and maintenance status; property data; drawings and photographs. Thereafter, the planning and design meetings start taking place on average about twice a month. Usually there are around six meetings for each project. However, the planning and design phase can stretch over a longer period due to delays caused by the outcome of the investments group's orientation decision. During the project group meetings, documents, plans and drawings produced for the procurement process are discussed and negotiated. When the first draft of suggested measures and solutions is completed by the project group, the suggestions are sent to the company's investment group to be considered. The investment group takes an orientation decision after considering whether the suggested measures are economically affordable. If they are not affordable, the issue is iterated back to the project group for reworking.

³⁹⁵ Inspired by time geography and Kajsa Ellegård's work. For example: Ellegård, Kajsa, *Akrobatik i tidens väv*. En dokumentation av projekteringen av Volvos bilfabrik i Uddevalla. Choros 1989:2. Kulturgeografiska institutionen, Handelshögskolan vid Göteborgs universitet.

Consequently, such an orientation decision can be taken several times in the same planning and design phase of a project. The main reason for the iteration is that the suggested measures are considered not to be within budget.

Also during the planning and design phase, two meetings are arranged with the tenants (tenant meetings). Right after the orientation decision has been taken, the first tenant meeting is arranged, mainly to inform tenants about the renovation to come. At the second tenant meeting the new rents are presented and thereafter the housing company collects written consent from the tenants. Before the tenant meetings are arranged, some written information is sent to the tenants' homes together with the invitation to the meetings.

At the first tenant meeting the tenants are informed about the renovation and that they will have to sign a tenant rights agreement confirming that Stångåstaden is allowed to do the renovation, with all its implications. They also get to fill in a questionnaire where they can express their wishes regarding the renovation and also report on any damage in their apartments. The law sets out certain criteria about what measures need to be approved by the tenants. If, for instance, the hall or the laundry rooms are renovated, then only 50% of the tenants need to approve. If renovations are done inside the apartments, then all of the tenants need to give their approval. If the tenants disagree, the case goes to the Regional Rent Tribunal³⁹⁶ where a decision is taken. The Regional Rent Tribunal decides then between the two interests of doing a renovation and implementing certain measures versus not doing so. In almost all cases (95% to 99%) the decisions are made in favour of the landlord, according to Stångåstaden's rent negotiator and the Swedish Union of Tenants. The tenants who attend the second tenant meeting have an opportunity to sign the tenant rights agreement directly at the meeting.

When the investment group has taken the final decision concerning the budget for the entire renovation, the tender document is finalised and the public procurement for the reconstruction phase can start. Thus, the planning and design phase ends with the public procurement document. EU regulations are followed for the procurement process, and calls for bidders are published and advertised on the Opic website (www.opic.com). Afterwards, when the whole planning and design phase is finalised and the procurements are over, the reconstruction is performed.

4.5 Situating the renovation objects in the Swedish residential building stock and its energy performance

This section provides an overview of issues concerning the residential building stock for apartments and categorisations of age related to its energy performance.

³⁹⁶ In Swedish, Hyresnämnd. (Regional Rent Tribunal)

<<http://www.hyresnamnden.se/Funktioner/English/Matters/Land/Tenancy/>>, <http://www.hyresnamnden.se/>, accessed 2017-05-16.

Furthermore, background information about the four buildings in the three renovation projects is provided.

It is important to understand how the current renovation activities and the actual rate of renovation activities contribute to the energy performance of residential stock. In most EU countries the rate of new construction lies at approximately 1% to 1, 5% of the total building stock, and the construction rates are declining. This emphasises again the importance of renovations of buildings.³⁹⁷ The Swedish national strategy for energy efficient renovation in buildings (a result of the EU's energy efficiency directive) states that 75% of the existing buildings are in need of comprehensive renovation measures until 2050, which means that 1 875 000 apartments will have to be renovated.³⁹⁸

There is limited reliable information and statistics about renovation activities in the EU. Renovation often takes place when there is a window of opportunity for it, like relocation of tenants, replacement or renovation of defective components, or when modernisation is needed in kitchens or bathrooms. Such situations open opportunities to cost-effectively replace certain components with more energy efficient ones. The most common renovation activities in Sweden are the modernisation of kitchens and bathrooms.³⁹⁹ According to experts, modernisations commonly occur just at the end of component's service life or to solve problems regarding comfort. Other reasons mentioned are mould or moisture problems, upgrading of social neighbourhoods or even a reduction of maintenance and operation costs.⁴⁰⁰

According to Meijer et al., it is hard to find reliable information and statistics about renovation, and it is also difficult to get information on national monitoring of renovation effects. Monitoring projects are commonly short-term, focusing for instance on issues regarding indoor air quality, and there is a focus only on the neighbourhood level and demonstration projects. Since there is a lack of systematic monitoring, there exist not much knowledge about long-term performance of equipment or even the influence of the tenants' behaviour concerning the energy saving that the renovation aimed to achieve.⁴⁰¹ One can argue that *"[m]ore knowledge and supporting tools are needed in order to make systematic, synthesized decisions in renovation projects that will enable us to balance various desires, needs and values with respect to a number of important aspects such as energy, environment, technical, and economic performance as well as social, cultural and architectural aspects."*⁴⁰²

³⁹⁷ See also Thuvander et al., op. cit.; Meijer, Itard & Sunikka-Blank, op. cit., p. 544.

³⁹⁸ The Swedish National Board of Housing, Building and Planning (Boverket) and the Swedish Energy Agency, 2013

³⁹⁹ Bathroom and kitchen renovations often represent more of a lifestyle choice. Whereas more insulation may be added or new windows may be installed, these changes are often not noticeable. What is the value of energy efficient renovation? Cheonghoon Baek & Sanghoon Park, "Policy measures to overcome barriers to energy renovation of existing buildings", *Renewable and Sustainable Energy Reviews*, vol. 16, 2012.

⁴⁰⁰ See also Meijer, Itard & Sunikka-Blank, op. cit., pp. 544, 545.

⁴⁰¹ See also *ibid.*, p. 545.

⁴⁰² Thuvander et al., op. cit., p. 1190.

Also, Thuvander et al. state that in Sweden, although more than half of all investments in today's housing construction are related to renovation of some kind (about 56%), knowledge in these areas is still fragmented, and new construction is often used as the norm. Renovation is a major challenge for housing companies from the perspective of the requirements of the various directives and regulations regarding how to successfully and simultaneously meet reduced energy consumption, increased accessibility and the objectives of social sustainability and economic viability.⁴⁰³

4.5.1 The residential building stock and its energy performance

Buildings can be categorised according to building type, for example, single-family dwellings (detached houses) and apartment buildings (multi-story buildings), and distinctions can be made between buildings of different age. The buildings for my followed renovation projects are multi-family apartment buildings built in 1961 and in the early 1950s. They belong, then, to the Swedish building stock of apartments from the post-war time period (or the “*folkhemsperioden*”).

What influences a renovation and the resulting energy performance, according to Meijer et al., are (1) the type of building and (2) the age of a building, which usually reveals what building techniques were used and which also indicate different renovation needs. However, not only the building's age and type are decisive for its energy performance but so too are (3) its technical characteristics.⁴⁰⁴ Those characteristics define what kind of renovation measures are possible in a building and comprise the parameters discussed at the planning and design meetings.

The technical characteristics influencing the energy performance of the residential building stock are presented here with a focus on space heating and hot water and ventilation systems and insulation, since much emphasis is put on such issues in the discussions and negotiations during the planning and design phase. An overview of the RPs and buildings in my case follows in section 4.5.2. The actual selected measures presented in the annual report and the tender documents are provided in section 5.4.2.

The Swedish building stock for apartments and its age

In 2011, there were over 4.5 million apartments in Sweden, 2 million of them in small houses and 2.5 million in multi-family apartment dwellings.⁴⁰⁵ It is multi-family apartment dwellings that are relevant for my study.

⁴⁰³ Thuvander, Femenias & Andersson, op. cit., p. 12.

⁴⁰⁴ See also Meijer, Itard & Sunikka-Blank, op. cit., pp. 534-536; Mangold et al., loc. cit., p. 42.

⁴⁰⁵ See also SCB (Statistics Sweden), *Statistisk årsbok*, Stockholm: Statistics Sweden, 2013, p. 161; Statistics Sweden, *Bostads- och byggnadsstatistik årsbok 2009*, op. cit.. In Castell, op. cit., p. 1.

Meijer et al. concluded that the pre-war residential stock in the European countries is about 20% to 39% of the whole building stock and is rather homogeneous. Post-war buildings and buildings constructed before the oil crisis in the 1970s comprise about one-third of all buildings. The latter buildings are much less homogeneous than pre-war buildings and they are usually poorly insulated. These buildings are now in need of renovations. Buildings constructed after the oil crisis were built at a time when there were some mandatory thermal regulations, and they are therefore reasonably well insulated; however, many of those buildings also now show some need for (basic) renovations.⁴⁰⁶

The average apartment building in Sweden was built in 1959 and consists of a basement and three floors above ground. This fits very well for my case study, as the four buildings were built around that time and have similar characteristics (see below, section 4.5.2). The façade is in brick or plaster and the roof is a gable roof/pitched roof (in Swedish: sadeltak) with concrete roofing tiles (in Swedish: betongtakpannor). The heated area, A_{temp} is 1426 m² and the exterior walls' U value is 0.411 W/(m²*K). The house has 14, 55 apartments and an average occupancy is 1, 7 people per apartment.⁴⁰⁷ The distribution of the total window area is approximately 25% in each direction for all buildings.⁴⁰⁸ Two- and three-room apartments are the most common types built in all time periods. The smallest apartment size (one bedroom apartment) is commonly found in buildings built before 1960.⁴⁰⁹

Technical factors influencing the energy performance of the residential building stock

Space heating features

Space heating significantly impacts the energy performance of a building. According to Meijer et al., factors that contribute to the overconsumption of energy for heating are: heat transmission losses, which are proportional to the degree of insulation, and ventilation and air infiltration losses, which are determined by the ventilation system. The fabric and quality of a dwelling, as well as the heating system used and its efficiency, are important determinants of the base consumption.⁴¹⁰

The share of multi-family dwellings heated by district heating is large in Sweden compared to that in other EU countries. In apartment buildings, district heating is the dominant source of heat, with around 64%. The district heating systems utilise relatively low-temperature waste heat, which makes it one of the most sustainable energy option.⁴¹¹ Other space heating installations are local heating (if there is no

⁴⁰⁶ See also Meijer, Itard & Sunikka-Blank, op. cit., pp. 540, 541.

⁴⁰⁷ See also Boverket, *Teknisk status i den svenska bebyggelsen – resultat från projektet BETSI*, op. cit., p. 16.

⁴⁰⁸ See also ibid., p. 34.

⁴⁰⁹ See also ibid., p. 19.

⁴¹⁰ See also Meijer, Itard & Sunikka-Blank, op. cit., p. 541.

⁴¹¹ See also ibid., p. 543.

central heating), heat pumps or electrical heating.⁴¹² In Sweden, the total heated floor area (A_{temp}) for apartment buildings is 237 million m². According to Boverket, about 25% of apartment buildings use some sort of heat pump; ground-source heat pumps are most common in apartment buildings, while outdoor air heat pumps are common in detached houses. Few multi-dwelling buildings have a supplemental heat source. The most common supplementary heat sources in apartment buildings are tiled stoves in those built before 1960 and solar panels in newer buildings.⁴¹³

All four of the buildings in the three renovation projects in my case are attached to district heating sources. Therefore, there were no discussions on heat pumps for these renovation projects.

Systems for hot water

Around 25% of the energy consumed in the residential sector in the EU is generated by the use of domestic hot water.⁴¹⁴ The share of electric water-heating in Sweden is between 10% and 20%. There are electric boilers for hot water, which might be combined with space heating, and local gas-fuelled water heating (combustion boilers). The latter has disadvantages for indoor air quality and is unusual in Sweden. If space heating is provided by district heating, this is often in combination with water heating,⁴¹⁵ and there is a large share of apartment buildings in Sweden attached to district heating systems in this way. It is regarded as a relatively sustainable solution.

The buildings in my case have district heating which also includes hot water.

Ventilation systems

A ventilation system should deliver a constant rate of fresh air distributed by mechanical fans or by operating openings. Ventilation is very important and the rates must be at a certain level, thus they need to be high enough to remove indoor pollutants and, additionally, to avoid humidity problems and mould growth. However, regarding air exchange rates from an energy conservation perspective, the exchange rates should be low. Thus, indoor health concerns and energy use depend greatly on ventilation, however, in opposite directions.

There are three main types of ventilation systems. First, there is *natural ventilation*, which means airing through windows and continuous ventilation through window grilles, often applied in combination with a bathroom and/or kitchen fan. The second system is a *mechanical exhaust ventilation system*, in which air comes naturally

⁴¹² Ibid., p. 542.

⁴¹³ See also Boverket, *Teknisk status i den svenska bebyggelsen*, op. cit., pp. 38, 44, 46, 47.

⁴¹⁴ See also Meijer, Itard & Sunikka-Blank, op. cit., pp. 541, 543.

⁴¹⁵ See also *ibid.*, p. 543.

through window grilles and there is a ventilator in an exhaust duct that makes sure that air is constantly given off to the outside. The advantage with this method is that there is minimal air flow; possible disadvantages are that it can make noise and the ventilator consumes electricity. The third ventilation system is *heat recovery with mechanical ventilation*, which is also called *balanced ventilation* or *mechanical supply and exhaust heat recovery ventilation*. In this system there is a mechanical supply of air to a heat exchanger and then there is a transformation of heat from the exhaust hot air⁴¹⁶ to the cold incoming air. Additionally, before the supply of air from the outside comes into the room it is preheated, which reduces the demand for heating in a building.⁴¹⁷ Supply air with heat recovery can also have an exhaust air installation with a heat pump.⁴¹⁸

In Sweden, the different types of apartment buildings may utilise various types of ventilation systems within different parts of the same building. In the older buildings, from before the 1960s, nearly half have natural ventilation. Buildings constructed from 1986 to 1995 are dominated by supply and exhaust ventilation systems with heat exchangers. In the entire stock, exhaust ventilation accounts for the largest share, followed by natural ventilation. The smallest share have systems with mechanical supply and exhaust air (with heat exchanger).⁴¹⁹

As shown in table 4.2, in section 4.5.2, RP1 had exhaust air with inlets under the windows by the radiators, RP2 had natural ventilation, and RP3 had supply and exhaust ventilation with heat exchanger.

Insulation, u-values and windows

It is essential to have data on the number of insulated buildings since it provides information about the potential for energy savings in residential building stocks. Nevertheless, there is little statistical data and information on the degree of insulation in existing buildings. Buildings have different kinds of external walls, such as cavity walls (masonry walls with cavity space) or solid walls (no air cavity), which impacts the type and possibility of insulation.⁴²⁰

In Sweden, most buildings have solid walls, and this is the case in the four buildings that I studied. It is possible to insulate solid walls by adding material to either the outside or the inside of the wall.

If insulation is applied externally, one can avoid moisture problems as well as the risk of mould that might arise using indoor insulation. Apart from moisture and mould, indoor insulation could reduce internal space or create condensation problems.

⁴¹⁶ See also *ibid.*

⁴¹⁷ See also *ibid.*, p. 544.

⁴¹⁸ See also Boverket, *Teknisk status i den svenska bebyggelsen*, op. cit., p. 50.

⁴¹⁹ See also *ibid.*, p. 50; Boverket, *Energi i bebyggelsen – tekniska egenskaper och beräkningar – resultat från projektet BETSI*, Karlskrona, Myndigheten för samhällsplanering, byggande och boende, 2010, p. 75.

⁴²⁰ See also Meijer, Itard & Sunikka-Blank, op. cit., p. 541.

However, an issue with external insulation is that it is rather expensive and impacts the appearance of the façade. The impact on the façade can be an issue for the housing stock with historical and cultural values.⁴²¹ One big question is whether it is possible to apply additional insulation without losing the cultural value of a building, and this question is even more problematic since the definition of what constitutes cultural heritage changes. New cultural values are added gradually, but there is a risk of something disappearing that cannot be recreated. What is perceived as mundane and perhaps even ugly today may prove to be an important key to understanding our past at some point in the future. Therefore it is important to make conscious decisions when changing something on a building, which is done, for example, in connection with a building permit process. It is difficult to put a monetary value on cultural heritage. In relation to this in Sweden, Boverket says that there are many buildings where it is difficult to apply additional insulation without spoiling the building's heritage values. It underlines the importance of skilled assessments in the construction process.⁴²²

When using additional insulation, it is important to gather data on the typology of solid walls, what technical solutions might be used and the possible energy savings.⁴²³

The average U-value of external walls of apartment buildings in Sweden is much lower in older buildings than newer ones. It lies at around 0, 60 W/ (m²*k) in buildings constructed before 1960, and between 0, 4 to 0, 5 W/ (m²*k) in buildings from 1961 to 1975. In buildings from 1996 to 2005, the u-value lies at 0, 2 W/ (m²*k). In order for older buildings to achieve U-values as low as those in the younger buildings, it is necessary to add on average insulation equivalent to 190 mm mineral wool.⁴²⁴

The average U-value for multi-family dwelling roofs is on average 0, 23 W/ (m²*k).⁴²⁵ In order to get the U-value for roofs in the older buildings as low as those in the later ones, it would require on average additional insulation equivalent to 250 mm blowing wool (in Swedish: lösull).

In Sweden, the average U-value for windows was just slightly lower in younger buildings than in older ones. There are various reasons for this small difference between age groups. One is that the windows in older properties have been worn out and are replaced with newer windows with relatively low U-values. Another reason is that it has been difficult to assess whether a window has low emission layers in one or more panes of glass not. If all windows in the building stock were to be replaced with modern energy efficient windows, it is suggested that the average U-value could be reduced to less than half compared with the average for the windows in the current stocks. For apartment buildings, the average for the entire stock is around 2.2 W/ (m²*K).⁴²⁶

⁴²¹ See also *ibid.*

⁴²² See also Boverket, *Teknisk status i den svenska bebyggelsen*, op. cit., p. 40.

⁴²³ See also Meijer, Itard & Sunikka-Blank, loc. cit.

⁴²⁴ See also Boverket, *Teknisk status i den svenska bebyggelsen*, op. cit., p. 39.

⁴²⁵ See also *ibid.*, p. 41.

⁴²⁶ See also *ibid.*, p. 42.

How to think about energy efficiency measures

It has been shown that there is a great deal of technical potential to improve the housing sector with an integrated combination of different kinds of demand reduction strategies, such as improving airtightness, adding insulation, using increasingly efficient appliances, and changing behaviour as well as using low- or zero-carbon technologies such as solar technologies and heat pumps.⁴²⁷ It is argued that the way to achieve a 50% or more increase in levels of carbon savings through refurbishment is not to simply implement one technology but instead a suite of coordinated strategies that view the dwelling, its provided services and its occupants as an integrated system.⁴²⁸ Janda and Killip refer to this as the “house as a system” approach. A selected holistic retrofit approach, even if occupant participation is not taken into consideration, should not be underrated as lots of savings can be achieved.⁴²⁹

4.5.2 Overview of the three renovation projects

In table 4.2 I present the information, attributes and characteristics of the buildings in the three renovation projects that I followed: year of construction, the number of apartments in the building, how many floors there are in the building, what type of windows are installed, how the building is constructed, what type of ventilation is used for the building and the level of energy consumption of the building, as well as assumptions about what the problems with the buildings are. Figure 4.3 shows pictures of the three renovation projects both from the inside and the outside.

⁴²⁷ See also e.g., Brenda Boardman et al., *40% House*, Oxford: Environmental Change Institute, 2005. <<http://www.eci.ox.ac.uk/research/energy/downloads/40house/40house.pdf>>;

Christophe Marchand et al. “Le bâtiment sans énergie fossile? Les bâtiments pourront-ils se passer des énergies fossiles en France à l’horizon 2050?” *Futuribles*, vol. 343, 2008: in Janda & Killip, op. cit., p. 35.

⁴²⁸ See also Andreas Hermelink, “A retrofit for sustainability: meeting occupants’ needs within environmental limits”, In *Proceedings of ACEEE Summer Study on Energy Efficiency in Buildings*, American Council for an Energy-Efficient Economy, Washington, DC, 2006. <http://aceee.org/proceedings-paper/ss06/panel07/paper10>: in Janda & Killip, op. cit., p. 35.

⁴²⁹ See also Janda & Killip, op. cit., p. 35.

Table 4.2: Overview of the three followed renovation projects

	RP1	RP2	RP3 (two buildings)
Built	1961	Early 1950s	1961 (partly renovated 1985)
Apartments	12	33	32, 4
Floors	4	3	4, 2
Building construction	Concrete frame	Lightweight concrete construction	Lightweight concrete construction
Windows	3-pane windows	2-pane windows	3-pane windows
Ventilation	Exhaust air with inlets under the windows by the radiators	Natural ventilation	Supply and exhaust ventilation with heat exchanger
Energy consumption (Heat and water)	153 kWh/m ² per year	141 kWh kWh/m ² per year	154 kWh/ kWh/m ² per year (not known to me from the second building)
Problems in the building	Poor external façade, poor roof construction, poor performance of windows, several cases of water damage in bathrooms, problems with balconies	Poor plumbing, inadequate ventilation, outdated wiring, inadequate fire insulation, and limited accessibility	Indoor environmental problems, low and varying indoor temperature, stuffy air, and odours

Figure 4.3 shows photos of the buildings in the three renovation projects. One can see that, for RP3, there are two different buildings.

Figure 4.3: Pictures of the three renovation objects⁴³⁰

⁴³⁰ Pictures taken by Katharina Reindl

CHAPTER 5

5. Locating the middle of the planning and design phase

It is a bit before 9 o'clock in the morning. I arrive at the municipal housing company's headquarters, the so-called "tower" building. I am waiting at the reception of the housing company, together with some of the external consultants and the university participants who have already arrived, to be met by someone from the housing company. You need a key-card to get into the building, which we do not have. The project leader meets us at around 9 o'clock and takes us to floor 17, where we will have breakfast together. There is a hotel in the same building, and the hotel guests as well as the housing company employees can have breakfast or fika⁴³¹ here. The breakfast area is very nice and has a wonderful view over Linköping and the lake Roxen, which lies next to Linköping. It is always very nice to be up there. We all take our breakfast and sit down at the table together. Everyone has arrived except the two architects; they always arrive late, and sometimes they miss the breakfast entirely and come only to the meeting at 9.30. It is an informal atmosphere; we are talking about the project and everyday life matters. Everyone is laughing and joking.

At around 9.30, we go down to floor 11 for the meeting, and people bring a cup of coffee or glass of water. At the meeting the more formal part starts. We go through the agenda, but it is still a very open atmosphere with occasional jokes, and everyone is laughing. It is mainly men of middle age and above who are sitting around the table. They already know each other and refer in their jokes to previous projects in which they have worked together. The meetings are quite male dominated. There are four females, young women, two external consultants and two university researchers (including me); otherwise, it is the men who have worked many times together before. A lot of the discussion is around the drawings. Drawings are shown and discussed, and notes are taken for changes. As usual at the meetings, the discussion circles around the shafts and their influence for all other installations. Other common discussion points mentioned at the meetings are the ventilation and heating system, elevators, accessibility, possible changes of the apartment layout, changes of balconies, electrical outlets and lighting, garages and laundry rooms as well as issues such as preventing rats from getting into the building. If energy was discussed in the meetings, then it was only very briefly.

(Summary and excerpt of a project meeting, RP1)⁴³²

⁴³¹ "Fika is Swedish for a coffee break that's more about socialising than drinking coffee. And something sweet is also welcome" <<https://sweden.se/culture-traditions/fika/>>, accessed 2017-06-16.

⁴³² This is an excerpt from the notes for the meetings for RP1. It has to be noted here again that RP2 was quite different, as there was no common breakfast and the meetings also usually started after lunch at 1 pm. However, there was a coffee break that allowed for some informal conversations with the other participants. (Three meetings of RP3 were very similar to the RP1 meetings and the other three were similar to the RP2 meetings)

This fieldwork description exemplifies how the meetings of the planning and design phase were usually arranged in renovation project 1. The professionals in the middle do the actual planning and design of a renovation, wherein they prepare and take decisions regarding the adoption of energy measures, but they are also influenced by other actors, both on the top and bottom. Almost all professionals participating in the project groups have been engaged by the company before for other projects and thus they are familiar with each other.

Questions arise concerning what consequences come out of such arrangements in terms of utilisation of knowledge from their background, work practice and experience from earlier projects (aggregated knowledge) and developments of new knowledge. The project groups consist of both external consultants and internal employees of the housing company who work together over a long period of time, and the formal project meetings usually follow a predefined agenda. The internal employees and external consultants represent many different professions and come into the project groups with their different professional work practices. What do aggregated knowledge and the routines for the meetings mean for the outcome of the planning and design phase? Questions of this kind will help me to understand how and why certain energy measures are promoted or rejected in the planning and design for renovations.

This chapter serves as an introduction to the middle actors and the project group meetings as an arena for enabling or disabling energy issues and measures in renovations. I will later also elaborate on the top and bottom and their relation to the middle in the planning and design phase. I start by identifying and locating the middle and its relation to the top and bottom in my case study, and I introduce the professionals in the middle and their different professions, work practices and backgrounds, which were briefly presented in my analytical framework, section 2.3, and in section 3.3.1. Then I present what the middle professionals think is important to achieve with a renovation. After that I give an overview of the content and structure of the meetings and the meeting routines, also in relation to energy-related issues and discussions. Finally, I discuss energy efficiency in the building renovations and whether it can be seen as realised.

5.1 Middle professionals in planning and design phase meetings of renovation projects

When I started to follow the three renovation projects, the official aim, as introduced by the housing company, was for these renovations to lead to reduced energy consumption in the buildings concerned. These renovation projects were the very first ones undertaken with this aim in mind.

Briefly, again, I regard the professionals working in the project groups during the renovation planning and design phase as the middle (including the internal employees as well as external consultants). The investment group (the CEO and the management)

constitute the top, while the tenants and the Swedish Union of Tenants are found at the bottom.⁴³³

The middle professionals create an action plan for the (energy) measures to be implemented for the upcoming renovation. This middle can be seen as a loose group or level with heterogeneous professionals, representing different areas of knowledge, who come together to plan and design a project. For each specific renovation project, a project group is put together for the planning and design phase. Each project group exists for one specific project only, constituting a temporary coalition. They participate in the planning and design of a building renovation, and thereby bring their different work expertise and practices to the meetings. The combination of their different work practices forms the planning and design meeting practice of a specific project. This is shown in figure 2.8 in section 2.3. However, since the construction sector is not particularly big in Linköping, the same actors come together and meet over and over again in other projects initiated by Stångåstaden and other purchasers, so that the planning and design meeting practice can endure as it is repeatedly enacted.

In the following analysis (in chapters 5, 6 and 7) I will employ my analytical model for investigating the practices as developed in the meetings of the project groups as well as the relation of the middle to the top and bottom. According to the middle-out perspective, the middle actors are crucial for including energy in renovation projects, as they are making decisions about how a renovation will evolve.

Regarding the professionals, I will make one important distinction in my analysis. I distinguish between the internal employees and the external consultants. I decided to do so in order to investigate whether there are differences in knowledge, opinions or information between the actors working within the housing company and the professionals contracted for the planning and design phase of the renovation. I also differentiate to some extent between the different professions involved, such as architects, HVAC consultants and electricity consultants, but the focus on the different professions is not a major focus in this thesis.⁴³⁴

The middle is not a coherent group but rather a permeable and heterogeneous entity in which professionals with different areas of expertise and different work practices and personal opinions and preferences meet. Professionals come together in a project group to put forward the plan and design for a renovation project. From the middle-out perspective, emphasis is put on the professionals in the middle in the planning and design phase of renovation projects; however, the permeability of the middle must be addressed, especially in a setting such as in my case study. I therefore want to underline that even within the project group meetings of a renovation project, there are variations regarding the level at which certain professionals actually work. In

⁴³³ See also section 2.3 and section 3.3.1. Section 3.3.1 also shows in more detail an overview of all the different professionals and professions involved in the planning and design phase of the three renovation projects, split into internal employees and external consultants. This is shown graphically in figure 3.1.

⁴³⁴ This would be interesting to include in future research, however.

my case, the top, middle and bottom should be seen as levels rather than as static groups or categories, since professionals might move between different levels and, also, professionals that are part of one level might be representing another. Hence, certain people “move” between different levels in different contexts, like, for instance, the real estate development manager who sometimes took part in the project group but was also an advisory member in the investment group. This member did not usually attend the project groups’ meetings and might have been participating because the project was one of the first to be oriented more specifically towards energy issues and maybe also because we, the researchers, were present.

The middle professionals have different points of departure and various areas of expertise, and they are engaged in project groups to realise renovation projects of Stångåstaden. The goals established by the company are important, and, in relation to this, I was interested in investigating what the middle professionals involved in the projects think is important to strive for.

5.2 What to achieve with a renovation project

The housing company stated that renovations should lead to reduced energy consumption of buildings, and also, in many conversations with the housing company before the projects started, energy reduction and the 25-25 energy goal were highlighted. Thus, my assumption when entering the research project was that these renovations would have a special focus on energy efficiency and energy conservation.

To find out more about whether this goal was in the minds of the middle professionals, I asked all the involved external consultants and the internal employees in my interviews what they considered to be important in the renovations and what should be achieved with the renovation of the specific building. I wanted to hear what each person thought about these issues and see whether they would mention that they considered energy efficiency to be important for renovations without my specifically asking about it.

The middle professionals mentioned in total seven different aspects considered to be important when renovating a building. These were (1) having a good standard for the tenants, (2) increased energy efficiency or reduction of energy use, (3) technical aspects and improving the building, (4) economic considerations, (5) a good-looking and aesthetic building, (6) following the laws and regulations, and finally (7) getting more rent. These are mentioned in order of the frequency, where (1) was mentioned most often and (7) least often. These different aspects are shown in table 5.1. The table is divided into responses by internal employees and external consultants. Furthermore, the same professions are marked in the same colours to get an overview of possible similarities.

I am interested in whether the internal employees shared the same opinions, and I am also interested in whether people with similar professions had similar ideas about what to achieve.

Table 5.1: Overview of aspects seen as important to achieve with a renovation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Internal, Project leader	○				○		
Internal, Project leader					○		
Internal, Project leader		○	○				
Internal, trainee			○	○			
Internal, real estate development manager		○	○				
Internal, rent negotiator	○	○	○				
Internal, area manager	○	○	○				
Internal, area manager	○	○	○	○			
Internal, renovation coordinator	○						
Internal, energy manager	○				○		
Internal, HVAC	○		○			○	
Sum internal	7	5	7	2	3	1	

External, HVAC (company x)		○		○			
External, HVAC (company x)	○	○					
External, energy consultant (company x)	○	○	○				
External, EI				○			
External, fire consultant					○	○	
External, fire consultant			○			○	
External, architect (firm z)	○	○					○
External, architect (firm z)	○	○	○				
External, architect (firm y)	○	○	○				
External, building engineer (firm y)	○						
External, construction engineer		○		○			
Sum external	6	7	4	3	1	2	1
Sum total	13	12	11	5	4	3	1

The goal of achieving a *good standard for tenants (1)* was mentioned by most of the interviewees (13 out of 22). They aimed at improving tenants’ living environment with higher standards after the renovation. Interviewees also mentioned making the

buildings accessible and more secure for the tenants (e.g., regarding fire). It should be a building that works for the tenants, and after the renovation the apartments should reach today's standards. Another important factor was customer satisfaction. Seven out of 11 internal employees and six out of 11 external consultants emphasised this goal.

Yes, well, it is the standard increase that people want to have.
(Interview, EC-1)

Several consultants (12 persons of 22) mentioned *increased energy efficiency – reduce energy* (2) as important goals to strive for. It should then result in a building that consumes less energy and thereby reduces energy consumption. The building should be energy efficient and good from an environmental perspective. They also discussed the 25-25 energy goal and that there is an increasing focus on energy and measures such as HRV ventilation systems, better windows and insulation of the façade. Five internal employees out of 11 and seven out of 11 external consultants mentioned this aspect.

Stångåstaden is hunting this 25-25 [energy goal]..., very much in order to reduce energy consumption and the cost of electricity. (Interview, EC-6)

Concerning *technical aspects* (3), several interviewees (11 persons of 22) said that the old systems should be exchanged; for instance, there were old pipes and wires that needed to be fixed. Many houses had also been damaged, so the buildings needed to be renovated and repaired. Renovations help to ensure that the house can stay in service and will extend the life-span of a building. Renovations will maintain the building so that it will work and last for the next 50 years. Among the 11 professionals, this goal was mentioned by seven internal employees and four external consultants.

So the main thing is to get all the old pipes and wiring out, and old electricity and so on. So, much security. One wants to avoid things that can suddenly become expensive, like water leakage in several apartments. Once ... a house gets over five or sixty years old, everything comes at the same time.
(Interview, IC-1)

The rest of the goals mentioned by the middle professionals were put forward by five or fewer persons. The goal of having a *good-looking and aesthetic building* (4) was said to increase the standard so that the building would look new, and the focus was more on the appearance; some saw this as important for the common areas as well. Two internal employees out of 11 and three external consultants out of 11 said this, in total, five of 22.

It should be good-looking and aesthetic [...] (Interview, EC-5)

Economic considerations (5) were important to a few middle professionals, who argued that finding economic and robust solutions or the lowest LCC (life cycle cost) are important in a renovation. Here, robust means that solutions should function well with minimal maintenance over time and they should be easy, simple and cost efficient. Also, it was mentioned as important to hedge the value of the building for the next 50 years. Another aspect was to get the right product for the right price. This was considered important by three out of 11 internal employees and one out of 11 external consultants, in total four.

The product at the right price is important. (Interview, IC-5)

Just a few professionals mentioned the goal of following the *laws and regulations* (6), maybe because it was self-evident that they must be followed. It was mentioned by one out of 11 internal employees and two out of 11 external consultants, by a total of three of 22 interviews.

Of course, solutions that meet the legal requirements specified in the building regulations, and in the most optimal way. Optimal is for me really the cheapest solution, or with the lowest life cycle cost. So that you find a solution that will last over time and is financially robust. (Interview, EC-2)

Finally, only one professional mentioned the goal of getting more rent (Interview, EC-7)

Well, I would say to get more rent, I think that is the main goal. (Interview, EC-7)

To summarise, increased energy efficiency was a goal mentioned by many middle professionals, but it was not the most frequently mentioned one. Rather, the middle professionals put the tenants' apartment standard highest.

The result shows what the interviewees regarded as important to achieve with renovations, and it can be used to analyse the variation within different professions, to get a picture of whether people with the same profession were working with the same orientations.⁴³⁵

Within the professions there were also variations; however, one or two aspects were often the same. Most overlap appeared among the architects and area managers as professions. Interestingly, the project leaders had quite different ideas about what was important to achieve with a renovation.

⁴³⁵ Also, it can be used to study professions and possible development of professions in relation to increasing the inclusion of energy aspects in renovations, which would be related to the research conducted by Janda & Killip (op. cit.). This can be pursued in future research. (See more on Janda and Killip in section 1.3, on previous research.)

The importance of energy efficiency was more often highlighted by the external consultants compared to the internal ones. Although the representatives for the housing company stated that energy had become important, especially since the 25-25 energy goal was introduced, only half of the internal consultants mentioned energy efficiency or energy reduction. One representative of the energy group thought it was most important to have satisfied tenants and that there are economic considerations when it comes to energy. S/he did not emphasise the importance of the energy measures. Maybe the internal consultants found it self-evident to include energy, or maybe it was still such a new concept that it had not yet been translated or embedded into people's minds and everyday work.

5.3 A meeting structure supporting the known

Having looked at what the professionals wanted to achieve with a renovation or what they said was most important to consider when renovating a building, I will focus next on the actual planning and design meetings and describe the structure, content and actors. This will lay the ground for the analysis of the meeting practice in chapter 6. The theoretical concepts elaborated on here are mainly aggregated knowledge, enabling and mediating as presented in the middle-out perspective.

5.3.1 General set-up and sociality

At the meetings of the project groups, the participants discussed what specific measures and solutions to suggest, and some decisions were taken regarding their implementation in the renovation. I will describe the meetings' set-up and structure and then investigate how solutions and measures were discussed and negotiated and how decisions were made.

The project group meetings were held in the headquarters of the housing company, and for each renovation project the meetings took place at least every second week and lasted between one and a half to two hours. In between the meetings, the professionals worked in-depth with their professional tasks for the upcoming meetings.

RP1 and RP3 had a similar social and informal character, in contrast to RP2. For RP1 and RP3, the meetings mostly took place in the morning and started with the common breakfast and get-together. At these breakfasts, it was possible to talk more informally to the project leader and other participants before the regular meetings would start. These get-togethers were great opportunities to socialise and get to know the participants, and to hear about their struggles, problems they encountered or questions they had about, for example, drawings, calculations, energy issues or dialogues with the tenants. It was also possible to discuss what had happened between the meetings, such

as what kind of work the consultants had done. This information was then more formally presented at the meetings that followed right afterwards.

In contrast, there were no informal starts to the RP2 meetings. There we started directly with the meetings and usually had a short coffee break where there was a chance for the participants to talk with each other more informally.

The agenda of the meetings

The performance of the planning and design phase for the renovation projects had a similar structure, and the meetings followed a rather similar predefined agenda. The content of the meetings was framed by this agenda, defining what issues to discuss. Even how the meetings were conducted can be referred to as aggregated knowledge, as (almost) everyone knew the meeting routine. Thus, basically everyone knew what to expect from the meetings and what to do.

The agenda was similar for the projects, with only some slight variations. In summary, it included: (1) administration, (2) authority issues (e.g., building permits), (3) documentation (e.g., construction plans), (4) quality and environmental issues (e.g., the waste management and work environment at the building site), and (5) project time plans. The project leader always chaired the meetings. Each professional consultant was given a time slot in which to report progress on their work and raise discussion issues, usually in the following order: architecture, construction, HVAC, electricity, and other construction/installation issues, such as fire, accessibility, energy, and sound. From all the participant observations it was obvious that architecture, HVAC and electricity issues got most of the time. Fire came in towards the end of the meetings, but it was seen as important by everyone involved as all the others must adjust their work to the fire regulations. Some of the involved consultants even thought that fire should come in earlier in the process. The presentations and discussions at the meetings were very lively and friendly. Accessibility was often discussed during the meetings. Sound was never included at the meetings of any of the three followed projects.

The content of the meetings of the three RP's, then, were routinised and based on a similar formal structure, but with a different kind of sociality. The involved internal employees as well as the external consultants knew what to do and what to expect from each other; also, most of them already knew each other from before. This became especially obvious when new people entered the renovation projects as, for them, it was harder to understand what was going on at the meetings.

I know them, yes it is as I say, like a chicken run (in Swedish: hönsgård)... you know most of them. (Interview, EC-1)

We have a few old hands (gamla rävar) who have always been involved and know Stångåstaden's requirements pretty well, so they probably do quite a lot on routine, for the better or worse. (Interview, IC-6)

Content of the meetings

Between the meetings the practical work was done, and the results from this work was presented at the next meeting. To get the involved professionals up to date with what had happened in general within the project between the meetings, the project leader presented an overview of the project's progress and showed what was already decided upon and underlined what issues needed more discussion.

After this introduction the architects did their presentations. Issues that the architects presented concerned the drafting of drawings, such as for door positioning, washbasin dimensions, the relationships between washbasin dimensions and shafts in the building and so on.

Then usually HVAC issues followed, which to a large extent concerned the positioning of shafts. Shaft positioning always took a lot of time during the discussions. The shafts were seen as important because the position of the existing shafts determines what is possible to do with the building during the renovation, since they cannot be moved. Ventilation and heating systems were also discussed at each meeting. Regarding ventilation, in all of the RPs it was at least discussed whether a supply air ventilation should be installed, from economic as well as technical standpoints. Regarding the heating system, it was discussed whether the heating system would be replaced or left untouched. In one of the meetings, the question of heat pumps was raised by the researchers from the engineering department of the university. This was never a possible option, however, since all buildings in my study were already connected to the district heating system, which is run by the local municipal energy company, Tekniska Verken AB. Both the housing company and the local energy company are owned by the municipality, and the municipality policy is that its companies should choose district heating whenever possible. Thus, the option to disconnect from district heating and install a different heating system was never discussed. This must have been common knowledge among the external consultants as they did not bring this option up. It was further said that heat pumps can be considered as an option for new constructions but not renovations.

Discussions on electricity usually followed HVAC. These were merely practical and concerned where to locate outlets and light fixtures, and whether cables should be exposed or not. When electricity was discussed, the project leader and the consultant for electricity were the main participants in the conversation. During the discussions on HVAC and electricity, a lot of time was also spent on telling anecdotes and referring to earlier projects, particularly if buildings had just recently been renovated in the same area. The HVAC and electricity consultants were in general quite dominant in RP1 and RP3, while in RP2 the electricity consultant dominated. They took up a lot of space and time during the meetings.

The other members of the project group only took part in the HVAC and electricity discussions when they had questions or their part of the work would somehow interfere with their installation and might need to be marked on the drawings. The same was true for all the other professions when it was their turn.

When the architecture, HVAC and electricity issues had been discussed and dealt with, the time of the meeting was usually running short and other issues, such as general energy issues and the tenants' views, were treated very briefly and it was concluded that these issues would be taken up again at the next meeting. However, this was repeated at all meetings again and again without ever really having much time for energy-related discussions. There were large similarities from meeting to meeting, but the issues discussed, even though similar, got more detailed over time in the planning and design phase, so that in the end decisions could be made for the tender document.

Differences between the meetings

In the interviews, the involved consultants were asked specifically about the content and structure of the meetings of each project, and whether they thought that the meetings were "normal" or if they were different every time. It was clear that the agenda stayed the same for each meeting, which was also shown by protocols from previous meetings. All the interviewees indicated that the meetings were more or less the same and followed the same pattern. For example, one external consultant said, regarding the content and structure of the planning and design meetings:

It is difficult to put it in those terms, because things are so specific from project to project. What differs is what you need to do, the measures and kind of contracting involved [e.g., all-in or divided]. The other matters are quite similar. It is the same steps that you go through and look at in every project.
(Interview, EC-10)

Additionally, all the renovation projects follow a process document created by Stångåstaden, which includes the steps of and within the different phases of a renovation project as well as roles. This was not discussed in the meetings, but I found out about this process document during the interviews. Then I received a copy of the process document and I could compare the actual document with the participant observation, which overlapped.

The differences that emanated between the three renovation projects concern the specific measures to be implemented, which also relate to differences in the specific buildings and the different project leaders. No buildings are the same; they are heterogeneous, as the housing company and the consultants state. Nevertheless, usually a common package of measures is used for all building renovations, which is based on the aggregated knowledge about the buildings among the professionals involved. This

common package is then simply mediated to fit a specific building. However, in my case study there are similarities between the buildings as they were built during the same time period, they are located quite close to the city centre and they have roughly the same size and building materials.

As regards the project leaders, I observed that even with the predefined agenda and the process document of the renovation steps, there were some differences between the projects. The project leaders' different approaches to the renovation projects affected the projects and gave slightly different dynamics to the planning and design meetings.

On the whole, it's pretty much the same. There are some parts, and some have their ideas that it should be like that, and some have other ideas like that and that... But basically it is the same thing, really. (Interview, EC-5)

One of the external consultants, however, observed some changes relating to the fact there were a few new and younger people who had been hired within the housing company as project leaders:

Stångåstadenhas become so... there are so many new project leaders that their opinions sprawl. They do not have the same requirements. In the past, the old guys who were at Stångåstaden all had the same idea, and now there are a lot of new/freshmen [...] with new ideas. (Interview, EC-1)

5.3.2 New participants in the routinised meetings - challenging the practice

A new architect in town

The members of the project groups were familiar with the structure and the routines of the meetings and they had aggregated lots of knowledge concerning how to do the planning and design and how the buildings work. In addition, the professionals knew each other quite well, not least because of the limited size of the construction industry in Linköping and, also, they had worked with each other before. This became especially apparent in one of the projects, where there was a new architect involved, who was also new in town and consequently not familiar with Linköping's construction industry, its actors and its planning and design practice. S/he came into RP1 later than the other consultants, but was included from the beginning for RP3. This architect said in the interviews that s/he had not been properly introduced to the practice and to the other involved actors and wanted more information about what stage the planning and design was in when s/he became involved.

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. (Interview, EC-8)

Since the renovation process is highly routinised and the professionals in the middle have lots of aggregated knowledge, both regarding the buildings and how the planning and design meetings in Linköping are performed, it creates difficulties for outsiders and newcomers entering the process. New professionals need an introduction to the way renovation projects are run.

Including an energy consultant to enable more energy efficiency

It was uncommon to include an energy consultant in the company's project groups for renovations. Among the external consultants working in the renovation projects there were some who knew more about energy and energy measures. Usually, this was ascribed to the HVAC consultants since their work concerns the big installations, such as heat and ventilation, and it becomes their task to operationalise their professional expertise. Their work usually does not include any direct input on energy issues, but it is their big installations that lead to energy consumption reductions.

However, in one of the three projects, and as an effort to bring energy more into the planning and design process, an energy consultant was included, employed at the same company as the two external HVAC consultants. Even though there was usually no specific consultant for energy, the HVAC company seemed to be in charge of providing some kind of energy calculations. In one way or another, these energy calculations from the HVAC company were supposed to be included. However, as especially obvious from RP2, where no external energy consultant was included in the meetings, it was unclear how and to what extent these calculations were actually done and whether they were used at all. The external energy consultant from RP1 should have been behind all the energy calculations according to the interview with one of the HVAC consultants, and according to her/him, this was also valid for the other renovation projects, RP2 and RP3, in which the energy consultant was not physically present at the meetings. As the energy consultant was only present at RP1, s/he left her/his existence there as a "shadowy figure", as a project leader called her/him.

No, s/he is a shadowy figure right now. The thing is that they are so new, these energy issues and questions so far, so I do not think we really have established it yet. [...] [The energy manager] is new in his role. The goal is new. This is new. So it ... we are barely out of the starting blocks yet, but there is ... will probably change a lot, the ways of working/working methods. Absolutely. (Interview, IC-5)

In RP1, which included the external energy consultant, energy was a more prominent part of the meetings, but still, little time was spent on the energy point from the meeting agenda. Energy questions were taken up for a few minutes and not in-depth, and the process and solutions discussed stayed the same, compared to a previous meeting protocol and RP2 and RP3. The external energy consultant's presence in RP1 was apparently not even noticed by one architect, who said in the interview during a discussion about energy efficiency renovations that it would be a good idea to involve an external energy consultant to strengthen the energy issues.

If you really would like to build and renovate a building up to date, then you would have needed to take someone external in ... like an energy consultant. Maybe someone at HVAC knew something about it. We didn't get any information about that. (Interview, EC-7)

It remains unclear what was expected from the external energy consultant apart from the calculations s/he provided. Whether and how these calculations were actually used also remained unclear. Even though the external energy consultant was included in RP1 in order to enable energy efficiency, the structure and routines of the process did not change, and the same solutions and measures suggested were taken from the aggregated knowledge and experience and mediated to fit the renovation objects in question. It could also be assumed that the researchers' presence affected the involvement of the external energy consultant, namely that s/he was there for our benefit as it was supposed to be an energy efficient renovation.

Introducing the energy group – a tool to enable energy efficiency?

The company's energy group was formed in 2011/2012, with the main task of working with energy issues for Stångåstaden as part of the new energy policy and the 25-25 energy goal. One aspect of the energy group's work involves raising energy questions and bringing more energy efficiency and energy awareness to the renovation projects. However, the group was still in its formative period when I did my fieldwork in 2013 and 2014, and at that time it was still unclear how the energy group should work. The task of the energy group, according to its energy manager, is to operate and work towards the 25-25 energy goal. However, the energy manager also said in the interview that the group had not yet found a good way of working as it was so new.

We have not established all roles and tasks. That is how it is. It will likely take one or two years and then we will know, but we are working and it is obvious that things go in different directions and ..., but we do things and we save energy, we find energy projects like that. [...] forming this group is of

course to get a proper focus both internally and externally, showing that this group is working with energy. (Interview, IC-9)

The real estate development manager within the housing company reflected that they had tried on earlier occasions to include energy experts, which did not work out very well and had limited success, and that even with the introduction of the energy group, there was more work to do regarding energy.

There is much left to do, improve [...] above all, maybe get our consultants even more involved in this. Get some more specialists involved on the energy side in our projects... in all honour, but I mean like the [HVAC consultant], for example, s/he is not really an expert on energy issues, but s/he knows the system and so the [buildings] ... but one might go a step further and get some people who work more with energy issues and that is a bit why we are creating this energy group. (Interview, IC-2)

For renovation projects, the roles of the people who were part of the energy group were not clearly defined yet. The energy manager was present at the beginning of the planning and design meetings for RP1 and RP2 but did not participate at all in the project meetings of RP3, which was due to her/him not having time to join.

For the consultants, working together with the energy group was, of course, something new. It seems there was no clear communication from the housing company to their external consultants about the tasks related to energy efficiency and the existence of the energy group. Not even the consultants from the same external HVAC company all knew about the existence of the energy group. In RP1 and RP2, where the energy group was present, one of the consultants even said s/he had never heard of them, and the other one said s/he was working very closely with the energy group.

The role of the energy group was positively emphasised in the interviews but it still seems unclear as to how the group will develop and integrate into the municipal housing company's work. It seems as if there is a lot of power assigned to the energy group by the members of the project groups, but it also appears as though the energy group is not yet using this power.

The participant observation showed that when attending the meetings, the energy manager gave some comments about energy measures, but did not play a major role. At the meetings there is always a bullet-point "Energy" and/or "Environment" on the agenda, but the discussions were rather diffuse and very short compared to other topics.

Even though it was pointed out several times that energy is a central part of the project, and a representative of the energy group joined some of the meetings, energy issues did not play a major role during the meetings.

The energy group is fairly new too, I do not know how ... I think there might be some little problems in communication, I can imagine. But I really have

no evidence for it, more than a feeling so.... But it is, as I said, it's fairly new, the group is being formed... (Interview, EC-3)

The formation of the energy group aimed to enable energy efficiency actions taken by the professionals in the middle in renovation projects (and in other projects of the housing company). However, the group was new and roles and tasks were not established. Not much changed in the meetings of the renovation project groups, and the same solutions seemed to have been used again, based on aggregated knowledge. The energy group might play a bigger role in the renovation projects within the housing company in the future practice if it gets time to establish itself as an important actor and if some kind of routines are introduced in the project group meeting agendas. It will take time to create new routines for the energy group, which in turn may result in new practices. All the participants in the planning and design phase need to learn to work with the energy group.

5.3.3 Discussion on energy and energy measures during the meetings

In terms of time spent, energy as an issue was paid the least attention of all issues at all the observed project group meetings. Energy discussions generally did not take up more than five to 10 minutes (out of about 120 minutes for each meeting), if discussed at all. I had expected that energy issues would be a big part of the planning and design of the renovation projects since it was said they would become increasingly important and the renovation projects were said to be energy projects. Nevertheless, as it turned out the energy-related measures, such as insulation, U-values, exchange of windows and individual metering and billing, were dealt with very quickly. This can partly be explained by the fact that the professionals in the middle had lots of aggregated knowledge on how the buildings work and they had their standard package of traditional measures that they knew would work and thus they suggested using them again.

The obvious priority of the meetings in the planning and design phase was the coordination of installations so that everything would run smoothly when the work on the buildings would start, and energy issues did not take a place therein. The structure and organisation of the project groups' meetings did not leave space for brainstorming or developing new solutions, for example, regarding energy efficiency. Instead, the meetings were conducted in a way that emphasised and encouraged measures that everyone was familiar with and did not lead to further explanations and deeper discussions. All the involved professionals knew what must be done to get the building renovated, that fire regulations needed to be followed, that the shaft position was a central concern, and that cables needed to be put in place and that all installations needed to be coordinated around them. Thus, the aim of the planning and design phase was not to have extended discussions on new measures or to come up with new ideas

for reducing energy consumption. It was rather to make the renovation installations happen.

All this shows that the structure and organisation of the planning and design meetings was not open for taking support from the new energy group, and it did not encourage project groups to commit themselves to reducing the energy consumption nor did it inspire them to work with the 25-25 energy goal. Overall, at the project group meetings, the purchaser and the consultants met and the consultants were assigned time slots for issues concerning their individual specialties, but there was no common goal on energy and no time slot to talk about issues related to energy specifically. The involved consultants made decisions in their own specialised areas which benefited established solutions based on aggregated knowledge, and there was no encouragement during the meetings to go beyond the ordinary and do things differently and enable other possible measures.

As I said, it's great that it has become routine, but it is maybe not only good. There should maybe be something new... (Interview, IC-6)

As a result, the routinised structure of the renovation projects and the aggregated knowledge concerning traditional measures and solutions actually disabled new solutions.

5.4. Realising energy efficiency in the building renovations?

This section comprises two parts on energy efficiency outcomes. The first part is a discussion about whether the middle professionals thought that energy efficiency and including energy measures had become a major part of the planning and design of renovation projects. In the second part I present an overview of the actual implemented energy measures of the three renovation projects.

5.4.1 Energy included in the renovation projects?

From the interviews, I gained a diverse picture of whether the middle professionals thought that it was important to achieve energy efficiency and include energy measures in the renovation projects (see also table 5.1, in section 5.2).

The majority of the interviewed middle professionals said that energy was included in the projects. Yet, the middle professionals did not agree on the extent of the inclusion of energy issues; some said yes, more than before; others said yes, a little; some said no; and some said they did not know.

Many said that energy was now included more than before. Some mentioned that the focus had shifted towards energy being a bigger aspect today. One of the project

leaders said that energy efficiency was now a central aspect and that this was a new focus within the company:

The only difference with this project is that we really focus on energy. Now it is like a very explicit focus. We have looked at it [...] in previous projects as well, but this time it's a ... a big point. (Interview, IC-5)

Three interviewees mentioned that energy was now included because of the 25-25 energy goal. One internal employee said that it had become better, with a greater focus on energy. The only risk this employee saw was that if the focus on energy led to higher costs, then the energy measures might be taken away again and not much would be done in the end.

[...] it's a clear improvement compared to previous [projects]. Absolutely. That is how you should see it. At the same time, I can have opinions or comments; I was of course both scared and sad too ... No, but with that reasoning of the investment group when they start to say that it is too expensive and we need to keep the costs down because this project only costs 30 million, for example, and you start and check, yes [...] do we have to do those measures? Then they look directly at those that we have recently started to include and those have to do with energy. (Interview, IC-10)

One internal employee emphasised that there ought to be more of a focus on energy than there is currently. Also, there were middle professionals who thought energy efficiency did not play a big role in the renovation of buildings. Two external consultants thought that there was no particular focus on energy per se, but that the renovation followed the building norms (BBR requirements)⁴³⁶.

No, it's the same as usual in other projects. We have BBR and fall back on it, saying that we should have those demands of so and so many watts/square metre. We always consider that. Then it can happen that the client may have more stringent requirements, but it is usually not the case, but it can happen. (Interview, EC-5)

Moreover, two other external consultants said that energy was not really included and that in general it was very rare for energy to be included in renovation projects. Another argued that energy was included to some extent but it was rather superficial and not really consequential when it came to the actual work. This consultant thought the 100 mm insulation was not good enough, that it should be at least 150mm. Additionally, this consultant thought that when energy was discussed the cost also immediately came up and the energy measures were then abandoned.

⁴³⁶ BBR requirements - <http://www.boverket.se/sv/byggande/bygg-och-renovera-energieffektivt/energikrav/>

And then there were the costs again. The costs. So first you want to do it, then it costs and then you do not do it. But maybe, if one calculates it for 100 or 30 years, the costs have perhaps paid off because one saves costs. (Interview, EC-7)

There were also two consultants who could not tell whether energy was included more now than before.

Even though the majority of the middle professionals gave the impression that energy was being taken into consideration in the projects, there were also a few who had the opposite opinion, that energy issues were not included, and also some who did not know or thought more could be done. Hence, it was not a clear picture.

5.4.2 Implemented energy measures

In this section I describe what Stångåstaden sees as their set of possible energy measures to install according to their annual report. I then present the energy measures mentioned in the tender document.

Technical factors influencing the energy consumption of the residential building stock were presented in section 4.5, with a focus on space heating and systems for hot water, ventilation systems, windows and insulation, since these are the areas where energy measures are most relevant.

Almost all energy efficiency and reduction measures mentioned by the interviewees as most commonly chosen were: additional insulation, exchange of windows and if possible HRV systems – the so-called “traditional things”, as one of the project leaders referred to these measures. Another commonly mentioned measure was to choose energy efficient appliances. However, these are possible measures and not all are selected for each renovation. Further they were chosen according to experience instead of taking a whole-system approach. As one project leader said, energy efficiency questions were considered before but were not part of the planning and design of a renovation as much as now. Also, energy calculations were never really done before. But what energy measures were selected in the end and included in the renovation projects?

Implemented energy measures according to Stångåstaden’s annual report

In Stångåstaden’s annual report from 2014 and 2015, there is a list of possible energy measures that could be implemented, showing what the company considers as energy measures. There are six energy measures, but not all are implemented for each renovation project. In the annual report, the company gives an overview of the renovation projects conducted in the previous year and describes which energy

measures were applied. The six theoretically possible energy measures are (1) HRV ventilation, (2) supplementary insulation, walls, (3) supplementary insulation, loft, (4) new windows, (5) supplementary sealed glazing unit, internal and complete replacement of bathroom windows, and finally (6) exhaust air heat pump.⁴³⁷ Interestingly, heat pumps are included in the list of possible energy measures, even though, as noted above, due to the connection to the municipality-owned energy company Tekniska Verken AB, it was said in meetings that it is not an option for renovations, only for new construction. An overview of the three renovation objects and their implemented measures as described and presented in the annual report can be seen in table 5.2.

Table 5.2: Overview of the implemented energy measures according to the annual report

RP1	Finish: 2014	(1) HRV ventilation (2) Supplementary insulation, walls (3) Supplementary insulation, loft (4) New windows In total, four out of six measures.
RP2	Finish: 2015	(1) HRV ventilation (2) Supplementary insulation, walls (3) Supplementary insulation, loft (4) New windows In total, four out of six measures.
RP3	Finish: 2015	Building A-C: (2) Supplementary insulation, walls (4) New windows In total two out of six measures. Building D: (1) HRV ventilation (4) New windows In total, two out of six measures.

Implemented energy measures according to the tender documents

I analysed and summarised the decided-upon energy measures written down in the tender documents produced as a result of the planning and design phase (see table 5.3).

The tender documents for RP1 and RP3 had the same format, while the tender document that I received for RP2 had a quite different format.⁴³⁸ The reason I received

⁴³⁷ Stångåstaden, Årsredovisning 2014, Del 1 Verksamhet, op. cit., p. 73; Stångåstaden, Annual report 2014, op. cit., p. 73.

⁴³⁸ For R1 and RP3, the tender document was simply uploaded onto the shared cloud storage, and for RP2 I received the tender document by mail since it was starting up again from the beginning.

this different format for RP2 is that, after the tender document was finalised and the bids came in, it became obvious that the project as a whole was too expensive to conduct and the entire process was iterated back to a project group and the planning and design had to be done again. Then it was based on another type of contracting form, with partnering instead of design- [and-] build contracting. I did not follow the second planning and design phase of RP2 with partnering.

Both for RP1 and RP3 there were several tender documents, e.g. separately for HVAC, architecture, electricity or fire.

In the architecture tender document for RP1 and RP3 it says the energy requirements and measures are dealt with in the HVAC tender document. However, there is nothing extra written about energy in the HVAC tender documents. It almost appears to be just a general assumption and shared knowledge that most energy can be saved with HVAC, which probably refers to changes in the heating system and/or ventilation system, and thus the reference to energy efficiency and saving in relation to HVAC. Several times during the interviews, it was mentioned that energy efficiency and saving can be reached through HVAC. In the three planning and design phases followed it was apparent that the HVAC consultants had, and still have, the role of also being some kind of energy experts for the planning and design (for example, they were doing the energy calculations).

The results of the tender documents conform to the overview of energy measures presented in Stångåstaden's annual report shown in the previous section, in table 5.2. However, it is of course more detailed, as u-values are actually mentioned. Additionally, there is information on roof insulation, energy efficient appliances and environmentally friendly materials.

Table 5.3: Energy measures in the tender documents

RP1	Start: 2012 Finish: 2014	<p><u>Space heating (water):</u> All had district heating installed and will keep it</p> <p><u>Ventilation:</u> HRV ventilation</p> <p><u>Environment:</u> Selection of materials must meet class A or B according to the "SundaHus" ("Healthy House")⁴³⁹ environmental database.</p> <p><u>Roof:</u> Attic (floor)/loft supplementary insulation with 300mm mineral wool</p> <p><u>Windows:</u> 3 glazing and fitted with interior blinds. U-value: 1,1 W/m² K. Windows with balcony, U-value: 0,9 1,1 W/m² K</p> <p><u>Doors:</u> Exterior doors and entrances. insulation value, U_{max}=0,8 1,1 W/m² °C</p> <p><u>Walls:</u> Exterior walls supplementary insulation with 100 mm mineral wool</p> <p><u>Appliances:</u> Electrolux or equivalent, energy class A++</p> <p><u>Elevator:</u> Generally, resource-efficient systems should be selected.</p>
RP2	Start: 2013 Finish: 2015	<p><u>Measures:</u> Energy saving measures such as insulation of façades, blowing wool (in Swedish: lössull) in attics, replacing windows, new entrances, new basement windows, a new ventilation system (HRV), and change of stoves should be done and implemented.</p> <p>The need for purchased energy shall be limited by efficient heating, cooling and electricity consumption both during the project phase and when the object is in normal operation. The use of non-renewable energy and electrical energy shall be minimised.</p>
RP3	Start: 2013 Finish: 2015	<p><u>Space heating (water):</u> All had district heating installed and will keep it</p> <p><u>Ventilation:</u></p> <p>8A-C: The heating system is kept and connected to district heating. Mechanical exhaust air system is kept.</p> <p>8D: HRV ventilation</p> <p><u>Environment:</u> Selection of materials must meet class A or B according to the "SundaHus" ("Healthy House") environmental database.</p> <p><u>Roof:</u> Attic (floor)/loft additional insulation with 400 mm blowing wool (in Swedish: lössull)</p> <p><u>Windows:</u> 3-glazing and fitted with interior blinds. U-value: 1,1 W/m² K Windows facing balconies, U-value: 0,9 1,1 W/m² K</p> <p><u>Doors:</u> Exterior doors and entrances. U-value better than 1,1W/m² K</p> <p><u>Walls:</u> Exterior walls with additional insulation of 100 mm mineral wool (8A-C)</p> <p><u>Appliances:</u> Electrolux or equivalent, energy class A+</p>

⁴³⁹ Sundahus – Trygghet för fastighetsägare - Efficient solutions for conscious material choices: <www.sundahus.se>, accessed 2015-05-26).

5.5 Concluding remarks

With this chapter I have started to elaborate on the research aim concerning the enabling and disabling of energy measures in the planning and design phase of renovations. Thereby, this chapter serves as an analytical introduction to the in-depth analysis of the meeting practice in relation to energy measures and also to the analysis of the top and bottom. It also lays the ground for the analysis of their relation to and influence on the uptake of energy measures in the planning and design phase. Theoretically, I focus on the middle professionals in the middle-out perspective. I have also started describing important insights relevant to the practice-theory-based analysis of the meeting practice in chapter 6, and I used the terms “aggregating” (here mainly referred to as “aggregated knowledge”), “enabling” and “mediating” in describing the way energy measures are dealt with, as presented in the middle-out perspective. Overall, with this chapter I have set and described the scene in which the middle professionals work with energy measures at the meetings of the planning and design phase.

Goals of a renovation

The views among the middle professionals differed slightly with regard to the purpose of renovation, as they viewed different issues as important. Energy efficiency, however, was the second-most mentioned issue of importance and it was highlighted more by the external consultants than by the internally employed middle actors. This could simply be the result of the internal professionals regarding energy as self-evident, or conversely, it might be because the idea of focusing on energy was still new and therefore it had not yet been embedded in the employees’ everyday thinking. Apart from the area managers and architects as professions or professional groups, there were big variations among the professions in terms of what they saw as the goal of a renovation.

The scene of the meetings

Routines govern the planning and design meetings, which can be helpful in understanding why certain energy measures were taken into the project while others were not. For instance, everyone was aware of the routines steered by a predetermined meeting agenda. The meetings and the selection of (energy) measures were dominated by aggregated knowledge. Project group members also knew from before how the meetings worked. Thus, in terms of the middle-out perspective, the structure of the project meetings built in and also reinforced aggregated knowledge. The common routines could be broken up by recruitment of new people and project leaders. Then the aggregated knowledge of today’s professionals would have to be verbalised, and as a consequence it might be re-evaluated.

Even though each project group is a temporary coalition, the same people meet repeatedly, in different contexts, and they build relations to each other and establish a

meeting practice for planning and design. New people did not understand what was going on, as the established meeting practice was not obvious to them. Since there was no formal introduction to that, it was difficult to understand the specific routines, habits and meanings within the group and their practice. Both an external energy consultant and the company's own energy group had problems influencing the process as, for instance, the agenda did not leave much time for energy per se. Thereby, the meeting structure and predefined agenda and aggregated knowledge as regards how to conduct the meetings disabled the uptake of more and longer energy-related discussions. The energy group itself was also so new that it had not yet found its own way of working and, thus, had no established work practice to add to the meeting practice.

The role of energy – energy efficiency and measures playing hide and seek

Energy was not discussed very much at the meetings in relation to other topics, especially compared to issues of technical installations, even though it was the second-most mentioned goal in terms of what is important to achieve with a renovation. The company has tried to increase the importance of energy efficiency by introducing the 25-25 energy goal and by creating an energy group. So far the energy group has not been able to change the agenda of the RP meetings, so it remains to be seen how much time will be spent on energy issues and how much the energy group can influence the process in the future. In the meetings, it was said that the energy consumption of the buildings should be reduced “as much as possible” after the renovation, but that raises the question of what “as much as possible” means. It might mean that there should be a clear focus on energy, and then it might influence other factors, such as financial argumentation. The projects I observed were chosen because of their potential for being so-called energy projects, in that more attention than usual might be paid to energy aspects. However, the interviews and observations at the meetings showed that surprisingly few energy discussions were held at the meetings. The conclusion is that the 25-25 energy goal was not translated into the renovation project. This is a question I will follow more closely in chapter 6.

Overall, it can be concluded from the interviews that the middle professionals' opinion is that energy is now more in focus and more included than before. However, there are still people who cannot judge whether the focus on energy has increased, and also some who think it has not increased at all. There is a trend towards more awareness about energy issues and inclusion of energy measures, but it is not dominating. Thus, there was/is no clear picture on the uptake of energy measures and the realisation of energy renovations.

CHAPTER 6

6. Energy efficiency in the project group's meeting practice

In this chapter I investigate the meeting practice of the project group in the planning and design phase, focusing on how and why building professionals in the middle decide to enable or disable energy measures for the renovation. Further, I investigate whether and how the 25-25 energy goal is translated into the planning and design practice. I discuss how the new and explicitly stated focus on energy influenced the well-established practice concerning how to conduct the meetings. My main interest is in how this new energy topic is dealt with in the meeting practice. For this analysis I use the practice theory approach as presented by Gram-Hanssen⁴⁴⁰ and, therefore, the key concepts guiding my analysis are her defined four elements holding a practice together.

With the discussion on engagements and meaning I look at what energy, innovation and the 25-25 energy goals mean to the middle professionals planning and designing a renovation. I focus on the meetings and how the professionals engage with energy aspects and goals, in contrast to chapter 5, where the focus was on what the professionals said were the most important things to achieve with a renovation. This is followed by an analysis of the role of the next element of practice, *technology*, where I discuss the role of technology in the meetings and concrete energy measures. I continue by analysing the *explicit rules* as well as explicit goals and guides relevant to the planning and design of a renovation, and finally, I turn to the *know-how and habits* influencing the selection of energy measures in the planning and design. Additionally, I show how the involved professionals handled energy questions and energy measures by using the terms “enabling”, “disabling”, “mediating” and “aggregating”.

The project meetings are analysed as moments of sayings and doings related to energy measures, where the elements of a practice come together and different professionals bring the work practices from their respective organisations into the project, based on their experience, opinions and expertise. On this basis, they come together in the meetings and shape a specific planning and design meeting practice, which can endure because it is enacted repeatedly.

6.1 Element of practice: engagement and meaning

Meanings can accumulate through engaged professionals and then be understood as collectively shared interpretations. Thus, it is of interest to understand how meaning was perceived and attached to energy renovations by the professionals. In this section I

⁴⁴⁰ See also Gram-Hanssen, “Residential heat comfort practices”, op. cit.; Gram-Hanssen, “Standby consumption in households”, op. cit.; Gram-Hanssen, “Understanding change and continuity”, op. cit.

describe the meanings that the middle professionals ascribed to energy measures and innovation. I touch upon issues relating to other elements of a practice, such as technology and the know-how and habits of the professionals. The role the 25-25 energy goal played during the meetings, and what meaning it had for the middle professionals, are also of interest.

6.1.1 The meaning of energy, promoting energy measures and electricity saving measures

Within the housing company there was a common view that as many energy measures as possible should be implemented, but within reasonable economic limits. Hereby, the thinking in economic restrictions disabled energy efficiency. During the interviews the external consultants emphasised that they participated in the meetings with their specific tasks in mind and their aim was to fulfil them at the lowest cost possible. This is what they were hired to do, and their view was that the purchaser's request should be fulfilled and they should do what they were paid for, no more and no less. There was no extra ambition to enable energy efficiency, as one of the interviewed architects said:

If the purchaser has no ambition to do anything other than what the building codes specify ... then we won't force them to do so. (Interview, EC-8)

The company made little effort to change the overall meaning regarding what measures should be suggested and what input was expected from each participant. No specific goal for the energy reduction of the buildings to be renovated was introduced nor was the 25-25 energy goal discussed. (I will discuss explicit energy goals for each specific building to be renovated in more depth later, when I consider the practice element *explicit rules*.) The middle professionals used their traditional aggregated knowledge about energy efficiency and buildings, however, which enabled energy efficiency to some extent.

There was also a lack of intention to save electricity. During the interviews it became obvious that the professionals agreed with that observation. Regarding electricity, the common view was that it was not an issue that was worth spending more time on. An external consultant said the following regarding the electricity issue:

I have given the electricity controller at Stångåstaden a list of measures that would save electricity and have short pay-off times, but they have not been implemented. There are a lot of measures to implement, but the problem is that electricity [consumption] is too small in relation to the total. So you don't save 25% in total if you reduce the electricity consumption by 50%. To

save 25% you need to include HVAC. But then you have other investments as well. (Interview, EC-1)

One of the HVAC consultants said in relation to electricity saving measures that electricity did not play a big role and that Stångåstaden did not care about it very much since it did not make a big difference. As s/he put it, even if one saves 50% it would only be a drop in the ocean.

6.1.2 The meaning of innovation

What meaning did energy-related innovation have for the middle professionals? Usually, the professionals in the middle preferred the measures they knew from before, which can be seen as their aggregated knowledge or know-how. The middle professionals knew that these measures worked and, also, due to time pressure, these were selected again. This refers to the element of know-how and habit, which I will elaborate on in more detail later on in this chapter.

When it comes to innovations or using new products, most of the middle professionals wanted to be on the safe side. New solutions were commonly not chosen, and there was the general attitude of letting others make the mistakes of using new measures or technologies. One external consultant commented on newer things such as passive houses, low energy houses and LED, saying that it was better not to choose these because they would not work:

It is the same thing as with LED, let others make the mistake. It will go really bad when we build so tight, I think [referring to passive houses and low energy houses]. And it's not that I'm reactionary. (Interview, EC-1)

Among the middle professionals there were also a few who said that it would be fun to try something new and to be a bit more on the cutting edge. It was mainly internal professionals in the housing company who did not have a technical speciality role who emphasised this:

The most common things that we do are to install an HRV system, add insulation, replace windows, ... but it is nothing directly revolutionary. I think it would be interesting if you could maybe find something more, some new kind of insulation or something [...]. Something that is new, so that we could test it and be a bit on the cutting edge. It would be cool. But sometimes it is not possible to do very much with such an old building. But I do not know, try [something] a little different, maybe a few solar cells and that kind of stuff. (Interview, IC-1)

As a way to avoid always implementing the same measures, some interviewees mentioned the possibility of exchanging the consultants who were usually involved in the projects with different ones.

Yes, [...] you can think it's a slow process, it's like ... [...] because you see the same consultants all the time. It's the same electricity consultant and the same HVAC consultant and they have their thoughts and their ways [...] if you're just the same people all the time. If you replace ... [...] if you change a consultant, you can get new eyes. You still have what you learned from the previous consultant [...] but it is security if you know that they [the consultants] work... (Interview, IC-8)

6.1.3 The company's 25-25 energy goal as a potential enabling factor

The housing company's 25-25 energy goal is ambitious, and then the question is whether the goal became part of the company's culture and the planning and design meeting practice.

Before the project groups' meetings started, we researchers got a strong sense of the importance of the 25-25 energy goal. At a meeting with representatives from the housing company before the start of the renovation projects, the 25-25 energy goal was introduced as very important and crucial for the work of Stångåstaden in general and for renovation projects in particular. I interviewed two project leaders (RP1 and RP2) at the very beginning of the projects, where they also highlighted the importance of the 25-25 energy goal and said that everyone, all the external consultants, were already aware of it and worked actively towards it. But as the participant observation showed, the 25-25 energy goal was not really brought into the meetings of the project groups. In none of the meetings was there an introduction describing what the 25-25 energy goal stands for nor was it apparent that the company regarded it as an important goal that should have a central position in the renovation of the buildings. There was also no discussion on how it might be possible to contribute to the 25-25 energy goal within each specific renovation project.

During the three projects' planning and design phases, I also conducted interviews, where I asked about the 25-25 energy goal in order to make sense of the fact that the housing company had said it was crucial, yet it was not emphasised during the meetings. The interviews showed that the internal employees who participated in the meetings were convinced that the external consultants' knowledge and information about the 25-25 energy goal was satisfactory, that they all knew about it and worked actively towards it.

Interviewer: *So are you working with the 25-25 [energy] goals with the consultants in a renovation project also; do you inform them about the goal and do they know they should ...*”

Informant: *Absolutely.*

Interviewer: *So the consultants work on it and come up with solutions to reach the 25-25 [energy] goal?*

Informant: *Yes!* (Interview, IC-2)

My assumption then was that all the external consultants knew about the goal from previous projects and that this is why all the participant observations showed that there was no information given to the external consultants about the 25-25 energy goal.

Interestingly, the interviews with the external consultants showed that even though the interviewed internal employees said that the external consultants all knew about the 25-25 energy goal from before and worked actively towards it, this was not the case. I could observe discrepancies in knowledge and thus different meanings and engagements regarding the 25-25 energy goal, which became more apparent during the interviews with the external consultants. Just three out of 11 of the external consultants were familiar with the goal. Two of them were employed by the involved HVAC company, one of whom worked as an HVAC consultant and one as an energy consultant, and the third consultant who knew about it was one of the architects. The rest of the external consultants had no idea what the 25-25 energy goal was. One could assume that those who knew about the goal may have worked with the housing company before and therefore had time to learn about it; however, the fact is that most external consultants had worked with Stångåstaden before in many projects and did not know about the 25-25 energy goal.

No, I have not heard about it ... I have no idea what it is. (Interview, EC-2)

I have not a clue what it is, if it's about to say 25 years to reduce energy demand by 25% or whatever it is, whatever goals they have. (Interview, EC-4)

Furthermore, even though it was not introduced or discussed in-depth, the 25-25 energy goal was mentioned a few times during some meetings in statements such as “... *since we have the 25-25 energy goal, we will change the windows ...*” (Observation notes). Thus, I was encouraged in the assumption that everyone already knew about the 25-25 energy goal and included that in their work before I conducted the interviews. The 25-25 energy goal was mentioned at the meetings; however, it was never translated or communicated in any meeting minutes written by different participants of the project groups, indicating that they did not view it as something necessary to note.

No, I cannot say I know what it is; I think it was mentioned in a planning meeting, though, and it has something do with energy consumption, but more than that, I unfortunately don't know. (Interview, EC-11)

Since almost all of the external consultants emphasised that they had previously worked with the housing company in other projects, this may have led Stångåstaden to assume that everyone involved in the renovation planning process knew about the 25-25 energy goal and thus was working actively towards the goal. Nevertheless, there seemed to be a lack of information and communication about the housing company's 25-25 energy goal towards the external consultants in the project groups. The internal employees at Stångåstaden believed that they were providing more information to the external consultants than they actually were.

One new internal employee mentioned that the external consultants probably had not been well introduced or prepared for the 25-25 energy goal at the beginning of the meetings. S/he was the only one inside the housing company who actually reflected upon introducing or reminding the external consultants about the company's 25-25 energy goal at the beginning of the meetings. However s/he was also convinced that the consultants already knew about the 25-25 energy goal from before anyway, and thus this lack of introduction at the meetings would not matter or be a problem.

A way to explain the difference in knowledge about the 25-25 energy goal relates to the time dimension. Figure 6.1 shows what happens over time when a new energy goal is introduced by a company. Before the goal is introduced, there is an idea for a new energy reduction goal. This idea is then developed further within the company by employees, and then the decision is made to implement the new goal. The details about what happened before the introduction of the idea is unknown to the external consultants. Thus, when the 25-25 energy goal is finally introduced, there is a knowledge gap between, on the one side, the internal employees, who have heard about it before and even experienced the process of its development, and on the other side, the external consultants, who have not been a part of the process of developing and introducing the goal. The external consultants cannot work actively towards the goal if they are not informed and do not know about it.

Figure 6.1: Implementing the 25-25 energy goal - overcoming a knowledge gap⁴⁴¹

The question is whether it matters if all involved professionals know and work with the housing company's goals. The professionals that are actually familiar with the 25-25 energy goal might have influenced the energy consumption in the buildings anyway. The others, not familiar with the goal yet, potentially miss opportunities to focus on energy reduction and they might indirectly disable energy efficiency. If properly introduced and communicated, the 25-25 energy goal could be a way to enable energy efficiency.

Also, Stenberg et al. say: *"In order to put knowledge into practice, to achieve environmental goals and to obtain lasting results, knowledge needs to be incorporated into the organisations involved, i.e. the housing company employees on the one hand, and the organisations influencing tenants such as the family and other social networks, on the other."*⁴⁴²

6.2 Element of practice: technology

In practice theory, technologies are described as products or physical things that influence a practice. Technologies in the case of renovation and the meeting practice

⁴⁴¹ Inspired by time geography and Kajsa Ellegård's work on time geography.

⁴⁴² Jenny Stenberg, Liane Thuvander & Paula Femenías, "Linking social and environmental aspects: a multidimensional evaluation of refurbishment projects", *Local Environment: The International Journal of Justice and Sustainability*, 2009, p. 549.

refer to the physical layout and construction of the house and energy measures decided upon or products and materials used. Energy-related renovations are influenced by the materiality of the house, which determines what is possible to do. Also, technologies structure the design and materialise the renovation plans. Thus, technology is one important element influencing the meeting practice and its discussions and decisions.⁴⁴³

One purpose of the planning and design phase is to produce a tender document for the public procurement. For the creation of the tender document, the technology-related discussions leading to the production of figures, drawings, descriptions and definitions were prioritised, and the discussions at the meetings were focused on, for instance, the positioning of shafts, ventilation system issues, number of outlets and possible changes in the layout.

Well, for the building, it is pretty much those technical solutions that often affect the most. (Interview, IC-4)

The project groups' members represented different professional knowledge spheres, and the extent of their influence on the process varied. Since much of each meeting was spent on discussing changes or renovations to the actual building, for example, looking at layout changes, technical installations or construction-related questions, most of the time went to professions such as architects, HVAC and electricity, and also to fire consultants towards the end of the phase.⁴⁴⁴ The predefined agenda of the project group meetings was designed in a way that did not leave time to raise issues out of the ordinary, and emphasis was put on such technology-related issues.⁴⁴⁵

When I asked the 22 middle professionals which one of the consultants they thought was the most influential, a few highlighted the importance of technologies rather than a person or profession. One interviewee said that technical solutions in general had the most influence, another said that it was the shafts that had the most influence. Additionally, two interviewees said that the HVAC consultants, working with big technological installations, had the most influence, and yet another interviewee emphasised the importance of electricity, dealing with technology.

There was, however, a lack of a more general architectural perspective and design issues in the process, and questions of design were in the background compared to the discussions on technology. Nevertheless, 14 interviewees thought that architects had the most influence on the projects. However, two out of three interviewed architects felt

⁴⁴³ In section 6.1, I described the meaning of energy measures and innovation, whereas here I focus on the role of technology in the meetings of the middle professionals.

⁴⁴⁴ If needed, construction consultants and building engineers are also included. Nowadays, energy consultants could also be involved, and if there is noise pollution in an area, then a sound consultant can be involved as well. But traditionally the main areas are architecture, HVAC and electricity, and towards the end of the process, also a fire security consultant.

⁴⁴⁵ This was also described in chapter 5, where I showed that each profession gets a time slot on the meeting agenda to report on their progress.

that they were constrained by all the technology that must be in place for the renovation of the building. Also, one of the architects thought that HVAC and the electrical consultants were the most influential.

Yes, we also have some influence, but in certain phases of the process they [i.e. the HVAC and electrical consultants] can have too much influence. This is because they have so many issues and so many things to sort out. So, just looking at the time aspect, they take a lot of time during the planning and design meetings. (Interview, EC-8)

In relation to why design issues were not discussed much but rather only specific details and standards, an architect said that technology dominated the discussion because it was seen as vital for the functioning and managing of the building, for instance, the importance of the shaft positioning.

The technology has more or less taken over; there is always a risk in these kinds of projects that technology gets more attention than it should. This is because the technology is supposed to support the functions of the house. But it is not supposed to be the main theme. This is partly because the technical consultants usually have a lot of influence on the process. Our homes are very installation-dense today and an enormous number of cables and pipes must be installed before you are finished. (Interview, EC-8)

Another architect said that the role of the architects had been reduced to that of “drawing slaves” (EC-7), that is, that they were only supposed to produce drawings and not address other (design) issues. This was also noticed during the meetings.

Most of the interviewees who said architects had the most influence, however, also mentioned HVAC, the shafts or ventilation system or electricity as second- and third-most influential. Thereby, many also highlighted that the architects always need to consider HVAC and electricity in their work.

In this regard, it can be concluded that the issues about the installation of technology replaced other issues. This was apparent in that a lot of the meeting time was spent discussing where to place the HVAC shafts, ventilation or heating system-related issues, or where electricity outlets and cables should be located. The shafts played a central role as they were also referred to in relation to many other issues. It can be understood from the participant observations at the meetings that the shafts were prioritised because they are difficult to move, thus the other things need to be planned around the shafts. In a way, the shafts disabled energy efficiency discussions as they had such a prominent role during the meetings. This might also be due to the specific HVAC consultants, who gave the shafts primary consideration.

6.2.1 The adaptation of energy measures

In general, there was a shared understanding among the middle professionals that the measures making the greatest difference regarding energy efficiency and reduction were related to ventilation and other HVAC installations. Other energy measures considered were window replacement, insulation and upgrades in laundry rooms, especially with more efficient appliances. As said earlier, many electricity-saving measures were not focused on or even considered. One of the project leaders said:

Yes, I am a traditionalist and old builder. It's often the insulation and U-values and stuff like that that you look at. And then we have an HVAC consultant who looks at systems like heat and HVAC systems, [...]
(Interview, IC-4)

There was one example of how the middle professionals discussed, negotiated and argued for the use of a certain (innovative) energy-related measure and technology, LED lamps, where two of them had very different views on innovation. The LED lamp technology and its possible installation was a topic of energy-related discussions in one of the renovation projects. The question of whether LED lamps should be installed in the apartments was discussed during some meetings. These discussion took place between the area manager, the external electricity consultant and the project leader. The project leader was more neutral and simply wanted to hear the different opinions. The external electricity consultant and area manager did not agree on whether it was a good idea to install LED lamps. The area manager was a proponent of LED lamps because they are more energy efficient, will probably be widely used and popular in the future, and they had been requested by the tenants. The electricity consultant, however, was a strong opponent of LED lamps. This discussion, then, circled around energy issues, the question of innovative measures and the future development of the technology and installation of LED lamps.

During the meetings of the project group no obvious decision about LED lamp installation was taken; instead, the interviews shed more light on the discussions. It still remains unclear what the final decision was. There was a lot of back and forth during meetings as well as in the background, outside the meetings, that changed some decisions. Of interest here are the discussions and negotiations that took place among the professionals in the middle.⁴⁴⁶

The external electricity consultant strongly argued against LED lamps for many different reasons. S/he was against trying something new and felt that LED lamp technology was not yet well developed and that it should be left to others to make the mistake of using them first. S/he also said that they were too expensive, that it would

⁴⁴⁶ As explained in section 3.3.4, the housing company realised through the public procurement process, that it would be too costly to conduct the renovation as planned. In the end it was decided that the whole planning and design phase would start all over again with partnering instead of DB. We were not involved in this process.

not work to install a proper dimmer, and that they do not save as much energy as people claim. Finally, s/he found the light quality to be rather bad.

Yes, I have the opinion that it is lobbying, there is too much trust in this. Let the others make the mistake, we do not need to. [...] The energy saving is not as great as people think, there is less energy than a low-energy lamp/bulb, but it is not that amazingly much lower [...]. (Interview, EC-1)

A while after the heated discussions, I asked the project leader what had happened and if LED lamps would be used or not. My impression was that it had been decided not to use LED lamps. The reason LED lamps would not be selected was that the technology was regarded as too immature and therefore the risk would be too big, as the project leader concluded:

So we want to wait a bit more so that we do not make any mistakes that will make it more expensive in the end and we have to exchange the fixtures ... (Interview, IC-5)

About one month later, when I interviewed the area manager, I asked again about the LED lamp case and what had happened from her/his perspective. Then it appeared that the area manager had put pressure on other professionals in the project group and LED lamps had been selected after all. The area manager had first had a discussion with the project leader, then with the internal employee responsible for electricity and, finally, with the real estate development manager, who participated in some meetings of the project group and also had an advisory role in the investment group.

*You cannot, or I do not think that you can just see the cost, but you must also have an attitude about what we are doing and [...] sometimes it has to be simply allowed to cost a little more. [...] And I think that it is wrong in the relationship between customer and consultant. Now it is [the project leader] who rules over her/him. But I had to have a discussion first with [the project leader], who referred me to the ... person internally responsible for electricity, who has expertise in this, who then referred me to [the real estate development manager], who said that this is a strategic question that we take and start and, like floating away so that it is uncertain who the * it is who takes the decisions. And then I became really angry and now you must tell me who it is, you have to take responsibility for the decisions and then you have to know who decided and say how it is and how we look at this. But then we agreed that LED lamps would be installed.* (Interview, IC-10)

There are two important conclusions from this example: First, it became obvious that the different middle professionals had different opinions and attitudes towards innovative energy measures and technologies. The middle comprised individuals with

different opinions, even ones strongly opposing each other, which needs to be acknowledged when studying their meeting practice. Second, the example shows that there were individual middle professionals who were not active only at the middle level of the company. The area manager is one of the professionals of the middle in the planning and design phase, but s/he was also expected to give the tenants a voice in the meetings. Additionally, the real estate development manager operated in RP1 and RP2 in the middle and on the top since s/he participated in the project meetings and was an advisor in the investment group. For instance, the area manager said in the quote above that a decision against LED could also possibly lead to bad relations with the customers⁴⁴⁷ if the professionals in the middle did not represent the tenants' wishes.

6.3 Element of practice: explicit rules

This element holding a practice together refers to explicit rules, knowing how to do things, and what is or is not allowed. I focus here mainly on the role of explicit building rules and regulations or codes and their influence in the planning and design of renovation projects. I will, however, also consider formulated energy reduction goals that can be regarded as explicit rules and guidance to follow for the planning and design of a renovation as well as financial rules and guidelines that need to be followed regarding the selection of energy measures.

6.3.1 Regulations and standards

Various legal regulations and standards must be followed when renovating a building, such as fire safety requirements, accessibility and noise levels, but there are also rules for energy consumption. When legal standards were discussed, it was not a matter of *whether* but rather *how* to meet these with the renovation of a building. The energy consumption requirements, for example, the BBR requirement, were not openly discussed at the meetings. Everyone simply seemed to know about them and act accordingly in their work as a sort of tacit knowledge. It became clear from the interviews that the BBR requirement must be followed and everyone was aware of that. Maybe because it was so self-evident for them, it was not necessary to discuss them in the meetings.

One system of standards to assess construction materials and products from an environmental and health perspective is the Swedish SundaHus. The housing company's consultant stated during the planning and design that these SundaHus standards must be met.

⁴⁴⁷ The housing company refers to their tenants as customers.

In general, that the processes of the project groups were so alike can also be explained as due to the regulations and standards that guided the meetings and their practice.

There are many routines and standards that you must uphold. This is why they [i.e. the processes] are so similar. (Interview, EC-9)

This process is the same as usual, as in all projects. We have the building codes to rely on. That is, we need to meet the requirements for kWh/m² – that is what we always do and follow. Then, the requirements of the contractor can be tougher, but that is not so common, but it can happen. (Interview, EC-5)

When talking about who is most influential at the meetings, one interviewee argued that it was the rules and regulations that needed to be followed.

6.3.2 Explicit goals as rules to follow for enabling energy efficiency

In order to perform a renovation project with ambitions to reduce energy use, we as researchers assumed that one needs to know how much energy a specific building is consuming *before* it is renovated, then set up goals for how much its energy consumption should be reduced. I also thought this would be done in the light of the importance of the 25-25 energy goal and because the followed renovation projects were supposed to be energy renovations. This is an expectation that we brought to the meetings, which has definitely influenced my perception and how I have analysed the material. *“Few would deny the importance that project goals have for the initiation, development and evaluation of a construction project—the goal is commonly thought of as the project’s raison d’être.”*⁴⁴⁸

The participant observation revealed that there was a lack of set energy reduction goals. There was no clear information on measurements nor were there energy calculations showing how much energy was currently used in the buildings to be renovated and how much the energy consumption should be reduced after the renovation. Following the renovation projects also revealed that the stated goal of being energy renovations was more vague than expected:

The goal of the project is that the energy savings will be “as good as possible”. Stångåstaden has no explicit demands or requirements for how much energy efficiency should be achieved. (Meeting minutes, 2013-01-18)

Since nothing like that was discussed at the meetings, I started to investigate further with the interviews. After one of the meetings in a project group, I had an

⁴⁴⁸ Kjell Tryggestad, Susse Georg & Tor Hernes, “Constructing buildings and design ambitions”, *Construction Management and Economics*, vol. 28, no. 6, 2010, p. 695.

interview with the project leader and asked if there was any kind of energy reduction goal for the building:

Project leader: I have not been involved in producing any specific figures. Have you heard anything about it? [Asking another internal employee who was also present]

Other respondent: No, no, me neither. It is the general aim.

Project leader: But rather, it is a little more ... we have some guidelines that really direct us in this, but that prevent us from going wherever we want to. We cannot add as much insulation as we want to ... Unfortunately, I have to say no to it [i.e. a question about an energy goal for the building], but it was a good question. I ought to see if we should concretise that actually. (Interview, IC-5, other respondent, IC-1)

It became clear from many interviews that there were no specific goals formulated regarding energy reduction, but many internal employees seemed interested in our feedback and our suggestion to set up an energy reduction goal for each building to be renovated.

Just once in my interviews a concrete number for energy consumption after renovation was mentioned, which was in RP3. However, this project started several months later than the other two. One of the interviewed project leaders mentioned that RP3 aimed to reach an energy consumption of 80kWh/m² after the renovation, which, however, simply equals the BBR requirement. Since this interview took place much later and after the researchers' feedback to the housing company that they lacked a concrete goal, this might be what led to the interviewee mentioning the goal. The project leader mentioned this 80kWh/m² goal only in the interview and not during the meetings of the project group. Also, in the other projects it seems like the BBR requirement was a goal but was never stated explicitly or translated to the protocols. Again, it appeared to be somehow just part of the tacit knowledge that the involved professionals possessed.

In a second interview with one of the project group participants, a few weeks after we gave the feedback on working with an explicit reduction goal for any building that is to be renovated, the interviewee reflected upon the negative aspects of having an energy reduction goal for each building separately:

[...] such a goal [for each house] ... it would be possible to have, partly. The problem is more ... there is a difference when buildings are new [...] then you can build with a material that fits [...]. Here we are sitting with all materials in the building [...] that is already there [...] it's a problem then with the house's design [...] with additional insulation [...] and windows and

so that it is feasible at all. [...] we try instead to come to an energy reduction that is as good as possible [...] I think if you have a goal to a certain level, that would be good, but we would soon face problems, because the goal would just be a paper product and in practice we would never reach it. To some extent it is also a financial question [...] so not a goal directly, but maybe it could be considered to reach a certain level; but today, if we use the solutions that we think are reasonable, we can halve the energy consumption of the building. (Interview, IC-2)

This interviewee argued for the opportunity to set a goal which could serve as a guideline, but it would not have to be the same for all houses. Rather, it could be set individually, actually depending on the system and the preconditions of the house.

This points at a need for detailed, building-specific goals and measures or estimations at a project level, otherwise the goal as enabler for energy reduction could turn into its opposite, a disabler of energy efficiency. One could assume that the 25-25 energy goal was broken down and followed up. Then it would be possible to get information on how much energy the building consumes, set a goal for how much the energy consumption of the building should be reduced and then do a follow-up investigation after the renovation. But the orientation was instead to do “as much as possible” and hope for the best. Also, when it comes to establishing whether energy reduction, formulated in the 25-25 energy goal, was achieved in the housing company, the energy reduction was checked yearly using statistics on the entire real estate properties, not single projects.

6.3.3 Explicit and implicit financial rules for energy measures

Financial aspects also framed the work of the project groups of the planning and design phase. In general, short-term profit and saving money in the short run seemed to be more important than making decisions that would be more costly at first but maybe economically more efficient in the long run. The ethos here is that the costs should be low now and pay-off times should be short. The housing company formulated the rule that if the pay-off time is less than six years, then it is possible for the project group to freely decide upon any measures, otherwise the investment group must be consulted. Even though the investment group decides on the budget with the orientation decision as well as the final investment decision, the thinking on economic restrictions could also clearly be observed during the meetings, and the project groups themselves adopted an economic argumentation.

However, some professionals in the middle, internal as well as external, disagreed strongly with this ethos, especially in the light of focusing on energy for the projects.

[Energy] well so I think that it is not a central topic. And then there were the costs again. The costs. So first you want to do it, then it costs and then you do not do it. But maybe, if one calculates it for 100 or 30 years, the costs have perhaps paid off because one saves costs. (Interview, EC-7)

It was emphasised that if there is an energy goal and energy is supposed to be a central topic, then it should be allowed to cost money.

Energy savings have to cost money [...] but they, it's a commercial company [the housing company] and then it is clear they must have some limit on the pay-off time. But no one should think that it's free to save energy. That is not how it is. [...] Yes, yes, but then there are ... five years, if you just talk economy, then five years is quite a lot. But we know that the things we do in all cases are used for twenty years, and then five years doesn't seem like that much. (Interview, EC-1)

[...] because if you are doing a renovation, you have such a meeting, then the costs come up all the time. They want to do this and that, but costs must be as low as possible. So they want to have golden taps but just want to spend money on cardboard tubes! And then if you really have a target somehow to sustainably renovate the house for the next 50 years, then money should not come in within the very first hour of the meetings. (Interview, EC-7)

More or less all of the interviewees said that it is usually money issues that determine which measures will be implemented. Even if good ideas regarding energy measures were discussed, in the end they were, more often than not, simply too expensive. Then, energy measures are discussed and there is a wish to implement different kinds of measures, but more often than not, the cost disables them. Energy measures are often the first to be excluded since the building will work even without these. This reveals that decisions are taken according to budget restrictions, which excludes many energy measures.

[...] we have to take care of energy measures in these projects [buildings from the 1950s] if we are to reach 25-25 [referring to the 25-25 energy goal], because they are the accelerator...or the lever arm actually to reach 25-25. Because now we start, to go backwards a little here, I feel the investment group, because the costs start to get too high. And then of course, it's easy to remove the additional insulation; you cannot just say, "We will install additional insulation, we will replace the roof and we will fix the windows and so on, but the bathrooms and kitchens, we will leave to the tenants [leave them unrenovated]". That doesn't work. (Interview, IC-2)

Even the standard energy measures that are commonly used by the housing company are not always implemented due to budget restrictions. Rather, aesthetic considerations are focused on, such as updating the kitchens and bathrooms and so on during the renovation. The participant observations showed that there were many discussions on budget, for instance, about whether adding insulation at all or whether exchanging windows would be too costly. This is also shown in the following quote from the meeting minutes of a previous planning and design meeting in 2009, where insulation was not chosen at all due to budget restrictions.

[...] there is no economic benefit in the extra insulation. (Meeting minutes number 9, RP 2009)

6.4 Element of practice: habits and know-how

In this section I investigate the element know-how and habits, one of the elements holding a practice of professionals together. The focus is on the middle professionals' embodied, aggregated and tacit knowledge referring to their experience-based rule-of-thumb knowledge or their know-how and habits concerning how to implement energy measures for the upcoming renovations and the habit of conducting the meetings as they have done before.

6.4.1 The importance of know-how and aggregated knowledge from previous projects and rule of thumb

The external consultants brought with them their specific work practices, professional knowledge and know-how when joining the meetings. Also, the external consultants and internally employed professionals had worked on similar projects before, often even in the same or similar constellation of people. Thus, they brought a certain experience and expertise from previous projects and collaborations to the projects. They were familiar with these meetings and they had the know-how to conduct the meetings smoothly. Overall, I found out that the middle professionals usually suggested measures that they had used before. During the interviews, it became apparent that these measures were chosen simply because the professionals knew that they worked, since they had used them repeatedly in previous projects.

The consultants' know-how was based on this rule-of-thumb experience and knowledge coming from years of experience and aggregated knowledge about the buildings and the use of certain energy measures. It was certainly a strong element in the practice of these middle professionals. Experience and know-how, then, help to estimate the extent to which energy can be reduced with the installation of certain measures and, to some extent, this aggregated knowledge enables energy efficiency. Since the company did not set any specific energy reduction goal for each building, the

involved actors mostly appeared to apply their rule-of-thumb know-how to energy measures, as at least the legal requirements (BBR) needed to be met.

The observations, the interviews, the annual reports and also the meeting minutes from a previous renovation project performed in 2009 show that these kinds of typical standard energy measures are most commonly installed if they are economically beneficial for a specific building. As said above, if the pay-off time is less than six years, the project group can freely decide upon any measures without consulting the investment group. The standard energy measures were presented in chapter 5, and not all of these were selected for each renovation. On average, two to four measures were put into practice. Often these standard measures were suggested for implementation without further investigation regarding whether they would be the most useful measures for a specific building and context. The motto was “let's just do as much as we can and see what happens”, which appeared to be the common habit in approaching renovation projects.

For each building, energy measures must be adapted and mediated to certain situations. For instance, in RP1, the insulation needed to be adapted to the existing construction of the building that did not allow for the use of 100 mm of insulation. How much insulation could be used for a certain building was mediated according to the type of building, and, depending on how much insulation the roof or structure allowed, the middle professionals would take the measures from their previous experiences and adapt and mediate them to a given situation.

In the three projects it was observed that time was a decisive parameter for the planning and design phase. Time was short and thus experiences from previous projects were important. As an architect and a building engineer said:

It is easy to take the solution you have used before. You know it was good then and when you get a bit in a hurry and ... and ... [the job has to get done] so, as a quick solution, you implement it in the next one again, with some adjustments. (Interview, EC-9)

We have done some before, so you have learned a lot of lessons and bring them with you. (Interview, EC-10)

A renovation project can get an (unintended) extended time horizon if the investment group does not find the first suggestion from the project group satisfactory. Then an iterative process between the investment group and the project group starts, but still under time pressure.

The standard measures may enable energy efficiency to some extent; however, then other measures are not taken into consideration due to the lack of reflection or the lack of viewing the building as a system and adopting energy measures according to that, or simply because it is easier, when time is limited, to choose solutions that have worked before. The habit of doing the planning and design meetings was designed and

organised in a way that did not leave time and space for brainstorming or developing new solutions. Rather, the process was designed to develop a solid base for a public procurement document, where issues such as requirements of energy-classified appliances, number of sockets, thickness of insulation and so on are listed. Therefore, and in combination with time pressure, suggestions based on established and well-known energy measures were favoured.

6.4.2 Energy calculations and measurements - enabling energy efficiency?

When we entered the meetings, we researchers had the idea that the energy consumption for each building would be measured, then an energy reduction goal would be formulated and, based on that, energy calculations would be done in order to establish which measures would be best to reach the reduction goal.⁴⁴⁹ That is not how it worked, as I have already shown; no energy reduction goals existed for each building. When it comes to the measurements and energy calculations, it gets more unclear what was really done.

First of all it appears that no measurements for the buildings were done. Regarding the fact that the followed renovation projects had no exact measurements on how much energy each building consumed before it was renovated, different explanations were provided by many internal employees. It was said to be rather difficult to obtain these kinds of measurements for specific buildings because the meters covered larger areas and not individual buildings. This meter system consequently did not allow the housing company to obtain values broken down to individual buildings. However, extra meters could have been installed well before the renovation to get this kind of data. Now, when renovations are conducted, new meters are installed for each building. This is also done in order to be prepared for starting with IMB if necessary.

The question of whether measurements were done for the to-be-renovated buildings and, if so, by whom, seemed unclear to most of the professionals in the middle. Some said that the internal HVAC consultant did measurements on a building before a renovation, others said that no measurements were done. There were some unfulfilled expectations or assumptions by the external consultants who thought that Stångåstaden took such measurements and had clear goals, even though they themselves had never seen any of that – no goals were communicated outwards, or at least not clearly. On the other hand, some others did not know anything about measurements or goals and had no assumptions about either.

The energy manager and one area manager also mentioned that the housing company had developed a new system for keeping track of the consumption of a building. However, at the time of my research it was still under development. With that system the housing company will have the opportunity to use values and figures

⁴⁴⁹ This is also in line with the decision support tool approach as presented in Nielsen et al., op. cit.

showing the consumption of individual buildings, supplied by Tekniska Verken AB. However, the system was not really up and running at the housing company yet, because there had been problems fitting the numbers it generated into the company's own computer program.

The next assumption was that energy calculations would be done and different alternatives of energy measures would be discussed based on the calculations. Energy calculations were mentioned during the participant observations, but at the time it was rather difficult to find out who had produced them, who used them and in what way as well as where they could be accessed.

Energy measures appeared to be estimated based on experience instead,⁴⁵⁰ which could be the basis for a rough estimation of how much energy they would save. The energy consumption was expected to be reduced "as much as possible".

They probably did as much as they could. There was probably only space for seventy millimetres of insulation and then plaster. Otherwise you are hitting the base of the roof and so. [...] and then they exchanged the windows and HRV ventilation and They did probably as much as possible and then we have to see what the result will be. (Interview, IC-9)

We got access to energy calculations for one or two projects. They were done by an external energy consultant from the HVAC company. Also, researchers from the engineering department at Linköping University were asked to do some energy calculations for one project at very short notice. The latter calculations showed different results using a different approach. This seemed to be interesting to the housing company, but still, the results from the researchers were never used for the actual project as, according to the housing company, they came too late in the process. At that point, the technical researchers were still viewed more as consultants by the housing company. However, our long-term close collaboration led to a better understanding of each other's work and role in this type of collaboration project. This can be useful for future projects.

In the other RP it was trickier. In that RP, one of the HVAC consultants mentioned in an informal conversation at one of the meetings that energy calculations had been produced within her/his company since it was part of their contract to deliver these calculations. This HVAC consultant, however, also told me that s/he did not know who used them or in what way they were used. S/he assumed that someone at the municipal housing company must need these calculations and take them into consideration. After the meeting I also briefly asked the project leader specifically about these energy calculations that were supposedly produced by the involved HVAC company. It turned out that s/he in fact was unaware that the HVAC company was producing any such calculations for the renovation project. At an interview a few days later I asked the project leader again about these energy calculations and s/he confirmed that they had

⁴⁵⁰ Olsson, Malmqvist & Glaumann, op. cit., had similar results.

received calculations but that s/he had not taken notice of them before. Apparently, someone was doing energy calculations at the HVAC company, but it is unclear who used them. The role of the energy calculations remained rather unclear at that point.

Even though there were no obvious specific goals for energy savings when a renovation is done, it was still necessary to have estimations or calculations in order to see whether energy consumption had been reduced or not, according to another project leader. These ideas and possibilities about energy reduction should then also be presented to the investment group as part of the basis for their orientation decision. However, these estimations and calculations were never openly presented and discussed during the planning and design meetings.

[...] we have to report how much we expect to lower it [...] We know that we have to do more in renovation projects to manage the 25-25 energy goal, on average. Then we need to lower much more than 25% in some renovations, otherwise we will never get there. (Interview, IC-4)

No, but we have an energy calculation for [the renovation project], and we will follow it up. [...] They do the energy calculation of the existing building. But, that is when we get started ... in the beginning of the planning and design phase, to know what it consumes. Thus, their theoretical values are right, it's usually a reconciliation with the actual values. [...] Otherwise we do not know really where we end up. So the theory has to comply with the practice too. (Interview, IC-4)

Other external consultants also assumed that energy calculations were done without having seen them or knowing more about them. One was convinced that the construction or building engineer was doing calculations and had a big influence. Some of the external consultants knew that the HVAC company did the calculations but saw it, in the same way as the project leader, as an estimation, to give an idea what the project would end up with. One external consultant explained that some kind of energy calculations had to be done and somehow they needed to be used as there were legislative demands (e.g., the BBR requirement) that needed to be reached and, as s/he said, this would be “*maybe 90 kWh/m² or whatever it is now*” (Interview, EC-1). S/he was this vague in her/his explanation; further, s/he seemed not to know exactly what the current BBR requirement is, which is 80 not 90 kWh/m². The external consultant concluded that the point of the energy calculations was basically just that it was interesting to see if the legislative demands could be met (BBR requirements).

The external energy consultant explained that there are different ways of doing energy calculations. It is possible to just do calculations to see where it might be possible to end up, or another way is to actually have a specific goal to work with. S/he did not remember if Stångåstaden had an extra energy goal for the renovation as s/he had not been part of the project from the very beginning but took over from a colleague

who did the actual calculations. I know from other interviews and the participant observations, however, that there was no specific goal for energy consumption reduction after the renovation. Thus, the energy calculations here must have been done just to see what result the renovation work might end up with, to do as much as possible (and then hope for the best). This way of looking at the energy calculations was also mentioned by one project leader.

Many assumed that someone did measurements and calculations and that there was a specific goal that Stångåstaden was using and taking into consideration. Even though energy became more important for renovations, the habit of conducting the meetings as always persisted, and energy calculations that were supposedly done and used by someone did not find their way into longer discussions about energy in the meetings. The use of energy calculations had so far not become a habit during these meetings.

6.5 Concluding remarks and discussion

Many energy measures exist but are often not implemented. My study of the planning and design phase concerns how and why energy measures are included or excluded. I studied the meeting practice of project groups in the planning and design phase for renovations of multi-family apartment dwellings in Linköping with Stångåstaden as purchaser, which situates my study in a certain time and place. At these meetings, different professionals come together and form the temporary coalition of the project group. Since they repeatedly participate in such meetings, in the same or similar constellations with Stångåstaden and with other purchasers, this meeting practice for the planning and design of renovations is repeatedly enacted. The different professionals bring their own set of work practices to the meetings, which bring in different opinions, knowledge and expertise on how to treat energy issues. I studied how the four elements making up the meeting practice (engagement and meaning, technology, and explicit rules as well as know-how and habit) influenced the middle professionals and their negotiations and decisions for building renovations, with a focus on their handling of energy measures and goals.

The study of the meeting practice helped me to investigate the uptake of energy measures and understand why energy measures are promoted or rejected and why it takes time and effort to translate a goal into a practice. It turned out that I studied a meeting practice where energy did not yet play a big role. Examining such a meeting practice can lead to a better understanding of what hinders the uptake of energy measures, thereby making it possible to learn how the practice could be changed so that a more sustainable built environment can be achieved. This also sheds light on why the meeting practice is difficult to change regarding energy measures. A practice can persist due to practice memory and its structure. Even though there is a practice memory, this

does not mean that there is no possibility for change.⁴⁵¹ A practice is an assemblage of elements that, individually, can be seen as easy or straightforward, but taken together form a more complex issue, as shown in this chapter.⁴⁵²

Engagement, meaning: The housing company aims to reduce energy consumption as much as possible with the renovation of the buildings. However, this should be done within economic limits. The general 25-25 energy goal was not properly communicated outwards and the housing company wrongly assumed that the external consultants knew about it and were working on it. The consultants came to the meetings and did what they usually did and what the purchaser asked of them. That the purchaser had asked for an energy focus was not communicated. The *meaning* stayed the same as usual. If the purchaser does not see energy as a high-priority issue and clearly introduce and communicate or even define extra goals for the buildings, they cannot expect the external consultants to do so. Innovations and new measures were regarded as something for others to use, so that they would be the ones to make the mistakes. Also, measures to reduce electricity played a minor role.

Technology: Technology-related discussions played a central role and were often prioritised in the meetings and might be seen as one reason why discussions on other measures or solutions were disabled, as technology took so much space and time. Also, many interviewees saw technology as very influential, and some even saw it as the most influential thing. Many argued that technology took over the planning and design; the technological discussions took so much time that discussions on other measures, including energy measures, had to be kept short. Usually, the standard energy measures were installed based on a rule of thumb and they did not get time for extended discussions.

Explicit rules: Regulations and standards were not discussed during the meetings. However, during the interviews it became apparent that they played a major role and that everyone implicitly knew about them and followed them. There was no goal defined for how much energy consumption should be reduced in each building. The goal was to reach the BBR requirement; however it was never really discussed at the meetings either. Also, reaching this BBR requirement might simply be the norm for all the middle professionals and something everyone knew implicitly, and therefore it was not even mentioned. Financial rules guided the planning and design as well. The middle could choose any energy measures with a pay-off time of less than six years. Even though economic restrictions come primarily from the top, where the final economic decisions are made, the actors in the project also took economic restrictions into consideration.

Know-how and habit: The professionals in the middle used the same solutions over and over again, based on their aggregated knowledge about the building types and

⁴⁵¹ See also Schatzki, "On organizations as they happen", op. cit., p. 1869, and Schatzki, "The sites of organizations", op. cit., pp. 475, 476.

⁴⁵² See also Gram-Hanssen, "Standby consumption in households", op. cit., p. 158.

also the standard energy measures. They had been in the industry for quite some time and knew the buildings and what worked for which type of building. Thus they were able to estimate how much energy they could save with each measure that they chose for a building. They seemed to rely on this type of knowledge a lot. Although energy calculations were done, it was not obvious from the meetings and the interviews that those calculations existed or how they were used. Thus, rule of thumb and tacit knowledge appeared to play a bigger role. Further, the calculations that were done were seen as truths. The calculations done by the researchers from the technical department of the university showed different results, which came as a surprise. For example, there were no discussions on viewing the building as an energy system and approaching the renovation in that way, which was done in the researchers' calculations. Interestingly, many external consultants assumed, just as we had, that these measurements, reduction goals and energy calculations existed at the building level and that the housing company handled and took care of this information, and that is why the external consultant thought they did not have to worry about it. On the other hand, the housing company expected the external consultants to know about the 25-25 energy goal and also expected them to work actively with energy in the planning and design phase. Both parties had these ideal assumptions about each other and were not aware that none of it was taking place. Improved communication and information sharing would be needed in order to change the meeting practice and the way that energy measures were treated and goals were included.

Were the studied projects energy renovations? The interviewed professionals and actors were certainly right: energy was more part of the projects, it was talked about more, there was a general energy goal, and an energy group had been formed. However, all this was not enough to change the practice of the meetings and the way energy was handled.

CHAPTER 7

7. Where there is a middle, there is a top and a bottom

In this chapter I will expand the focus on the middle professionals by studying how the middle, top and bottom relate to and influence each other regarding the enabling or disabling of energy measures. I do this in order to capture the complex vertical and horizontal context of the planning and design phase of renovation processes and therefore include actors at all levels. I focus on the question of how the relations and influences of the middle with respect to other levels affect the enabling or disabling of energy measures.

I discuss the role of the top and their influence downwards to the middle, and also the influence from the middle upwards to the top. Thereafter, I introduce the role of the bottom and what influence it has upwards to the middle, and the influence from the middle downwards to the bottom. I will also discuss the sideways influence of the middle, directed to other middle professionals.

The sections in this chapter follow the arrows in my analytical model, as presented in chapter 2. These relations, connections and mutual influences affect the meeting practice of the project groups and their promotion or rejection of energy measures. My analysis diverges thus from the original intentions of the middle-out perspective. My main focus is on the middle and their outwards influence, but since I study of the adoption of energy measures in the planning and design phase of renovation projects, it is useful to include the interdependence between the top and the middle and also between the bottom and the middle. I thus have an extension of the middle-out perspective including the interdependences between the top and middle and the bottom and middle, and from the middle and sideways.

7.1 The top and the middle

The top is defined as the investment group of the housing company. The analysis is based on interviews with all the members of the investment group at the top of the company, but as already mentioned in the method chapter, section 3.3.3, I did not participate in their meetings since I found out about their role and importance too late.

This section focuses on the relations between the top and the middle, as shown with the blue circle in figure 7.1. I start with the role of the top and their top-down influence on the middle and then continue with the upstream influence of the middle to the top.

Figure 7.1: Influence between the top and middle

7.1.1 The role of the top and the top-down influence to the middle

The investment group at the top takes the financial decisions concerning what (energy) measures to implement in the planning and design phase,⁴⁵³ and therefore I will look more closely into their reasoning about such issues. Economic reasons are usually brought to the fore when energy measures are rejected. My study shows that some energy measures were disabled by the top due to their power over the budget decisions, but it also reveals that the top might enable such measures. Also, the professionals in the middle used arguments referring to economic restrictions, but the final decision power lay within the investment group, which did investment analyses and thereby considered the suggestions from the project group.

In the beginning of the planning and design phase of each specific renovation project, a first draft of suggested (energy) measures was produced and presented by the project leader to the investment group. As a next step, the investment group took an orientation decision for the project. It is the task of the investment group to evaluate and decide whether the suggested measures and ideas are reasonable to implement from a financial standpoint. Thereafter, the project group does its work laying the ground for the tender documents within the economic frames set by the top. The whole planning

⁴⁵³ The members and role of the investment group were already presented in chapter 3, section 3.3.1.

and design phase runs more smoothly because of this early orientation decision since it frames the furthering of the work. Usually it means that not too much will have to be changed when the tender document is finalised and the final investment decision is to be taken. However, suggested measures from the project group might iterate between the project group and the investment group several times before the orientation decision is taken. In the three projects in my study I could observe that the orientation decision had a great influence and that it delayed and changed the projects. In the end, the final investment decision is taken by the investment group concerning what should and should not be included in the tender document. One of the top actors of the investment group explained the role of the investment group the following way:

It's one of those overall tasks. For me it is very important to ensure that those projects we do are somehow long-term financially sustainable. And for me, I have the final responsibility towards the board of directors to ensure that the projects will also be financially responsible, that we do not ruin the economy. And there we must have a holistic approach to the projects. You cannot just take out a single issue. (Interview, IG-3)

Due to the task of the group, the participants in the investment group have a rather strong financial perspective.

Those of us in the investment group, we are not technicians, but many of us have a technical background [...] foremost, we are supposed to count the money and see that it harmonises the technical solution and the money we spend. (Interview, IG-1)

The interviews show that the general opinion was that financial aspects had recently become more emphasised for renovation projects. It was said that one reason for this increased emphasis on the economic and financial aspects was due to the increased need for more building renovations in the coming years. This will lead to enormous costs, which must be handled and considered carefully.

Divided perspectives could be observed concerning the decision making for the implementation of energy measures with, on one side, the middle and, on the other side, the top, both discussing the renovation project from different premises. The perspective of the professionals in the project groups was to focus on what kind of measures to adopt in order to achieve a functional building, including decreased energy consumption after the renovation. The investment group's perspective was merely to consider the financial aspects of a renovation project. They had no deeper knowledge of the argumentations that took place in the meetings of the project groups, where pros and cons of different kinds of measures were discussed, nor about why certain measures were suggested for implementation.

Additionally, the investment group had a slightly different way to discuss what

measures are possible to implement compared to the project groups. As one member of the investment group explained, it is not wise to simply implement certain bigger measures with the argument that a renovation is going on. If building components are not too old and broken, for instance, windows, they should not be changed just because the customer is inconvenienced anyway. Then it is better to inconvenience the customer again in the future.

Then you often think habitually, yes, but it's good to do it while we're here anyway ... we will replace the windows while we are in the house anyway, and the customer is disturbed for that reason. Wrong, I say. Wrong. It is good [...] if the windows must be replaced within three years, but if they will last thirteen more years, then it is wrong. Then no private house owners, where the money comes from their own pocket, would take that decision. Then they would rather disturb the customer again after thirteen years. [...] So that is a bit of my role – to praise as well as criticise and look at the investment analysis. (Interview, IG-1)

The pay-off time for energy measures was a recurrent topic in the discussions. As mentioned before, there is a general rule within the municipal housing company that if the pay-off time is less than six years, any measure can be directly implemented without consulting the investment group. However, it turns out that the way that pay-off times for energy measures are actually calculated in the housing company is a mere construct and is also still under development and not yet clearly defined. In an interview, a representative of the investment group reflected and concluded that it was still unclear how best to calculate the pay-off for energy measures. The interviewee said that the formula to calculate pay-off times is rather pessimistic in comparison to other housing companies. As a result, it happens that energy measures are easily rejected. Then, questions arise as to why this kind of formula is used and why more information is not collected in order to figure out how to calculate the pay-off times of energy measures in a more structured way.

We say that they can implement energy measures if the straight pay-off is a maximum of six years, then they can select what they want and no investment decision is needed. But it is difficult with the replacement of windows [or the] insulation of a façade. And then we have also seen that, in comparison with other companies, they get a better pay-off than we do. Then we came to the conclusion that they probably only look at the additional cost of inserting a third pane of glass for the window. Then they maybe do not count the entire replacement of the window but only the additional cost for the third pane of glass. Then they get a different pay-off, so we check that out. We feel that we are counting too pessimistically. (Interview, IG-2)

However, one investment group member said, in relation to energy measures and pay-off, that it is necessary to compare all the investments with alternative costs.

Then there is the energy question when you renovate, so you cannot do things where you have 100 years' pay-off time. Then it is better to do things and decide on another energy measure with only ten years' pay-off time. In general, I think that it is wrong to take one building at a time and do everything to make it new. You get less environmental effect that way. It is better to try to use the money in the best way. (Interview, IG-3)

7.1.2 Upstream influence from the middle to the top: replacing a heating system

I will describe in detail a situation where the top and the middle came into conflict over replacing a heating system in one of the buildings and how the middle exerted influence upwards to the top. Even if replacing this heating system would save a great deal of energy, energy efficiency or reduction would be only a side-effect in this situation. Instead, the discussion primarily concerned technical and economic aspects. Consequently, even though the discussion was not primarily about energy, and it was not the main argument, it is still a good example to exemplify the upstream influence of the middle to the top.

Before the analysis of the negotiation and discussions leading to the upstream influence from the middle to the top, I will situate the example from this RP. In general, the project leader is the link between the top and the middle. In this particular project, however, there was an extra link between the project and investment group: the real estate development manager participated in the project group meetings and also held an advisory position in the investment group. This position gave her/him opportunities to bring the discussions of the project group into the investment group. The investment group usually bases its decisions on the presentation made by the project leaders, who thereby influence what measures will be adopted by putting forward arguments for the suggested measures and ideas. Sometimes the suggestions are returned to the project group for further investigation.

Yes, I will show what problems there are based on inventory [...] and then suggest what we should do about it. And sometimes they say no, we do not want you to do that, we will do this instead. Or they think you should investigate another option. Then I will have to come back one more time. Then they take an orientation decision on what I will be working with. And then I prepare a package of measures and then I go back to get an investment decision from the company. I cannot do anything without getting a "good to go" from the company. (Interview, IC-4)

In the discussions during the specific meetings of this RP, the middle professionals concluded that it was time to replace the heating system in the building since it was already over 50 years old. The life-span was considered by most participants to be around 30 years, and when a big renovation is to be done it is a good opportunity to also replace the heating system.

The extra cost for the replacement of the heating system were not regarded as too high by the middle professionals in relation to the total costs of the renovation. The replacement cost was estimated at 22 000€. In total, the renovation project was estimated to cost approximately 1 200 000€, thus the replacement of the heating system, according to the project group, would not be a large part in relation to the total, but it was still seen as substantial by the investment group. Additionally, they argued, if leakage should appear in the building after the major renovation, another big renovation would have to be done which would lead to rather high costs. The suggestions for the renovation as a whole, including the renewal of the heating system, were presented to the investment group for it to take the orientation decision. The investment group thought replacing the heating system was an unnecessary extra cost. In order to save money, they initially decided against its replacement.

After the investment group's orientation decision, many middle professionals, both internal and external, disagreed with the outcome regarding the heating system, and some even tried to actively influence this decision. In the end, the investment group was convinced, the members changed their minds, and the heating system was replaced. With this final decision from the top, energy efficiency was indirectly enabled by actions taken by professionals in the middle, even though the argumentation in this example was based on technical and economic reasons.

This example, which reveals a disagreement between the project group (middle) and the investment group (top), shows that the middle may exert influence upwards. I will describe in depth what happened during the negotiations and discussion between the middle and top regarding the heating system and how it was decided to replace it after all.

It was clear from the inspection of the building to be renovated and discussions that took place in the project group that the heating system ought to be replaced

The project group members were quite upset when the first orientation decision not to replace the heating system was made. They considered the heating system too old and the only argumentation for keeping it was to keep expenses down. They concluded that the long-term effects of not replacing it had been overlooked. One external consultant reacted as follows:

But now we will do a complete renovation. And then I asked the question, the heating system, what should we do with it? It's forty, fifty years old. Should we replace it or should we keep it? We should change it, the project leader said. It costs money, but there is no discussion about it, s/he said. We replace

it. [...] Everyone [thought that] except those who sit and decide. Yes, I think that they do not understand what they are doing. They do not know the consequences of the decisions they take. They just look at the money, the finances. And not the implications of that. (Interview, EC-6)

Also, within the housing company several internal employees in the project group were rather critical towards the decision not to replace the heating system. They argued that it was the short-term money considerations that were determining whether the heating system should be replaced but that in the long run it would not be economically advantageous to keep it. As two of the internal employees said:

Yes, what I did not like is that we were not allowed to replace the heating system. It was a shame; I think they do not understand that it will not be beneficial. It will be nearly as expensive anyway, and it will complicate the process and the building will retain the old pipes. [...] No, then I say, that's what I think, it will probably be even more expensive. No, to me it was a wrong decision. (Interview, IC-7)

Because it is, if you start to work on it, there is a risk that it may leak elsewhere. No, it is a decision on a different level, where it is the money that decides. (Interview, IC-9)

One external consultant thought it was an unacceptable decision by the investment group. S/he continued having discussions about it with the project leader and even called up one member of the investment group who s/he knew from before to talk about the orientation decision and to ask for reconsideration. The investment group member s/he called, however, did not want to have this discussion with the external consultant and referred the consultant back to the project leader. The external consultant's phone call was initially received negatively by the investment group member. For the external consultant it was a matter of professional honour as s/he was concerned about her/his reputation in the construction industry because it might fall back on her/him if problems occurred and people might start wondering why this consultant did not replace it.

Yes, I do not want to take the blame when everything is finished and it starts to leak and everyone in town is talking about it. The industry is not so big ... what kind of consultant is s/he? Ah, yes it is [name of the consultant] at [name of consultant firm] and s/he did not say anything. (Interview, EC-6)

The investment group member that s/he called explained her/his reluctance to allow the heating system replacement. The member said it was her/him who promoted the decision not to exchange the heating system as it would be wasted money and “*if you or I owned the building we would not replace it since the costs are too high*” (Interview, IG-1). Furthermore, the member believed that no privately owned housing

companies would replace a heating system in the same situation. According to this member, there is no reason to exchange a system if it is not entirely broken.

Why should we replace the heating system? It is wasted money, no one does that. If you were the house owner you would never have replaced the heating system and neither would I. So why should we do it? Because we called Stångåstaden, why ...? No other privately owned company in town replaces the heating systems. Answer that! (Interview, IG-1)

The deeply engaged external consultant also tried to put the investment in another perspective by reflecting upon the investment costs and seeing it as more costly to not exchange the heating system. The costs for exchanging it were not that high in relation to the total costs, according to the external consultant.

You're sitting in the investment group, I said, you are in charge of the money and I just want to point out that this is sheer madness and ... because I did a calculation with the replacement of the heating system. It cost around eight hundred thousand (SEK). It costs five hundred eighty thousand if you keep the heating system and take the necessary measures in the existing system. So we are talking then about two hundred twenty thousand, that's peanuts in this context. And you get a new system. Then I talked with the project leader again, and then [s/he] said, now it is like this and I have pointed it out to them several times. And now we will see what happens. (Interview, EC-6)

One member with an advisory role in the investment group also participated in some of the meetings of the project group. S/he did not agree with the investment group's decision to keep the heating system either.

[...] we have to make some changes in this system and now the pipes are all embedded in the vaults and it is a very bad combination and everyone around says that – but the investment group says we should not replace it. So I feel like if the investment group sticks with their decision, then I want to have it written down that we have recommended it. [We should] say the foot soldiers (in Swedish: fotfolk), or those who work with it, recommended that we should replace it, because I think we will have problems with it rather soon. (Interview, IC-2)

Further, this advisory member saw problems in relation to the fact that the investment group was not aware of all important arguments behind the suggestions for the renovation as they were neither part of the inspections and discussions of the project group's meetings nor were they informed about details in the discussions at those meetings.

[...] we do a fairly thorough investigation, we have consultants, we think for ourselves internally, we have experts in-house, and the whole thing, and this is ongoing for quite some time, we think about it a lot and consider it from many angles, what do we have to do and what do we not have to do. And then you will come to a result, you will go up to the investment group, who has not been part of the process and they say, no, but this is not possible. That is just crazy; we can't just leave it. And then we try anyway to say, but we have discussed this, but ok we will go back again one more time. [...] But to rebuild the house for several millions while there is a heat pipe which might break, then you drown half the house, it is totally insane. (Interview, IC-2)

The investment group member who was against replacing the heating system regarded this issue as a good ground for lots of discussion. S/he emphasised not liking the argument for replacement that said “*if we are there anyway, we can just as well do it*”, and s/he maintained that no private owner or private housing company would do it either. S/he had the opinion that it is usually unnecessary to replace a heating system as it may last more than 100 years.

The heating system, which is a great thing to discuss – why should we replace the heating system? They say yes, it is embedded pipes [...] because there is a great risk that there will be damage. Oh, if it is so poor, we say, then we do it [...] It's just a pure cost, it is a cost that is taken from year one, that is no investment, it is taken at the result. So then we give in, but we - such a thing is really a good question or great thing to discuss [...] normally, you do not replace it, it lasts one hundred years. (Interview, IG-1)

After many discussions and some months of delay it was decided to replace the heating system. This did not result in any loss of prestige for the investment group.

It is with energy and everything, sometimes you might have to step back. I mean, we saved some old heating systems in houses even though everyone knows it is not good to have those pipes left after forty years when we are renovating, so thirty, forty years additionally. But, there is no money, so, well the heating system we can take a chance on. It looks good and it looks fresh and, well it's a bit like that. But sometimes you have to step back. (Interview IG-4)

As with the matter of the heating system, the LED lamp case, presented in section 6.2.1 also shows an upstream influence. There was discussion and disagreement between two professionals over whether to install the fairly new LED technology; however, one of them took the case to the top, the real estate development manager, who had an advisory role in the investment group and argued for it successfully.

7.2 The bottom and middle

In my study, the bottom is defined as the tenants and the Swedish Union of Tenants. When it comes to the bottom, the analysis is mainly based on observations made at five of the six tenant meetings, telephone interviews with tenants and one interview with a representative from the Swedish Union of Tenants. But the interview with the rent negotiator played a role here, too, and, additionally, the interviews with the other middle actors who were involved with the tenants helped me better understand the role of the tenants and the Swedish Union of Tenants.

In this section I focus on the relations between the bottom and middle, as shown with the blue circle in figure 7.2. I investigate the role of the bottom as well as their influence from the bottom upwards to the middle. This is followed by an analysis of the rent negotiations between the bottom and middle where a downstream and upstream influence take place. Then I analyse the downstream influence of the middle to the bottom.

Figure 7.2: Influence between bottom and middle

7.2.1 The role of the bottom and their bottom-up influence to the middle

I start by describing the structure and content of the tenant meetings, then the influence the Swedish Union of Tenants has as well as the influence and role of the tenants.

In order to understand the situation and role of the bottom, I investigate the information flow between the housing company and the tenants when a renovation is to take place. Therefore, I elaborate on questions concerning the role of information, whether the tenants know about the 25-25 energy goal; if they are interested in energy in general and the implementation of energy measures; what the tenants wonder about; what they usually want to influence in renovations and, finally, what issues they can influence. I will also look into the upstream influence of the bottom to the middle and how energy measures are affected.

Structure and content of the tenant meetings

For each renovation project the housing company arranges two tenant meetings at which the project leader, the area manager, the renovation coordinator, the rent negotiator and usually also the Swedish Union of Tenants take part. The meetings are to inform the tenants about the renovation and prepare them for what to expect. The housing company said that they also listen to the tenants to find out what they think regarding the renovation. The company employees emphasised that it is important to have good communication with their tenants in situations like this, so that the tenants feel that they are listened to. The rent negotiator said that the tenants play a central role and it is important to present what the renovation means at the tenant meetings, what will happen in their apartments and how the Swedish Union of Tenants is involved.

The tenant meetings for RP2 and RP3 took place in a common room of the housing company near the buildings to be renovated. For RP1, the first meeting took place in a common room in a hotel close to the building that was to be renovated, and the second was held at the housing company's headquarters, in the nice hotel breakfast area. According to the company, tenants' participation was especially low in RP2. This could be because the neighbouring buildings had recently been renovated and the tenants already knew what to expect. There was medium participation for the second meeting of RP3⁴⁵⁴ and the first meeting for RP1. At the second tenant meeting for RP1, every tenant who stayed after the renovation participated.

The aim of the first tenant meeting is mainly to inform tenants that the housing company plans to renovate and explain why the renovation is important. The renovation project is described and then the issues concerning rent are presented. At this meeting the tenants are acquainted with the renovation and get used to the idea that there will be

⁴⁵⁴ I missed the other tenant meeting and so did all the other researchers due to time issues.

a major renovation coming up. The tenants are informed that they will later be required to sign a tenant agreement and thereby give their approval for the renovation.⁴⁵⁵ At the first tenant meeting, the tenants also get to fill in a short survey where they have a chance to express their wishes regarding the upcoming renovation. The tenants might also be aware of specific problems in the apartments that no one else knows about. For instance, they are the ones who know if there are windows that do not open properly, if kitchen counters are too short or too low to be functional or if the wardrobes are not properly constructed; these are the types of issues that come up in the survey responses. Thereby, the tenants to some degree provide a problem inventory of the apartments. They can affect the cosmetics of their apartments to some extent, but nothing major.

Well, it is different. In fact, they cannot affect very much. The main pipes (Swedish: stammarna) we have to do, [...] we have to do the bathroom and kitchen. So.... That is how it is. [...] But then they can affect the very small things, I think that may be important anyway, and they can surely come up and say that, yes, our balcony rails are really bad, can you fix that too. At [name of a different RP] we had a lot of comments about the windows because they were in such bad shape, which was not at all included in the planning and design at the beginning. But we included them. They also had comments on the electrical outlets, which were really bad. So those we exchanged too, grounded electrical outlets, because they wanted that. So we try to listen. Sometimes, you hear almost nothing from the tenants and sometimes it is a lot. (Interview IC-3)

At the second tenant meeting, the comments collected from the first meeting and the survey, as well as the final measures to be implemented in the renovation, are presented. Then the rent increase is discussed and explained. It is also again emphasised that the tenants need to sign the rental agreement. If the tenants want to, they can sign it right at the meeting, which apparently many do, according to the Swedish Union of Tenants.

Hence, the tenants' opinions and knowledge about the apartments and building go into the planning and design phase of the renovation (information based on answers to the survey distributed at the first tenant meeting), but more of the tenants' knowledge could be used. It is notable that relatively few tenants attended some of the meetings (RP3 and especially RP2), and thus less tenant input was received for those projects. Also, in the meetings for two of the three renovation projects, RP3 and especially RP2,

⁴⁵⁵ As already explained in section 4.4, this is a requirement for Stångåstaden, which will allow them to do the renovation, with all its implications. If some tenants should disagree and refuse to sign the tenant agreement, the case automatically goes to the Regional Rent Tribunal, where a decision is made as to who is in the right, the landlord or the tenant. However, the tenants are also informed that in more than 95% of the cases, the decision is made in favour of the landlord. This is due to the fact that the renovations are not luxury renovations and the point is rather to improve the standards and maintain the functions of the building itself.

not many tenants attended the meetings arranged for them and thus not as much input from the tenants was given as it could have been

The tenants – their perspectives and involvement in the renovations

I am interested in whether the tenants think they get enough information about the renovation, if they get any information about the 25-25 energy goal, and what they think they can influence as regards the renovation in general and about the implementation of energy measures in particular. Overall, many of the tenants had a positive attitude towards the renovation since, in their view, the buildings are in such bad condition.

Information

Tenants who participated at the tenant meetings appreciated them as a forum in which to receive useful information. All tenants were asked what, in general, they thought about the information they received regarding the renovations, and they expressed ambivalence. Some thought that the information they received was good whereas others saw it as quite inadequate. Also, after the renovation took place, some thought the whole renovation project had gone smoothly and that they had been kept well informed, while others saw problems the whole way through. Many tenants said they were informed differently by the project leaders and the construction company that took over for the actual reconstruction. When the construction commenced, the information flow decreased, which was criticised by many. Also, during the reconstruction work, time plans were not kept, unannounced power cuts occurred, and for one RP, the storage space in the apartments changed after the renovation without any information about that beforehand.

The company's rent negotiator thought that the tenants were not given enough information by the housing company for the renovation.

Yes, you cannot provide enough information. If I am honest, I do not think we do that. And I think ... I will be critical that we can get better at it. I think so. Because between the project meetings ... or tenant meetings one and two, there is sometimes quite a long period because the company cannot decide what to do. No, but honestly, it can actually be like that, and then I think it is not right of us not to go out and say that yes, right now we are here [in this stage] [or] actually tell them that nothing has happened [clarification: It would be better to always inform the tenants what is going on at the moment].
(Interview, IC-3)

Although tenants had diverging opinions about the information given by the company, and even the rent negotiator said more information should be provided, the

Swedish Union of Tenants thought that the information the tenants received had improved a lot.

Knowledge about the 25-25 energy goal

It was also interesting to investigate whether the tenants knew about the company's 25-25 energy goal since the housing company emphasises its importance so much. Almost all of the tenants said that they knew that Stångåstaden was working to reduce their energy consumption in one way or another, but not that the housing company had set this 25-25 energy goal. Only a few said that they had heard of it somewhere, however, they said that this was not something they thought about. One tenant said the goal was not surprising as every company has such a goal today. One other tenant said that s/he would appreciate more information on the 25-25 energy goal and energy measures in general and what measures the company planned to implement in order to achieve this goal.

Influence on renovation and energy measures

An important issue concerning renovations is whether the tenants can and want to influence a renovation project. My conclusion, based on the tenant and planning and design meetings, the interviews with the Swedish Union of Tenants and the rent negotiator is that the tenants have little influence on the renovations. However, in the phone interviews the tenants answered quite differently, as some thought they had the opportunity to influence the renovations while others thought they had no influence at all. Regarding influence, a quite common answer was that it is only possible to influence to some degree; for instance, tenants can influence certain aspects of the renovation, especially if they are willing to pay for things themselves, but they cannot influence things when the landlord would have to pay. In general, it is possible for tenants to influence the cosmetics of the apartment but no big measures. Many tenants also wished to influence only the cosmetics of the apartment, like what colours or wallpapers were used, and what kind of floor they would have. Some of the tenants, however, wanted to have better windows because there were issues with draughts in the apartments, and they wanted new and better radiators. Better insulation was also mentioned, however, not for energy efficiency reasons but for soundproofing, as the apartments were quite noisy. Another issue mentioned was getting more energy efficient household appliances, since the existing ones were old and consumed enormous amounts of electricity, which the tenants paid for themselves. Here the argumentation for certain energy measures, such as better windows, more insulation and energy efficient appliances, were motivated by economic reasons (to save money) and issues related to comfort. The company's area manager was, in this context, held up as a positive person

who functioned as a link with whom they could discuss ideas and problems. This was often seen as a way to get wishes and problems heard. Also in that regard, some argued that in order to influence the renovation project it would take lots of engagement and time and then in the end it might not even work and would thus only be time wasted. Thus, it was probably seen as not worth the effort. Some tenants did not have any wish to influence the renovation, or they simply did not try to do so.

One person had suggested using automatic light switches or motion-controlled lightning in the common areas of the building, such as the entrance and staircase. This tenant suggested that doing so could possibly influence the total energy consumption. The suggestion was not applied, however, and the tenant was frustrated that her/his energy saving measure was not taken into consideration. Another tenant said it is not possible to influence a company because they only want to make money. I had observed during the tenant meetings that the tenants did not ask any energy-related questions. This observation was confirmed by the Swedish Union of Tenants. Interestingly, most of the tenants said in the interviews that they were positive towards energy measures, even if they resulted in an increased rent. Some said that as long as the rent increase can be justified and the increase is not shockingly high, it could be accepted. A few mentioned that it is good to care for the environment. A number of tenants thought that everyone has to contribute to more energy efficiency. There were also tenants who would accept an increase in rent as long as it resulted in a reduced electricity bill. However, some tenants were less positive towards (more) energy measures mainly in relation to the issue of a possible rent increase. Many tenants argued that these energy measures are normal maintenance and should not affect the rents. Others said that they did not want to have a higher rent and some felt that the rent was high enough already. One opinion from a tenant who did not want to pay a higher rent was that the housing company implements all those things only to be able to raise the rent. Another argument was that it is instead better to educate the tenants and make them reduce their use of resources.

Upstream influence to the middle

Some tenants felt that, as a tenant, you are more or less powerless when a renovation takes place. The housing company has made plans about what to change and how to renovate, and they decide on what will increase the standard after the renovation, which influences the rent. To do a renovation, the company must have the tenants approve and sign an agreement. But even if a tenant says no and does not give the approval, the Regional Rent Tribunal will most likely agree with the landlord. Thus, the tenants have little power. It may be another reason why many people sign the tenant agreement at the meetings directly, because they understand that it is very unlikely that they can actually stop the renovation, even if there are things they do not like.

The tenants and their knowledge about the buildings could be used much more to enable not only energy efficiency but also a better-functioning building that works for the tenants. Thus, workshop meetings, where tenants are actively engaged and included, could be held instead of just simple information meetings. Such workshops could focus on various kinds of tenant-related issues, including energy issues, which many said they were positive about, and could thereby serve as a method to include tenants in the development of the building they live in.

The collective tenant: The Swedish Union of Tenants and its involvement in the renovations

During the planning and design phase of a renovation, the Swedish Union of Tenants is an important external player representing the tenants. In my analytical model, it is located at the bottom. The Swedish Union of Tenants works for and with the tenants regarding the rent negotiations, and it also represents individual members if there are problems concerning housing. There are also questions about the tenants' influence, where the union helps the tenants see how they may affect their own living environment, and it organises activities for the tenants. The Swedish Union of Tenants represents everyone who has a negotiation clause in their contract, which is practically everyone.⁴⁵⁶ Such a clause should always be in the contract when it is signed, and if the clause is removed, then the tenants have to negotiate for themselves. Around 50% of tenants are active members in the Swedish Union of Tenants.

Speaking to them in their role as representatives for the tenants, I asked, among other things, how effectively information about a renovation is communicated to the tenants, whether they think the tenants know about the 25-25 energy goal, and what tenants are interested in and what they want to influence and about the implementation of energy measures and the tenants' opinion.

Information

Regarding renovations, the Swedish Union of Tenants has indicated that the information flow to the tenants has become much better in recent years. They said that a few years ago there were many more complaints and questions and more confusion at the tenant meetings than is the case today. Now, the tenant meetings in the planning and design phase go quite smoothly and the tenants are provided with a lot of good information from the housing company. Also, according to the Swedish Union of Tenants, the housing company usually applies the same measures all the time and thus they have learned what kind of information is needed. This shows also that the standard

⁴⁵⁶ Any organization other than a Swedish Union of Tenants could do this work as they have no monopoly on this.

package of energy measures installed by the housing company for renovations is based on their aggregated knowledge and habits.

I feel that this has become better and better over the time that I've worked here, as they have worked on several, more and more projects in the same way, thus they use about the same measures and then you realise what kind of questions arise at those meetings [...] And so that these meetings, I feel that in the beginning, when I started working here, then there were a lot of discussions and comments and in some cases tenants were quite upset and questioned many things. This has been reduced and I think that is because the information is better now. (Interview, SUT-1)

Many tenants usually sign the tenant agreement on the spot at the second tenant meeting, and this is probably a result of the improved information, according to the Swedish Union of Tenants.

I think it is also apparent at the second meeting, when it's clear what actions will be taken and what measures will be implemented. It becomes clear what the new rent for the apartments will be and you bring all the materials and hand them out because the tenants are supposed to accept the standard increasing measures. A fairly large percentage of those who attend the meeting sign it directly on the spot. There has been so much information before, so they know. I do not need to go home and think much more about it, I'll sign it, so I guess it is one reason that I can see that the information is good. (Interview, SUT-1)

Knowledge about the 25-25 energy goal

The Swedish Union of Tenants also spoke about the tenants' knowledge about the 25-25 energy goal and was rather convinced that most tenants do not know about it. Maybe it was mentioned in the housing company's newspaper, but as long as there is no obvious gain for the tenants, people are probably not interested in it. This was also confirmed from the phone interviews with the tenants.

But for many people it's also about what's in it for me. Why ... why is it good for me to do this? Yes, you can reduce your housing cost by a hundred per month, yes, then maybe it will be interesting. (Interview, SUT-1)

Questions, influence and energy measures

According to the representative of the Swedish Union of Tenants, the tenants' questions concerning an upcoming renovation mainly concern what things will cost, practical details about the evacuation of the building, where to move and what to do with the furniture during the renovation, who will take care of the clean-up and so on. Such questions were also asked during the tenant meetings I attended. Energy questions are usually not mentioned or raised according to the Swedish Union of Tenants, and I also observed that at the tenant meetings.

The tenants can exert some influence on the renovation project, and a possible tool they can use to do so is the survey they fill in at the first tenant meeting. The representative of the Swedish Union of Tenants thinks, however, that usually no major adjustments are made in the project based on the tenants' survey. Planned measures are not taken away, but small changes in the kitchen layout could be adopted if the tenants are saying it is not working at all as it is right now. In that regard, the interviewee from the Swedish Union of Tenants raised an interesting point, namely, how much should the housing company actually listen to the current tenants and how much should they focus on the future tenants.

Well, Stångåstaden has to consider how much they should listen to those who live there today and how much they should think about how the buildings will work for another forty, fifty years from now. There will be other tenants and they will have their wishes ... so the building has to function properly. I think it's probably more at the level of changing some details of the design but not giving people the opportunity to, for example, exchange measures or to add big things either. (Interview, SUT-1)

The Swedish Union of Tenants did not actually participate in any of the tenant meetings of any of the projects I followed, and the internal rent negotiator apologised for their absence. S/he emphasised, however, that they care and are usually present and that it was a pity they did not attend, as their attendance gives confirmation and credibility to what the housing company is presenting.

Upstream influence to the middle

Especially for RP2, the researchers discussed with some internal employees the possibility of installing IMB (individual metering and billing). Such technology would make the tenant pay for water and maybe even heating according to their own consumption, just as they do with electricity. However, the Swedish Union of Tenants in Linköping is rather sceptical about IMB and currently opposes it because there is a risk that the tenants will need to pay extra for the installed measurement equipment. This resistance has so far prevented the implementation of IMB in Linköping.

The Swedish Union of Tenants influences the planning and design of the renovation projects and the adoption of different (energy) measures, mainly in relation to rent questions, and it can possibly disable different kinds of (energy) measures if it argues that the rents are affected too much. I will describe the rent negotiations in more detail later. In the next section I will focus on the rent negotiations as an upstream and downstream influence struggle.

7.2.2 Downstream and upstream influence between middle and bottom: Rent negotiations

The Swedish Union of Tenants is always kept up to date on what is happening at the housing company and, for example, which buildings are next up for renovation. The negotiations for a new renovation project usually start with a meeting where the Swedish Union of Tenants is invited to the housing company. Often the Swedish Union of Tenants does not know what the apartments look like, therefore they do a site visit, so everyone involved has a picture of the situation and a good idea of how everything looks. Without this detailed knowledge it is difficult to have a discussion and negotiate the rents. At the negotiation meeting with the Swedish Union of Tenants, the project leader presents the project, including all the plans and ideas and why they have to take certain measures. The rent negotiator has a prepared list of measures s/he thinks will increase the standard in the apartment as well as a comparison to other similar apartments in the same area and their rents in order to compare rent levels. Then a new rent level is suggested. The Swedish Union of Tenants receives all the information and comes back later to the housing company with a counter-offer, as usually the suggested rents are considered too high. Then the new rents are negotiated. It usually takes two to three meetings and ends with a phone call. But it can be much more troublesome and take several meetings.

The Swedish Union of Tenants plays a major role in the rent negotiation and influences the new rents after the renovation. According to the interviewee with the Swedish Union of Tenants, Stångåstaden is in such a strong financial position that they do not need to maintain the current rent levels. The profits do not have to be that high, even if the prices increase for the next year. The prices of heating, salaries and other things, go up, but the money coming in is already sufficient to pay all the company's bills, about eighty to a hundred million each year. The Swedish Union of Tenants sees no incentive to continue that way, arguing that, if you put the whole puzzle together with low borrowing costs, no vacancies, low tariffs, high rents and a strong financial position, there is no need for higher rents.

The rent negotiator is internally employed by the housing company and in charge of rent negotiations and is part of the middle professionals of the housing company. S/he usually participates at least in the first few meetings of the planning and design phase, the meetings that are directly relevant for her/his work in order to get a picture

of the renovation project to understand what is happening and to get an idea of how it might affect the rents. In my study, the rent negotiator was present at the beginning of RP1 and RP2, but not RP3. The work of the rent negotiator is crucial for the whole planning and design phase of a renovation because of the negotiator's central role at the tenant meetings and because the rent negotiations taking place could influence the adoption or rejection of energy measures in the project groups.

The rent negotiator suggests a new rent level after renovations and is in charge of negotiating changes in rents and also of doing annual rent negotiations with the Swedish Union of Tenants. Rents need to be negotiated for renovations and for new constructions, and also when an apartment is fixed up after sustaining water damage, for instance; if the standard of the apartment is improved, the rent is adjusted. As regards renovations, the rent negotiator negotiates with the Swedish Union of Tenants about the measures that will increase the standard, as those will have a direct influence on the rent. For example, a new window is seen as standard increasing if it is also soundproofing and decreases the noise pollution in the apartment. Reduced energy consumption from the new window is not seen as a standard-increasing measure. Also, rents need to be adopted for each tenant individually if they, for example, have a space in the parking lot or garage, or if they have a storage area, but those have nothing to do with the Swedish Union of Tenants.

In the rent negotiations, it might be decided not to implement energy measures in order to keep the rents down. But the Swedish Union of Tenants explained that, regarding energy measures and rent, it gets a bit difficult. So far, it has not yet been easy to deal with energy measures with regard to how these factors will or should affect rent levels. There is no clear way of dealing with most energy measures yet; only a few are somewhat clear to this point. A window exchange, for instance, leads to better thermal comfort, eliminates draughts and might improve soundproofing. Also, new ventilation can lead to better air quality inside the apartment. The measures are valuable for these reasons, however, their value comes from the "side-effects" of, for instance, increased living comfort. Increased energy efficiency in itself is thus not regarded as valuable or justifiable. It has to be learned in the future how to set rents in relation to energy measures as it still seems to be a little bit of a struggle.

The Swedish Union of Tenants and the rent negotiator both work on setting rents for the tenants, but of course they bring different perspectives. The goal of the Swedish Union of Tenants is to keep the rents as low as possible and they want, and need, facts and arguments that they can use to clarify the results of the negotiations when facing their members. On the other hand, the rent negotiator thinks the housing company also needs arguments when the tenants complain about the raised rents. In the opinion of the rent negotiator, the company cannot just raise the rents and expect the Swedish Union of Tenants to agree to it; thus they must have well-grounded arguments to justify any raise.

7.2.3 Downstream influence from the middle to the bottom

In general, approximately half of the tenants of a building move to a new place after a renovation and do not move back. They do so for different reasons, for example, they wanted to move anyway, they do not want to move many times, or the rents are too high after the renovation. Their decision is influenced by the fact that a renovation is taking place.

The middle professionals exert influence on the tenants' living situation, for example, by making decisions about what materials are used in the renovation, what appliances are selected, where the outlets are, what lighting is installed, whether tenants have their own washing machine and so on. Such decisions influence the rent levels of the apartments as well as the tenants' electricity bill.

The power of the middle regarding the new rent levels relates to the total cost of the renovation. The ambitions of the middle and what the top decides are decisive for the outcome. During the planning and design phase, however, there are discussions and negotiations on how much the rent can be increased, which also influence the outcomes.

The middle influences the tenants, which may affect whether they will stay or leave, their living situation, and what measures are installed, and thus it influences the tenants' energy consumption. They could have a greater effect on energy efficiency in the long run and work more with the tenants at tenant inclusion meetings instead of simply informing the tenants as is currently done.

7.3 Sideways influence of the professionals in the middle

Enabling or disabling energy efficiency can also be analysed in terms of influence from the middle and sideways, to other professionals in the middle, see figure 7.3. The influence to the sides refers both to influence from the external consulting companies, whose employees are engaged as external consultants in Stångåstaden's renovation project groups, and to upcoming or future renovation projects within Stångåstaden or other purchasers.

Figure 7.3: Influence from the middle and out

During the planning and design meetings, the middle professionals were constantly referring to other (similar) projects that they had completed in the past and were using as points of reference for the current projects. Along that line of thinking, in the future they can use their experiences from current projects as points of reference. The consultants thereby perpetuate momentum and a path dependency as they get yet another project that they can add to their experience base of aggregated knowledge and know-how about renovation projects. However, there is also the possibility that new ideas, if adopted, might spread this way. It would reasonably be possible to spread the attitude of including energy issues in renovation projects in the construction industry in Linköping and to other consultant companies, if the inclusion of energy issues were to become self-evident over time and if the consultants were to repeatedly choose energy measures, see that they work and use them again for other projects.

One external consultant gave an interesting example of this. In an area of Linköping passive houses were constructed, and the professionals involved in the construction first had to learn about how to build passive houses. After the construction of the passive houses, conventional buildings were built on the same street by the same professionals. As it turned out, the professionals had learned a great deal from their passive house experiences and they added this knowledge to their aggregated knowledge and know-how. As a result, the conventional buildings turned out to be rather similar to the passive houses, with low energy consumption. This is an example of sideways influence.

What amazes me, Stångåstaden has built passive houses in that area outside there and built normal houses like passive houses on the other side of the street. And there is very little difference between them and I know exactly why! Because those guys who were building the passive houses ..., they went to a course [...] where they learned the things they also implemented in the conventional houses. (Interview, EC-1)

7.4 Concluding remarks and discussion

With this chapter I have analysed the influence on the middle from the top and the bottom and vice versa, regarding implementation or rejection of energy measures. Together, the middle, the top and the bottom play important roles when it comes to the adoption of energy measures for a renovation.

I addressed the role of the investment group, the top, and their influence on the middle and the resulting effect on the adoption of energy measures. I also elaborated on the tenants and Swedish Union of Tenants as the bottom and their role and influence upwards to the middle and the adoption of energy measures. Additionally, I analysed the influence of the middle upwards to the top and downwards to the bottom. Moreover, I investigated possible influences of the middle sideways regarding energy measures. In this way I was able to analyse and expand the focus of the middle professionals and their meeting practice and also consider other influences on the middle and the uptake of energy measures by putting my analysis into a wider context.

Overall, the task of the investment group is to decide upon financial aspects of the renovation. It is often the case that the investment group, the top, restricts or disables energy measures due to economic considerations. The members of the investment group have, and should have, a strong financial perspective. In their financial decisions, they might be restricted by long-term investment decisions and by the fact that many more renovations are on the list for the coming years. Another issue regarding the financial decisions of the investment group is that they lack detailed knowledge about how the project groups discussed and reasoned about their suggestions of different (energy) measures. The project leader is the link between the project group and the investment group and has the opportunity to argue for the implementation of certain measures. In one of the renovation projects in my study, the real estate development manager was an extra link, as a part of both groups, and had the opportunity to bring the project group discussions to the investment group. Another important aspect in relation to financial decisions is that the calculation of pay-off time is a mere construct of the investment group and is considered even by some of its members as rather pessimistic compared to the practice of other housing companies. This results in easily rejecting energy measures. A question and task for the investment group is to figure out a good formula for calculating pay-off time in the future, which of course depends on what their goal

is for the upcoming renovations and the company itself and if energy is to play a bigger role.

In my analysis I found an example of upstream influence from the middle to the top. Professionals in the middle successfully influenced the decision to replace the heating system, as they saw it as irresponsible not to replace it when such a big renovation was being done. The initial decision not to replace the heating system when doing the big renovation appears to have been motivated by short-term rather than long-term economic arguments. The final decision to replace it enabled energy efficiency, but this was as a side-effect of technical and economic discussions and decisions. There was also downstream influence from the middle to the bottom, mainly concerning the rents, the tenants' living situation and what materials and products would be installed, which in turn impacts the tenants' energy consumption.

The Swedish Union of Tenants represents the tenants, acting as a collective tenant, mainly when it comes to rent issues, including in the rent negotiations during the planning and design phase. They, however, have the power to stop energy measures in renovations if, in their view, implementing them would affect the rents too much. So far there is no good way to deal with energy measures in the rent negotiation. The tenants' experiences could potentially serve as a source for compiling a problem inventory, as they have a lot of knowledge about the apartments and buildings they live in. Tenants' points of view, given in the short survey filled out at the first tenant meeting, are also discussed at meetings of the project groups. Regarding energy measures, every interviewee who had experience working with tenants said that questions concerning energy were not really an issue for the tenants. Energy measures were not asked for, but most tenants seemed to regard them with a positive attitude, even though not everyone wanted to pay for them. Also, the tenants did not know about the company's 25-25 energy goal. So far it seems like the tenants want to, and are only able to, influence the cosmetic aspects of the apartments and not anything major. In general, the influence from the bottom to the middle is not activated as much as it could be. There could be more active inclusion in meetings and workshops with the tenants compared to the currently dominant information meeting.

The middle potentially also has the opportunity to spread ideas and knowledge about energy and energy measures to other consultants on their own middle professional level, both externally and internally for future projects.

Inclusion and implementation of energy measures seemed to be something new for most of the involved actors. As said in the previous chapter, apparently no clear way has been identified for dealing with energy calculations. It is also not yet clear how to calculate pay-off time when it comes to energy measures. Additionally, in rent negotiations it has not yet been established how to view energy in relation to rent setting. These are all issues that need to be learned over time if energy is to play a bigger role in the future.

To sum up, the top, of course, has a lot of power and influence with their financial decisions. However, their decisions are not set in stone and it is possible to change them, as the example of the replacement of the heating system showed. In that example, the middle professionals persisted and did not give up and, finally, their influence brought them success and the heating system was changed in the end. As individuals, the tenants so far have not had much upstream influence, but with the Swedish Union of Tenants representing them as a collective tenant in the rent negotiations, they can affect the enabling or disabling of energy measures. There is a downstream influence coming mainly from the rent negotiation, which directly affects energy measures considered in the planning and design phase. Another downstream influence is more related to tenants' long-term energy use in terms of the installation of certain products and appliances, which thus affects the tenants' living situation and energy consumption (use). The middle does have a sideways influence to spread ideas on energy and energy goals, and knowledge about energy measures, as during the meetings, they always referred to previous projects and what they knew based on their own experiences. They also referred to the concrete example where building professionals learned about passive houses and brought that knowledge to the construction of conventional buildings, thereby also decreasing their energy use.

CHAPTER 8

8. Discussion and conclusions

When the understanding of a process increases, it is possible to also improve the outcome in the long run. There is a gap between existing energy measures and their actual implementation. It needs to be understood why in order to achieve an energy efficient and sustainable built environment and mitigate climate change.

When the opportunity for a renovation arises due to aging buildings, there is a chance to not only improve and modernise the building, but also to include energy measures in order to reduce the energy consumption and improve energy efficiency. There is a need for increasing numbers of renovations and each one is a window of opportunity to implement energy measures in the existing building stock, which, consequently, might be used to achieve a long-term sustainable built environment with reduced energy consumption. Then, the possibility increases to meet energy targets at international, national and company levels, resulting in reduced energy use and CO₂ emissions, thus ultimately mitigating climate change. Many earlier studies have shown that even though energy measures exist and are being developed, they are slow to be adopted, if they are adopted at all, making it questionable whether energy targets can be reached.⁴⁵⁷ Why are energy measures not enabled more? And why it is so difficult to enable energy measures in building renovations? These are overarching problems which inspired my research.

My analysis contributes by showing different layers of explanation regarding why it was hard to initiate changes focusing on energy measures in renovation projects, even in light of the fact that the housing company had formulated their 25-25 energy goal and that energy efficiency and saving was introduced as an explicit goal and focus for the projects. The aim of my study is to investigate the enabling or disabling of energy measures leading to energy efficiency and reduction by building professionals and other actors in renovation projects, specifically in the planning and design phase. My study increases understanding of why energy efficiency measures are enabled or disabled and why is it so difficult to include energy measures in building renovations. I have shown that the way the planning and design phase is performed repeats itself and, with my analytical framework, tried to understand why. Therefore, to deepen understanding of the uptake of energy measures in renovations, I have studied the work of actors and middle professionals in relation to the planning and design phase of renovations, and the meeting practice of the middle. The early phases of a renovation project are decisive since this is when most decisions are taken as regards what to do with the building and what measures to implement.⁴⁵⁸ I want to increase understanding of why specific

⁴⁵⁷ See also Xylia, op. cit.; Janda, Killip & Fawcett, op. cit., p. 912; and Glad, op. cit., p. 274; Mangold et al., op. cit., p. 41.

⁴⁵⁸ See also, e.g., Thuvander et al., op. cit.; Konstantinou & Knaack, op. cit.; Boudeau, op. cit.; Nielsen et al., op. cit.

measures are enabled or disabled, but I will not make any judgements as to whether the suggestions regarding energy measures are good or bad.

A general empirical result and conclusion of my study is that energy did not play as big a role as I expected. Thus, in the end, my study is more about how energy measures are handled and in a way why they are disabled. Which can however be regarded as a strength of this particular case study as the lessons learned from this study might be useful towards improving the outcome of future renovation projects. Thus, it increases understanding of why energy measures are disabled and elaborates on how to enable them.

The planning and design meetings could be an opportunity for project groups to create a common understanding of the company's goal on energy efficiency. Thereby, some part of the meetings could be used as a hot pot wherein different backgrounds and knowledge areas meet and develop new ideas on energy efficiency and savings. In the latter case, the project group can benefit from different types of expertise and try out new ideas and solutions to develop a procurement document that considers energy measures to a larger extent.

My research questions were:

1. How are energy measures discussed and transformed into plans and decisions by professionals in the middle?
2. Is the housing company's 25-25 energy goal translated into the planning and design practice, and if so, how?
3. Why do the middle professionals decide to enable or disable energy measures in the planning and design of renovation projects?

8.1 Research approach – a learning story

In the light of previous research, I place my thesis in the interpretivist approach.⁴⁵⁹ I also want to use my case study to tell a learning story, as suggested by Janda and Topouzi, which is in line with an interpretivist approach.⁴⁶⁰ Janda and Topouzi as well as Schweber and Leiringer call for more research in this area.⁴⁶¹ This approach currently covers only 20% of all research on energy and building from the last decade, according to Schweber and Leiringer. Schweber and Leiringer mention several examples of research gaps, such as how to explain and thus support the uptake, diffusion, and use of new technologies, materials, systems and processes from an interpretivist approach.⁴⁶² My study has looked into the uptake of (possibly new) energy measures and technologies. Another mentioned example is how meaning, practices and institutional environments shape the supply and demand for energy as well as different characteristic

⁴⁵⁹ See also Schweber & Leiringer, op. cit.

⁴⁶⁰ See also Janda & Topouzi, op. cit.

⁴⁶¹ See also Schweber & Leiringer, op. cit.; Janda & Topouzi, op. cit.

⁴⁶² See also Schweber & Leiringer, op. cit.

of the built environment. This is also related to my research, as I study the meeting practice of middle professionals and, thereby, as an element of what holds a practice together, the meaning of energy goals. Furthermore, they emphasise the need for studies investigating the relation between the different phases in renovation projects in order to better understand the obstacles and opportunities for more integrated whole-life and whole-system approaches. I focus on the planning and design of renovation projects to understand how energy measures or technologies are decided upon, which can help to understand what constitutes the current process and how it would be possible to integrate whole-system approaches, viewing a building as a system, in the future. Moreover, Schweber and Leiringer highlight that it would be beneficial to persuade industry partners of the benefits of more long-sighted research.⁴⁶³ This was the overarching goal with the CAREER project I was part of. The whole project was a learning process for both parts, the university researchers as well as the municipal housing company. At the beginning, the engineering researchers were expected to fulfil the role of consultants and it appeared as if no one really understood why we, the social scientists, were there, never saying anything and just taking notes. It was sometimes understood that we were there to observe their behaviour. It took time for us, the researchers, to get in and become a “natural” part of the planning and design project group. It is difficult to do this type of research over a shorter period of time as it is time-consuming, but nevertheless of vital importance, to build up trust in and understanding of each other. Because this research had a longer time span and since we collaborated and met on several occasions outside the actual planning and design meetings, it was easier to create this trust and understanding. This opened many doors for me, and I think I had a great chance to be part of and get to know the housing company better. The fact that we learned to understand each other and help each other was also highlighted and seen as valuable by the housing company at our final presentation meeting. After the CAREER project, the work between Stångåstaden and the university has continued with other research projects, and more applications for further research collaborations have been handed in, which can also be seen as success.

In many ways, this case study can be seen as a learning story. It is not a case where a fantastic new innovation was successfully installed and all of the buildings were renovated for maximum energy efficiency. Rather, it is a case of a housing company learning how to include more energy efficiency thinking in its renovation projects and how to transform goals into practice. By understanding what the meeting practice actually looks like, it is possible to learn what can be done differently in the future and what to change in the meeting practice towards enabling energy and thus change the “energy” outcomes. (It also needs to be kept in mind that this housing company has a lot of renovations ahead of it, including the big Million Programme renovations).

This also a learning story, concluding that there is technical potential for energy renovations but that there is still much to do in order to realise it in practice. The

⁴⁶³ See also *ibid.*, *op. cit.*

ordinary professionals in the housing and building sector who respond to the challenge of becoming more energy efficient in renovations are not saved by a hero or magic solutions but instead must rely on their own actions. The process of making the transition towards more energy efficiency is difficult and will need participation and reflection that acknowledge that there is not one single truth.⁴⁶⁴

Furthermore, as described in more detail in previous research, the research is placed in the realm of science and technology studies (STS), which means technology and society are seen as interdependent, and society as well as individuals are able to shape the technologies that surround them.⁴⁶⁵

Also I focus on the professionals regarding energy and buildings. Often in research on energy and buildings there is a focus people's behaviour, the individuals who operate and behave as consumers or citizens. There is less focus on the practitioners and professionals providing services for the building. As Janda and Killip I want to instead study professionals and the decisions they make concerning renovations.

From a focus on the individual's behaviour to the professionals

Janda and Killip criticise the claims that issues concerning energy and buildings can be addressed by technology instead of by changes in people's behaviour. Such a claim is based on a determinist view where technology and people can be easily separated from each other (it is also related to the positivist approach and the hero story, as mentioned above). Another issue is that the task of social sciences is limited to investigating individuals who operate and behave as consumers or citizens, and there is little focus on the practitioners and professionals providing the services. Thus, social scientists are assumed to work only with changing homeowner behaviours. Exactly this assumption and its implications are challenged by Janda and Killip.⁴⁶⁶ I relate to this, as I also study professionals and the decisions they make concerning renovations.

8.2 Energy in the planning and design phase

The three renovation projects I studied were, from the very beginning, supposed to be energy renovations; however, in the process, energy issues were not dealt with to the extent expected. I investigated what the middle professionals regarded as the most important goals to achieve with a renovation, and energy efficiency was the second-most mentioned goal. When I asked the middle professionals if energy was part of the planning and design for the renovation, many said that energy was now more in focus and more included than before. Others said that it was the same as usual and the

⁴⁶⁴ See Janda & Topouzi, op. cit.

⁴⁶⁵ See also Pinch & Bijker, op. cit.; Callon, op. cit.

⁴⁶⁶ See also Janda & Killip, op. cit., p. 40.

renovation projects would be nothing special this time, while some could not say whether the focus on energy had increased or if it was included at all. This shows that energy efficiency is not (yet) a clear focus within the housing company or among the middle professionals and therefore not in renovations either. However, from 2011 on, increasing efforts were made to focus on energy efficiency in renovation projects: the 25-25 energy goal was introduced, the energy group was formed, and many thought that energy was more in focus compared to previous projects.

I identified five issues that made energy and energy measures appear rather elusive and introduced a hide and seek game for us researchers, to a point where it was sometimes hard for me to find the energy aspects of the renovation. These five issues contribute to answering all three research questions concerning how energy measures are discussed, how the 25-25 energy goals are translated into the planning and design practice and why the middle professionals decide to enable and disable energy measures:

- Energy goals: 25-25 energy goal and specific reduction goals for each building
- Energy calculations and measurements
- Energy group
- Energy measures and pay-off time
- Energy measures and rent

There was a lack of any clear way of dealing with energy aspects. Meeting practices in which energy is integrated have not yet been developed and, also, energy-related communication and information is lacking.

Energy goals: 25-25 energy goal and specific reduction goals for each building

The problem with energy goals was that they were either poorly communicated or entirely missing. The middle professionals did not all share the same level of knowledge or understanding about the 25-25 energy goal. The housing company thought that all of the external consultants knew about the 25-25 energy goal and were working according to it, which was not the case. Apparently, the 25-25 energy goal was not explicitly communicated to the middle professionals.

Furthermore, there were no specific energy reduction goals in the renovations, like for each building. Many external consultants assumed that there was a specific goal for each building and that Stångåstaden's employees knew about the goals and were acting to comply with them. There were a lot of assumptions about energy goals and work that were not realised in the projects. Overall, there were many different mutual expectations that were not met in reality. Most of the middle professionals had different ideas and goals concerning what to achieve with a renovation and how to deal with energy in the projects. The members of the project groups did not work closely together on energy

aspects, and everyone thought that someone else was working with energy efficiency. These different understandings of the place of energy in the renovations surely contributed to a simple purchaser-consultant relationship between external consultants and the housing company, where everyone was trying to fulfil their tasks according to the contracts and based on routines and aggregated knowledge. There were no obvious attempts made to create a common understanding about the purpose of the renovation projects in relation to energy and work together to achieve it.

Energy calculations and measurements

In general, energy calculations and energy measurements of the building before the renovation remained unclear and hard to follow. “It was difficult to get a clear picture of what was going on and I am still somewhat unsure what actually happened regarding the “energy calculations”.

Overall, during the meetings of the project groups, energy calculations were talked about. This type of knowledge did not seem to be regarded as particularly important. Energy calculations did not play a big part and were seldom or never discussed. The interviews showed that not all involved middle professionals knew about them either and could thus not really help me to find answers to the mystery of measurements and energy calculations. However, many external consultants assumed that measurements were done and that Stångåstaden had clear energy reduction goals and followed them up with energy calculations, but this was not the case – again an unfulfilled mutual expectation. Even though energy was included as a separate item on the meeting agenda, it was not given time and space at the meetings as an important discussion point, so there was no opportunity to bring up the subject of (the supposedly done) energy calculations.

Doing energy measurements of the buildings and having a clear reduction goal and actually using energy calculations could possibly enable energy efficiency. However, it appeared that it was seen as more valuable for the professionals to use measures that they had used successfully in earlier projects, knowing that these had worked well. Thus, the know-how of the middle professionals was used since the municipal housing company trusted the participating professionals and their aggregated knowledge about buildings and renovations.

Energy group

As part of the new focus on energy and the formulation of the 25-25 energy goals, an energy group was formed within the company to watch over energy issues and to intensify the work on energy reduction. However, during the renovation projects in my study, their roles were not clearly defined.

Yet, at a general level, energy has become a bigger issue within the housing company and it is now spoken about much more, even though it had not yet translated into the meeting practice during the study. The energy group itself is so new that it still needs to establish its own work practice before starting to work more concretely, intensively and coherently on energy issues in renovation projects and, thereby, have a chance to influence the meeting practice of the project groups.

Energy measures and pay-off time

As long as the pay-off time is less than six years, a project group can decide on any energy measures without needing approval from the top. However, some members of the investment group reflected on the pay-off time requirements and found that the company calculates rather pessimistically when it comes to energy measures. Given this, it seems to be a struggle to promote energy measures.

If the housing company aims to focus on energy as a goal, the investment group would need to find a new formula to calculate pay-off times that allows more energy efficiency or saving measures to be taken up for the renovation projects. Maybe this implies placing less focus on maximising profits.

Energy measures and rent

For rent negotiations it is also still unclear how to deal with energy measures. The Swedish Union of Tenants and the rent negotiator (one of the middle professionals) come together to negotiate rents during the planning and design phase. This has a possible influence on the adoption of energy measures, for instance, IMB.

The Swedish Union of Tenants sees no need for higher rents due to the strong financial position of the housing company, as it does not need to get much profit. Thus, this also points towards the housing company being a profit maximising housing company. Energy measures could have been affected by efforts to keep rents down, as there was not yet a clear way to prioritise energy measures in renovations. The discussion concerned what measures increase the standard of the apartments and, thus, influence the rent. The energy outcomes of the measures that were included have not yet been assessed. For example, when windows are exchanged for better ones, results can include thermal comfort, decreased draughts and better soundproofing. Another example is that a new ventilation system can improve air quality in the apartment. Arguably, these effects increase the standard of the apartment. But decreased energy consumption resulting from a new window is not regarded as increasing the standard, nor is increased energy efficiency. There is a need to evaluate what is to be included in standard increases.

These five issues need to be cleared up and ways to deal with them need to be found and communicated in order to achieve energy efficiency and energy reduction for future renovations. Then renovation projects can lean on consistent work with energy efficiency and not simply hope for the best. A more sustainable built environment can thereby be achieved in the long run.

8.2.1 Energy efficiency in the company

Applying the typology suggested by Högberg et al.⁴⁶⁷ from a study of Swedish real estate companies, as presented in section 4.1.1, my studied municipal housing company should be classified as a “Strict Profit Maximising Company” with some “Little Extra” tendencies. This typology is interesting since it can be used in studies of changing strategies regarding energy efficiency measures at the company level. It is also interesting since it might be used to categorise the company in my study and relate its ambitions to the actions taken as regards energy measures. Even if the municipal housing company mainly fulfils the “Strict Profit Maximising Company” criteria, there are people within the company (as well as contracted external consultants) in the middle that strive for a little extra, and some even had an upstream influence (see the heating system example in chapter 7, and the LED lamp example in chapters 6 and 7). Furthermore, some internal employees expressed a wish for more innovation, doing something new and being a bit more on the cutting edge when it comes to increased energy efficiency for the renovation projects.

8.2.2 Energy efficiency follow-ups

Follow-ups after the renovation appear not to be as central as expected. The renovation projects were finished in 2014 and 2015. Up to now (June 2017) we researchers still do not know by how much the energy consumption was reduced after the renovation. It should be at least around 90kWh/m² since that is the BBR requirement (this is, however, also estimated with calculations), but it is not checked and verified with any measurements.

Olsson et al. highlight that there should be a follow-up period after a renovation has been conducted in order to verify the outcome of the implemented measures, which should be done before continuing with the regular property management process. The organisations that Olsson et al. studied, however, limited follow-ups. Also, limited checks were done on energy consumption before the renovation. These are similarities I could also see in my case study.⁴⁶⁸

⁴⁶⁷ See also Högberg, Lind & Grange, op. cit.

⁴⁶⁸ See also Olsson, Malmqvist & Glaumann, op. cit.

8.3 Meeting practice – current practice, problems and opportunities to change

In order to understand why building professionals in the middle enable or disable energy measures, I used practice theory and its four basic elements that hold a practice together: (1) meaning and engagement, (2) technology, (3) explicit rules and (4) know-how and habits. Investigating these elements helped me understand why certain energy measures were enabled or disabled (thus relating mainly to research question 3). It appeared that the meeting practice of the project groups was not changed due to the intended increased focus on energy, and that the practice was instead conducted as usual, with the difference that energy was more talked about. The case study is interesting because lessons can be learned from a company on the verge of increasing its focus on energy, where more energy measures are brought into renovations. The case illustrates the current struggles the housing company deals with in relation to energy aspects. From this case, I had the opportunity to study a meeting practice where energy aspects should start to play a big role, but it was not quite there yet. I investigated the practice of the project groups' meetings, which revealed what problems exist and what needs to be changed in order to achieve the increased focus on energy in renovations that the company was striving for.

Schatzki says that in an organisation, many different practices can be found, for instance, a meeting practice.⁴⁶⁹ In my study, however, the meeting practice is not purely within the housing company. External consultants are contracted and come in from consulting companies to participate in the planning and design of renovations. The middle professionals, then, are both internal and external and they do not constitute a homogeneous group. Instead, they bring in different opinions, competencies, skills, expertise, knowledge and work practices from their organisations to the meetings of the project group, which bring different dynamics into the planning and design meetings. These diverse actors come together and form a meeting practice in the planning and design phase. Even though each project group is such a temporary coalition, the meeting practice is repeatedly enacted since the middle professionals have met each other for similar projects before and they might meet again for other construction projects. The meeting practice identified had existed for many years, and new people who come into it inherit and thereby perpetuate it.

According to the housing company, the followed projects were supposed to be energy projects. It is a bit difficult for me to judge whether the practice as it was at the time of study had changed compared to how it was before the stated focus on energy since I did not study the process before the energy goal was introduced. Thus, I have to rely on the interviews and on how the interviewed middle professionals described the meetings. Also, I can compare what I observed in the meetings with the statements

⁴⁶⁹ See also Schatzki, "The sites of organizations", op. cit.; Schatzki, "On organizations as they happen", op. cit.

about how it was before. Additionally, this can be verified to some extent as I have access to meeting minutes of planning and design phases before the introduction of the 25-25 energy goal. I can see that some changes have taken place, however, the meeting practice as a whole appears to be stable and has not changed much yet. Why did the middle professionals of the project group repeat their meeting practice and the way they dealt with energy? Why is it difficult to change the meeting practice with respect to how energy measures are handled? It takes more than simply introducing a new general energy goal, an energy group or an external energy consultant, or adding energy as a bullet point on the agenda, to actually change a practice.

The housing company made efforts to include energy efficiency and energy saving measures in the renovation projects, based on the 25-25 energy goal, and they also created the energy group. Thereby, an understanding about the importance of energy efficiency has been spread among the internal middle professionals in the company, but it is not clearly communicated outwards, neither to the external consultants nor to the tenants or the Swedish Union of Tenants. Energy efficiency has in some sense become a bigger issue within the municipal housing company, however, the old practice established around the way of dealing with energy in renovation persisted.

Applying practice theory to analyse the meeting practice of project groups in the planning and design phase helps to understand why certain energy measures were not enabled, as there is much in the current practice that hinders it, and energy measures were instead disabled.

Elements holding a practice together

(1) Engagement, meaning

Related to meaning and in the quest to figure out why energy efficiency measures were promoted or rejected, it was said that energy issues had become more pronounced and important. If that is the case, why were they not overtly presented during the meetings and instead were merely implemented as side-effects? The meaning of energy did not change. As a result, it is not clear that the projects were energy renovations.

There is no coherent meaning connected to energy issues, thus there is no widespread deeper engagement for the 25-25 energy goal. The internal employees knew about the 25-25 energy goal and it now had more meaning for them. They were directly or indirectly part of the process when it was formulated and set in action. The external consultants, however, were not part of this formulation process, and most of them did actually not know what this 25-25 energy goal stood for. Hence, there was a knowledge gap between the internal employees and the external consultants and no formal introduction to the energy goal took place (see also figure 6.1 in section 6.1.3. The employees of the housing company had simply assumed that all of the involved external consultants knew about it and were actively working towards it. The information and communication needs to be clear and repeated.

Electricity was not seen as a big issue and did not play a major role since it was regarded as having a limited impact. In this respect, it has to be noted that the tenants do pay for electricity themselves and the question is whether this affects the valuation of electricity reducing measures. All in all, energy goals have been formulated, but the question is how important the focus on energy has become, as it seems like the renovation continued with business as usual, with energy being only slightly more important than in the past.

The process was steered by a specific mind-set where certain approaches were not taken into consideration, for example, electricity saving measures and looking at the building as a system.

(2) Technology

The discussions about technological installations, for instance, the positioning of shafts or ventilation systems, took most of the time during the meetings. Technology, then, became more important than things like design issues or discussions on energy, and other thinking or solutions were disabled, for instance, the opinions and solutions offered by the architects.

(3) Explicit rules and goals

All of the middle professionals appeared to know the relevant building-related rules and regulations. The rules were not discussed but simply followed as some kind of tacit knowledge. The aim for the energy reduction after the renovation was “to do as much as possible” and see where the energy consumption ends up, but the claim was at least to meet the BBR requirement. No further clarified goal (or meaning and engagement) for the specific buildings was formulated.

(4) Know-how and habits

Aggregated knowledge or know-how for standard energy solutions were used and applied based on experience with a rule of thumb. Energy calculations did not, as mentioned above, play an obvious role. Also, the building was never explicitly viewed as a system with energy measures interacting in it. The consultants did what they were asked to do in their specialised area of expertise in a simple purchaser-consultant relationship. The consultants delivered solutions that were similar to what they usually did, based on their aggregated knowledge about buildings and measures. Also, Olsson et al. came to the conclusion in their study on housing organisations that when it comes to measures such as replacing the windows, then either LCC analysis is done or it is simply decided upon based on experience from previous projects.⁴⁷⁰ This is something I could also confirm with my study. The aggregated knowledge of experience from previous projects is seen as valuable and is the “tool” used for making decisions.

⁴⁷⁰ See also Olsson, Malmqvist & Glaumann, op. cit.

Changing a meeting practice?

In the future, the common routines of the project group meetings might be broken up by recruitment of new professionals (internally and externally) or different project leaders. Then the aggregated knowledge of today's professionals will have to be verbalised and as a consequence it might be re-evaluated. Simply including a few new people will not change the practice as a whole. Routines governed the project groups' meetings, which followed a predefined and established agenda. Thus, there was no room for brainstorming that could have yielded new combinations, solutions or alternatives to the well-known ones. Also, time pressure, both as regards the project as a whole and the individual meetings, led to simply using the measures everyone knew already as they simplified the project work.

Some middle professionals interviewed were not eager to try new solutions themselves. Instead, they let the "others" make the mistakes of trying something new. In order to avoid always implementing the same measures, some interviewees mentioned the possibility of exchanging some of the consultants that are usually involved. There was a willingness among some of the internal employees to change this routinised practice, but there was no supportive structure to facilitate such change. The established practice in the project groups' meetings works well when everyone knows what they are supposed to do and what is expected of them. It would take a great deal of effort to adjust the ways of doing things according to the new needs. If new consultants are involved, there might be a risk that the meetings would get longer and also that more things would need to be explained. As a result, the project groups would no longer work according to their established practice.

Also, just including an energy consultant or energy group without changing the meaning and the discussions about technology (energy measures) or introducing clear rules and goals, like specific energy goals to follow, will not change the practice.

If all of the people in the group were new, a meeting practice would take shape based on their backgrounds, work practices, knowledge and expertise. The housing company needs to step in and change the structure and the predefined agenda (or actively put more emphasis on energy). As Nielsen et al. suggest, there is a need to define a problem, set the right goals, and also the evaluation of alternatives.⁴⁷¹ Further, I could establish that it is crucial that this be clearly communicated to the external consultants and that they be well informed about what to do.

A durable and effective behavioural change may be created when individuals are supported by structural frames to change their engagement or habits, for instance. Communities, organisations and networks in which individuals are embedded or to

⁴⁷¹ See also Nielsen et al., *op. cit.*, p. 166; also for the municipal housing company, other studies on decision support tools might be helpful for further developments of their renovation projects to achieve more energy efficiency. (e.g., Ferreira, Pinheiro & deBrito, *op. cit.*; Nielsen et al., *op. cit.*; Thuvander & Femenias, "Rebo – Strategier für hllbar renovieren", *op. cit.*; Thuvander & Femenias, "Rebo - Strategies for sustainable renovation", *op. cit.*; Konstantinou & Knaack, *op. cit.*).

which they are affiliated bring social norms, order and practices during different parts and phases in life, and the work norms and structures are no exception.

Schatzki highlights that changes are usually fragmentary and gradual. However, there is also the possibility that practices are changed more fully if conscious interventions (from the inside or outside) are made to rework goals, alter rules and redesign projects.⁴⁷² This could be an approach the housing company could take to actively try to change the meeting practice into an energy efficient meeting practice, or one that enables energy aspects.

8.4 Agency and capacity of the middle, top and bottom - influence of different levels

The top and their role and influences

The top plays a crucial role as they have the financial power over the budget for the planning and design and thereby the decision power over what energy measures to include in a renovation. With their financial power, the top can enable energy measures, and they can also disable measures due to financial considerations. This contributes to answering the research questions concerning how energy measures are discussed and transformed into plans and decisions by professionals in the middle as well as why the middle professionals decide to enable or disable energy measures in the planning and design of renovation projects (research questions 1 and 3). However this also includes the aim to study how the relations and influences between the middle and the other levels affect the enabling or disabling of energy measures.

One problem when it comes to the investment decisions in my case study was that usually all members of the investment group lacked information and knowledge about the discussions and negotiations behind the project group's suggestions to promote specific energy measures. Thus, the investment group lacked important details of both technical preconditions and the arguments in the project group, as shown, for instance, in the heating system replacement case (section 7.1.2). This creates a knowledge and information gap. In the end, the investment group's decisions were taken based on the project information gained from the project leader, who served as a link, but also as a filter, between the project group and the investment group. The project leader's information could not be a substitute for being present at the meetings. In my case study, in two projects, the real estate development manager who also had an advisory role at the investment group was present during the planning and design meetings. This was an extra link, and more input and information about the discussion, negotiations and decisions taken at the meetings could therefore be brought to the investment group.

⁴⁷² See also Schatzki, "The sites of organizations", op. cit., pp. 475, 476.

When it comes to the top's viewpoint on energy measures, the investment group felt that energy measures should be implemented if they were profitable in the short or medium run. Again applying Högberg et al.'s typology, this type of "Strict Profit Maximising Company" is not easily affected by policy measures unless large subsidies are involved.⁴⁷³

The middle and their role and influences

On the middle level, energy is something people talk about and, according to some, it seems to have become more of a common issue to include in renovations, even if there is still a long way to go until it is a self-evident point of importance on the agenda. Again, it might be possible to argue that the middle wants to do a little extra when it comes to energy, but still within economic reasons and goals. Högberg et al. called this type of company the "Little Extra Company"⁴⁷⁴ Regarding measures in the renovation, the middle had opportunities to influence the decisions taken by the top. This was exemplified by the process of replacing a heating system in one renovation project. With this possibility of upstream influence, if energy were to become part of the meeting practice and something the middle works hard on and for, they might work against the company being strictly profit maximising and towards doing a little extra in their renovations. If it were to spread upwards, one could assume this kind of upstream influence could affect the attitude towards more energy efficiency.

The influence sideways from the middle is of importance for future renovation projects since completed projects will provide experience and become part of the aggregated knowledge in later projects. Thus, in that way the middle professionals perpetuate momentum and path dependency since they add yet another project to their experience-based and aggregate knowledge about renovation projects. It is also possible that new ideas could spread this way. The external consultants "move" between companies where they are employed and Stångåstaden, where they participate in renovation projects. It would be possible for them to bring news in both directions (and have a sideways influence). The middle professionals potentially have experience and knowledge that enables them to exert influence upwards, downwards and sideways. This is what constitutes "middle-and-out".

Another issue regarding the middle as a temporary constellation of people is that there are both traditionalists and people wishing for more innovations. As it is now, the traditionalists are in the majority or have more power and louder voices. In the middle there are individuals who want to enable energy efficiency, like the area manager pushing for LED lamps or those who try to disable energy by stopping new developments such as LED lamps and other solutions. The energy group would be an

⁴⁷³ See also Högberg, Lind & Grange, op. cit.

⁴⁷⁴ See also *ibid*.

example of enabling too; however, their roles are not yet defined and they did not play a major role in the projects that I followed. Most of the middle professionals were aggregators using the same solutions that they suggested before and which they knew from experience would work would work.

The discussion of the LED lamp example showed, for instance, that the middle professionals, even though they engage together in the meeting practice, bring many different opinions, roles and areas of expertise. Also, some of the middle professionals during the meeting may be “moving” between levels, thus the middle and top and bottom are not static groups in my case study example. This “moving” between different levels could also be seen in the heating system replacement example, where the real estate development manager filled a function in the project group but also in the investment group, thus bringing knowledge about the discussions in the project group to the investment group.

The bottom and their role and influences

When it comes to the bottom, the tenants and Swedish Union of Tenants, the Swedish Union of Tenants may have a great influence regarding the uptake of energy measures during rent negotiations, influencing from the bottom up to the middle. In general, they are sceptical towards energy measures, which might increase the rent for the tenants, which they want to avoid. No proper way to deal with energy measures has been found regarding rent setting. As the middle influences the energy situation on the bottom, they could also provide more information on what energy efficiency measures they would implement with the renovation and how the tenants could contribute towards achieving the 25-25 energy goal. The downstream influence from the middle to the bottom was more long-term. With the decisions made during the planning and design phase, the middle professionals affected the living situation of the tenants, for example, in the layout of the apartments, the materials used and the type of appliances installed. Many tenants seemed interested in having energy measures installed if they were not too costly, but they also wanted to be more informed. The tenants could be much more informed and engaged about the benefits of energy renovations and energy measures during the tenant meetings. They could also potentially serve even more as a problem inventory source than they do currently. The housing company could actively use a bottom-up influence from the tenants by engaging them more in workshops to discuss energy-related questions and use their knowledge more. A tenant inclusion meeting might be a better approach here in order to inform the tenants more thoroughly about the renovation and energy measures, use them more as a problem inventory source, and also teach them about possible ways to “drive” the building and live more energy efficiently (here we would have a possibility to approach the sphere of the

carrying story as in Janda and Topouzi).⁴⁷⁵ The benefits of tenant involvement were also highlighted by Olsson et al.⁴⁷⁶ Olsson et al. also came to the conclusion that tenant meetings are more information sharing meetings than tenant involvement meetings. Much more could be done by including the tenants.⁴⁷⁷

Agency and capacity of the top, middle and bottom

If I look at Parag and Janda's⁴⁷⁸ model on agency and capacity of the middle (see also in figure 2.1 in section 2.1.2), then my model would probably show a big top, a smaller middle and an even smaller bottom when it comes to decisions related to energy measures, see figure 8.1. The top has a lot of power in my case study, and the individual tenants (bottom 1) do not have as much power as the Swedish Union of Tenants (bottom 2), as a collective tenant. The middle professionals could use their agency and capacity regarding energy much more than they do, but so far it has not become part of their meeting practice, thus they cannot yet spread it upwards, downwards or to the side as much as theoretically possible.

⁴⁷⁵ See also Janda & Topouzi, op. cit.

⁴⁷⁶ See also Olsson, Malmqvist & Glaumann, op. cit., p. 3643.

⁴⁷⁷ See also *ibid.*

⁴⁷⁸ See also Parag & Janda, "Midstream and sideways", op. cit.; p.11.

Figure 8.1: Agency and capacity of the top, middle and bottom according to Parag and Janda compared to my case study⁴⁷⁹

There are also different restrictions for energy measures for the planning and design coming from the middle, top and bottom and their interaction. None of these groups related to the planning and design had their wishes entirely realised. They were restricted by the goals, wishes and power of the other actors at other levels.

The middle professionals are restricted by the investment group's decisions and the outcome of the rent negotiations with the bottom. Without these restrictions, certain energy measures could be implemented, for instance, IMB. The middle is further restricted by the material and solutions in the existing building, since it constrains what is possible to do. The top is restricted by long-term investment plans.

8.5 Plurality of goals

In this section I refer not only to whether the 25-25 energy has been translated into the planning and design practice, but I also discuss also how the presence of different or unclear goals might influence how and why energy measures are enabled or disabled.

There was not one clear goal for the renovations. During the observations and interviews I realised that a variety of goals, some explicitly stated and others simply assumed, were present at the meetings. Each of the different middle professionals might then also have their own goals for the renovation according to their work practice and the organisation where they came from. All of this might possibly pull the planning and

⁴⁷⁹ Based on *ibid.*

design in different directions rather than having everyone going in the same direction towards increased energy efficiency.

I have already elaborated on the fact that the 25-25 energy goal did not play a major role in the project groups' meetings and that there were also no specific goals set for each building, even though many external consultants assumed that Stångåstaden did do that. Also, there were financial goals, some directly stated, which enabled the project group to install whatever measures they wanted as long as the pay-off time was less than six years. Other goals were more indirect. For example, there was thinking in terms of economic restrictions that energy measures could be installed at decent prices. This kind of ingrained economic thinking also made the middle professionals hesitant to suggest more costly energy measures.

Overall, there was a mix of rhetorical, economic and no explicit goals for specific buildings. The 25-25 energy goal can be seen as a rhetorical goal that has not yet been translated into practice. The loosely formulated goal of "saving as much energy as possible" with the renovation could be regarded as another rhetorical goal. The renovation was always talked about in that way but it did not make the process clearer. There was no explicit goal on how much a building's energy use should be reduced, however, many external consultants assumed that Stångåstaden had such a goal and that it was striving actively to achieve it. At the meetings the thinking on economic restrictions was present, but it was more elusive and unclear. The economic goals used by the investment group defined and steered the process.

There is a difference between rhetorical, economic, and explicit goals for energy reduction. The first two types were identified in the studied renovation projects, but there were no explicit goals for each building.

There was no common approach for dealing with the different goals, which could often be contradictory, pulling the project in different directions – or in the case of the missing explicit goals, in no direction.

As Olsson et al. suggest, one way to better integrate energy into the renovation process is to disseminate more information about energy to the project managers, consultants or tenants.⁴⁸⁰ Right now it is confusing and not clear who knows what and who does what and why or how. Then the next step would be to define clear problems and goals and evaluate alternatives to achieving those goals. It can even be kept flexible, tailored to the specific conditions and restrictions associated with each building; as the real estate development manager stated, it would be difficult to have the same goal for all buildings.⁴⁸¹

⁴⁸⁰ See also Olsson, Malmqvist & Glaumann, op. cit.

⁴⁸¹ See also *ibid*.

8.6 Theoretical implications from my analytical framework

Janda and Parag referred to some difficulties when it comes to the definition of the middle. They point out vagueness and lack of definition as weaknesses. Then, the question is what, who and where is the middle?⁴⁸² Janda and Parag argue that there exists no cohesive group definition for this.⁴⁸³ I argue that the middle might be conceptualised differently depending on the research focus, aim and research questions.

I also wanted to test whether my analytical framework can work for a case study like mine. I argue that it makes sense to apply the middle-out perspective in other contexts than originally intended, for instance, for analysing project groups in the planning and design phase as I have exemplified. It is possible to argue that who is included in the top, middle and bottom is merely a construction in the model and the result depends largely on the focus of the analysis, context and research questions. Consequently, the definition of the top, middle and bottom may shift and move in different contexts. Some implications may change, but the core of the model is useful. It was helpful for me to focus on the middle professionals who drive the planning and design phase of renovations. Thus, I argue that the middle-out approach can be used in a more flexible way than initially intended. This can also lead to useful research on the energy gap and, in general, research on energy and buildings.

The middle-out perspective is useful for emphasising the building professionals and their role in a renovation process as they, during the planning and design phase, suggest measures that influence energy efficiency and energy reduction of the building. Here, I argue that once the middle, top and bottom professionals are defined, specific individuals still might move and shift position between the groups or levels. This leads to people moving between different levels and thereby they transfer knowledge, upwards, downwards and sideways. In my case, the professionals in the middle do not only exert influence from the middle and outwards, but they themselves can also move from the “middle-and-out”. Such “middle-and-out” moves were influential in my case. Some of the actors participating in meetings of the project group were also part of situations at other levels or had a representative role for one level but were part of another during the planning and design phase. In my case, such “middle-and-out” movements had an impact on the outcome regarding the inclusion of some energy-related measures in the renovation projects, as regards the real estate development manager, the area managers and the rent coordinators. It might be more problematic to identify movers like these when applying the middle-out perspective on a macro or meso level, but in my micro-level-focused study on the planning and design phase, they could be observed.

Practice theory has not been applied for meeting practices regarding the uptake of energy measures. Since the planning and design meetings in the renovation projects

⁴⁸² Parag & Janda, “Midstream and sideways”, *op. cit.*

⁴⁸³ Janda & Parag, “A middle-out approach for improving energy performance”, *op. cit.*

studied were repeatedly enacted with the same and similar people, I argue that it is possible to regard the meetings as a practice. Also, it has proven to be useful to look at the planning and design meetings as a practice and analyse this practice regarding the four elements holding a practice together in order to understand the well-established current meeting practice and why energy measures are disabled.

8.7 Future studies

I tested the development and usefulness of the analytical framework that I have developed for my analysis. Combining the middle-out perspective and a practice theory approach, I have used the developed framework to analyse the planning and design phase of renovation projects. I argue that this is a useful combination that could allow us to understand renovation projects better. Both approaches could also be used separately for the study of (the early phases of) renovation processes in different ways.

The middle-out perspective is useful for further studies focusing on the building professionals in renovation. Also, a practice-theory-inspired approach is useful at meetings dealing with energy to determine why energy measures are or are not selected.

My study helps to better understand this gap of existing energy measures and actual adoption. However, more studies on the early phases of a renovation project are needed in order to follow the decision-making process regarding the enabling (or disabling) of energy measures. This could also be done with different purchasers and/or different countries – so that diverse actors can learn from each other. It would also be possible to do a comparison of processes including more energy efficiency and reduction measures to identify and investigate concrete differences as regards why energy efficiency is integrated in some projects and not in others.

Now that I have looked more closely at the planning and design phase and the project group – mainly divided into internal and external – and studied their meeting practice in relation energy measures. Instead of distinguishing between internal and external professionals, the focus could be changed to investigate potential differences in professions and their potential need to change in order to enable energy efficiency in renovations. I have hinted that already in chapter 5, and similar research is argued for by Janda and Killip.⁴⁸⁴

More specific topics for further studies could include the construction of pay-off calculations' implications and outcomes for energy efficiency; a look at the construction of energy calculations and their differences (e.g., how different calculations lead to different results, as found with the calculations done by the energy consultant and the university researchers) and the implications of this; a study following the investment group, focusing on financial aspects as a barrier in renovation or a study focusing more in-depth on the tenants and their role.

⁴⁸⁴ See also Janda & Killip, *op. cit.*

SUMMARY

Summary

Introduction, contribution, aim and research questions

From the 1950s until about 1975, a lot of new building projects were undertaken in Europe, including Sweden. These buildings are now aging and in need of improvements and modernisations in order to sustain modern and comfortable accommodations. This opens a window of opportunity to focus on energy aspects in the renovations and thus to reduce energy use, improve energy efficiency and help to achieve local, national or international energy goals. There is a need for a drastic reduction in energy use and CO₂ emissions from the building sector in order to be able to mitigate climate change. When looking at the building sector it is important not to overlook existing buildings, as they will continue to represent most of the buildings in which people will live in the coming decades, as the rate of new construction is only about 1%.

The residential sector is one of the largest energy consumers in Europe, including Sweden, with about 40% of the energy consumption. This means that it is possible that energy saving and efficiency measures can have a major impact. The EU, for instance, has agreed to a 2030 climate and energy framework, building on the 20/20/20 targets, with the goals to reduce greenhouse gas emissions from 1990 levels by 40% to achieve a renewable energy share of at least 27% in the final energy demand and to increase energy efficiency by 27% (with 2007 as the reference level). In Sweden, goals have been set for a reduction of the total energy consumption per heated area unit in homes and premises. The goals in Sweden are to achieve a 20% reduction by 2020 and a 50% reduction by 2050 in comparison to 1995 levels. Many different studies have shown that even though energy measures and technologies exist and are being developed, they are not implemented, or implementation is very slow, making it questionable whether energy targets can be reached. That energy measures are not implemented even though they exist is referred to as the energy efficiency gap or paradox. The question is, why is it so difficult to implement and thus enable energy in renovation projects?

In order to contribute to an answer to this dilemma and gap and to increase understanding of the possible uptake of energy efficiency or saving measures in renovations, I focus on the planning and design phase of renovation projects. I do this because it is mainly in this phase that energy-related measures are decided upon by the building professionals. The focus in the analysis is not on what kind of measures are implemented but rather how and why energy measures are enabled or disabled.

1. How are energy measures discussed and transformed into plans and decisions by professionals in the middle?
2. Is the housing company's 25-25 energy goal translated into the planning and design practice, and if so, how?
3. Why do the middle professionals decide to enable or disable energy measures in the planning and design of renovation projects?

I am also studying how the relations and influences between the middle and the other levels affect the enabling or disabling of energy measures. My study is to test the usefulness and applicability of my analytical framework, the middle-out perspective for analysing the project perspective combined with a practice theory approach investigating the meeting practice and how energy is handled at the meetings.

Previous research

Broadly speaking, I study energy and buildings. Thereby, I focus more precisely on building renovations and how energy is handled. There are many studies focusing on technical and economic aspects. My study, however, belongs to the non-technical realm. I frame my study mainly with social science and interdisciplinary approaches. It relates to studies taking an interpretivist approach and I am telling a learning story. Further, my dissertation fits into the broad framing of science and technology studies (STS). Earlier social science studies often concentrate on the tenants or homeowners (users or occupants). There is a lack of earlier social science studies focusing the professionals and technology (installations that are later used by the occupants), which is the focus for this dissertation.

Main results and conclusions

The buildings that were to be renovated were built in the 1950s and 1960s and have similar issues, such as worn and weathered façades, poor window performance, indoor temperature variations and issues with the ventilation.

Stångåstaden has formulated the 25-25 energy goal, which means that they want to reduce their amount of purchased energy by 2025 by 25% compared to 2011 levels. Also, a new energy group has been formed within the company to watch over energy issues. However, as it is today, their roles are not clearly defined yet.

The project group of the planning and design phase representing the middle consists of internal and external professionals. External consultants – architects, HVAC, electricity and fire security experts – are contracted for the planning and design meetings. Other consultants may also be involved, such as a construction consultant, a sound consultant or even an energy consultant. Different kinds of internal employees

are also part of the project group, including a project leader, a renovation coordinator, a rent negotiator, an area manager, and HVAC and electricity experts. Additionally, there may also be a trainee, an energy manager or a manager of renovation projects. The project group members plan and design the solutions and measures regarding energy efficiency for the renovation.

The investment group comprises the CEO, business area manager, economist, administrative manager, tenant manager and real estate manager. They have an influence on the planning and design phase too, with their orientation decision, which is taken at the beginning of a project in order to give a first approval of the budget, and at the end of the phase they give the final investment decision. The investment group represents the top. They make the budget decisions concerning the energy efficiency measures for the planned renovation project.

At the bottom are the tenants as well as the Swedish Union of Tenants. The tenants' everyday lives are influenced by decisions taken by the middle and top, for instance, the installation of energy efficient appliances. Further, they could serve as a source for a problem inventory and for information that can be useful during the planning and design of the renovation. The Swedish Union of Tenants has a certain power to influence energy efficiency measures; for instance, they have long been against IMB and have been stopping or slowing down development in that regard. During the planning and design phase there are also two meetings with the tenants, to inform them possibly to get some feedback (e.g., a problem inventory) and to get their signatures for the tenant agreement, allowing the housing company to conduct the renovation. The Swedish Union of Tenants usually also represents tenants at the tenant meetings.

In RP1 and RP2, four measures were installed, namely, HRV ventilation; supplementary insulation, walls; supplementary insulation, loft and new windows. The two buildings in RP3 each received two measures; in one, supplementary insulation for the walls and new windows were installed, and the other received HRV ventilation and new windows.

Due to the introduction of the 25-25 energy goal, and the fact that the renovations were supposed to be energy renovations, I wanted to investigate what the involved middle professionals thought was important to achieve with a renovation and how much energy efficiency was included in the respective renovation projects. Regarding the view among the middle professionals, there were different opinions on what is important to achieve with a renovation. Still, energy efficiency was second-most often mentioned. However, it should be emphasised that it was more often mentioned by the external consultants than by the internal employees. It could simply be because it was already seen as self-evident by the internal employees to include energy efficiency issues in the renovation, or that the focus on energy was still so new that it was not yet embedded into people's everyday work. In general it was highlighted by almost all interviewees that questions of energy efficiency and energy saving had become more

important. Nevertheless, there were middle professionals that thought energy efficiency and energy saving questions were not involved much or even at all. There seems to be a trend towards putting more focus on energy aspects.

A main result is that the studied meeting practice did not appear to be much changed and energy did not yet play a major role. Using a practice theory approach for studying a meeting practice can help to understand what hinders the uptake of energy measures and thereby learn how the practice could be changed so that a more sustainable built environment can be achieved. This approach can help in explaining why a meeting practice is difficult to change regarding energy measures, and can show that it is possible for a practice to persist due to practice memory and its structure. However, despite a practice memory, it is still possible to achieve change. The 25-25 energy goal has been introduced, but many external consultants did not know about it. The middle professionals simply did what they have always done. Despite more rhetorical focus on energy, the meaning and engagement in the meetings had not changed yet. Technology played a central role; it took over the meetings and discussions related to installation technology (e.g., where to place the shafts) were often prioritised over other issues, such as energy efficiency.

Regulations and standards that need to be followed were never really discussed at the meetings, although they played a major role. Everyone has a tacit knowledge about these and an understanding that they are to be included in their work. There were no goals formulated for each building regarding by how much energy use should be reduced after the renovation. On a tacit knowledge basis, the BBR requirement was followed, presumably with standard calculations done. Financial rules and guides played an important role too; for instance, if the pay-off time is less than six years, the middle can select any (energy) measures. Economic restrictions came mainly from the top, but the middle considered them to be too much. It was common for the middle simply to use the same solutions repeatedly, based on their aggregated knowledge about the buildings and the standard energy measures they used. It was possible to estimate roughly the extent to which they could reduce energy use with. Rules of thumb and tacit, aggregated knowledge were valued more than defining goals, doing energy calculations and evaluating different alternative fittings for a specific building.

I also addressed the role of the top, the investment group, and the bottom, the tenants and the Swedish Union of Tenants, and looked at what influence the middle has upwards to the top and downwards to the bottom. With this I wanted to capture the entirety of the planning and design phase of the renovation process, as the middle, together with the top and bottom, does play a major role for the outcome of the renovation projects. Everyone plays their part. The aim was to show how the different professionals or other actors influence different energy efficiency or saving questions in the planning and design phase and why.

The investment group often restricts and thus disables energy efficiency or saving measures because of their economic considerations. Yet, the financial aspects were

commonly black-boxed and also fluid during the renovation process. Furthermore, the argumentations for the financial issues changed shape and transformed during the process. The role of the investment group is, at the beginning of the planning and design phase, to give an orientation decision in order to give approval, confirming that the current work and suggested measures are reasonable. At the end of the planning and design phase they take the final investment decision. For all the projects I studied, the orientation decision had an impact on the process and could possibly change the plan and suggested measures of the planning and design phase quite a lot. The work of the planning and design phase and the orientation decision can be an iterative process, possibly even going back and forth several times between the project group and the investment group. The overall task of the investment group was to make decisions on financial matters related to the renovation project. It is interesting to look at the reasoning of the investment group when it comes to promoting or rejecting energy efficiency or saving measures. It can be viewed as problematic that the investment group is not part of the project group's discussions and therefore lacks detailed knowledge about those discussions and argumentations when it comes to making decisions about implementing measures. The project leader serves as a link between the project and investment groups. S/he presents the results and ideas of the project group and has the chance to put forward arguments for the implementation of certain measures. Looking at the investment group, one can see that they all share a strong financial perspective. Furthermore, it is said that the current CEO focuses more on economic and financial aspects than her/his predecessor did. The project group has the opportunity to choose any measures as long as the pay-off time is less than six years. Yet, during the interviews I got to know that the way the investment group calculates pay-off time is rather pessimistic compared to the practice of other housing companies (even according to them). The investment group would need to find a new formula to calculate pay-off times that allows more energy efficiency or saving measures to be taken up for the renovation projects. This assumes that if the company truly intends to focus on energy measures things would need to change. It is now rather company that can be categorised as a "Strict Profit Maximising Company", as its focus would be incompatible with such a goal.

In relation to the top, I also showed the upstream influence of the middle to the top. This I could clearly show with the example of the replacement of the heating system in one of the renovation projects. The professionals in the middle initially suggested replacing the heating system as it was already quite old, and keeping it would be a high risk factor; it would be irresponsible to keep it when such a big renovation was being done anyway. However, in its orientation decision, the investment group rejected the suggestion to replace the heating system due to economic considerations. As a result, the project was then delayed for several months while discussions took place. A few of the middle professionals tried to actively change the minds of the investment group

members. In the end, the investment group did change their opinion and the heating system was replaced.

The tenants and the Swedish Union of Tenants represent the bottom in my case. During the course of the planning and design meetings, the tenants were invited to participate in two tenant meetings. At the meetings the tenants are mainly informed about the renovation and related issues, such as a rent increase or the need to sign a tenant agreement. The tenants have the opportunity to raise issues and concerns they have regarding the upcoming renovation. At the first meeting the tenants may also fill in a survey where they can express their wishes and concerns about the renovation. The tenants can also potentially serve as a problem inventory source. The results of the survey are also looked at and discussed later at the planning and design meetings. At the tenant meetings no energy-related issues were discussed. Also, the interviewees who were in contact with tenants said that the tenants themselves stated that energy issues were not something they were paying attention to. During the interviews with the tenants I found out that they thought that they could only influence small things, like cosmetic concerns or things they pay for themselves. None of the interviewed tenants said that they had asked for energy efficiency or saving measures. The attitude towards energy efficiency or saving measures was in general positive; however, not everyone would want to pay for them. The tenants also did not know about the 25-25 energy goal of the housing company. Regarding the quality of information the tenants received from the housing company, they were rather ambivalent. The Swedish Union of Tenants is there to represent the tenants. In the planning and design phase, they should participate at the tenant meetings (although they never did in the meetings that I observed) and they do the rent negotiations. The Swedish Union of Tenants looks at rent questions and can be a bit sceptical towards energy efficiency measures as there is a risk that their implementation will be paid for in higher rents. They have, for instance, been consistently working against the use of IMB in Linköping.

A downstream influence from the middle to the bottom could also be observed. With the decisions made during the planning and design phase, the middle professionals affect the living situation of the tenants, such as the layout of the apartments, what materials are used or the type of appliances that are installed. Additionally, depending on the level of ambition of the project group, they might affect the rents as these are related to the cost of the renovation. When it comes to rent negotiations, the rent negotiator, who is a middle professional, is in charge of negotiating the new rents with the Swedish Union of Tenants and might have a strong impact.

Sideways influence can be mainly seen in the middle professionals adding yet another project to their experience base and aggregate knowledge on energy measures and buildings. Knowledge and ideas on energy measures have the chance to spread to the side.

Method and material

In my research I have followed three planning and design phases of renovation projects of the municipal housing company Stångåstaden in Linköping, Sweden. I did a case study, seeing the housing company as one case with three different examples of renovation projects. Within my case study I did 34 semi-structured interviews with all actors in and related to the planning and design phase (the building professionals at the meetings, the investment group, and a representative of the Swedish Union of Tenants). Additionally, I have material from 39 telephone interviews with the tenants themselves. Also, I participated in the planning and design meetings (16) as well as the tenant meetings (5). Further, I analysed documents produced by the housing company related to the planning and design phase.

Theoretical approach

As a theoretical approach for the analysis of my empirical material I chose the middle-out perspective, focusing on the building professionals of a renovation process. I investigated how these middle professionals dealt with energy-related questions for the planning and design of a renovation. The middle-out perspective helps to put emphasis on the building professionals in the middle, in contrast to the commonly used top-down or bottom-up approaches. I see the building professionals forming the project group at the planning and design meetings as the middle, the investment group as the top and the tenants and Swedish Union of Tenants as the bottom. I used the approach from a between-organisations perspective, as originally intended, at a company level, thus, within an organisation, however with between-organisations elements since, for the project group, external consultants are contracted for the planning and design and, additionally, the tenants and the Swedish Union of Tenants play a role too and are not part of the company either. The middle professionals have the possibility to enable (or disable), aggregate or mediate energy efficiency measures during the meetings of the planning and design phase. The middle also has the agency and capacity to influence the top and the decisions made there, and also to direct influence to the bottom as well as to the side, such as to other building professionals, the construction industry or future projects. Furthermore, I used a practice theory approach in order to investigate why energy measures are enabled or disabled by the middle professionals. Therefore, I studied the meeting practice in relation to how energy measures are handled by the middle professionals. I used the four defined elements holding a practice together. The first element, engagements and meaning, refers to what the reasons for renovation are and if energy (or innovation) plays a role as well as what role the 25-25 energy goals plays. Technology was the second element, where I discussed the role of technology in the meetings and concrete energy measures. I continued by analysing the explicit rules element, as well as explicit goals and guides that are relevant to follow for the planning

and design. The final element is the know-how and habits that influence the selection of energy measures in the planning and design phase.

I have studied the planning and design phase for renovations of multi-family apartment dwellings with the purchaser Stångåstaden in Linköping, Sweden. This situates my thesis in a certain time and place. At the planning and design meetings, different professionals from different organisations come together, forming a temporary coalition of the project group. The professionals that come together bring their own work practices and different opinions, knowledge and expertise on how to handle energy aspects. However, they meet over and over again in this and similar constellations for other projects, and the meeting practice can be seen as repeatedly enacted. I studied how and why energy measures are enabled or disabled by the professionals in the middle with the help of the elements holding a practice together. This helped me not only to investigate the possible uptake of energy measures but also why it takes time and effort to reach a meeting practice focusing on energy or to translate a goal into a practice.

My analytical framework makes it possible to highlight the professionals in the middle and their meeting practice in relation to energy. This model allows me also to discuss how different groups of professionals and other actors have influence over energy efficiency and saving measures on different levels (top, middle, and bottom) in the planning and design phase of renovation projects.

Energy as the elusive aspect

The studied renovation projects were said to be renovations with an explicit goal of reduced energy consumption. Yet, after following the planning and design phases it can be concluded that energy was not handled in the expected way nor was it included to the extent expected. Energy efficiency has been identified as the second-most common goal given by the middle professionals when asked what they wanted to achieve with a renovation (after having a good standard for the tenants). Interestingly, there were different views on whether energy efficiency was part of the renovation or not. Some middle professionals thought it was considered, some said it was considered more than before, some thought it was not really considered or not considered at all, and some did not know. Many saw it as an important goal, but how much energy efficiency was actually included is not a simple and clear question to answer. Energy aspects seem to have gained more importance, though, and more emphasis has been put on energy by the housing company since 2011 (25-25 energy goal and the energy group), but often energy efficiency is still used more in a rhetorical sense. Energy remains rather elusive during the planning and design of the renovation. For instance, the employees of the housing company thought the external consultants knew about it and were working actively towards it, but most did not even know the goal existed. I had expected that measurements on energy consumption would be taken, then a clear

goal would be defined for each individual building, also in relation to the 25-25 energy goal, and then different alternatives would be evaluated with the help of different kinds of calculations. None of that took place. Rather, experience and aggregated knowledge on energy measures and buildings from previous projects were valued. Further, the energy group has not managed to establish themselves and has not yet influenced the planning and design much. Moreover, the housing company themselves said that they calculated energy measures rather pessimistically, which means that, often, energy measures are not selected. Also when it comes to rent and energy measures, things are not entirely clear. Overall, one can say that a clear way of handling energy aspects and measures has not yet been established. The company is more focused on maximising profit, and the little extra, for energy, often falls short, even though many employees within the company lobby for it. Energy use is also not obviously followed up. The BBR requirement has to be met, which is defined with clear calculations and should thus not be more than 90 kWh/m². But how much the buildings consume as of 2017, two to three years after the renovation, we do not really know, this was apparently not important to communicate to us.

A plurality of goals might add to the difficulties. There is the rhetoric about the 25-25 energy goal, there are financial goals and restrictions to keep the price low, and there are no specific numeric goals regarding how much an individual building's energy use should be reduced. The goals are somewhat contradictory and sometimes work against each other, and they do not encourage a clear focus on energy.

The analytical framework of using a combination of the middle-out perspective and practice theory (even differently from how they were intended to be used) shows great potential to increase understanding of the energy efficiency gap, and it is suggested that it be used in future research.

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APPENDIX

Appendix

A: Overview of different rules and regulations for construction (new and existing)

This section, appendix A, gives an overview of different kinds of rules, regulations and laws relevant for the construction of new buildings as well as renovation of existing buildings. Renovation projects are guided and governed by different types of directives, rules, laws and regulations, and thus I present those of relevance for the Swedish building sector and especially for renovations in Sweden. These were rarely mentioned during the planning and design meetings in my case study but were there as tacit knowledge as everyone knew about them and worked with them.

There is a considerable energy saving potential in the large stock of existing buildings not least since the amount of existing buildings widely surpass that of new buildings in most developed countries. Still most regulations and instruments are focused on construction of new buildings. However, lately policy attention has increasingly focused on the building stock but standardized routines, policies and regulations for renovation projects still lack.

Some of the most important Swedish laws in the construction context are the Planning and Building Act ('Plan och bygglagen', PBL) and "Buildings Act" ('Byggnadsverkslagen, BVL) (actually: Law on Technical Requirements for Construction and more). Corresponding regulations are the Planning and Building Regulation, PDB, and the Buildings Ordinance (byggnadsverksförfordning, BVF). The regulation authorities pertaining to these two laws are the National Board of Housing, Building and Planning's Building Regulations, BBR, and the National Board of Housing, Building and Planning's construction Regulations, BKR.

In short, The PBL, Planning and Building Act, contains regulations of relevance for renovations as regards municipal planning of land and water, building permit, demolition and ground permit and supervision and inspection of construction work. In the PBF, Planning and Building Regulation, regulations for how to apply the PBL are given. The BVL, Buildings Act includes several areas like technical requirements for construction work (for example, carrying capacity, fire safety, hygiene, noise, energy and water management, and accessibility for disabled); construction products (as regards suitability requirements, labelling, supervision, etc.): function testing of ventilation; approval and control of production of building materials and constructions, etc. BVF (Byggnadsverksförfordningen) contains regulations for the application of the BVL. Especially there are the different requirements developed for the construction and building products.

Energy requirements are included in the BBR, the building regulations of the National Board of Housing, Building and Planning (Boverkets byggregler, BBR) include and it was updated in 2015.

These regulations include rules for buildings in many different fields, like accessibility, (fire) security, health, noise and environment, and finally energy. The latter is of special importance for my study on energy efficiency and reduction in renovation projects. The BBR says that the specific energy use for multi-family dwellings in the climate zone of Linköping is limited to 80 [kWh/m² Atemp and year].⁴⁸⁵

The EU has decided on more directives related to energy, namely the Energy Performance of Buildings Directive, the Ecodesign Directive, the Energy Labelling Directive, the Energy Efficiency Directive, Energy Declaration for Buildings which stimulate energy reducing measurements.

The **Energy Performance of Buildings Directive**⁴⁸⁶ set the minimum requirements for energy performance in buildings and the requirement to perform energy declarations.⁴⁸⁷ Eco-design and energy labelling requirements are product specific EU regulations and are both immediately applicable in the EU member states.⁴⁸⁸ The **Ecodesign Directive**⁴⁸⁹ regulates the level of energy efficiency required for products like fridges, freezers and washing machines for the EU markets and the most inefficient products are banned.⁴⁹⁰ Also, boilers run on electricity, gas and

⁴⁸⁵ See also <http://www.boverket.se/sv/> (2016-02-24); <http://www.boverket.se/sv/byggande/> (2016-02-24)

⁴⁸⁶ The Energy Performance of Buildings Directive (2010/31/EU).

⁴⁸⁷ See also Swedish Energy Agency, *Energy in Sweden 2012*. (Report et 2012:75. Eskilstuna, 2013, p.19.

⁴⁸⁸ See also Swedish Energy Agency, *Energy in Sweden 2012*, loc. cit, p.19.

⁴⁸⁹ The Ecodesign Directive (2009/125/EC).

⁴⁹⁰ See also Swedish Energy Agency, *Energy in Sweden 2012*, loc. cit, p.19.

oil, heat pumps, water heaters and storage tanks are also covered by the Ecodesign Directive and Energy Labelling Directive since the 26 September 2015.⁴⁹¹ Further, consumers can gain knowledge about how energy efficient a product is from energy labels which are specified in the **Energy Labelling Directive**.^{492, 493}

The aim of the **Energy Efficiency Directive**⁴⁹⁴ is to encourage improved energy efficiency. Requirements on the renovation of buildings and measurements as well as billing of electricity, natural gas, district heating, district cooling and hot water for domestic customers is regulated with this directive. There are specific renovation demands and requirements for public sector buildings with the intention for them to serve as good examples. Good energy performance should be considered when public sector buildings are to be renovated.⁴⁹⁵

There are additionally Swedish regulations for **energy declarations for buildings** found in The Energy Declaration of Buildings Act (2006:985). An energy declaration informs about how much energy a specific building consumes. The aim with the declaration is to promote efficient energy use and a good indoor environment. The National Board of Housing, Building and Planning develops rules on energy declarations and oversees the energy declarations and the independence of the experts who are legitimized to judge the energy use of buildings.⁴⁹⁶ The energy declaration of buildings includes information on the heated area of the house (A_{temp}), the energy use for heating, comfort cooling, domestic hot water as well as building electricity building, additionally it contains proposals for actions to reduce energy consumption, if the energy expert has suggested such. Furthermore information if radon measurement were performed or not is included, and if so, the measured value.

The energy declaration contains other information about the heating system and ventilation system in the building. The energy performance (energiprestanda) is described in the declaration as energy use. Energy performance is a measure of how much energy is used on heating, comfort cooling, domestic hot water and for the building's electricity. All energy used for a whole year is added together and divided by the house's heated area. The result is the number of kilowatt hours (kWh) consumed per square meter (m^2). The energy performance is expressed in kWh / m^2 per year. In order to facilitate a comparisons between different buildings, there is a system of classification of energy performance available since 1 January 2014. The classification is designed as a scale from A to G, where A is the best class. The energy declaration is done by an independent expert commissioned by the owner and is valid for ten years.⁴⁹⁷ Consequently, the electricity used by the households for white and brown goods and small electric appliances are not included in the energy declarations.

⁴⁹¹ See also Swedish Energy Agency, *Energy in Sweden 2014*. (Report) ET015:19. Eskilstuna, 2015, p.15.

⁴⁹² The Energy Labelling Directive (2010/30/EU).

⁴⁹³ See also Swedish Energy Agency, *Energy in Sweden 2012*, op. cit, p.20.

⁴⁹⁴ The Energy Efficiency Directive (2012/27/EU).

⁴⁹⁵ See also Swedish Energy Agency, *Energy in Sweden 2012*, loc. cit, p.20.

⁴⁹⁶ See also <http://www.boverket.se/sv/byggande/energideklaration/>, accessed 2016-02-24).

⁴⁹⁷ See also <http://www.boverket.se/sv/byggande/energideklaration/>, accessed 2016-02-24); see also Swedish Energy Agency, *Energy in Sweden 2012*, loc. cit, p.20.

B: An example of an interview guide for the investment group

- Background: how long have you been at the Stångåstaden?
- What are your main tasks?
- What is your role in the renovation projects?
- What is the investment group doing?
- How often do you meet?
- When are you involved in the renovation process?
- What happens when you get involved?
- Regarding the need for renovations, what do you think overall about energy, the environment, economy or issues of comfort in renovations?
- Stångåstaden has the 25-25 energy goal – what does the implementation plan for that goal look like?
- Energy measures are often not profitable in the short run, but in the long run, how do you think and reason about the pay-off time?
- Are there different renovation goals for different areas? (renovation often means higher rent)
- What does a project leader do if s/he is not satisfied with the investment group's decision?
- What would be an alternative to an investment group?
- The investment group seems to have an incredible amount of influence; do you agree with that?
- What happened with the heating system in [the renovation project] and what is happening now in RP3?

C: An example of an interview guide for the project group

This is a summary of all of the interview guides. The questions were adapted to the respondents, their roles and where they were working. Some sections of questions did not need to be used with all respondents. For instance, not all were in contact with the tenants. As I described in the method chapter, there was flexibility in both the wording of the questions and the order in which they were asked.

Introductory questions and questions about the current renovation process

- What is your job/position at [...]? What are your responsibilities? (what does that mean? questions regarding position, background and education)
- How long have you worked at [...]?
- Is this the first time you have been involved in a renovation project?
- What is your position/role in the renovation project?
- What do you think about the renovation process so far? (Are you satisfied with the results you have accomplished so far?)
- What do you think is important in the renovation process, what is it that you want to achieve with a renovation project? (possible suggestions if needed: good housing standards, building regulations, having a good façade..., good aesthetics/beautiful, reduce energy consumption, more energy efficiency and so on)
- How will the renovation project now continue?
- How many renovation projects have you been involved in, in the past year?
- Is this renovation project in some ways different from the other projects you were involved in? (How?)
- What project leaders did you work with?
- Do you think the planning and design phase differs a lot with different project leaders? (Or is it the same?) If so, how? Is it (un)surprising that it looks different? How? Why?)
- How much are energy issues (energy efficiency/saving) taken into consideration in this renovation project? (Now more than usual? Always the same?)
- Do you have a specific target for reducing energy consumption, such as -20% or -30% from the current use? (Or is it just to make it better?)

Actors

- How would you describe the consultants' roles in the process?
- Who has the most influence? (Can you describe the participants' relationship to each other? What is the role of the architects? What is the role of the HVAC consultant? Fire? (And so on)
- Do you feel that you have enough influence on building design?
- Is it always the same consultants who are involved? (Have you worked with any of them before? Who? How often? How to does the collaboration work?)
- Are you satisfied/happy with the work of the consultants?
- Would you say you lack any specific competence/expertise in the project so far?
- Do you think it is good to have a dedicated energy consultant who makes energy analyses and calculations, or would that not be necessary? (In one of the renovation projects there is an energy consultant, but there is not in the others.)

Questions about tenants

- How much contact do you have with the tenants?
- What can a tenant do before a rebuilding/renovation? How much influence can they have?
- Can you describe the tenants' role in a renovation process? For what issues is there tenant influence? Can they decide what actions should be implemented or not?

Appendix

- What do you think about tenants' level of access to information? (Do they have access to the information they want? Is there a lack of information?)
- What is the situation regarding rent increases? How big are they? Is there always a rent increase for a renovation?
- Does it happen that a tenant cannot pay the raise? (Who? How often does that happen?)
- What happens with the tenants who cannot pay a raise? (Where will they go? Do they receive help?)
- How much influence do the tenants have regarding their possibility to stay in their apartments?
- What measures do the tenants usually want to influence?
- Does it happen often that the tenants say no to a renovation project? If someone says no, what could be the reason for it?
- Are the tenants commonly satisfied or dissatisfied with the result of a renovation?
- Individual metering reduces energy and water use – what do you think about it?
- What do you know about tenants' opinions on individual metering?
- (If a tenant meeting has already taken place) What do you think about the tenant meetings we had? (Have you participated in a tenant meeting before?) Is it normal that not many tenants attended? Or was it many? What do you think? Do you think that everyone will sign the tenant agreement?
- Do you or anyone else from Stångåstaden give information regarding energy to the tenants? (If so, what information is it?)
- Do you talk with tenants about energy? (Do they have questions about energy? Comments? Are energy issues important for the tenants? Do they know about Stångåstaden's 25-25 goal?)

IMB

- What do you think of IMB?
- How would you proceed with IMB?

Area

- Now you are renovating in the inner city, but not, for example, in Ryd or Skäggetorp, is the reason the age of the buildings?
- How do you choose the buildings to be renovated?

Other

- Is there anything you want to add?

D: An example of an interview guide for the tenants

- (After) Did you live in the building before the renovation?
- We called around to your tenants before the renovation of your building – did you or anyone in your household respond to our questions last time?
- What kind of information did you get about the renovation? (Before and/or after)
- What would you like to influence for a renovation of the building?
- Do you feel that you could affect the issues you want to influence?
- Have you tried to influence Stångåstaden with respect to any decision? (Which? How? After: If yes, has it helped? Have they taken your views into consideration?)
- Did you participate in the tenant meeting(s)? What did you think about the tenant meeting(s)?
- Stångåstaden has the goal to reduce energy use by 25% by 2025. Did you know that? (Do you get information about 25-25 goal?)
- Do you know if Stångåstaden will/did implement energy measures in connection with the renovation? (If so, which ones?)
- *(Stångåstaden plans to implement measures such as additional insulation (loft/walls), use better windows, install energy A-classified appliances and install meters for heat and hot water)*
- What energy measures do you think Stångåstaden should implement in the renovation?
- What do you think about energy-related measures costing money and possibly increasing the rent?
- Do you know what Stångåstaden has changed in the building, what measures were implemented (in general)?
- Are there any measures that you think Stångåstaden should have taken in the renovation?

E: Overview of the interviews

Investment group – management				
Investment group members	Code Name	Date	Interviewer	Number
Investment group member	IG-1	2014-02-14	JP, KR	1
Investment group member	IG-2	2014-02-11	JP, KR	2
Investment group member	IG-3		JP, KR	3
Investment group member	IG-4		JP	4
Internal consultant (also part of the investment group)	IC-2	2014-01-15 (same interview as below) ⁴⁹⁸	JP, KR	8

Planning and design phase				
Internal	Code Name	Date	Interviewer	Number
Internal consultant	IC-1	2013-05-15	KR, NM	5
		2016-	KR	6
Internal consultant	IC-2	2013-05-20, 2014-01-15	KR, NM JP, KR	7 8
Internal consultant	IC-3	2013-05-15 2016-	KR, NM KR	9 10
Internal consultant	IC-4	2013-0-07 2013-05-03	JP, NM, KR KR, NM	11 12
Internal consultant	IC-5	2013-01-07 2013-03-04	JP, NM, KR KR, NM	13 14
Internal consultant	IC-6	2013-11-08	KR	15
Internal consultant	IC-7	2013-05-08	KR, NM	16
Internal consultant	IC-8	2013-11-08	KR	17
Internal consultant	IC-9	2013-05-10	KR, NM	18
Internal consultant	IC-10	2013-05-08	KR, NM	19
Internal consultant	IC-11	2013-05-15	KR, NM	20
Internal consultant	IC-12		KR,	21

⁴⁹⁸ I have included this interview in the table for the investment group and internal consultants because this person has a somewhat double role and the interview covered the project group meetings and the investment group.

Planning and design phase				
External	Code Name	Date	Interviewer	Number
External consultant	EC-1	2013-05-23	KR, NM	22
External consultant	EC-2	2013-05-24	KR	23
External consultant	EC-3	2013-05-23	KR, NM	24
External consultant	EC-4	2013-05-13	KR, NM	25
External consultant	EC-5	2013-05-16	KR, NM	26
External consultant	EC-6	2013-05-23	KR, NM	27
External consultant	EC-7	2013-11-26	KR	28
External consultant	EC-8	2013-11-26	KR	29
External consultant	EC-9	2013-05-16	KR, NM	30
External consultant	EC-10	2013-05-08	KR, NM	31
External consultant	EC-11		KR,	32
Tenants, Swedish Union of Tenants				
Interviews	Code Name	Date	Interviewer	Number
Swedish Union of Tenants	SUT-1	2013-02-06	JP, NM, KR	33
Tenants		September 2013, July, August 2014, Fall 2015	Ana Stanojcic, Josefin Frilund, Helena Karresand	

JP = Jenny Palm

NM = Mattias Nyman/Thorängen

KR = Katharina Reindl

F: Overview of the observations

Meeting	Date	Researchers	Number
Start meeting	2012-11-07	KR, JP	
RP1, (1)	2012-11-14	---	1
RP1, (2)	2012-12-12	KR	2
Informal visit of the building of RP1	2012-12-19	KR, JP	
RP2, (1)	2013-01-08	KR, JP	3
RP2, (2)	2013-01-17	KR, JP	4
RP1, (3)	2013-01-18	KR, JP	5
RP2, tenant meeting	2013-01-23	KR, JP	6
RP2, (3)	2013-01-31	KR, NM	7
RP1, (4)	2013-02-07	NM	8
RP2, (4)	2013-02-14	KR, NM	9
RP2, (5)	2013-02-28	KR	10
RP2, (6)	2013-03-20	KR	11
RP2, tenant meeting	2013-05-06	KR, NM	12
RP3, (1)	2013-05-21	KR	13
RP1, tenant meeting	2013-06-12	KR	14
RP3, (2)	2013-06-12	KR	15
RP1, (5)	2013-08-15	KR	16
RP1, (6)	2013-09-04	KR	17
RP1, tenant meeting	2013-12-02	KR	18
RP3, (3)	2014-01-15	KR, JP	19
RP3, tenant meeting	2014-01-21	---	20
RP3, (4)	2014-02-05	KR	21
RP3, (5)	2014-02-28	KR	22
RP3, (6)	2014-03-12	KR	23
RP3, tenant meeting	2014-06	KR	24

JP = Jenny Palm

NM = Mattias Nymann/Thorängen

KR = Katharina Reindl

G: Overview of the studied documents

Here I present all the documents I had access to for my research. Not all of these were analysed in depth, which is described in the method section. (There were updates later on for the building meetings, which I also excluded.)

Figure: Overview of the folders on the cloud storage.

Folders for the renovation projects	
Categories	Sub-categories ⁴⁹⁹
Renovation project 1	
Protocols	Protocols (6), noise measurements, information on electricity, suggestions on measurements
Administrative regulations	
CAD files	Architect drawings and modelling: façade, plans, sections
Drawings	Architecture, lift, construction, grounds
Standards	Documents related to architecture, electricity, heat and sanitation: Operating and maintenance instructions
Time plan	
Tenant questions	Tenant agreements
Quality/Environmental Management	Own control, environmental plan, “SundaHus” (healthy house)
Operating instructions	Fire prevention, facility, building, HVAC cooling, electricity and telecommunications systems, transport system, maintenance instructions for the tenants
Regulatory issues	Working environment, construction consultation

⁴⁹⁹ Each contains several different documents, photos, drawings, contracts or descriptions.

Appendix

Inspections	Preliminary inspections before, final inspections
Tender documents folder for RP1	
Administrative regulations	
Building and room descriptions	Architecture
Fire	
HVAC documents	
El documents	
Lift/Elevator	
Architect drawings	Architecture
Tender forms	
Renovation project 2	
Protocols	Protocols
Administrative regulations	
Descriptions	Standards: documents related to architecture, electricity, heat and sanitation: Operating and maintenance instructions
CAD files	Model files
Drawings	Architecture, electricity, construction, grounds, HVAC
Time plan	
Tenant questions	Tenant agreement, information
Quality/Environmental Management	
Regulatory issues	
Inspections	Architecture
Renovation project 3	
Protocols	Protocols
Descriptions	Architecture
Administrative authorities	
CAD files	Model files architecture, model files El, drawing definitions El, model files HVAC, drawing definitions HVAC, model files ventilation, drawing definitions ventilation
Drawings	
Time plan	
Tenant questions	
Quality/Environmental Management	
Operating instructions	Fire prevention, facility, building, HVAC cooling, electricity and telecommunications systems, transport system, maintenance instructions for the tenants
Regulatory issues	
Inspections	Inspection before, inspection after, final inspection
Tender documents folder for RP3	
Administrative regulations	
Descriptions	Architecture, fire, electricity, HVAC
Drawings	Architecture, electricity, HVAC
Other documents	
Previous renovation project, 2009	

Inspections	Inspection before (general), inspection before (building), inspection before (air), inspection before (pipes), guaranty inspection, final inspection
Descriptions	Fire, tender documents, traffic noise investigation
CAD files	Model files architecture, drawing definition files architecture, complementary files electricity, model files construction, drawing definition files construction, complementary files HVAC, model files HVAC, drawing definition files HVAC, commentary files ventilation, model files ventilation, drawing definition files ventilation
Operating instructions	Fire prevention, building, HVAC cooling, electricity and telecommunication systems, transport system, maintenance instructions for the tenants
Tenant questions	Tenant agreement, information
Quality/Environmental Management	Environmental plan
Protocols	Protocols
Drawings	Architecture, electricity, construction, HVAC, ventilation

Additional documents received by mail

Tender documents RP2 (6 documents).

Overall time plan for renovations 2010-2015.

Process document for renovations.

Electricity, district heating, water consumption for the building complexes where the renovation projects were located.⁵⁰⁰

Stångåstaden, årsredovisning, 2012, 2013, 2014, 2015.

Stångåstaden, annual report, 2012, 2013, 2014, 2015.

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⁵⁰⁰ The measurements are per building complex, for several buildings, not one single building.