Master Thesis

Energy efficiency renovations in privately rented apartment blocks: how to align policy instruments to barriers?

A case study in the Flemish region that explores how policy instruments can be implemented to reach the Flemish targets for reducing energy usage in buildings by energy efficiency renovations and alleviating energy poverty in the private rental sector.

A thesis submitted to Delft University of Technology for the degree of Master of Science in Architecture, Urbanism and Building Sciences

by

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Colophon

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Abstract

Belgium, one of the top four European countries with high per capita fossil fuel usage in buildings, has allocated 332 million for improving renovation subsidy schemes in the Flemish and Brussels-Capital regions. This funding aims to accelerate energy efficiency renovations (EERs) in residential buildings. However, financial constraints are not the only barriers to EERs. Governance presents a significant challenge, particularly for non-owner-occupied buildings. In Flanders, 29% of dwellings are rented, with 66% being privately rented. More than half of the rented homes in Flanders have an energy performance certificate D or even lower. Tenants in multi-family buildings encounter difficulties in meeting socially and materially required energy service levels. Renovating privately rented apartments can play a crucial role in achieving Belgium's energy efficiency targets and reducing energy bills for tenants facing energy poverty. Existing literature primarily focuses on identifying barriers for homeowners and governance issues related to energy-efficient building stock, but little research examines aligning policy instruments with these identified barriers. This study aims to explore how policy instruments can overcome barriers and help achieve Flemish energy efficiency targets while alleviating energy poverty. The research includes a literature review and semi-structured interviews, with a focus on incorporating the tenant perspective on EERs. Recommendations will be provided to the Flemish government to accelerate EERs in the private rental sector. To reach the energy efficiency targets, policy instruments should be implemented at the regional and municipal levels, involving distribution grid managers, banks, and other organizations. The Flemish government should create a stable environment for landlords, integrate energy poverty reduction targets into their strategy, and prioritize measurable regulatory interventions. Municipalities, such as Antwerp, should adapt to regional strategies and provide educational support in collaboration with energy houses. Market parties should develop business models that demonstrate the financial benefits of energy efficiency renovations to both landlords and tenants and offer temporary dwellings. By studying Flemish and European renovation strategies, analyzing barriers and policy instruments, and considering the Flemish context, this research aims to answer the question of how policy instruments can be implemented to achieve Flemish targets for energy efficiency renovations and reduce energy poverty in the private rental sector.

Key words – energy efficiency renovations, policy instruments, barriers, private rented apartment units, Flemish region

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Definitions

Alignment of policy instruments and barriers = policy instruments that target specifically the barriers identified by stakeholders. This is assessed through the evaluation of the policy instruments by stakeholders.

Barriers = aspects of energy efficiency renovations that could be negatively experienced by stakeholders, resulting in holding them back from performing or initiating an energy efficiency renovation.

Budgetnorm = income - rent

Contextual factors = political, economical, social, technological, environmental, and legal factors specific to the Flemish context that might be of influence when implementing policy instruments.

Energy efficiency measures = measures that make a building more energy efficient by both limiting the energy usage and replacing the remaining fossil fuel usage by renewable sources leading to an improved energy performance certificate.

Energy efficiency renovations (EERs) = implementation of measures that make a building more energy efficient by both limiting energy usage and replacing the remaining fossil fuel usage by renewable sources leading to an improved performance certificate.

Energy performance certificate = certificate that should be developed by every European member state to assess and compare the energy efficiency of buildings based on its energy consumption.

Energy poverty = an above average "Woonquote" or a below average "Budgetnorm".

Flemish energy efficiency ambitions = all the targets to increase the energy efficiency of the Flemish building stock stated in the Flemish renovation strategy.

Governance = "intended activity undertaken by one or more actors seeking to shape, regulate, or attempt to control human behavior in order to achieve a desired end" (van der Heijden, 2014, p. 60).

PESTEL-analysis = method to identify the contextual factors including the political, economical, social, technical, environmental, and legal factors.

Policy instruments = methods to steer towards a collective end that can be divided in to three different approaches to governance: direct regulatory interventions, collaborative governance, and voluntary programs and market driven governance.

Private rental sector (PRS) = housing sector wherein rents are not regulated. Rents are determined based on the market. Everyone who can pay the rent and has a residence permit, has permission to rent in the private rental sector.

Renovation rate = the percentage of buildings that is renovated yearly to an energy performance certificate C or higher.

Renovation Wave = strategy developed as part of the European Green Deal that aims to double renovation rates in the next ten years to cut emissions and to reduce energy poverty.

Social rental sector = housing sector wherein rents are regulated by the Flemish Government. People may only rent in this sector if their income is under the income limit for social rent.

Stakeholders = individuals, groups, or organizations that have a vested interest in or are affected by energy efficiency renovations.

SWOT-analysis = method that analyzes strengths, weaknesses, opportunities, and threats to develop a strategy.

Woonquote = percentage of income that citizens pay for their rent.

Chapter 1

Introduction

1 Introduction

This section introduces the problematization, problem statement, research scope, goals and objectives, deliverables, audiences, research relevance, research questions, personal targets, and thesis outline.

1.1 Problematization

Buildings account for 40% of the total energy consumption and 36% of the greenhouse gas (GHG) emissions resulting from energy usage in Europe (European Commission, 2020a). These significant figures can be attributed to the percentage of older buildings in Europe, with approximately one-third being more than fifty years old (Economidou et al., 2011). The energy performance of these old buildings is compromised due to the absence of building codes pertaining to energy efficiency during that era (Pohoryles et al., 2020). Furthermore, the building materials used in these buildings have deteriorated and aged over time (Pohoryles et al., 2020).

The renovation of the existing building stock plays a critical role in addressing energy consumption and emissions to achieve the European Union's 2030 target of reducing emissions by 55% and attaining climate neutrality by 2050 (European Commission, 2020a). These renovation efforts encompass various measures aimed at reducing energy usage in buildings, such as enhancing insulation in walls, roofs, and floors, as well as replacing outdated windows with high-quality alternatives. (Salvalai et al., 2017). Furthermore, the incorporation of renewable resources such as solar panels and heat pumps, can be implemented to minimize energy consumption (Salvalai et al., 2017).

The European Commission introduced the concept of energy efficiency renovations (EERs) to improve the efficiency of the existing building stock for the first time in the Energy Performance of Buildings Directive (2002/91/EU) in 2002 (EUR-Lex Europa, 2002). In addition, in 2020, the European Commission released the strategy "A Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives" to stimulate renovation efforts across the EU (European Commission, 2020b). However, the pace of renovating the existing building stock remains too slow (European Commission, 2020a). Over the past 10 years, only 0,4% to 1,2% of the European building stock underwent renovation annually (Pohoryles et al., 2020). To achieve the objective of reducing energy consumption by at least 32,5% by 2030, 2 to 3% of the European building stock should be renovated yearly (Pohoryles et al., 2020).

Belgium appeared to be a country that belongs to the top four European countries that have the biggest per capita fossil fuel usage in buildings (Nijs et al., 2021). Residential heating has a share of 15% in the total emissions in Belgium (Klimaat.be, 2023). In Belgium, the responsibility to decrease the fossil fuel usage in buildings of the Belgian building stock, is subsumed to the three regions: Brussels, Wallonia, and Flanders (.be, 2023). The strategies to minimize fossil fuel usage differ per region.

Wallonia presented its first renovation strategy in 2014 which is updated in 2017 and 2019 as an annex to the National Energy Efficiency Action Plan (NEEAP) and to the National Energy and Climate Plan (NECP) (Wallonie énergie SPW, 2019). In 2020, the second update of this strategy was published (Walloon Government, 2020). The strategy mobilizes investments in renovating the stock of public and private, residential, and tertiary sector buildings (Walloon Government, 2020). The main aim of the strategy is to reach a decarbonized building stock in 2050, while providing occupants with a healthy and comfortable environment conducive to the activities carried out there (Walloon Government, 2020). The renovation strategy is based on three priorities: 1) create a transparent framework favorable to energy efficiency investments; 2) organize and strengthen the market supplying goods and services associated with renovation; and, 3) boost demand for energy-efficient and carbon-neutral buildings (Walloon Government, 2020).

The Brussels region published its renovation strategy in 2020 (Brussels Government, 2020). This strategy establishes clear requirements with set deadlines for the residential and tertiary sector, describes

the funds for the transition of existing buildings, and outlines the support before, during and after the renovation process (Brussels Government, 2020).

The Flemish Government approved the "Flemish long-term renovation strategy for building 2050" in 2020 as well (VEKA, 2020). This strategy followed the "Flemish climate strategy", approved in 2019. The Flemish climate strategy includes the target to reduce GHG emissions in sectors such as mobility, agriculture, and buildings by 85% by 2050 compared to 2005, with the ambition to reach full climate neutrality as soon as possible after 2050 (VEKA, 2020). The Flemish renovation strategy 2050 is a refinement of the Flemish climate strategy. The main aim of this strategy is to reach climate neutrality for non-residential buildings and a reduction of 75% for residential buildings (VEKA, 2020). To reach the ambitions stated above, between 2020 and 2050, over 2,9 million out of 3 million homes will have to undergo renovations that highly increase the energy efficiency yearly. If energy efficiency measures are implemented one-by-one yearly, the number of renovations multiplies (VEKA, 2020). Currently, the renovation rate (for renovations that result in a significant energy reduction) is estimated at 2,5%, this should increase to 3,5% (VEKA, 2020).

Overall, the ambitions of the strategies of the three regions have a lot in common: they all aim for a reduction of fossil fuel usage in buildings by renovating the existing building stock. In addition, the three regions developed a framework to assess the energy performance of buildings: 1) the "energy performance certificate" (EPC) in Flanders, 2) the "performance énergétique des Bâtiments" (PEB) in Wallonia, and 3) the "energy performance of buildings" (PEB) certificate in Brussels. These frameworks calculate the theoretical annual primary energy consumption based on the characteristics of a building in kilowatt hour per square meter. However, how these characteristics are included in the calculation and the legislation and the minimum requirements around these certificates differ per region. (Brussels Government, 2020; VEKA, 2020; Walloon Government, 2020).

From literature, it appears that despite defined targets and support defined in the renovation strategies of European countries or regions, in the case of Belgium, renovation of the building stock is going too slow (Pohoryles et al., 2020). This became evident during the energy crisis occurring this year. Due to a diversity of factors, including the rapid economic rebound following the Covid19 pandemic and Russia's invasion of Ukraine in February 2022, energy prices reached records highs, and as a result, in some global markets electricity prices as well (IEA, 2022). Higher energy prices have added to inflation and pushed both low-income and middle-income households into poverty (IEA, 2022).

Households in the private rental sector (households renting properties at a market rate from a private landlord), and especially those with a lower income, face far more issues with affording socially and materially required levels of energy services than the general population in Europe (Papantonis et al., 2022). In Europe, 34 million people are unable to afford indoor thermal comfort affecting health, social exclusion, environmental quality, mental well-being, and productivity (Papantonis et al., 2022; Salman et al., 2022). The private rental sector (PRS) accommodates 30% of the European's citizens. According to the Energy Poverty Dashboard (EPD, 2022), households in the PRS across Europe struggle paying for the required levels of energy services to a considerably greater extent than the overall population, while privately rented homes are considered the least energy efficient on average across the various housing sectors such as the owner-occupied sector and the social rental sector (Papantonis et al., 2022). In this context, energy efficiency of buildings is identified as an important policy area for both enhancing the living standards of households and simultaneously meeting the European targets for reducing emissions in the building sector by energy efficiency renovations (European Commission, n.d.; Papantonis et al., 2022).

1.2 Problem statement

In literature, numerous studies have examined the barriers associated with energy efficiency renovations (EERs). These studies have explored various contexts, sectors, and perspectives. Within the private rental sector (PRS), multiple barriers to EERs have been identified, originating from different

stakeholders (Papantonis et al., 2022). Although there is limited research available on barriers faced by tenants, some common barriers have been identified, including disturbance caused by renovation works (Femenias et al., 2022), rent increase (Femenias et al., 2022), lack of information or knowledge, and limited control over renovation works (Papantonis et al., 2022). Landlords face barriers such as high upfront costs, uncertain return on investment, skepticism towards governmental policies, complexity, and lack of internal motivation (Ebrahimigharehbaghi, 2022; Papantonis et al., 2022). Associations of homeowners encounter barriers primarily related to achieving consensus on the implementation of measures (Berghs, 2022; Ebrahimigharehbaghi, 2022; Papantonis et al., 2022). These studies provide recommendations to reduce barriers for landlords by proposing policy and legislative instruments. However, these recommendations often lack review by policy makers or field experts and fail to address the tenant perspective.

Conversely, studies have also focused on the governance aspects of accelerating EERs. "Governance" is understood as an "intended activity undertaken by one or more actors seeking to shape, regulate, or attempt to control human behavior to achieve a desired collective end" (van der Heijden, 2014, p. 60). These studies examine specific political contexts and analyze various policy instruments, including subsidies, information provision, and tax incentives based on behavioral sciences, with the aim of expediting EERs (Van der Heijden, 2014). However, reviews of stakeholders assessing whether these policy instruments reduce barriers in practice, are limited.

1.3 Research scope

The objective of this research is to bridge the gap between governmental studies and barrier studies, while also providing insights from the tenant perspective. To examine the governmental perspective, it is essential to select a specific political context. This political context determines the policy instruments in effect and enables an assessment of their effectiveness. The findings of this study will be context-specific, but they can serve as an illustrative example for other contexts. Moreover, other contexts can serve as a source of inspiration for the policy instruments proposed in this research.

The specific context chosen for this research is private rented apartments in Antwerp, and this selection is based on several factors. Firstly, Belgium ranks among the top four European countries with the highest per capita fossil fuel usage in buildings (Nijs et al., 2021). Considering that the governmental context varies across regions and municipalities, it was necessary to focus on a specific region for conducting the research. The Flemish government provides extensive information on the current state of the building stock and has made significant progress in implementing measures to promote energy efficiency renovations (EERs) compared to Brussels and Wallonia. This allows for an in-depth study that can assess the status of the building stock and the latest measures in place. As certain policy instruments, such as subsidies, are influenced by the municipal context, all interviewees involved in this research are renters, landlords, or operators within the city of Antwerp. In Antwerp, 70% of the population lives in the private rental sector (Personal Communication, S. Snyders, 3 April 2023). Therefore, this research holds great relevance for the municipality of Antwerp. The percentage of rented dwellings in Flanders is 29% of which 66% is privately rented. In cities these figures are respectively 55% and 75% (Statistiek Vlaanderen, 2018).

In the Flemish private rental sector (PRS), rents are not regulated. Everyone who can pay the rent and has a residence permit, has permission to rent in the PRS (VEKA, 2022b). However, people with a lower income who qualify for the social rental sector, will likely be preferred to rent in the social rental sector (VVSG, 2020). These rents are regulated by the Flemish government and will never be higher than the rent of a comparable dwelling in the PRS (VEKA, 2022b). Due to long waiting lists, it is not possible for everyone who qualifies for the social rental sector, to rent in this sector (VVSG, 2020). Young people (28%) and single people (45%) have the highest share in the PRS. But also, low-educated, unemployed, and sick and disabled people rent in the PRS. This makes the PRS a vulnerable sector to energy poverty (VEKA, 2020).

From literature, it becomes clear that more barriers to perform EERs arise in apartment buildings due to complex stakeholder structures (Papantonis et al., 2022). With an average of 6,5 units per building, Flanders has around 850.000 apartments. In 2019, 28% of the number of homes were apartment buildings. This percentage is expected to grow as more permits are issued for apartment buildings than for single-family homes (VEKA, 2020). 60% Of the people within the PRS lives in apartment buildings (*Census 2011*, n.d.; Dreesen et al., 2021). Since the characteristics of a building impact the energy efficiency potential and the stakeholder structure (Dreesen et al., 2021), this research focuses on apartment buildings in the PRS. More information about the PRS can be found in the literature review.

1.4 Goals and objectives

The Flemish region appeared to be a relevant context to study how approaches to governance can minimise barriers to perform EERs in the PRS. In Flanders, private rented apartment blocks are most suitable for this research since they have the highest share in the PRS and include complex-stakeholder structures. Therefore, the objective of this is the following:

This study aims to explore how policy instruments can speed up EERs in private rented apartment units to minimise energy poverty in the Flemish region.

One of the objectives is that the research will add the tenant perspective on EERs to the current available literature. In addition, it proposes policy instruments to be used by the municipality of Antwerp and the Flemish Government that appear to be relevant to speed up EERs in the PRS.

1.5 Audiences

This research proposes policy instruments to reduce barriers to perform EERs specified for the current legislation in the Flemish region. In addition, the research gives insight in how the current legislation is experienced by stakeholders in the field.

Furthermore, this thesis is aimed at European member states to showcase policy instruments to speed up EERs in the PRS while reducing energy poverty. The research provides an overview of these instruments and arguments when and how these instruments could provide a solution to specific barriers to perform EERs. In addition, by conducting interviews with stakeholders in the field such as landlords, tenants, federations, and local authorities, more insight can be gained about their stances. The research also provides insight to what extent governmental authorities can lower barriers to perform EERs.

To delineate the study, since the research is based on the European targets for EERs, this research might only be partially applicable on a global scale.

1.6 Research relevance

1.6.1 Societal relevance

Due to the Covid19 Pandemic and Russia's invasion of Ukraine in February 2022, the changing energy market pushed low-income and middle-income households into poverty (IEA, 2022). In Europe, households in the private rental sector (PRS) appear to be very vulnerable to this energy crisis (Papantonis et al., 2022). In addition, buildings are responsible for 40% of total energy consumption and 36% of the greenhouse gas (GHG) emissions from the energy used in Europe (European Commission, 2020a). Energy efficiency renovations are stimulated by the European Commission as the key solution to energy poverty and the reduction of GHG emissions (European Commission, 2020a). But still, the renovation of the existing building stock is going too slow (Pohoryles et al., 2020).

EERs has been a strongly debated topic since the EPBD was presented by the European Commission (Ebrahimigharehbaghi et al., 2021; Nijs et al., 2021; Papantonis et al., 2022). This topic has become even more relevant due to the current energy crisis (IEA, 2022). Together with the GHG emission

reduction goals of the EU for 2050, it is now urgent to learn from the energy crisis to increase the living standards in the PRS and to keep the 2050 reduction targets feasible.

1.6.2 Scientific relevance

In literature, speeding up EERs is often researched. However, research on speeding up EERs either focuses on (1) the barriers to perform EERs (bottom-up) or on (2) governance to EERs to minimize energy poverty (top-down). Research wherein speeding up EERs is researched from a bottom-up perspective, often recommends more research on the governance perspective. In addition, research from this perspective often proposes some legislations or policy instruments while the context and background of these policies is often not studied.

On the other hand, literature can be found that focuses on the top-down perspective. This research studies different types of governance but does not consider the barriers that are identified from the bottom-up perspective. In addition, little research can be found on approaches to governance to minimise barriers of EERs within this specific sector. Figure 1 visualises the scientific gap that this research aims to fill in.

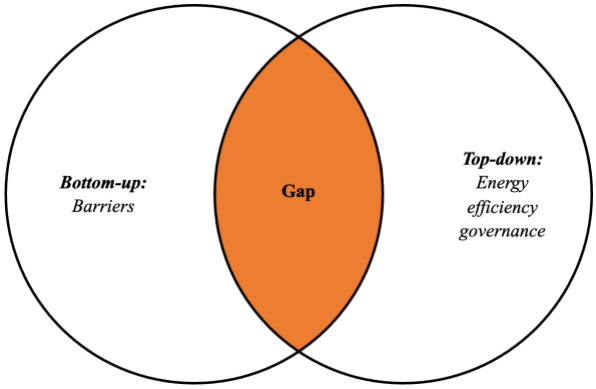

Figure 1 Visualization of the scientific gap (source: author).

This research will connect the bottom-up and the top-down perspective by researching both the barriers and energy efficiency governance. The research adds to the existing literature by focusing specifically on the PRS and investigating the missing link between approaches to governance, barriers to perform EERs in PRS and energy poverty.

1.7 Research questions

This section includes the main research question and the sub-questions.

Main research question

To gain an answer to the research objective stated in paragraph 1.4 Goals and objectives, the main research question of this thesis is as follows:

How can policy instruments be implemented to reach the Flemish targets for reducing energy usage in buildings by energy efficiency renovations and alleviating energy poverty in the private rental sector?

Sub research questions

To find an answer to the main research question, the main research question is supported by the following sub questions:

SQ1: How are energy efficiency renovations and energy poverty included in the Flemish renovation strategy to meet the European energy efficiency renovation targets?

SQ2: What are barriers before and during the energy efficiency renovation process of private rented apartments according to stakeholders?

SQ3: What policy instruments are implemented to stimulate energy efficiency renovations and to alleviate energy poverty in the Flemish context?

SQ4: How are policy instruments to stimulate energy efficiency renovations and to alleviate energy poverty in the private rental sector aligned to the barriers according to stakeholders?

SQ5: How can the Flemish context be leveraged to increase energy efficiency renovations and to alleviate energy poverty considering its strengths, weaknesses, opportunities, and threats?

Figure 2 visualises the conceptual framework of this research by connecting the key concepts of the research to each other.

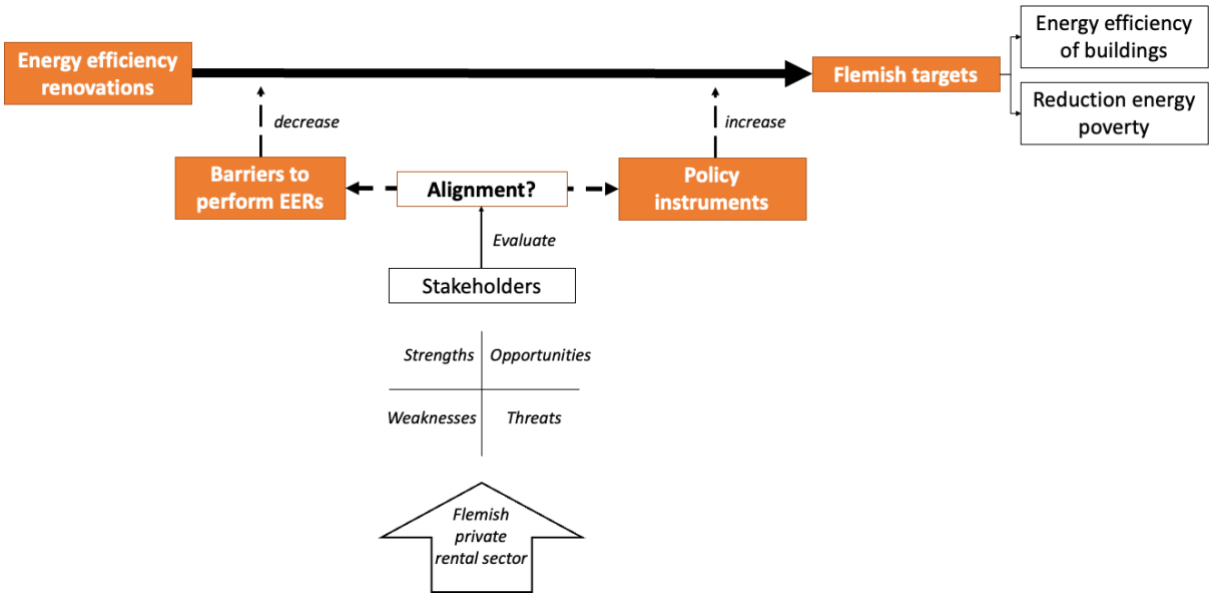

Figure 2 Conceptual framework (source: author).

1.8 Personal targets

During my graduation process I would like to strive for both content as well as personal targets.

1.8.1 Content targets

Since I am planning on working in Belgium after graduating from the Master Management in the Built Environment (MBE), I would like to learn more about the Belgian Context and legislations. With a world full of buildings realized in the past centuries, I think it is impossible to ignore the existing building stock and move on with only realizing new highly efficient buildings. Therefore, I would like to learn more about feasible opportunities for energy efficiency renovations. Energy efficiency renovations are highly connected to the political and legal context since energy efficiency renovations is one of the priorities of the European Union. I think it is interesting to learn how this subject plays a role at such a major scale.

1.8.2 Personal targets

In past research project, I noticed that I do not ask too often for feedback. During these projects, I worked very independently while feedback contributes always to the quality of your research. During this research project, I would like to push myself in asking for feedback, not only form my tutors but also my family and friends.

In addition, I would like to train myself in working on my research in shorter periods of time. Since the research project overlaps with the electives of the MBE programme, it is impossible to focus only on my research. This requires using every spare hour to dive shortly in literature studies instead on continuous periods. Lastly, this study allows me to speak with a broad range of tenants. I would like to learn how their opinion differ from each other and could potentially be related to their current living situation.

1.9 Thesis outline

Table 1 elaborates on the content of this study.

Chapter	Content
1. Introduction	The introduction provides a first understanding of the identified research problem based on an introduction of the topics relevant for this thesis. This problem is supported by literature and is eventually translated into the thesis' research objective and research questions.
2. Research method	The research method defines how the data of this research is conducted and analysed.
3. Literature study	The literature study elaborates on the terminology of the concepts used in the research question. In addition, the literature study dives deeper into the topics introduced in the introduction to gain an in-depth understanding of the topics and to build on already existing knowledge.
4. Empirical study	In the empirical study, includes the main findings from the interviews and focus groups.
5. Conclusion & Discussion	The conclusion summarises the main findings. The discussion interprets and relates the findings to previous studies.

Table 1 Thesis outline (source: author).

Chapter 2

Research approach

2 Research approach

This section discusses the methodology applied in this research. The problem addressed in the research is knowledge related, the goal is to explore how policy instruments can minimise barriers to perform energy efficiency renovations (EERs) in private rented apartment blocks to minimise energy poverty in the Flemish region. Figure 3 shows an overview of the research approach.

Sub - research question	Method	Goal
SQ1: How are energy efficiency renovations and energy poverty included in the Flemish renovation strategy to meet the European energy efficiency targets?	Literature review (Ch.3.2)	Define targets
	Interviews policy makers	Confirmation
SQ2: What are barriers before and during the energy efficiency renovation process of private rented apartments according to stakeholders?	Literature review (Ch.3.3)	Identify barriers
	Survey, interviews landlords + renters	Specify for context
SQ3: What policy instruments are implemented to stimulate energy efficiency renovations and to alleviate energy poverty in the Flemish context?	Literature review (Ch.3.3)	Identify policy instruments
	Interviews policy makers	Confirm and identify
SQ4: How are policy instruments to stimulate energy efficiency renovations and to alleviate energy poverty in the private rented sector aligned to the barriers according to stakeholders?	Literature review (Ch.3.3)	Develop framework and hypothesis
	Survey, interviews policy makers, renters and landlords	Analyse alignment based on framework
SQ5: How can the Flemish context be leveraged to increase energy efficiency renovations considering its strengths, weaknesses, opportunities, and threats?	Literature review (Ch.3.1)	PESTEL analysis
	Survey, interviews policy makers	Confirm and identify

Figure 3 Research approach (source: author).

For this research, a variety of methods are used to answer the research questions. Section 2.1 discusses the research design, section 2.2 discusses the data collection methods, section 2.3 discusses the selection of participants, section 2.4 discusses the data analysis, section 2.5 discusses the data plan, section 2.6 discusses the validity and section 2.7 discusses the ethical considerations.

2.1 Research design

First, a literature study is performed on the key concepts of this study including energy poverty, energy efficiency renovations and the Flemish energy reduction targets. Subsequently, the literature study investigates the Flemish context, explores what barriers can be identified before and during the renovation process, and what policy instruments are implemented to stimulate energy efficiency renovations.

In the empirical study, the sub-questions of the research will be further investigated through a survey and interviews with tenants, landlords, experts, and policy makers. During the interviews with the tenants and the landlords it will be investigated what barriers they face during and before the renovation process, how existing policies support them to perform energy efficiency renovations, and what kind of support they are currently missing.

Based on these interviews together with additional desk research on policy documents, an interview structure is developed for the interviews with the experts and policy makers. During these interviews the demands and opinions about current policy instruments of tenants and landlords are presented

together with policy instruments from other regions and countries that could match the demand of the landlords and tenants. Experts and policy makers have the chance to share their stances based on their experience about the proposed policy instruments and experience of tenants and landlords.

2.1.1 Theoretical research

Google Scholar, Scopus, literature provided during courses of the Master track Management in the Built Environment, and articles shared by the mentors were the key sources used to search for literature for this research. The search framework that was mostly used to find relevant literature for this research is the Box the Nouns And Provide Alternative Research Terms for Each (BONAPARTE)-framework. In this strategy, the nouns in the research question are used to search for relevant literature. For each word, other terms that might be used by other researchers are considered and searched in the search engine. A combination of the terms is searched by using "AND" and "OR" in the search field. (Cowen et al., 2009)

Starting with the main research question, this resulted in the following keywords: "policy instruments", "energy efficiency", "private rented apartment units", "Flemish targets", "energy efficiency renovations" and "energy poverty".

Table 2 shows an overview of the alternative keywords that are used in the search engine.

Main keyword	Alternative keywords
Policy instruments	Governance, financing instruments, building codes, political tools, regulations, approaches to governance.
Energy efficiency	Sustainability, low-carbon, green, energy saving, energy reduction.
Private rented apartment units	Private rental sector, multi-family homes, private tenants, multi-tenant buildings.
Flemish targets	Energy reduction targets, greenhouse gas emission targets, Flemish renovation strategy, Flemish renovation goals.
Energy efficiency renovations	Energy retrofits, energy efficiency measures, renovation depth, energy efficient construction, renovation process.
Energy poverty	Energy insecurity, energy scarcity, energy shortage, fuel poverty, energy exclusivity, energy inclusivity.

Table 2 Keywords literature study (source: author).

Articles were selected from the search results based on their title, date, keywords, abstract, methodology, and introduction. When an article deemed relevant, the full article was downloaded and read. ATLAS.ti was used to code the articles. The codes used to analyze the article were "barriers to perform energy efficiency renovations", "Belgian policy instruments", "energy efficiency renovations", "energy poverty", "influencing factors", "international policy instruments", "problematization", and "stakeholders". Based on these codes, the conceptual framework and the literature review is structured.

2.1.2 Empirical research

In this section, the methodology of the empirical parts of the study are elaborated. This includes the interviews and the focus group sessions.

2.1.2.1 In-depth interviews tenants and landlords

In this research, in-depth interviews are the primary method of data collection. These interviews are semi structured, meaning that while there are predetermined questions, there is also room for flexibility to allow the full story of the participant to be explored (Knox et al., 2009). A data management plan and an interview protocol are established beforehand to guide the conversation, but still allows for the

participant to discuss what they consider to be important (Morris, 2015). Semi-structured interviews offer the benefits of both structured and unstructured interviews since the method allows participants to talk about what they think is important while it is still possible to compare the interviews objectively (Morris, 2015). The interviews are preferably conducted face-to-face at the tenants' and landlords' homes. Interviewees may talk more freely, and the homes can also be subject to observation.

There is no consensus among qualitative researchers on the minimum number of interviews that are sufficient for a study, but some guidelines suggest a range of 5 to 50 interviewees (Dworkin, 2012).

In the interviews with the landlords and tenants, the following topics are discussed:

- Background information
- Experience with EERs
- Barriers to perform EERs
- Support and policy instruments to perform EERs

The complete interview protocol including the questions can be found in Appendix A, B, C, and D.

Tenants

From the literature review, it became clear that some barriers can be related to the characteristics of a tenant. For example, tenants with a low income, experience rent increase as a more important barrier than people with a medium or high income (Femenías et al., 2018). To further investigate the relation between characteristics of a tenant and how they experience certain barriers, a survey is conducted. This survey is shared via social media, the personal network of the researcher and by the local energy house of Antwerp Ecohuis. The survey includes questions on the age, household typology, duration of the contract, gender, education level, income level, construction year of their apartment, and total floor area. In addition, the survey includes questions on the renovation depth, the interest and power a tenant thinks to have in the renovation process, the barriers that a tenant experiences to initiate an EER, the support and the parties from which the tenant expects support. A complete overview over the survey can be found in Appendix F.

The relation between the characteristics of the survey is further investigated during the interviews. Table 3 shows an overview of the interviewees selected for this research. Attention is paid to a variety of characteristics.

	Age	*Household typology*	*Contract Duration*	*Gender*	*Education*	*Income**	*Construction year*	*Floor area (m2)*
R1	43	Couple with children	3, 6, 9	F	N/A	Q2	1965	80
R2	39	Couple with children	Undetermined	M	N/A	Q1	1930	60
R3	35	Single	Undetermined	M	N/A	Q1	1930	65
R4	45	Couple with children	Undetermined	F	Professional education	Q4	1970	120

R5	26	Co-housing	3, 6, 9	F	Master	Q3	2005	150
R6	29	Couple	3, 6, 9	F	Professional education	Q4	2000	95
R7	27	Couple	3, 6, 9	F	Master	Q3	2000	75
R8	35	Co-housing	3, 6, 9	F	Master	Q2	1960	120
R9	21	Couple	1 year	F	Master	Q1	1935	80
R10	62	Single	3, 6, 9	F	Professional education	Q3	1960	75

Table 3 Selected interviewees – Tenants
**Income is divided into four quantiles:*
Q1 = < 13.541 per year
Q2 = 13.541 – 29.300
Q3 = 29.300 – 41.360
Q4 = > 41.360

From literature it became clear that biggest groups within the PRS of people living in apartments are people between 18-34 (Dreesen et al., 2021). Therefore, it is assured that multiple interviewees within this age range are selected.

Other requirements of the tenants are:

(1) They rent a private rented apartment in Antwerp
(2) They rent apartments in different apartment blocks.
(3) They are willing to share personal background information to make sure that the results of the interview can be interpreted.
(4) They can speak Dutch or English.

Landlords

From the literature review it became clear that the characteristics of landlords do not show a significant relation to their stance towards EERs (Papantonis et al., 2022). In addition, a certain income or assets are required to be capable of renting out an apartment. This makes the characteristics of landlords less diverse. Table 4 shows an overview of the interviewees.

	Age	*Household typology*	*Contract Duration*	*Gender*	*Education*	*Income**	*Construction year*	*Floor area (m2)*
L1	60	Couple with children	3, 6, 9	M	Master	Q4	2x 1935	2x 100
L2	55	Single with children	3, 6, 9	M	Master	Q4	1x 1940 1x 2010	2x 70
L3	28	Couple	3, 6, 9	M	Professional education	Q4	3x 1965	3x 80

L4	31	Couple	1 year	F	Professional education	Q4	< 1900	120
L5	29	Single	Undetermined	M	Master	Q4	1935	100
L6	51	Couple with children	3, 6, 9	F	Master	Q4	1980	65

Table 4 Selected interviewees – Landlords
**Income is divided into four quantiles:*
Q1 = < 13.541 per year
Q2 = 13.541 – 29.300
Q3 = 29.300 – 41.360
Q4 = > 41.360

Other required characteristics of the landlords are:

(1) Individual owner of at least one private rented apartment.
(2) The private rented apartment is situated in Antwerp to make sure the same rules and regulations apply.
(3) The landlords rent apartments in different apartment blocks. The combined result of the interviews should cover different perspectives within the PRS. The different landlords cover a wider range and different insights can come to the surface regarding influential characteristics within the PRS.

2.1.2.2 Interviews policy makers and experts

Following on the survey and the interviews with the tenants and landlords, the interviews with the policy makers and experts are set up. During these interviews the demands and opinions about current policy instruments of tenants and landlords are presented together with policy instruments from other regions and countries that could match the demand of the landlords and tenants. Experts and policy makers have the chance to share their thoughts based on their experience about the proposed policy instruments and experience of tenants and landlords. A complete overview of the set-up of the interview questions can be found in Appendix E. In addition, policy experts have the knowledge and experience to design new regulations. To find policy makers and experts who can provide information, snow-ball sampling is used. This means that each policy expert is asked to identify other policy experts that have knowledge about energy renovations strategies and approaches to governance (Goodman, 1961). This is done until a total of five policy experts was found. Attention is paid towards different roles and policy levels. Table 5 shows an overview of the interviews with the policy experts selected for this research.

	Name	*Function*	*Company*	*Description of the company*
E1	Sven Snyders	Renovation Coach	Ecohuis	Energy house located in Antwerp that supports homeowners and renters in improving the energy efficiency of their house.
E2	Veva Roesems	Project Manager Renovation	City of Antwerp	The municipality of Antwerp.
E3	Roel Vermeiren	Advisor Renovation Strategy	VEKA	A Flemish energy and climate agency that implements sustainable energy climate policy.

E4	Zeno Winkels	General Director	Woonbond NL	Dutch organization that supports renters with a variety of issues they might face.
E5	Simon Gheysen	Deputy Chief of Cabinet for Housing	Cabinet for housing	Cabinet that is responsible for advising the minister in topics related to housing policy.

Table 5 Selected interviewees – policy makers and experts.

2.2 Data collection methods

Data in scientific research can be divided in to primary and secondary data (Bryman, 2016). In this research, the secondary data sources are the articles used in the problematization and literature review. Since much research is available on stakeholder viewpoints on barriers to perform energy efficiency renovations, this available secondary data is also used as an addition to the primary data gathered during the empirical study. The primary data is collected through the survey and interviews.

The survey is shared via the personal network of the researcher, online platforms, such as Facebook groups for tenants and via Ecohuis Antwerpen. Ecohuis Antwerpen performs energy scans in the city of Antwerp. The energy coaches of Ecohuis Antwerp filled in the survey together with their clients during a visit for an energy scan at their home. The survey was available between 21 March 2023 and 31 April 2023.

The interviews with tenants R1, R2, R3 and R4 were arranged by Ecohuis Antwerpen. The researcher joined an energy coach during energy scans. These interviews took place during the energy scans and were held with tenants living in energy poverty. This method is chosen because tenants living in energy poverty appear to be less willing to perform an interview, while this target group is relevant for this research. In addition, the energy coach helped translating the questions and answers. These tenants did not feel comfortable with audio recording. Therefore, these interviews are summarized immediately after the interviews.

The interviewees R5, R6, R7, R8, R9, R10, L1, L2, L3, L4, L5 and L6 were found by sending out fifty letters to small apartment blocks situated in Antwerp. In addition, the personal network of the researcher was used to find additional tenants and landlords. To avoid conflict of interest, all the interviewees were not directly related to the researcher. These interviews are all recorded and transcribed.

The interviewees E1, E2, E3, E4, E5 were found by searching for people related to powerful organisations in the field of energy efficiency renovations. The interviewees were contacted via email or Linkedin. These interviews are all recorded and transcribed.

2.3 Selection of participants

The research is conducted in the Flemish context. Since regulations and measures to perform EERs are determined on municipal level, Antwerp is chosen as the municipality to perform the empirical research. The selection criteria for the municipality are shown in table 6.

Aspect	Requirement	Explanation
Region	Flanders	The study is conducted in the Flemish region since the Flemish region wants to support energy efficiency renovations, and people appear to be vulnerable to energy poverty in this region.

Environment	City	In cities, the percentage of private rented buildings and energy poverty appears to be higher. By conducting the research in an urban environment, more data will be available, and the results will be more relevant.
Minimum % private rented apartment blocks	66%	To be sure that there is enough data available and that the results can be interpreted to a regional level, the percentage private rented apartment blocks should be at least the average of cities in the Flemish region.
Minimum % apartment blocks	29%	To be sure that there is enough data available and that the results can be interpreted to a regional level, the percentage apartment blocks should be at least the average of cities in the Flemish region.
Availability of expert organisations	yes	To conduct the study, experts in the field are required. The municipality should have organisations installed to gather experts for the focus groups from.

Table 6 Requirements study context (source: author)..

Including only participants from the municipality of Antwerp, could be of influence on the outcomes of this study. Therefore, table 7 shows a comparison between the demographical and economical characteristics of Antwerp and Flanders.

Theme	**Antwerp**	**Flanders**
Age distribution:		
0-17	22,6%	19,4%
18-64	61,3%	59,7%
64+	16,1%	20,9%
Household typology:		
Single	42,7%	31,8%
Single-parent	9,8%	8,2%
Couple	18,7%	28,9%
Couple with children	22,9%	28,3
Other	5,9%	1,9%
Average rent price	678 euro	816 euro
Median monthly income	1.637	2.622

Table 7 Comparison characteristics Flanders and Antwerp (Stad in Cijfers, 2023; Statistiek Vlaanderen 2023a).

2.4 Data analysis

The interviews are transcribed and analysed by using ATLAS.ti, a software tool for the qualitative analysis of large amounts of data. The interviews will be coded by using deductive and inductive coding meaning that codes are added if they appeared to be relevant. The predefined codes were: (1) Barriers to perform EERs, (2) Energy efficiency renovations (3) Energy poverty (4) Contextual factors (5) Policy instruments (6) Renovation strategy. These codes correspond to the conceptual framework.

Additional codes that appeared to be relevant were: (1) Energy efficiency of buildings (2) International policy instruments (3) Motivation to perform EERs (4) Policy instrument evaluation.

"International policy instruments" were added since international policy instruments were often mentioned during the interviews and in the secondary data sources but should not be confused with the policy instruments currently used in Antwerp, Flanders or Belgium. "Policy instrument evaluation" was added since it appears to be necessary to distinguish possible policy instruments and the opinion of stakeholders towards these instruments.

The first sub-question: "How are energy efficiency renovations and energy poverty included in the Flemish renovation strategy to meet the European energy efficiency targets?" is answered based on the empirical results found in the interviews with policy makers (Code: Renovation strategy).

The second sub-question: "What are barriers before and during the energy efficiency renovation process of private rented apartments according to stakeholders?" is answered based on empirical results found in the interviews with landlords and tenants (Code: Barriers to perform EERs).

The third sub-question: "What policy instruments are implemented to stimulate energy efficiency renovations in the Flemish context?" is answered based on empirical results found in the interviews with landlords, tenants, and policy makers (Code: Policy Instruments)

The fourth sub-question: "How are policy instruments to stimulate energy efficiency renovations in the private rental sector aligned to the barriers according to stakeholders?" is answered based on empirical results. For answering this question the theory-based evaluation method found in literature is used for the evaluation of policy instruments. A code network is developed to answer this research question. First, subcodes are created for specific barriers and policy instrument instruments. These subcodes are related to each other in ATLAS.ti with the code network function. To analyse the relationships between de barriers and the policy instruments, quotes were related to the code network (Codes: Barriers to perform EERs, Policy instruments, policy instrument evaluation).

The fifth sub-question: "How can the Flemish context be leveraged to increase energy efficiency renovations considering its strengths, weaknesses, opportunities, and threats?" is answered based on empirical research. By creating subcodes with the code: Contextual factors for the strengths, weaknesses, opportunities, and threats of the Flemish context, a SWOT is developed.

2.5 Data plan

The Findability, Accessibility, Interoperability, and Reusability (FAIR) Data Principles are used in this research to encourage responsible and ethical practices in the collection, use, and sharing of data (Wilkinson et al., 2016). The complete data management plan can be found in Appendix A.

Findable

This research will be published on the Delft University of Technology repository. Here, the research can easily be found by searching for keywords, author name and title of the research. In addition, the data that is empirically acquired will be published as an anonymised data set which makes it easier to use for studies that are related to this research.

Accessible

The research is publicly accessible through the Delft University of Technology repository. No authentication is required to find and assess this research. In this published version, all the data that is related to individuals will be anonymised.

Interoperable

The data that derives from this research will be anonymously available in a file that can easily be used for further research (.excel for example). In addition, all the data that is used in the research will include a reference. Lastly, the research is written in English to increase the interoperability.

Reusable
The methodology is explained in the method section, and references are used to ensure the reusability of this research. In addition, the research includes a section with all the limitations of the research.

2.6 Validity

To ensure this study to be a trustworthy study, the four criteria for qualitative research proposed by Guba (1981): credibility, transferability, dependability, and confirmability are considered.

Credibility can be described as the degree to which the findings of a qualitative study can be assessed to be accurate and reliable (Guba, 1981). In this research the credibility is assured in multiple ways. First, the research only uses well recognized research methods such as interviews and focus groups. For this research, a specific context is chosen, private rented apartments in Antwerp. The target groups that are included in the research are based on the literature review focusing on this specific context. Lastly, this research is supervised by two mentors. These mentors provided feedback on the whole research and research process during the complete research project.

The transferability of the research refers to the extent to which the findings of a study can be applied to other contexts (Guba, 1981). Since this research takes place in a very specific context and uses a specific building typology, the transferability of the research is limited. However, since the research includes a clear description of its particular focus, readers can easily decide whether the results of this research can be applied on their specific topic. In addition, a total of 25 interviewees from different target groups are involved in the research. By including a high number of interviewees and target groups, the transferability of the research increases.

Dependability refers to degree to which the results of the study can be simulated by other researchers using the identical methods and under similar circumstances (Guba, 1981). The criteria to select the interviewees are clearly described in the method. In addition, the way the data is analyzed is included in the research. The research will use inductive coding. This means that the codes are based on the interviews whenever it seems like codes are missing. This could reduce the dependability. However, by providing a complete overview of the codes used to analyze the interviews, the dependability is still assured.

Finally, confirmability includes the extent to which the results of the study can be verified or supported by other sources of evidence. Bias is reduced in this research by including an extensive literature review that is used as the basis for the decisions that are made to define the research set up. Still, there are some parts of the research where bias of the author could lead to misinterpretation. This plays a major role in analyzing the interviews and the focus groups. Therefore, an extensive Atlas.Ti analysis of the interviews and focus groups will be shared with the first and second mentor. They confirmed the interpretations. In addition, a short list of recommendations resulting from this research is shared with policy experts. These policy experts confirmed the final recommendations.

2.7 Ethical considerations

Both landlords and tenants indicated they were uncomfortable with the idea that their tenant or landlord would know about the interview. Therefore, tenants and landlords interviewed in this study are not related to each other. This motivates the participants to speak freely. Conversely, opposing opinions of a landlord and a tenant cannot be fully examined.

Before the interviews are conducted, every participant will have to sign the interview protocol that complies with the GDPR to give informed consent. The interview protocol stresses that participation in the research is entirely voluntary, and interviewees are not required to answer any questions that they prefer not to answer. Interviewees remain anonymous. Only necessary information will be collected and stored confidentially to protect the privacy of the participants. In addition, the protocol gives information about the purpose of the research, the data collection process, and the analysis. Participants are given the option to opt out of the research at any time.

Chapter 3

Literature study

3 Literature study

This literature study starts with an elaboration on the main concepts of this research "energy efficiency renovations" and "energy poverty" followed up by a PESTEL-analysis that investigates the contextual context of this research. Next, this chapter follows the structure of the conceptual framework by performing a governance study, a barriers study, and finally, a cross-comparison between the governance and the barriers study.

3.1 Main concepts

This section elaborates on the main concepts of this research: "energy efficiency renovations" and "energy poverty".

3.1.1 Energy efficiency renovations

Energy efficiency renovations (EERs) play a major role in strategies of European member states to reduce the energy consumption (Salvalai et al., 2017). Building renovation is crucial to tackling the energy use and emissions to meet the European Union's 2030 emission reduction target and to become climate neutral in 2050 (European Commission, 2020a). In the European context, the term "energy efficiency renovations" can be interpreted in many ways (European Commission, n.d.).

Until recently, the renovation of buildings was focusing mostly on solving safety problems (such as minimizing fires by building materials restrictions) and increasing the energy performance (Pohoryles et al., 2020). Although, the European Commission stresses the urgency of EERs, earlier studies have shown that housing renovation is seldom motivated by energy savings but often driven by urgent technical need (Thuvander et al., 2012).

Multiple ways to categorise EERs can be found in literature (Femenias & Granath, 2022). These studies distinguish EERs by energy savings, investment costs, financial savings, implementation of renovation, or value increase (Femenias & Granath, 2022; Thuvander et al., 2012). The Building Performance Institute of Europe (BPIE) argued in its report on Deep Renovation, that clarity is missing around the typology of EERs in the Renovation Wave strategy published by the European Commission (BPIE, 2021). In their report on deep renovations, they investigated a suitable typology to categorize EERs in the context of the 'Renovation Wave' strategy. Based on this research, BPIE distinguishes minor renovations (0-30% of final energy savings), moderate renovations (30-60% of final energy savings), and deep renovations (60-90% of final energy savings) (BPIE, 2021).

The Flemish government highlights in the "Renovation Pact" the need for "deep renovations" (VEKA, 2020). From this report, it does not become clear how "deep renovations" are defined. However, VEKA inventories renovations based on requested building permits (VEKA, 2022d). If a building permit is required, is very specific to the measure that is implemented. For example, a building permit is required to install solar panels. However, exemption is given if the solar panels do not extend more than one meter above the roof edge in the case of a flat roof (Omgevingsloket Vlaanderen, 2023). Also, replacement of windows, cavity wall insulation, and inside wall insulation do not require a building permit unless the measures are taken in the façade at the streetside of the building (Omgevingsloket Vlaanderen, 2023). If a building permit is required, then the cooperation of an architect is mandatory (Omgevingsloket Vlaanderen, 2023). But here, too, there are exceptions. Cooperation of an architect is not required if the façade is plastered, windows and door openings are adjusted, solar panels are implemented, and if ventilation, air handling, smoke extraction or air extraction systems are installed (Omgevingsloket Vlaanderen, 2023).

In the report "The Concept of the Individual Building Renovation Roadmap" of BPIE (2018), it is investigated how Denmark, Flanders, France, and Germany use individual building roadmaps to measure the depth of a renovation. In Flanders, the depth of a renovation is measured by EPC+ and "Woningpas" (BPIE, 2018). These two initiatives are driven by the Flemish government (BPIE, 2018). Flanders stated that by 2050, the existing building stock should become as efficient as newly built

buildings (BPIE, 2018). “Woningpas” and EPC+ methodology are developed by the Flemish government to reach this target (BPIE, 2018). The “Woningpas” is a digital file connected to an individual building, providing information on for instance energy performance, renovation advice, and the housing quality (BPIE, 2018).

The EPC+ is a descendant of the Energy Performance Certificate scheme, published in 2019. The EPC+ report includes a renovation advice and outlines the actions that should be taken to improve the energy performance of the asset. Since measuring the energy consumption of the building stock is done by the EPC+ methodology in Flanders, this research will use this methodology as a guideline to measure the depth of EERs. It is important to note that this methodology does not consider the real energy consumption of buildings but the annual primary energy consumption. In addition, as described in the previous sections, there are other ways to define the depth of a renovation. This may in some cases mean that an increase in the EPC does not necessarily leads to a lower real energy consumption (VEKA, 2023c). The primary energy consumption is based on the characteristics of a building such as the roof and wall insulation and the building installations. The primary energy consumption is linked to a specific bandwidth ranging from F (high consumption) to A+ (low consumption) visualised in Figure 8. (VEKA, n.d.-d)

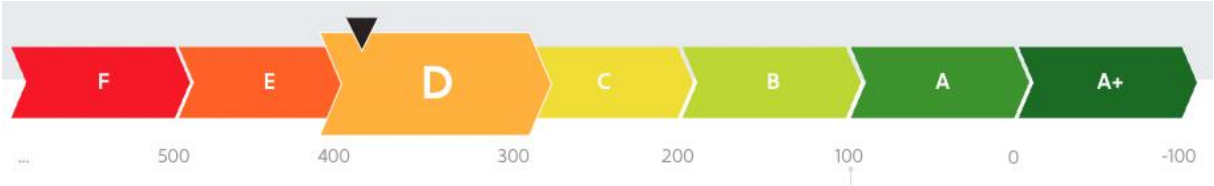

Figure 8 Primary energy consumption in kWh/m₂/year related to bandwidths in kwh/m²/year (source: VEKA(n.d.)).

3.1.2 Energy poverty

Tenants in the PRS and especially those with a lower income, face far more issues with affording socially and materially required levels of energy services than the general population in Europe (Papantonis et al., 2022; Vondung et al., 2022). Although, the EU commission recognizes that energy poverty should be defined at an EU-wide scale, a general metric to compare energy poverty in different member states does not exists (Karpinska et al., 2020).

In literature, energy poverty is related to a variety of aspects such as physical and mental wellbeing, social exclusion, environmental quality, productivity, and income levels (Karpinska et al., 2020; Papantonis et al., 2022). This variety of aspects related to energy poverty, make it challenging to measure and compare energy poverty in different contexts (Karpinska et al., 2020).

Generally, energy poverty refers to “the inability to a attain socially and materially necessitated levels of domestic energy services such as heating, lighting and hot water” (Martiskainen et al., 2021, p. 2). This can be interpreted as people that are unable to afford indoor thermal comfort affecting health, social inclusion, environmental quality, mental well-being, and productivity (Martiskainen et al., 2021).

Other ways to measure energy poverty are the expenditure and the consensual approach (Halkos et al., 2021). The expenditure approach investigates the share on income a household pays to energy services. A household can be defined poor when the share is above the defined threshold (Halkos et al., 2021). The consensual approach measures the difficulty to meet energy services indicated by energy affordability, thermal comfort, and dwelling efficiency (such as leak, damp, and rot) (Halkos et al., 2021).

The King Baudouin Foundation, which manages the platform against energy poverty, published the energy poverty barometer in 2018 for the second time. Here, energy poverty is divided into three forms: measured energy poverty (14.5% of Belgian households have high energy bills relative to their income), hidden energy poverty (4.3% minimize their energy consumption to get by), and subjective energy

poverty (4.9% indicate they cannot adequately heat their homes). The barometer correlates these figures with household size, housing, and health, concluding that singles, single-parent families, poor housing quality, and poor health increase the risk of energy poverty. These domains fall under the responsibility of the regions.

The Flemish government contributed a section in their “Renovation Strategy Report 2050” to energy poverty. Here they defined energy poverty as: “having trouble with paying energy bills” (VEKA, 2020, p. 61). This is measured by energy debts, number of cancelled energy contracts, the number of customers supplied by the grid operator after cancellation of the contract with a commercial supplier, and the number of budget meters with prepayment function (VEKA, 2020). Based on these indicators, 15,9% of the families in the Flemish region face energy poverty (VEKA, 2020). In the “Beleidsnota”, energy poverty is measured by the “Woonquote” and the “Budgetnorm”. The "Woonquote" represents the percentage of income that citizens allocate towards rent, while the "Budgetnorm" is calculated by deducting the rent from their income (Diependaele, 2020). In 2018, the “Woonquote” was 30%. 52% Of the private tenants paid a higher percentage. In addition, 31,2% of the private tenants was under the Budget Norm” (Diependaele, 2020).

3.2 Contextual factors

The PESTEL-analysis is a widely used framework to analyze the impact of contextual factors on a project (Perera, 2017). There are multiple contextual factors that influence energy efficiency renovations, its process, the barriers related to the process, and the relevance of policy instruments. Therefore, this section analyses the contextual factors of the Flemish context that are of influence on an energy efficiency renovation process.

The PESTEL-analysis forms the basis for the identification of strengths, weaknesses, opportunities, and threats in a SWOT-analysis (Perera, 2017). In this study, the PESTEL-analysis is important because it helps ensure that the policy instruments proposed in the conclusion fit within the Flemish context. The PESTEL-analysis analyses, the political, environmental, social, technical, economical, and legal factors. Every section in this chapter is determined to one of these factors.

3.2.1 Political

Political factors include political stability, political consequences, changes in policies, government actions, government stability and support. Belgium exhibits a unique political structure regarding the responsibility for energy-efficient renovations. The country has delegated this responsibility to its three regions: Flanders, Brussels, and Wallonia. Each region has developed its own strategy to achieve an energy-efficient building stock (Diependaele, 2020). In Flanders, the Cabinet of the Flemish Minister of Finance and Budget, Housing and Heritage, as well as the Cabinet of the Flemish Minister of Justice and Enforcement, Environment, Energy and Tourism, hold the responsibility for energy-efficient renovation policies (Diependaele, 2020). The Flemish energy and climate agency is tasked with formulating a renovation strategy aligned with European targets (VEKA, 2020). Collectively, these entities are developing legislation related to housing quality and energy efficiency (Diependaele, 2020). In recent years, this policy area has undergone significant changes, with the introduction or revision of premiums and the development of new legislation concerning minimum quality requirements (VEKA, 2023a). The reports indicate a strong emphasis on enhancing the energy efficiency of the building stock. However, there is a limited number of measures specifically targeting the private rental sector (Diependaele, 2020; VEKA, 2023a)

3.2.2 Economical

In 2028, the distribution of households in Flanders was as follows: 72% were homeowners, 19% were private tenants, 7% were social tenants, and 2% was resided rent-free (Diependaele, 2020). Despite the prevalence of single-family homes, there has been a noticeable change in the housing stock composition, with the proportion of apartments rising from 20% in 2000 to 25% in 2018 (Diependaele, 2020). The rental prices for apartments have also experienced a significant increase, with a 31% rise from 432 euros in 2005 to 627 euros in 2018 (Diependaele, 2020). This translates to an average annual growth rate of 1%, excluding inflation.

Energy-efficient renovation strategies often aim to address the issue of energy poverty. From Chapter 3.1.2 Energy Poverty it appeared that in Flanders, energy poverty is assessed through two indicators: the "Woonquote" and the "Budget Standard." In 2018, the "Woonquote" stood at 30%, with 52% of private tenants paying a higher percentage. Additionally, 31.2% of private tenants were below the "Budgetnorm" (Diependaele, 2020). These findings emphasize the importance of addressing energy poverty within the private rental sector.

Within the literature, there is a debated relationship between energy poverty and energy-efficient renovations. While improving the energy efficiency of a dwelling often leads to reduced energy costs, there is a reasonable likelihood that rent prices will increase due to the improved quality of the property (Papantonis et al., 2022).

Energy prices in Belgium, similar to those in neighbouring countries, have exhibited fluctuations in the past year (CREG, 2023). The most prominent peak occurred in October 2022 for both gas and electricity.

Although energy prices have subsequently declined, they remain considerably higher than the prices observed in 2020 (CREG, 2023).

Renovation costs in Flanders are generally elevated due to multiple factors. One of the primary contributors is the relatively high labor costs compared to other countries, particularly concerning skilled trades such as electricians, plumbers, and carpenters (FCIF, 2023). Moreover, the Flemish building stock exhibits significant diversity, which adds complexity to renovation projects (Vlaanderen, 2023c). Furthermore, the minimum energy efficiency standards necessitate the use of high-quality building materials, which further escalates costs (VEKA, 2023a).

3.2.3 Social

The pie chart in Figure 9 shows that 58% of the dwellings in Belgium are situated in Flanders (VEKA, 2022e).

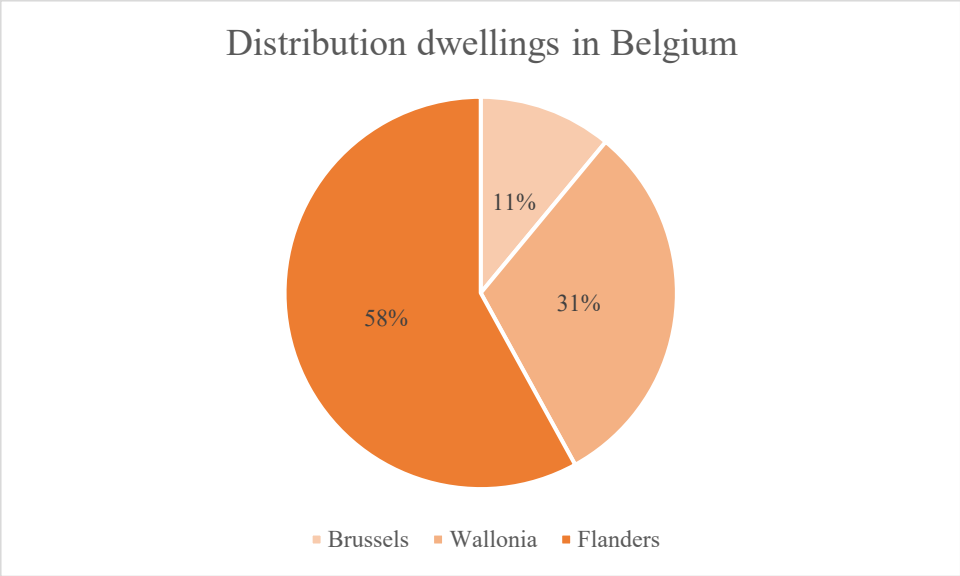

Figure 9 Pie chart that shows the division of the percentage of buildings in the three Belgian regions (source: VEKA, 2022c).

According to the Federal Planning Bureau, the household count in Flanders has surged to approximately 2,8 million households and is anticipated to reach around 3 million by 2033 (Diependaele, 2020). The bulk of this increase is projected to arise from one-person households, although there will also be a continued rise in single-parent households and couples with children (Diependaele, 2020). However, the number of couples with children is expected to further decrease (Diependaele, 2020).

Table 8 shows an overview of this projection.

Flemish region	**2008**	**2018**	**2020**	**2030**	**2050**
Single-person households	767.023	905.362	920.885	1.050.474	1.272.756
Couples without children	750.445	800.826	821.004	868.308	874.078
Couples with children	819.474	816.008	817.686	789.347	775.801
Single-parent households	205.509	237.850	232.850	244.514	271.356
Other	37.598	46.962	49.576	52.578	58.451
Total	2.580.049	1.807.008	2.842.001	3.005.220	3.252.442

Table 8 Demographic projection households Flanders (Diependaele, 2020).

The private rental market is characterized by small households. In the PRS, 22,1% of the tenants is single. Table 9 shows an overview of the distribution of household types by property status types.

	Owner	**Private tenant**	**Private tenant legal entity**	**Social rent of social housing corporation**	**Social rent of public legal entity**	**Not available**	**Total**
Couple with children	37,0%	16,9%	16,4%	17,7%	9,6%	29,6%	31,0%
Couple without children	33,0%	20,4%	19,5%	18,0%	15,9%	28,9%	29,1%
Single	22,1%	49,0%	52,7%	45,3%	66,7%	32,2%	30,1%
Single parents	6,3%	11,7%	9,3%	17,8%	6,9%	7,2%	8,0%
Other	1,7%	2,0%	2,2%	1,3%	0,9%	2,1%	1,8%
Total	100%	100%	100%	100%	100%	100%	100%

Table 8 Distribution household type per property status (Dreesen et al., 2021).

According to Census 2011, almost 30% of the households in the private rental sector is younger than 35 years. A complete overview can be viewed in Table 10. From this table it can be obtained that the percentage households decreases when households become older.

Age	**Single**	**Single parent**	**Couple with children**	**Couple without children**	**Total**
18 - 34	66%	62%	25%	46%	48%
35 - 44	48%	41%	13%	27%	25%
45 – 54	42%	30%	9%	18%	20%
55 - 64	33%	23%	9%	10%	17%
> 65	23%	13%	8%	11%	16%
Total	38%	33%	13%	16%	23%

Table 9 Percentage households in the private rental sector per age and household type (Dreesen et al., 2021).

With the use of Census 2011 data, housing history for individual persons can be obtained. From this data it appears that 41% of the private tenants were also private tenants in 2001, with the numbers distributed relatively evenly across age groups (Dreesen et al., 2021). The group of persons who were still living with parents 10 years ago, is responsible for the second largest group of 25% within the sector. Of those who owned a house in 2001 and are now renting in the PRS, half of them is single. But when one goes to see what kind of households these single people formed in 2001 when they were owners, it turns out that only 25% of them was single. So, it is not the single owners in 2001 who leave

their own property and rent as a single person in 2011, but it is mostly couples who have broken up (Dreesen et al., 2021).

From Table 11, it can be obtained that the education level decreases with the age of the household. In addition, it can be obtained that the education level is the highest in the owner-occupied sector.

	Owner	**Private tenant**	**Social tenant**	**Total**
18 – 34	43%	27%	10%	34%
35 – 44	41%	22%	10%	35%
45 – 54	33%	18%	8%	29%
55 – 64	26%	16%	6%	23%
> 65	13%	9%	3%	11%
Total	28%	20%	6%	25%

Table 10 Share (%) of households with a higher education degree by living situation and age, Flemish Region 2011, in % (Source: Census 2011, 2011).

Table 12 Shows how the share of working tenants is distributed by household typology. It is obvious that the lowest share is within the 65+ group since this group is normally retired. Among the youngest tenants, we see that among single-parent households, the share of working people is low, as is the case among single people. (Dreesen et al., 2021)

Age	**Single**	**Single-parent**	**Couple with children**	**Couple without children**	**Total**
18 – 34	68%	59%	70%	83%	73%
35 – 44	71%	73%	75%	77%	74%
45 – 54	68%	74%	74%	72%	72%
55 – 64	38%	49%	49%	38%	40%
> 65	2%	2%	6%	3%	3%
Total	28%	20%	6%	25%	57%

Table 11 Share of working private tenants by age and household type, Flemish Region 2011 (in %) (Source: Census 2011, 2011; Dreesen, 2021).

Table 13 shows the average floor area of private rented apartment buildings by age group and household type. From the table can be obtained that the youngest and single households live in the smallest apartments (Dreesen et al., 2021). Hereby, it is important to consider that the size of an apartment is very much dependent on the location. In cities, the size of an apartment is often smaller (Dreesen et al., 2021).

Age	**Single**	**Single-parent**	**Couple with children**	**Couple without children**	**Total**
18 – 34	87	94	98	96	91
35 – 44	90	99	102	97	95

45 – 54	91	103	107	99	96
55 – 64	92	102	109	102	96
> 65	95	103	107	103	97
Total	91	100	102	99	95

Table 12 Average floor area of private rented apartment buildings by age group and household type (source: Census 2011, 2011).

All the figures above show that young people (18-34), high educated, and working are a target group that requires extra attention in this research since this is the biggest group in the private rental sector. In addition, this group lives in the oldest houses which have on average the poorest performing buildings. However, this research will not only focus on young people. Since there are more factors than only age, that could influence the barriers to perform an energy efficiency renovation (Ebrahimigharehbaghi et al., 2021).

3.2.4 Technical

The physical state of all the Flemish dwellings has improved between 2013 and 2018. However, 15,9% of the private rented dwellings is in a very poor state (Diependaele, 2020). Only 8,8% of the owner-occupied dwellings is in a very poor state (Diependaele, 2020). The physical state of the dwellings cannot be related to the income of the occupiers. In every income quantile, the percentage of buildings in a very bad state is around 9% (Diependaele, 2020).

Currently, 2,4% of the single-family homes and 6,5% of the apartment buildings, meets the 2050 target of an energy label A (VEKA, 2020). The average energy performance certificate for apartments per building year is shown in Table 14.

Building year	**Average primary energy consumption**	**Energy Performance Certificate**
<1921	369	D
1921 – 1945	378	D
1946 – 1970	338	D
1971 – 1985	268	C
1986 – 1995	244	C
1996 – 2005	195	B
> 2005	153	B

Table 13 Average energy labels for apartment buildings per building year (source: VEKA, 2020).

Table 15 shows how the average building year of private rented households in divided among age group and household type. From this table can be obtained that the youngest and single people rent on average the oldest houses (Dreesen et al., 2021).

Age	**Single**	**Single-parent**	**Couple with children**	**Couple without children**	**Total**
18 – 34	1956	1963	1966	1971	1961

35 – 44	1960	1968	1964	1966	1963
45 – 54	1962	1969	1966	1970	1965
55 – 64	1964	1967	1966	1973	1967
> 65	1972	1970	1968	1977	1973
Total	1963	1967	1966	1973	1965

Table 14 Average building year of private rented dwellings by age group and householdtype (source: census, 2011).

3.2.5 Environmental

Belgium belongs to the top four of European countries that have the biggest per capita fossil fuel usage in buildings (Nijs et al., 2021). Buildings account for 35% of greenhouse gas emissions, and reducing these emissions is necessary to mitigate the impacts of climate change. Moreover, Belgium is obliged to meet the European energy efficiency targets (see Chapter 3.2 for more information).

3.2.6 Legal

The legal framework for energy efficiency of buildings can be divided into two groups: 1) Minimum quality of private rental homes stated in the "Codex Wonen". And 2) additional regulations designed to stimulate energy efficiency renovations in the private rental sector. Table 16 shows an overview:

Codex Wonen	- Roof insulation (>0,75m² K/W) - Double-glazing (Vlaanderen, 2021)
Additional regulations	- Limited indexation based on EPC - EPC label D five years after transaction - EPC mandatory on transaction (VEKA, 2020, 2023b)

Table 15 Legislation energy efficiency renovations Flanders.

3.2.7 SWOT-analysis

In the discussion, SWOT-analyses are used to identify the strengths, weaknesses, opportunities, and threats of the Flemish context to reduce barriers to perform energy efficiency renovations and to implement additional policy instruments based on the literature and empirical study. In Appendix H, a SWOT-analysis of the literature study can be found.

In the empirical study, the findings of the SWOT-analyses will be further investigated. Based on these additional findings, the SWOT-analysis will be interpreted according to the principles shown in Table 17.

	Opportunities	**Threats**
Strengths	Offensive = make the most out the favorable situation	Adjust = make full use of strengths to overcome threat.
Weaknesses	Defensive = careful consideration	Survive = be aware of threat and adapt.

Table 16 SWOT-analysis strategy development.

3.3 Governance study

The first section investigates how energy efficiency renovations and energy poverty are included in the Flemish renovation strategy to meet the European energy efficiency targets (SQ1). The topics that will be discussed are The European Strategy, the Flemish Strategy, and policy instruments. These subjects correspond to the first level of the conceptual framework shown in Figure 10.

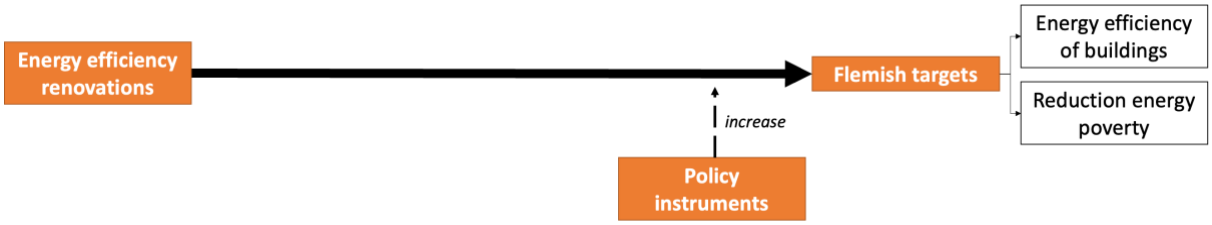

Figure 10 First level of the conceptual model (source: author).

3.3.1 European strategy

The European union can intervene on various levels to steer towards an energy efficient European Building stock (Pereira et al., 2017), visualized in Figure 11.

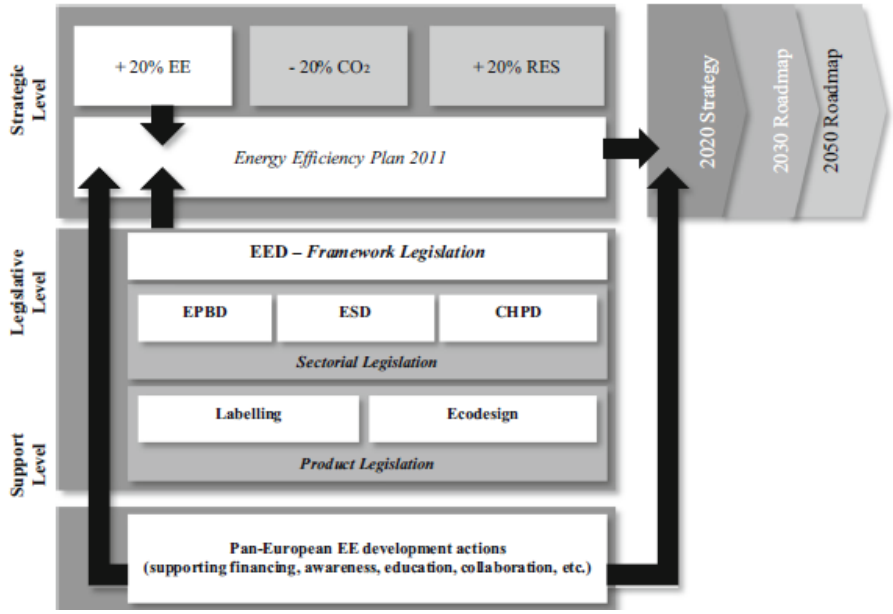

Figure 11 European Union EE Governance development scheme. CO_2 carbon dioxide. RE renewable energy, EPBD energy performance of buildings directive, ESD energy service directive, CHPD combined heat and power directive (source: Pereira et al., 2017).

On a *strategic level*, the EU has been implementing a range of policy road maps and communications including the 2020 strategy, the 2030 framework for climate and energy policies and the European 2050 Roadmap. These communications should shape a framework for action, and enable new directives and regulations, as well as support actions to be designed as supporting mechanisms for these strategies. The communications include the main goals and ambitions of the EU including: 20% reduction of primary energy consumption, 20% increase in renewable energy, and 20% reduction of GHG emissions by 2020 in comparison to 1990 (EUR-Lex, 2015). The European Commission analyzed that these goals were reached in 2020 (EUR-Lex, 2022b). However, not all member states reached their individual targets, and the large reduction was mainly due to the Covid-19 pandemic (EUR-Lex, 2022b). This means that the targets for 2030 and 2050 are still reachable but only if additional measures will be taken (EUR-Lex, 2022b). Before 2020, the European Parliament already professed a climate emergency (European Parliament, 2019). The European Commission responded to this by unveiling the European Green Deal (European Parliament, 2022). The European Green Deal is a roadmap towards the energy reduction

ambitions of the EU. By 2030, the EU aims to reach 55% of GHG emissions, 27% increase in renewable energy, and 30% reduction of primary energy consumption (EUR-Lex, 2022b). By 2050, the EU aims to reach 100% reductions of GHG emissions (Consilium, n.d.; Pereira et al., 2017). The European Green Deal consists of multiple plans, regulations, initiatives, and proposals to reach the European ambitions (European Parliament, 2022). The Renovation Wave, published on the 14th of October in 2020, is one of the steps on the road map of the European Green Deal (European Parliament, 2022). The Renovation Wave aims to double renovation rates in the next ten years to cut emissions and to reduce energy poverty (European Commission, 2020b). By 2030, 35 million buildings should be renovated (European Commission, 2020b). The strategy includes stronger regulations and standards, well-targeted funding, increasing capacity, sustainable construction products, and Neighborhood-based approaches (European Commission, 2020b).

On a *legislative level*, the Energy Efficiency Directive (EED 2012/27/EU and EED (EU) 2018/2012) (EUR-Lex Europe, 2012, 2018b) is the key legislative instrument for energy efficiency. Within sectorial legislation, the energy performance of buildings directive (EPBD) promotes cost-effective improvements in the energy performance of buildings. The European Commission already stated their aim to increase the efficiency of the existing building stock by energy efficiency renovations in the EPBD (2002/91/EU) in 2002 (EUR-Lex Europa, 2002). This directive is revised in 2010, 2018 and 2021 (EUR-Lex Europe, 2010, 2018a, 2021). The revision of the Directive in 2021 was based on the European Green Deal and the Renovation Wave strategy (European Commission, 2020b). In march 2023, a new proposal is written (European Parliament, 2023).

An overview of the revisions relevant to this research is shown in Table 18.

EPBD (2002/91/EU) (EUR-Lex Europa, 2002)	Lays down requirements as regards: a) The general framework for a methodology of calculation of the integrated energy performance of buildings; b) The application of minimum requirements on the energy performance of new buildings; c) The application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation; d) Energy certification of buildings; and e) Regular inspection of boilers and air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are more than 15 years old. (EUR-Lex Europa, 2002, p. 3)
EPBD (2010/31/EU) (EUR-Lex Europe, 2010)	This directive adds: a) The application of minimum requirements to the energy performance of new building units; b) The application of minimum requirements of the energy performance of - existing buildings, buildings units and building elements that are subject to major renovation; - building elements that form part of the building envelope and that have a significant impact on the energy performance of the building envelope when they are retrofitted or replaced; and - technical building systems whenever they are installed replaced or upgraded;

	c) National plans for increasing the number of nearly zero-energy buildings; d) Independents control systems for energy performance certificates and inspection reports. (EUR-Lex Europe, 2010, p. 5-6)
EPBD (2018/844/EC) (EUR-Lex Europe, 2018a)	The EPBD (2010/31/EU) (EUR-Lex Europe, 2010) is amended as follows: a) Definitions in A*rticle 2* are adjusted and extended; b) *Article 2a Long-term renovation strategy* is added stating that each member state shall establish a long-term renovation strategy. The article elaborates on the requirements for this strategy; c) *Article 6 New Buildings* is adjusted stating that member states should take into account high-efficiency alternative systems before the construction of new buildings; d) In *Article 7 Existing Buildings* the importance of addressing issues of healthy indoor climate conditions, fire safety, risks related to intense seismic activity, and financial feasibility is added; e) In *Article 8 Technical Building systems, electromobility and smart readiness indicator* the implementation of self-regulating devices is encouraged and is stated that the implementation of ducting infrastructure should be ensured by Member States for both residential and non-residential buildings; f) In *Article 10 Financial incentives and market barriers,* is specified "cost-optimal levels of energy performance" to "Member States shall link their financial measures for energy efficiency improvements of buildings to targeted or achieved energy savings"; g) *Article 14 and 15* about the inspection of heating and air-conditioning systems are further specified; h) *Article 19a Feasibility study* is added. This article states that the commission shall, before 2020, conclude a feasibility study clarifying the possibilities and timeline to introduce the performance certificates, in order to provide a long-term step-by-step road-map. (EUR-Lex Europe, 2018a)
EPBD (COM/2021/802 Recast) (EUR-Lex Europe, 2021)	The EPBD (2018/844/EC) (EUR-Lex Europe, 2018a) is revised as part of the 2021 Commission Work Programme "Fit for 55" package and follows up on the focus areas of the Renovation Wave Strategy. Directive 2010/31/EU (EUR-Lex Europe, 2010) is amended as follows: a) The subject matter underlines the vision for achieving a zero-emission building stock by 2050; b) A new definition of a zero-emission building is adjusted and the definition of a nearly zero-emission building is introduced; c) The monitoring framework of building renovation plans is strengthened; d) The possible use of metered energy is added to the calculation of the energy performance of buildings; e) The minimum energy performance requirements for protected buildings have been updated to account for advancements in

	technology. This update allows for the improvement of energy efficiency without altering the technical or visual characteristics of the building which was previously exempted from such requirements; f) EU-wide new energy performance standards for existing buildings have been introduced for public and non-residential buildings. Member states have to make sure that they meet these requirements; g) Member states have to introduce renovation passports before 2024; h) Stronger provisions on removal of obstacles and barriers to renovation, and the mobilization of financial incentives and technical support; i) Member States are required to focus their financial support on the alleviation of energy poverty and to support social housing to shield tenants from disproportionate rent levels following renovation; j) Comparability between energy performance certificates must be ensured across the Union by 2025 and the performance classes will be rescaled while taking into account national differences of building stocks. The validity of energy performance certificates between D and G should be reduced to five years. At the same time, energy performance certificates should be affordable. Lastly, national databases for energy performance certificates shall be set up by Member States. (EUR-Lex Europe, 2021)
Proposal EPBD 2023 (European Parliament, 2023)	a) As of 2030, all new buildings in the EU must be zero-emission (2027 for all public buildings) b) The minimum energy performance standards will be set at EU level. Residential buildings should be renovated to class F by 2030 and class D by 2033. EPC class G must cover at least 15% of buildings in each Member State, while lower class EPCs (D-G) would be issued for only five years. c) Higher EPC standards will be introduced for 2040 and 2050. (European Parliament, 2023)

Table 17 Amendments of the energy performance of buildings directive (source: EUR-Lex Europe 2002, 2010, 2018a, 2021).

Efforts to remove market barriers and support the delivery of planned energy are classified into the *support level.* These actions are designed to boost information sharing, training activities, and financial support enabling a broader reach of practices and technologies that contribute to improvements of the energy efficiency. These actions often support the implementation of ambitions on the European Level towards the European Member states level (Pereira et al., 2017).

3.3.2 Flemish strategy

Figure 12 shows an overview of the levels on which policy interventions regarding energy efficiency of the building stock can be implemented.

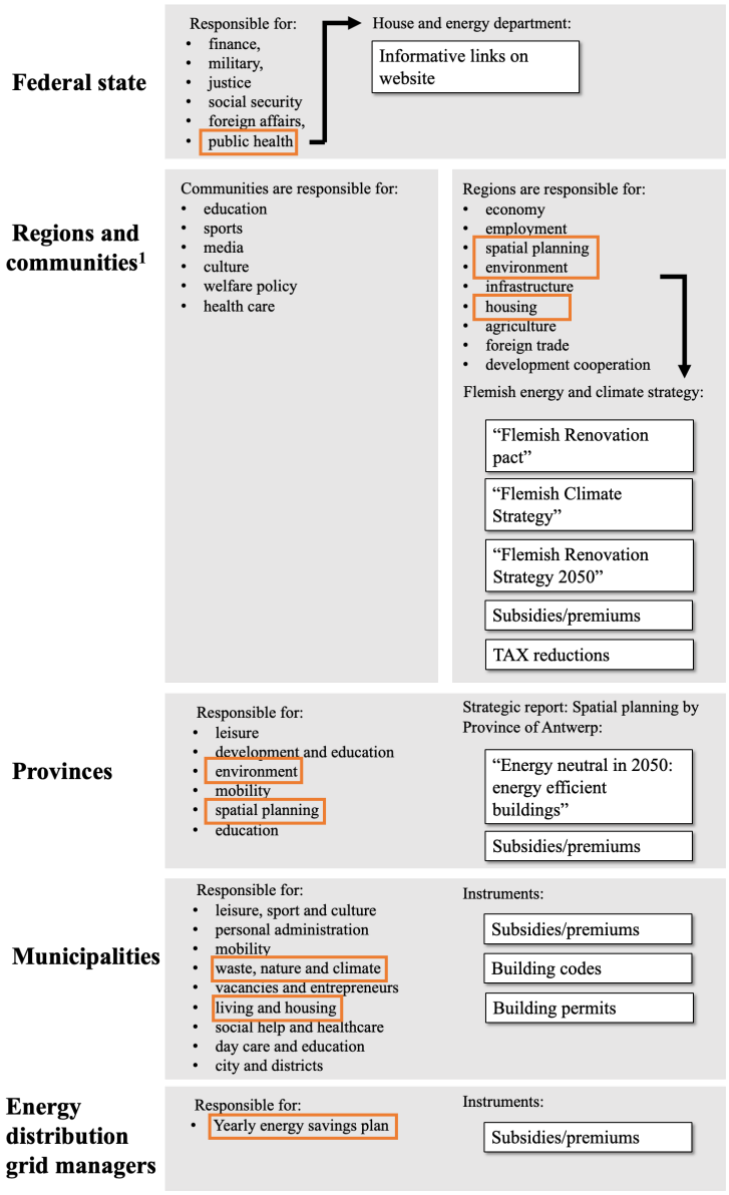

Figure 12 Levels of policy interventions in Belgium (Antwerpen, 2023, FOD Volksgezondheid 2023, Provinvie Antwerpen, 2023a; VEKA, 2023a).
[1]Communites in Belgium refer to the Flemish, German, and French speaking parts of the country.

3.3.2.1 The Federal State

The national governments of the European Member states are responsible to govern towards the goals drawn up by the European Union. As a federal state, Belgium subsumes the responsibility of the energy efficiency of the Belgian building stock to the three regions: Brussels, Wallonia, and Flanders (BE, n.d.). These regions are responsible for developing a strategy that increases the energy efficiency of buildings and reduces energy poverty (BE, n.d.). Although the Federal State subsumed the responsibility to the three regions, the Federal State introduced the 6% Tax rate for renovation works (VEKA, 2023e).

The responsibility for the rules and regulations on the efficiency of the building stock are not always the responsibility of regional governments. For instance, in the Netherlands the general rules are defined on a national level (Rijksoverheid, 2022).

There is a federal policy in place to protect residential energy customers with low income or in a vulnerable situation. This policy aims to make energy bills more affordable (Flemish Government, 2021). The policy includes several measures:

- Social tariff for electricity and gas: since 2004, a social tariff has been available for electricity and gas, offering lower prices than the average market rate for certain disadvantaged groups (Flemish Government, 2021). The tariff is recalculated every six months based on the cheapest rates in the market (Flemish Government, 2021).
- Gas and Electricity Fund: Local Public Social Welfare Centers (OCMWs) can provide preventive and curative support to the most vulnerable citizens who are unable to pay their gas and electricity bills through the Gas and Electricity Fund (Flemish Government, 2021).
- Social Heating Fund (fuel oil fund): For citizens who use heating oil, the Social Heating Fund was established to partially assist in the payment of heating bills for vulnerable target groups (Flemish Government, 2021).
- Instalment payments: the system of instalment payments allows customers to pay their fuel oil (or heating oil) bills in instalments (Flemish Government, 2021).
- Each region in the country has a regulatory body that oversees energy prices (Flemish Government, 2021). Suppliers are required to provide their respective regulator with the rates they apply each month. This encourages citizens to use these simulators and compare rates annually to choose the best contract (Flemish Government, 2021).

3.3.2.2 Flemish region

In 2020, at the initiative of Minister Demir, the Flemish Government approved the Flemish long-term renovation strategy for buildings 2050 (VEKA, 2020). This strategy followed the Flemish climate strategy, approved in 2019. The Flemish climate strategy includes the target to reduce GHG emissions in sectors such as mobility, agriculture, and buildings by 85% by 2050 compared to 2005, with the ambition to reach full climate neutrality as soon as possible after 2050 (VEKA, 2020). The Flemish renovation strategy 2050 is a refinement of the Flemish climate strategy. The main aim of this strategy is to reach climate neutrality for non-residential buildings and a reduction of 75% for residential buildings (VEKA, 2020).

In 2014, the Flemish government published the “Renovation Pact”. This was the first time that an energetic long-term target for 2050 was established (VEKA, 2020). Based on the work in the Renovation Pact and stakeholder consultations in the framework of the Power groups and the Energy Poverty Program, a Flemish long-term renovation strategy 2050 was drafted. This strategy implements Article 2bis of the EPBD Directive (2010/31/EU) on long-term renovation strategies of buildings (EUR-Lex, 2022a; VEKA, 2020).

The strategy is based on the following assumptions:

- Almost the whole building stock (96,5%) needs to be renovated or, if unavoidable, demolished and replaced by new buildings;
- Increase in tempo and depth of the current renovation pace is required;
- Barriers to speed up renovations should be minimized

(VEKA, 2020).

For residential buildings, the general ambitions are:

- All residential buildings in the Flemish region should reach a label A (see section 3.1.1 Energy Efficiency Renovations for elaboration) in 2050 (2022b). This is based on the idea that all

buildings should have the same energy performance certificates as a newly built building in 2015;
- An indicative GHG emission reduction of 2,3 Mt CO_2eq. The emission was in 2020, 109,26 million ton CO_2eq (Indicators, 2020). This requires a shift to making electricity and heat demand more sustainable, combined with energy managing through digitalization.

(VEKA, 2020).

To reach the ambitions stated above, between 2020 and 2050, over 2,9 million out of 3 million homes will have to undergo deep renovation yearly (VEKA, 2020). If energy efficiency measures are implemented one-by-one yearly, instead of total renovations, the number 3 million homes per year multiplies (VEKA, 2020). Currently, the renovation rate is estimated at 2,5%, this should increase to 3,5% (VEKA, 2020). The strategy of the Flemish government is to stimulate renovation on moments of transaction (selling and renting). Since 2008, landlords are obliged to calculate the energy performance certificate (EPC) of their dwelling and communicate the result to the tenant (VEKA, n.d.-d). This is verified through sampling. If no EPC is available, the landlord will receive a warning. The landlords can reply by submitting written arguments. After evaluating the arguments, a fine between 500 and 5000 euros may be imposed (VEKA, n.d.-d).

In addition to the EPC label A target, a package of measures has been put together in the "Renovation Pact" (VEKA, 2020):

1) Maximum U-values of the building envelope:
    i. Roofs and ceilings, walls and floors: U_{max} = 0,24 W/m^2.K
    ii. Windows: U_{max} = 1,5 W/m^2.K
    iii. Window glazing: U_{max} = 1,0 W/m^2.K
    iv. Doors and gates: U_{max} = 2,0 W/m^2.K
2. One of the following heating systems:
    i. Condensing boiler
    ii. (micro) Condensing heat pump
    iii. Decentralised heating devices with a maximum power of 15 W/m^2 connected to an efficient network

As stated in Chapter 3.1.2 Energy Poverty, the Flemish government contributed a section in their "Renovation Strategy Report 2050" to energy poverty. Here they defined energy poverty as: "having trouble with paying energy bills" (VEKA, 2020, p. 61). 15,9% of the families in the Flemish region appeared to face energy poverty (VEKA, 2020). To reduce this percentage, an Energy Poverty program is drawn up. This program includes measures for homeowners and tenants in the PRS such as:

- Rent and insulation premium for tenants and landlords: if a tenant initiates and coordinates insulation measures, the tenant will receive a fixed premium of 200 euros. The landlords will receive subsidies between 12 and 85 euros per insulated square meter.
- Interest-free loans for citizens who can only afford homes of low quality to increase the energy efficiency of these homes.
- Increased energy premiums for vulnerable homeowners.
- Rent subsidies and installation premiums when vulnerable citizens must move to a more suitable home.
- Free energy audits and energy coaches.
- Minimum energy performance requirements for roof insulation.
- Information provision.

(VEKA, 2020)

3.3.2.3 Provinces

As shown in Figure 12, provinces are responsible for leisure, development and education, the environment, mobility, spatial planning, and education. The environmental and spatial planning department have drawn up a strategic report “Energy neutral in 2050: energy efficient buildings” (Provincie Antwerpen, 2023a). To support energy efficiency in buildings, the province introduced premiums to support energy efficiency in buildings (Provincie Antwerpen, 2023a; VEKA, 2023e). Provincial authorities do not have direct competence over poverty policy. Nevertheless, they encounter the consequences of poverty in various policy domains (Provincie Antwerpen, 2023b).

3.3.2.4 Municipalities

Municipalities are responsible for the implementation and enforcement of laws and regulations proposed by the national government (Ecohuis Antwerpen, n.d.). Municipalities can support initiatives that support energy efficiency renovations such as energy houses (f.e. Ecohuis in Antwerp), CondoReno, and the FOSSTER-project which will be further described in chapter 3.2.6 Policy Instruments. In the Flemish region, 18 energy houses are spread amongst the provinces. These houses work as a one-stop-shop where citizens can gather more information about climate related topics and whether they require a building permit for renovation (Ecohuis Antwerpen, n.d.). These organizations are subsidized by the Flemish government and part of their renovation strategy to provide more information to citizens (VEKA, 2020). Everybody can request information for free (Ecohuis Antwerpen, n.d.). In addition, the energy houses sometimes offer temporary programs in collaboration with the municipality in which vulnerable target groups receive additional support in the form of a free energy advise including a 25 euro budget to replace lighting and shower heads (Ecohuis Antwerpen, n.d.). Furthermore, these energy houses and related energy coaches, check the physical state of dwellings (Ecohuis Antwerpen, n.d.). They assess whether the quality meets the minimum requirements stated in the Codex Wonen (Codex Vlaanderen, 2022; Ecohuis Antwerpen, n.d.). If the requirements are not met, the energy coaches are in the position to call for legal action (Ecohuis Antwerpen, n.d.).

Furthermore, when an initiator of an energy efficiency renovation requires a building permit, the municipality has the responsibility to approve or refuse the request (VEKA, n.d.-a). In addition, municipalities can provide premiums to support renovation works. In Antwerp, the municipality introduced a renovation premium specifically for landlords to support the renovation of private rented dwellings (City of Antwerp, 2023).

In the municipality of Antwerp, energy poverty is a significant challenge, particularly due to a higher proportion of groups at a high risk of energy poverty, such as renters, single individuals, single-parent families, and individuals without income from employment (Municipality of Antwerp, 2023). While several initiatives in Antwerp, such as Het Ecohuis, the autonomous municipal company AG Energiebesparingsfonds, and the energy department of the Public Center for Social Welfare (OCMW), are already contributing to addressing this challenge, achieving a socially energy and climate transition remains a mission for the city of Antwerp (Municipality of Antwerp, 2023).

Five cities, including Antwerp, are establishing living labs to implement social innovations in the energy sector. The Antwerp pilot projects within the SONNET living lab are named 'GelijkStroom' (Municipality of Antwerp, 2023). All these pilot projects aim to establish a connection between energy objectives, social objectives, and the empowerment of disadvantaged groups in Antwerp (Municipality of Antwerp, 2023). Within these pilot projects, the city strives to play a facilitating and connecting role by acting as a matchmaker, bringing together parties, and supporting them in their search for affordable energy solutions for vulnerable target groups in the city (Municipality of Antwerp, 2023). For instance, experimentation with innovative business models take place, such as through affordable rental formulas for energy-efficient appliances or systems that incentivize energy renovations in rental properties in the city (Municipality of Antwerp, 2023).

Some municipalities introduced the “Noodkoopfonds” that is introduced for “urgency buyers” (VEKA, 2023d). Urgency buyers are households who, partly out of necessity (due to a lack of decent and affordable private and social rental housing), have purchased a substandard quality home without the means to invest in improving its quality, resulting in high energy bills, among other consequences (VEKA, 2023d). Due to a lack of sufficient personal resources and solvency, these owners are systematically excluded from renovation grants or urban renewal subsidies (VEKA, 2023d). To address this issue, an interest-free loan of up to 50.000 euros is provided for each emergency purchase home (VEKA, 2023d). Given the size of this target group (estimated at 4% of homeowners) and their specific financing needs, a "bullet financing" formula is employed, wherein the borrowed amount is typically repaid in a lump sum at the end of the loan period, without a fixed term (VEKA, 2023d).

A project within the municipality of Gent called “Dampoort knapT OP” was launched in 2015 (SAAMO, 2023). The Public Centre for Social Welfare (OCMW) of Ghent allocated 300.000 euros for the renovation of ten homes (SAAMO, 2023). The partners of Community Land Trust (CLT) Ghent provided intensive social and technical guidance during the renovation works. Upon selling their property, the so-called “urgency owners” are required to repay the intervention to the OCMW (SAAMO, 2023). Additionally, a portion of any potential increase in value is allocated to the OCMW (SAAMO, 2023). This approach allows the same intervention to be utilized for multiple consecutive households and promotes efficient use of available government resources (SAAMO, 2023).

3.3.2.5 Energy distribution grid managers

Energy distribution parties are contractually bound to landlords or tenants but do not decide whether an energy efficiency renovation takes place. However, fluctuating, or high energy prices could be an extra incentive to perform EERs. Stable and low energy prices could decrease the urgency (Zakeri et al., 2022). Furthermore, Flanders has a unique strategy that energy distribution grid managers are obliged to send a yearly energy saving plan (Codex Vlaanderen, 2022). As part of these plans, they can provide premiums (Fluvius, 2023a). For instance, ENGIE and Fluvius offer subsidies in Flanders and Brussels for cavity wall insulation, floor insulation and roof insulation (ENGIE, 2023; Fluvius, 2023b).

3.3.2.6 Other organizations and actors

Multiple organizations can be found that support EERs in the PRS in different ways. Tenant organizations support tenants by providing information about laws and regulations that could support them. The “Eigenaarsbond” is an independent interest group to be at service of owners and co-owners, private individuals, and professionals such as managers, stewards and syndics, company managers, SME companies and real estate companies throughout the Flemish region. This organization defends the owners and advises and defends the right to housing (Eigenaarsbond, n.d.).

To sell more loans and to improve their image, banks offer renovation loans (Bertoldi et al., 2021). The conditions to request these loans differ per bank (ING, 2023). However, in general these loans can be used for energy efficiency renovations. With the energy savings caused by the renovation, the loan can be paid (Bertoldi et al., 2021). Some banks offer services to help the investor to identify what renovations could be implemented (CFP, 2023). For example, ING recently launched the ING Sustainable Buildings Guide in Belgium. This is a tool that their clients can use to identify building measures to improve the EPC of their building (ING, 2023).

Finally, regional, and local public health and welfare institutes take the responsibility to combat energy poverty. For example, the Flanders Institute for Healthy Living aims to promote healthy living and a healthy environment within different policy areas (Health Inequalities portal, 2023). The issue of indoor environment has been a topic of discussion on the international stage for some time, particularly within organizations such as the World Health Organization (WHO) and the European Union's Action Program

on Environment and Health (Gezond Leven, 2023). In 2000, the WHO recognized the fundamental right to breathe clean air indoors (Gezond Leven, 2023). In 2018, the WHO published the "WHO Housing and Health Guidelines" (World Health Organization (WHO), 2018). The Flemish Indoor Environment Decree of 2004 established reference and intervention values for a range of pollutants, with the main objective of reducing or eliminating health risks for residents or occupants of a dwelling or publicly accessible building (Codex Vlaanderen, 2004).

3.3.3 Comparison European and Flemish strategy

This section examines how the Flemish strategy corresponds to the European strategy. These differences could function as a conversation starter for the interviews with policy makers. Table 19 provides an overview.

European strategy based on EPBD	**Flemish strategy**
Supports a high energy efficient and decarbonized building stock by 2050 (EPBD (2010/31/EU) (EUR-Lex Europe, 2010).	States that a climate neutral building stock should be created as soon as possible (VEKA, 2020, p. 9).
Stresses that Member States should create a stable environment for investment decisions (EPBD (2010/31/EU) (EUR-Lex Europe, 2010).	Chapter 3, 6, and 7 elaborate on cost effective realization, investments in broader context and stimulation of mechanism for smart financing to support investments (VEKA, 2020, p. 2-3).
Stresses that Member States should enable consumers and business to make more informed choices to save energy and money (EPBD (2010/31/EU) (EUR-Lex Europe, 2010). Gives a strong political signal on the EU's commitment to modernize the building sector in the light of technological improvements and stimulating building renovations (EPBD (2018/844/EU) (EUR-Lex Europe, 2018a).	Chapter 4 discusses how citizens should be incentivized to take energy efficiency measures. The strategy focusses on providing information, technical advice, free loans, premiums, fiscal measurements, mandatory norms, unburdening and awareness, and communication and marketing (VEKA, 2020, p. 40-50).
Renovation wave strategy as part of the European Green Deal that contains an action plan with regulatory, financing and enabling measures to boost building renovation. The objective is to at least double the annual energy renovation rate of buildings by 2030 and to foster deep renovation ((EUR-Lex Europe, 2021; Papantonis et al., 2022).	The Flemish renovation strategy states: "Currently, according to data from the EPC database, about 3.5% of the existing housing stock of nearly 3 million dwellings (houses and apartments) meets the target, 2.9 million dwellings still need to evolve towards the 2050 target (rounded up 96.5% of the housing stock)8. This means that, if efforts are spread uniformly, an average of over 3% of the housing stock or over 95,000 housing units per year over the next 30 years must evolve toward the 2050 target" (VEKA, 2020, p. 12).
Stresses the need for an upgrade of the existing framework to reflect higher ambitions and more pressing needs in climate and social action, while providing EU countries with flexibility to consider the differences in the building stock across Europe (EPBD (2021/802/EU) (EUR-Lex Europe, 2021).	Not applicable.
Sets out a road map of Europe can achieve a zero-emission and fully decarbonized building stock by	"The Flemish Climate Strategy 2050, approved by the Flemish government on December 20, 2019, sets the taregts of

2050 (EPBD (2021/802/EU) (EUR-Lex Europe, 2021).	reducing greenhouse gas emissions from the non-ETS sectors by 85% by 2050 (compared to 2005 levels), with the ambition of moving toward full climate neutrality" (VEKA, 2020, p. 4). Meaning that the Flemish Climate strategy is a less ambitious than the European targets.
Focus on the worst performing buildings in each country (EPBD (2021/802/EU) (EUR-Lex Europe, 2021).	The Flemish renovation strategy focuses on "the least performing buildings of its building stock" (VEKA, 2020, p. 54). The least performing buildings are determined by the Energy Certificate in this report.
Modernizing the building stock, making it more resilient and accessible (EPBD (2021/802/EU) (EUR-Lex Europe, 2021).	Not specifically mentioned in the Flemish renovation strategy.
Supports better air quality, the digitalization of energy systems for buildings and the roll-out of infrastructure for sustainable mobility (EPBD (2021/802/EU) (EUR-Lex Europe, 2021).	Not specifically mentioned in the Flemish renovation strategy.
Facilitates more targeted financing to investments in the building sector, complementing other EU instruments supporting vulnerable consumers and fighting energy poverty (EPBD (2021/802/EU)) (EUR-Lex Europe, 2012).	Chapter 3 is specifically determined to cost effective investments. Chapter 4.6 is specifically determined to energy poverty (VEKA, 2020, p. 33-40 and p. 59-61).
Aims to contribute to reach a target of at least 60% emission reductions by 2030 in the building sector in comparison to 2015 and achieve climate neutrality by 2050 (EPBD (2021/802/EU)) (EUR-Lex Europe, 2021).	This target is not specifically mentioned in the Flemish renovation strategy. However, the following is stated: "Flanders is pursuing the goal of reducing its greenhouse gas emissions in the non-ETS sectors by 35% by 2030 compared to 2005. The Flemish Climate Strategy 2050, approved by the Flemish government on December 20, 2019, includes the target of reducing greenhouse gas emissions from the non-ETS sectors by 85% by 2050 (compared to 2005), with the ambition to evolve towards full climate neutrality" (VEKA, 2020, p. 9).
Will work hand in hand with other initiatives of the European Green Deal package. Within particular, the review of the proposed new emissions trading system for fuels used in building, the EED, the Renewable Energy Directive (RED), as well as the Alternative Fuels Infrastructure Regulation (EPBD (2021/802/EU)).	The Flemish renovation strategy takes the Green deal into account: "In its December 2019 Communication "The European Green Deal," the European Commission already proposed a 50-55% reduction in European greenhouse gas emissions by 2030 compared to 2005. Based on an evaluation of additional climate efforts by other major trading blocs, Flanders can support a feasible, affordable and bottom-up increase in the European 2030 greenhouse gas reduction target that is cost-efficiently distributed among member states, allows for international flexibility, and insofar as it does not increase energy bills for citizens and businesses" (VEKA, 2020, p. 8). The

	EED and RED are not mentioned in the Flemish renovation strategy.

Table 19 Comparison European and Flemish renovation strategy (source: author based on the EPBDs and the Flemish renovation strategy).

From the table can be obtained that the Flemish targets for 2050 and 2030 are lower than stated in the EPBD 2021/802/EU (EUR-Lex Europe, 2021). This can be explained since the Flemish strategy is based on the EPBD 2010 (EPBD 2010/31/EU) (VEKA, 2020). Since then, these targets have changed (EUR-Lex, 2022a).

3.3.4 Policy instruments

As stated in the introduction, there is a lot of research available on governance towards energy efficiency renovations. "Governance" can be understood as an intended activity undertaken by one or more actors seeking to shape, regulate or attempt to control human behavior to achieve a desired collective end" (van der Heijden, 2014, p. 60). For example, traditionally, the government introduced regulations such as building codes to reach the desired end goal of increasing the safety and sustainability of buildings (Driessen et al., 2007). All these different methods to steer towards desired collective end, can be defined as policy instruments. Policy instruments can be divided into three different approaches to governance (Van der Heijden, 2014). These will be discussed in the following sections.

3.3.4.1 Direct regulatory interventions

Buildings are one of the oldest regulated entities. The first laws on the construction of buildings were already developed around 1750 BC. Since then, direct governmental interventions were slowly integrated in the society (Van der Heijden, 2014).

Actors involved in direct regulatory interventions are predominantly governments. Looking at Figure 12, direct regulatory interventions take place on every level. It is often argued that governments are needed to establish and maintain property rights and address market failures to give certainty to citizens, investors, and developers for example (Van der Heijden, 2014). Nowadays, property rights are regulated by zoning regulations and issuing of land. The government reduces market failures and intervenes to minimize monopolies and asymmetric information. This is all done to protect citizens for unequal consequences of GHG emissions, unaffordable building benchmarking tools, and unfair building transactions due to hidden information. Another important aspect that asks for governmental intervention, is bounded rationality (Van der Heijden, 2014). This concept explains that people are limited by cognitive capacities in their decision-making. People are unable to see long-term impact of their behavior which could lead in context of climate change, to too little action to stop or minimize climate hazards (Van der Heijden, 2014). Finally, governments can apply a very long-term vision, which is often not the case for citizens and businesses (Van der Heijden, 2014).

Governance tools within the direct regulatory approach can be divided into statutory regulation, direct subsidies, and other economic instruments.

Statutory regulation

There are three types of statutory regulations that can exist on their own or combined: prescriptive based standards, performance-based standards, and target or goal-oriented standards (Van der Heijden, 2014). Prescriptive standards set standards are in place to prevent harmful events (Van der Heijden, 2014). Performance base standards specify the aimed performance but do not specify how to reach this performance. Goal-oriented standards link behavior to regulatory goals to prevent harmful events (Van der Heijden, 2014). Risky aspects of statutory regulations are that statutory regulations require sufficient support from citizens to avoid fuss (Van der Heijden, 2014). In addition, it might disrupt the free market (Van der Heijden, 2014).

In the Flemish region examples of statutory regulation can be found. Energy efficiency of buildings is mostly regulated by performance-based regulations. These regulations include targets for:

- Thermal insulation (maximum U-values or minimum Rc-values)
- Ventilation minimum (minimum required fresh air in m^3/h per m^2)
- Measures to minimize overheating (maximum U-values or minimum Rc-values)
- Efficiency of installations (outdated technologies must be replaced)
- Energy performance (Energy Performance Certificate)
- Minimum share renewable energy (in percentages)

(VEKA, n.d.-b).

Direct subsidies

Direct subsidies are a financial support to steer towards a specific outcome. Subsidies can be used to protect vulnerable citizens, but also to change the attitude towards a specific target. In Flanders, multiple subsidies are offered to support EERs. The subsidies differ per province, municipality, and grid operator. In Antwerp, 66 subsidies related to the renovation of buildings were found on the fourth of June 2023 in the subsidy searcher provided by the Flemish government (VEKA, 2023e). These subsidies include:

- Free energy audits;
- Rent subsidies;
- Subsidies for solar panels;
- Total renovation premium;
- Roof insulation subsidies;

(VEKA, 2023e).

Subsidies are criticized because they do not always realize equality (Van der Heijden, 2014). For example, some people are not able to obtain the information required to request a subsidy (Van der Heijden, 2014). Another critique is that subsidies do not always reach their goal. The money spent on the subsidies can be viewed as wasted (Van der Heijden, 2014). Lastly, it is not always clear which targets need to be supported (Van der Heijden, 2014). For example, is it fair to subsidize energy bills while the subsided money goes to fossil fuel companies?

Economic instruments

Economic instruments are used to steer behavior by taxes and tradable permits (Van der Heijden, 2014). In the Flemish region this strategy is also used in the context of EERs. An example is the regulation that stimulates landlords to increase the energy performance of their rented dwellings by limiting the rent indexation if the dwelling has an energy label D or lower (VEKA, n.d.-c). This instrument is sometimes criticized because it can create the illusion that not contributing is accepted if you pay your fines (Van der Heijden, 2014).

3.3.4.2 Collaborative governance

Collaborative governance is characterized by collaborations between governments, businesses, civil society groups, and individuals (Van der Heijden, 2014). These types of collaborations often occur between one or multiple levels shown in Figure 12 and sometimes, together with another (commercial) party. For governments, collaborating with business and society groups is valuable because governments gather information through these collaborations (Van der Heijden, 2014). This information sharing is often viewed as a major advantage of collaborative governance that results in more efficient governance tools (Van der Heijden, 2014). In addition, collaboration may help non-governmental actors in that they can try to have governance tools implemented that suit them best (Van der Heijden, 2014). Lastly, because non-governmental actors were involved in developing the governance tools, the feel more responsible for the results (Van der Heijden, 2014).The role of the government within these

collaborations is generally to initiate, the manage and to guard the governance tools (Van der Heijden, 2014).

Disadvantages of collaborative governance are that with including multiple stakeholders, it is harder to reach consensus the aims and goals are sometimes experienced as too ideological, and collaborative governance might lead to manipulation by stronger stakeholders (Van der Heijden, 2014).

Examples of collaborative Governance are the Energy Houses, CondoReno (CondoReno, 2023) and the FOSSTER-project (VEKA, 2022c). CondoReno creates Integrated Home Renovation Services (IHRS) in the Netherlands and Belgium that make energy efficiency renovations easier for homeowners in condominiums. This is done by combining strengths of market-driven home renovation services with local government-driven integrated housing renovation services in Flanders (CondoReno, 2023). These will be presented in adaptive business models. The business models will be integrated in financial schemes, tested in eight homeowners associations, and evaluated to show market-evidence (CondoReno, 2023).

The Flemish One-Stop-Shop for Energetic Renovations (FOSSTER)-project aims to evaluate the current support services of energy houses and to combine these with good practices from other related projects. In this way, one-stop-shop models should be created for different homeowners (VEKA, 2022c). This should reduce financial and technical barriers for homeowners to perform an energy efficient renovation (VEKA, 2022c).

3.3.4.3 Voluntary programs and market driven governance

The difference between collaborative governance and voluntary governance is that collaborative governance is based on the idea of sharing lessons and ideas while voluntary governance built on voluntary participation with financial or direct reward (Van der Heijden, 2014).The term market driven seems to imply that this governance approach is without government involvement. These tools are developed and implemented by non-governmental actors with governments at some distance (Van der Heijden, 2014). Therefore, these type of policy instruments cannot be related to the levels shown Figure 12. However, non-governmental actors often determine rules based on governmental regulations (Van der Heijden, 2014). This results in businesses and citizen groups that regulate their own behavior based on the regulatory interventions of the government (Van der Heijden, 2014).The idea is that businesses and citizens can better decide for themselves how to reach a collective end (Van der Heijden, 2014). The government can threaten to implement regulation unless citizens and businesses act for themselves (Van der Heijden, 2014). Examples of voluntary programs and market driven governance, revolving loan funds, contests and challenges, and benchmarking tools for the energy efficiency of buildings such as LEED, WELL, and BREEAM (Van der Heijden, 2014).These tools are developed by market parties, but they are highly related to regulations on the efficiency of buildings defined by the government (Van der Heijden, 2014).

Another example is Energy Service Companies (ESCOs). The general business model is that the company implements, operates, and maintains energy efficient measures. For doing so, the company charges a fee below the energy costs the client faced before modification (Van der Heijden, 2014).

3.3.5 Evaluation of policy instruments

Policy instruments can be evaluated by the theory-based evaluation method (Murphy et al., 2012). In this method, every policy instrument is described according to its content, the underlying theory, and the impact of the instrument (Murphy et al., 2012). Figure 13 shows the simplified steps of the evaluation method. This method is used in this research to study the relation between the barriers to perform energy efficiency renovations and the policy instruments that aim to reduce these barriers. During the empirical study, stakeholders are asked to evaluate if and how an identified barrier is reduced by a certain policy instrument.

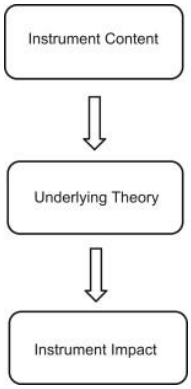

Figure 13 Simplified theory-based policy evaluation method (source: Murphy et al., 2012).

In the first step, the content of an instrument is described as it is described in literature. Secondly, the basis of the intervention is described. Thirdly, the impact of the instrument is described based on stakeholder opinions (Murphy et al., 2012).

3.3.6 Overview policy instruments

This section provides an overview of the policy instruments developed for energy efficiency renovations that could be identified from the literature study.

Instrument	Type	Providers
My Renovation Premium: Subsidies that can be applied for by owner-occupiers or landlords offered by the Flemish Government. A percentage of the costs for window replacement, wall/roof/floor insulation, heat pump, solar boiler, electricity and sanitary, gas condensation boiler. The premium can be applied after paying for the measure. The premium can be applied for once in five year's time (VEKA, 2023f).	Direct regulatory intervention – Direct subsidies	Flemish Climate and Energy Agency
Renovation Premium for Landlords: within the renovation premium, landlords automatically belong to the highest income category. The City of Antwerp wants that landlords can receive the same support as the middle income category (City of Antwerp, 2023).	Direct regulatory intervention – Direct subsidies	Municipality of Antwerp
My Renovation Loan: loan of max. 60.000 euros that can be applied for to implement energy efficient measures (VEKA, 2023b).	Direct regulatory intervention – economic instrument	Flemish Climate and Energy Agency
Index limitations: landlords can only increase the rent according to the indexation limit of 10% if the dwelling has an energy label C or higher. Landlords can increase the rent with 5% if the dwelling has an energy label D. Landlords cannot increase the rent if	Direct regulatory intervention – economic instrument	Flemish Climate and Energy Agency

the dwelling has an energy label E or lower (VEKA, 2023b).		
EPC required on transaction: in every region it is mandatory to have an EPC label available on transaction of a residential building (VEKA, 2023).	Direct regulatory intervention – statutory regulation	Flemish Climate and Energy Agency
Support offered by energy houses: (Free) support by energy houses, providing information and supporting the process that can be requested for by owner-occupiers, tenants, and landlords (Ecohuis Antwerpen, n.d.).	Collaborative governance	Flemish government and the municipality of Antwerp.
Road map on energy performance certificate: the energy performance certificate describes the measures that should be taken to improve the energy performance of a building (VEKA, n.d.-e).	Collaborative governance	The Flemish government in collaboration with commercial energy auditors.
Investment & savings calculation tools: tools offered by commercial parties and banks to calculate the expected investments and savings of the energy efficient measures that can be used by both owner-occupiers, tenants, and landlords (ING, 2023).	Voluntary governance	Banks
Consultants that offer support during the renovation process: multiple consultants that provide support and advise in energy efficiency renovations (Renoffice, 2023; Solvari, 2023).	Voluntary governance	Consultants

Table 18 Overview policy instruments based on literature study.

3.4 Barriers study

This section investigates the energy efficiency renovation process and the barriers to perform an energy efficiency renovation (SQ2). The barriers are structured per phase per stakeholder.

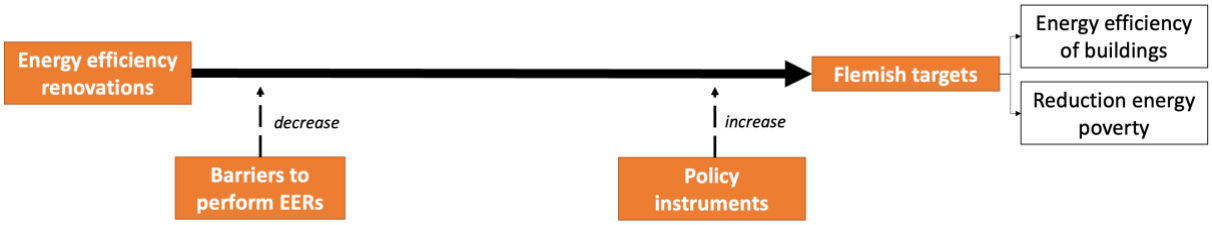

Figure 14 First and second level of the conceptual model (source: author).

3.4.1 Energy efficiency renovation process

Prior to each EER, stakeholders need to decide to perform an EER. This decision-making process in studied by multiple researchers. Often, the decision-making process is separated in different stages including understanding the needs, information gathering, pre-evaluating, finalizing the decision, implementation, and post evaluating (Baginski et al., 2017; Ebrahimigharehbaghi et al., 2019). This distinction is made because the way decisions are made, change during the renovation process (Ebrahimigharehbaghi et al., 2019). Ebrahimigharehbaghi et al. (2019) distinguish the following steps in the renovation process based on an extensive literature review: (1) considering, (2) planning, (3) decision, (4) executing, and (5) experiencing.

In the considering phase, the socioeconomic factors such as education and income appear to be most important, in the planning phase, the awareness of the benefits becomes relevant, in the decision and executing phase access to information and professionals appears to be required to decide to renovate, and during the evaluation phase, good and bad experiences will have influence on the following renovation project (Ebrahimigharehbaghi et al., 2019).

The process helps to identify the stakeholders and the barriers experienced by these stakeholders. Figure 15 shows an overview of the stakeholders playing a deciding role in the different stages of the renovation process and the barriers related to these stakeholders. The following sections elaborate on the content of the figure.

Phase	Stakeholders	Barriers
Considering	• Landlord • Renter • Syndics / AoO	• Discrepancies between estimated and realized savings • Lack of information • Rent increase • Split incentive • High upfront costs • Inequalities within association of owners
Planning	• Landlord • Renter • Syndics / AoO • Architect • Contractor	• Varying energy efficiency targets • Disagreement on the energy efficiency effect of measures • Limited rights to renovate • Time-consuming and complex process • Complex stakeholder structures
Decision	• Landlord • Syndics / AoO	• Mistrust in governmental policies • Finding reliable professional
Executing	• Landlords • Renters • Syndics / AoO • Contractor	• Disturbance caused by renovation works • Temporary move • No profits for contractors
Evaluation	• Landlord • Renter • Syndics / AoO	• Bad experiences (of others)

Figure 15 EER process related to the stakeholders and barriers (source: author).

3.4.2 Stakeholders

Multiple stakeholders with different roles on different moments are involved in the renovation process. Barriers to perform EERs may arise from the type of stakeholder and the decision-making process phase. This section describes the role of every stakeholder in the renovation process to understand their behavior, intentions, interrelations, interests, and decision-making (Brugha et al., 2000).

3.4.2.1 Tenant

In this research, a tenant is defined as someone who occupies an apartment and pays rent to the owner of the apartment based on the agreements stated in a contract between the tenant and the landlord. A tenant in the private rental sector has little choice but to rely on landlords' willingness to perform an EER (Middlemiss et al., 2015). This is visible in the Decision Phase shown in Figure 8. The tenant does not play a deciding role in this phase (Middlemiss et al., 2015). If a tenant aims to reduce its energy consumption, often, tenants can only reach this by behavioral changes (Papantonis et al., 2022). This puts tenants in a vulnerable position (Middlemiss et al., 2015). However, not all tenants support energy efficiency renovations due to multiple barriers such as the heavy impact of the renovation works (Femenias & Granath, 2022). More barriers will be discussed in section 3.4.3 Barriers.

3.4.2.2 Landlord

In this research the landlord is defined as someone who rents out an apartment in the private rental sector. In Flanders, 94,4% of all the private rented dwellings are held by private owners (Winters et al., 2010). In Flanders, there is no tradition of pension funds or insurance companies investing in residential property (Winters et al., 2010). On average, private landlords let 2,2 dwellings (Winters et al., 2010). This means that the private rental market is very scattered among lots of private landlords. In 2005, 33,9% of the landlords was over 65 years old. Almost half of them was still employed. In addition, landlords have an above average educational decree and income (rental income not included) (Winters et al., 2010). Typical for Flanders is that investing in private rental is not seen as very profitable and seen as risky (Winters et al., 2010). Therefore, there is a strong tendency to selecting tenants based on their financial situation and sometimes even based upon other demographic characteristics such as their

gender, origin, and household type (Winters et al., 2010). Since 2018, there is a restriction on the data a landlord can request from a potential tenant to reduce discrimination (Moore, 2018).

The contractual relationship between the tenants and landlords is based on the principal freedom, described in the Housing Rental Decree of 13 April 1997 if a contract is signed before 2019 (Winters et al., 2010) and the Flemish Housing Rental Decree if the contract is signed after 2019 (Vlaanderen, 2023b). These acts state that a landlord is free to choose who is renting his property and to what price. Only annual adjustments can be made to the contract (VEKA, 2019). Tenants can be asked to pay at most a three-month-deposit at the start of the rental agreement (VEKA, 2019). A rental agreement for a dwelling must be for a period of at least nine years, although exceptions can be made. The maximum duration of a short-term contract is three years, and if both parties do not decide to cancel the contract, the contract will convert to a nine-year contract (VEKA, 2019). For nine-year contracts, tenants must end their contract on a three-month's notice, and landlords can require rent depending on the year of the contract (VEKA, 2019). Landlords must give a six-month's notice to end the contract and can only do so if the dwelling will be used by a family member or due to renovation works (Vlaanderen, 2023b).

Sometimes the landlord is represented by a renting office. No useful scientific literature was found on the role of a renting office during the energy efficiency renovation process. Since a renting office is an additional stakeholder in the process, it is plausible that this complicates the renovation process, particularly due to the communication between the landlord and tenant being facilitated through the real estate agent.

3.4.2.3 Association of Owners (AoO)

When dwellings are situated in the same building block, an owners' association is set up (Eigenaarsbond, n.d.). An owners' association is a legal entity that brings together all the owners of a building. This legal entity is responsible for the management and maintenance of a building (Eigenaarsbond, n.d.). How the owner association is set up depends on the type of building. For small apartment blocks, the owner association often includes all the owners of the apartments in that specific building block. If the building is owned by more than two owners, it is obliged to appoint a syndic (VEKA, 2022a). The owners' association can make decisions about the common parts of the building. In the case of large investments such as roof or wall insulation in smaller buildings, all the members of the association should agree and pay for the investment (Berghs, 2022). This sometimes makes it challenging for landlords to perform energy efficient renovations (Berghs, 2022). Even if they are willing to do so, they are not always permitted (Berghs, 2022).

3.4.2.4 Architect

It is mandatory to appoint an architect when the energy efficiency renovation requires a building permit is required (VEKA, n.d.-a). With the architect, clear agreements should be made about the construction works. These agreements are contractually defined (VEKA, n.d.-a). An architect is not the one who decides or initiates whether a renovation takes place and is therefore only involved in the planning and executing phase.

3.4.2.5 Contractor

Like the architect, appointing a contractor is necessary if a building permit is required (VEKA, n.d.-a). Also, the contractor is not the one who decides, or initiates if renovation works take place (VEKA, n.d.-a).

3.4.2.6 Supporting stakeholders

Besides the deciding stakeholders discussed in the previous sections, there are stakeholders that can support energy efficiency renovations such as governmental actors, energy distribution grid managers, and banks. Chapter 3.3 described these actors and the related policy instruments.

3.4.3 Barriers

To speed up energy efficiency renovations, stakeholders must act. However, the assumption is that stakeholders will not come in action if they perceive to face risks or disadvantages (Ebrahimigharehbaghi et al., 2019; Jakob, 2007). Therefore, many researchers investigated what barriers towards EERs could be. In these studies, the barriers are linked to specific stakeholders, specific phases in the decision-making process, and specific sectors such as the non-residential sector, owner-occupied dwellings, and the social rental sector. Little research is performed on the barriers to perform EERs in the private rental sector. Therefore, in this research, the barriers identified from literature, should be confirmed in practice. This section will discuss these barriers based on the different phases of the decision-making process introduced in Figure 16.

3.4.3.1 Considering phase

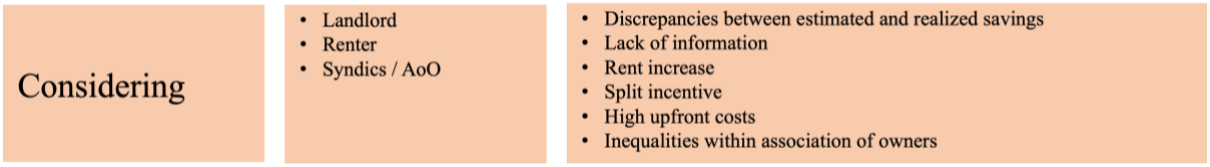

Figure 16 Barriers in the considering phase (source: author).

Palm et al. (2020) identified the barrier "discrepancies between estimated and realized savings" as one of the barriers occurring in the considering phase. This barrier relates to the technical implications to estimate the real savings of an investment in energy efficiency measures since the savings are very specific to the building but also to the behavior of the occupier. This could be a barrier for all the different landlord and tenant types. Even though, tenants and landlords are willing to perform the renovation, this uncertainty could make it too risky to invest. (Palm et al., 2020)

Another barrier that is often identified in literature is "lack of information" (Papantonis et al., 2022). This barrier refers to the fact that a lot of tenants and landlords are not aware of the urgency or the benefits of EERs. And even if they are aware, they do not know how to take initiative. "Lack of information" does not only refer to a shortcoming in information. It also refers to the complexity of finding all the right information. "Lack of information" is a barrier for almost all tenants and landlords. However, some tenants could feel enough motivation to gather information, even if the information is complex or hard to find. (Papantonis et al., 2022)

"Rent increase" is a barrier identified for tenants (Femenías et al., 2018). Since EERs increase the quality of a dwelling and require investments, there is a fair chance that landlords will index the rent of the dwelling maximally or increase the rent significantly when the contract expires. Some tenants could therefore be very hesitant to initiate EERs since it may cause them to be unable to pay their rent. (Femenías et al., 2018)

A barrier that is related to this issue is the split incentive issue (Maciosek et al., 2022; Papantonis et al., 2022). This is related to the issue that in the most common situation, a landlord needs to invest in energy efficiency measures, while the landlord will not benefit from energy savings, more comfort, and other benefits of an energy efficient dwelling. This can hold landlords back from investing in EERs (Maciosek et al., 2022; Papantonis et al., 2022).

Even though a landlord is willing to invest in an EER and believes that the investment will be paid back in a certain way at a certain point in time, it could be the case that the landlords is not able to pay the "high upfront costs" (Papantonis et al., 2022).

An issue that could occur in owner associations, could be that the owners in the association have a different amount of money to spend. For some owners, it might be no problem to invest in energy efficiency measures, for others, the investment might be too high. For measures that should be taken together, this holds back the owners that were willing to invest from doing so (Berghs, 2022).

3.4.3.2 Planning phase

Figure 17 Barriers in the planning phase (source: author).

Palm et al. (2020) identified that in the planning phase, the "varying energy efficiency targets", could cause confusion for tenants, landlords, architects, and contractors. In addition, contractors and architects could "disagree on the energy efficiency effect of measures". Both could reduce the willingness to move forward in the process (Palm et al., 2020).

For tenants, a major barrier to EERs is that they have "limited rights to renovate". If they are convinced that a renovation would be beneficial for them, they must get permission from their landlord or must convince their landlord to lead the process (Murphy et al., 2012). In addition, legal aspects could limit landlords' capability to renovate (Murphy et al., 2012). Some limiting legislation could be the required permission of the owner's association to renovate or the protected city and village sights (Vlaanderen, 2016).

Besides the legal aspects, the process is perceived as a time-consuming and complex process. Not every tenant of landlord, has the time or motivation to perform sufficient research on EERs (Papantonis et al., 2022).

A financial barrier is the idea that there is "limited amount of subsidies" (Ebrahimigharehbaghi et al., 2019). Although Fluvius, ENGIE and the Flemish government offer a wide range of subsidies for energy efficiency renovations, it could be that landlords and tenants are not aware of these subsidies or do not qualify for these subsidies (Ebrahimigharehbaghi et al., 2019). The attitude towards subsidies in the Antwerp region specifically will be researched further in the empirical study.

Finally, the "complex stakeholder structures" in the private rental sector could cause eventually that no agreement can be found in the planning phase, leading to landlords quitting the process (Palm et al., 2018).

3.4.2.3 Decision phase

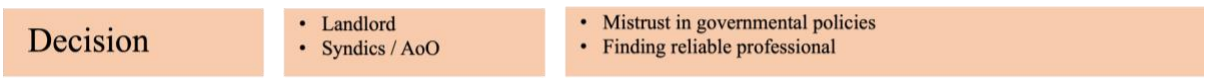

Figure 18 Barriers in the decision phase (source: author).

Within the decision-phase two barriers can be identified in literature. The first one is "mistrust in governmental policies" and the second one is to find a "reliable professional" (Palm et al., 2020). If landlords and tenants are not experienced with EERs, they fully rely on the information provided by others. Therefore, they need to have faith in the people they rely on to move forward in the process.

3.4.2.4 Execution phase

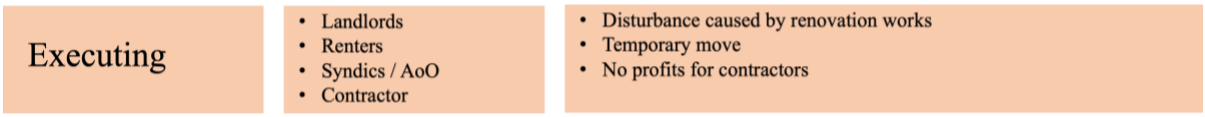

Figure 19 Barriers in the execution phase (source: author).

For tenants, two barriers for the execution of an EER are "disturbance" caused by the renovation works or even a "temporary move" (Femenías et al., 2018). The depth of the renovation determines the disturbance for the tenants which results in a high uncertainty about their living situation. The importance of this barrier could differ per tenant based on duration of their contract (Femenías et al., 2018).

The execution of EERs appears to be not very profitable for contractors (Palm et al., 2020). This keeps contractors from taking contracts. Currently, contractors get enough offers to be critical about the offers that they take. This contributes to a shortage of contractors for EERs specifically (Ebrahimigharehbaghi, 2022).

3.4.2.5 Evaluation phase

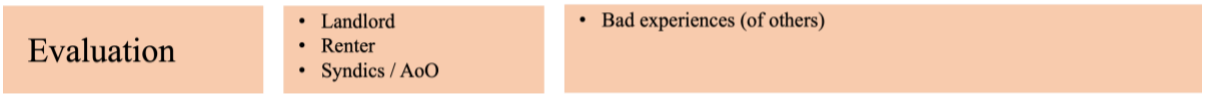

Figure 20 The evaluation phase (source: author).

For both landlords as tenants, past experiences of themselves or from others, could influence the willingness to perform renovations (Ebrahimigharehbaghi et al., 2019). Renovation works can be highly expensive and complicated (Papantonis et al., 2022). Additionally, these works are still perceived as a novel form of renovation by some individuals (Papantonis et al., 2022). This presents risks for both landlords and tenants, especially considering the difficulties in holding contractors accountable for errors after the completion of the works (Thuvander et al., 2012). Negative experiences of others can reduce the willingness to undertake EERs, while positive experiences can increase this willingness (Ebrahimigharehbaghi et al., 2019).

3.5 Cross-comparison barriers and policy instruments

This section connects the policy instruments identified in Chapter 3.3 to the barriers identified in Chapter 3.4 based on the underlying theory of each policy instrument to study the alignment of the barriers and policy instruments (SQ4) according to the conceptual framework shown in Figure 19.

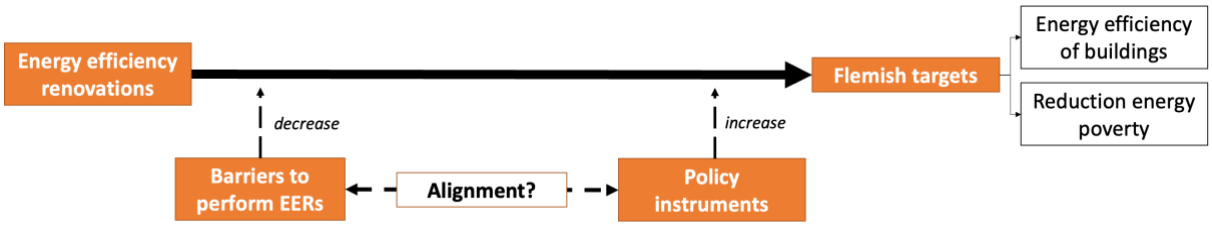

Figure 19 First, second, and third level of the conceptual framework (source: author).

Table 20 shows an overview of the policy instruments and the related barriers.

Phase	Type	Instrument	Underlying theory
Considering phase	Direct regulatory intervention – Direct subsidies	**My Renovation Premium:** Subsidies that can be applied for by owner-occupiers or landlords offered by the Flemish Government. A percentage of the costs for window replacement, wall/roof/floor insulation, heat pump, solar boiler, electricity and sanitary, gas condensation boiler. The premium can be applied after paying for the measure. The premium can be applied for once in five year's time (VEKA, 2023f).	Aims to reduce the barrier of **high upfront costs** by making it more affordable to invest in energy efficiency measures. (VEKA, 2023f).
Considering phase	Direct regulatory intervention – Direct subsidies	**Renovation Premium for Landlords:** within the renovation premium, landlords automatically belong to the highest income category. The City of Antwerp wants that landlords can receive the same support as the middle income category (City of Antwerp, 2023).	Because nearly 60 percent of the people in Antwerp live in rental properties, the city want to support making these properties more energy efficient with a premium specifically designed for landlords to reduce the barrier of **high upfront costs** (City of Antwerp, 2023)**.**
Considering phase	Direct regulatory intervention – economic instrument	**My Renovation Loan:** loan of max. 60.000 euros that can be applied for to implement energy efficient measures (VEKA, 2023b).	Aims to reduce the barrier of **high upfront costs** by making it more affordable to invest in energy efficiency measures (VEKA, 2023b).

Considering phase	Direct regulatory intervention – economic instrument	**Index limitations:** landlords can only increase the rent according to the indexation limit of 10% if the dwelling has an energy label C or higher. Landlords can increase the rent with 5% if the dwelling has an energy label D. Landlords cannot increase the rent if the dwelling has an energy label E or lower (VEKA, 2023b).	Aims to reduce the **split incentive issue** by adding financial advantages to improving the EPC of a dwelling for the landlord (VEKA, 2023b).
Considering phase	Voluntary governance	**Investment & savings calculation tools:** tools offered by commercial parties and banks to calculate the expected investments and savings of the energy efficient measures that can be used by both owner-occupiers, tenants, and landlords (ING, 2023).	Reducing the barrier of **discrepancies between estimated costs and savings** (ING, 2023).
Considering phase	Direct regulatory interventio	**EPC required on transaction:** in every region it is mandatory to have an EPC label available on transaction of a residential building (VEKA, 2020).	Reduce the barrier of **varying energy efficiency targets**
Planning phase	Collaborative governance	**Road map on energy performance certificate:** the energy performance certificate describes the measures that should be taken to improve the energy performance of a building (VEKA, n.d.-e).	Reducing the barrier of **varying energy efficiency targets** and **disagreement on the energy efficiency effect of the measures** (VEKA, n.d.-e)**.**
All phases	Voluntary governance	**Consultants that offer support during the renovation process:** multiple consultants that provide support and advise in energy efficiency renovations (Renoffice, 2023; Solvari, 2023).	Reducing the barrier of **lack of information, finding a reliable professional,** and reducing **discrepancies between estimated costs and savings** (Ecohuis Antwerpen, n.d.).
All phases	Collaborative governance	**Support offered by energy houses:** (Free) support by energy houses, providing information and supporting the process that can be requested for by owner-occupiers, tenants, and landlords (Ecohuis Antwerpen, n.d.).	Reducing the barrier of **lack of information** and **finding a reliable professional** (Ecohuis Antwerpen, n.d.).

Table 20 Cross-comparison between barriers and policy instruments per phase and approach to governance.

From the table, it appears that the policy instruments in the considering phase identified from the literature study are almost all direct regulatory interventions. Besides the direct regulatory interventions, support can be requested from consultants and energy houses. In addition, investment and savings calculation tools can be used to minimize the barrier of discrepancies between actual and realized savings. Barriers that do not seem to be minimized with the policy instruments that are currently in place, are rent increase and inequalities between homeowner associations. During the empirical study it should be investigated if rent increase and inequalities between homeowner associations are important

barriers and how these barriers can be reduced. In addition, the success of the policy instruments in place to reduce the other barriers should be analyzed.

An important policy instrument in the planning phase appeared to be the road map on the energy performance certificate. This should reduce the barrier of varying energy efficiency targets and disagreement on the energy efficiency effect of measures. Again, support from consultants or energy houses can be requested to minimize the complexity of the planning phase. Barriers that do not seem to be minimized with the policy instruments that are currently in place are the limited rights to renovate and the complex stakeholder structures. During the empirical study it should be researched whether the limited rights to renovate and the complex stakeholder structures are important barriers. Especially for renters, the limited rights to renovate might be a very important barrier during the planning phase especially since it seems like there is currently no policy instrument that seems to support renters in initiating an EERs. For example, loans cannot be requested by tenants (VEKA, 2023b).

During the decision-making phase, the execution phase, and the evaluation phase, only support from consultants or energy houses are policy instruments that could minimize the barrier of finding a reliable professional. Barriers that do not seem to be minimized are mistrust in governmental policies, disturbance caused by renovation works, temporary move, no profits for contractors, and bad experiences of others. The importance of these barriers will be investigated during the empirical study.

Chapter 4

Results

4 Results

This section summarizes the results of the empirical findings based on the main themes derived from the sub-questions. The topics will be discussed in order of the conceptual model: correlation between the Flemish and European targets, barriers to perform EERs, policy instruments and their evaluation according to stakeholders, and the PESTEL-analysis. The interviews are coded in ATLAS.ti by using deductive and inductive coding meaning that codes are added to the predefined codes if they appeared to be relevant. Codes that were used to analyze the correlation between the Flemish and European targets are "energy efficiency renovations", "energy poverty", "renovation strategy", and "international policy instruments". Codes used to analyze the barriers are "barriers to perform EERs" and "motivation to perform EERs". Codes used to analyze policy instruments and their evaluation are "policy instruments" and "policy instrument evaluation". The code to perform a PESTEL-analysis is "contextual factors". This code is split-up into the following subcodes: political-, economical-, social-, technical-, environmental-, and legal factors.

4.1 Correlation Flemish and European targets

Interviewee E3, who is responsible for designing the Flemish Renovation Strategy, indicated that he always writes a renovation strategy based on the European guidelines for 2030, 2040, and 2050 (Interviewee E3). These guidelines set the minimum targets for Flanders (Interviewee E3 and E5). On this basis, the measures needed to meet these guidelines are determined (Interviewee E3). However, interviewee E3 mentioned that the European guidelines are constantly becoming more ambitious and that he is now working on a renovation strategy that meets the new targets. This plan is yet to be evaluated and approved by the European Commission (Interviewee E3). In the meantime, current policy instruments will be used to achieve the new European targets (Interviewee E2, E3, and E5). Interviewee E3 does, however, reveal that his proposals for implementing certain policy instruments are sometimes weakened due to political discussions. This, he said, could result in European and Flemish ambitions not being achieved after all (Interviewee E3). He argues that it is not about the types of measures that are missing, but more the scope of these measures (Interviewee E3). This has resulted in a greater focus on minimum requirements instead of premiums in the next strategy proposal (Interviewee E3).

Interviewee E2, E3, and E5, all confirmed that energy efficiency renovations are an important policy area now. However, interviewee E3 and E5 mentioned that there is a tendency to be hesitant in implementing measures for the private rental sector. At both the Flemish energy and climate agency and the Flemish cabinet for Finance and Budget, Housing and Heritage, there is a fear of distorting the private market too much by taking strict measures (Interviewee E3 and E5). Interviewee E5 explained that implementing strict measures could lead to many private landlords selling their houses while there is already a shortage of housing in the private rental sector. Interviewee E3 and E5 said that there is a strong focus on creating a long-term strategy for the private rental sector to give private tenants time to adjust, instead of pushing these landlords to energy efficiency renovations. In addition, implementing regulations for the private rental sector could push low-income groups out of their houses due to rent increase (Interviewee E2, E3, and E4).

All the policy experts refer to the energy performance certificate methodology to measure the depth of a renovation (Interviewee E1 – E5). According to the Flemish Renovation Strategy, all buildings should have an energy label A in 2050 (Interviewee E3 and E5). Therefore, all the legislation is focused on improving the energy performance certificate (Interviewee E3).

In general, energy poverty is measured by the "Woonquote" and the "Budgetnorm" as described in the literature study. However, a clear strategy to reduce the percentage of citizens above the "Woonquote" and below the "Budgetnorm" was not defined. Both Interviewee E3 and interviewee E5 indicated that within the private rental sector, effort goes into stimulating letting within social rental offices. In Flanders, private tenants can let their house via a social rental office. The social rental office searches for tenants and guarantees continued payments. Private landlords letting via a social rental office, can

make use of the highest premiums for renovations (Interviewee E3 and E5). In this way, the Flemish government tries to stimulate both energy efficiency renovations while reducing energy poverty. Interviewee E1 stated that energy poverty is a complex issue because the different types of energy poverty require different strategies. He mentioned three types of energy poverty:

1) Normal energy consumption but not enough income to pay for it.
2) Higher consumption than estimated leads to high energy bills in the annual statements and not enough savings to pay these bills.
3) Excessive consumption due to ignorance or poor condition of the house.

According to E1, the strategy for the first case is very clear. He stated: "In this case, help from the government is required". In the other cases, it is more difficult to determine who is responsible for solving the problem. Interviewee E1 said that education could already play a role in the conscious use of energy.

Interviewee E1 and E2 stated that help from the government and education is a task that is performed on the initiative of the municipality. Especially energy houses and initiatives supported by municipalities take the lead in support and education (Interviewee E1 and E2). Interviewee E2 stated that as a municipality they performed a lot of research on energy poverty. However, she mentioned that the municipality is currently not allowed to work on this topic too often since only a small share of the financial resources from the Flemish government is devoted to energy poverty (Interviewee E2).

Financial support, such as the social tariff offered by the Federal State introduced in the literature study, is being phased out according to Interviewee E1. This is illogical considering the proportion of people living in energy poverty has only increased (Interviewee E1).

4.2 Barriers to perform energy efficiency renovations in the private rental sector

In this section, all the barriers identified from the interviews with landlords and tenants are discussed per stakeholder per phase.

4.2.1 Considering phase

Discrepancies between actual and realized savings

Landlords L1, L2 and L5 said that lack of clarity about costs and savings was not a barrier for them. However, it was not that they had much clarity on that. Moreover, they did not approach the investment that way. They saw the implementation of energy efficient measures more as necessary maintenance and not as something that they had to earn back based on rent increase (Interviewee L1, L2, and L5).

Lack of information

Interviewee R1, R2, R3, and R4 all stated that they did not feel they had a good understanding of what energy efficiency measures can be taken in a house. These interviewees were all waiting for social housing, belong to the lowest income group, and interviewee R1, R2, and R3 did not have a diploma. These interviews were taken in collaboration with Ecohuis Antwerp, meaning that all the interviewees were aware of Ecohuis Antwerp. When was asked how they get to know Ecohuis, they all said that Ecohuis approached them actively.

Other tenants stated that they did not have the feeling that they knew a lot about energy efficiency renovations, but they thought they could find sufficient information online, at energy houses, or from friends and family (Interviewee R5, R6, R7, R8, and R9). Besides the fact that tenants did feel that they would be able to find information, most tenants (Interviewee R1, R2, R3, R5, R6, R7, R8, R9, and R10) indicated that they would not be so sure what to do with that information. They feel like renovation is the responsibility of their landlord.

Landlord L1, L2, and L3 stated that they were very confident about their knowledge. They had a good understanding of the measures that could increase their energy performance certificate (Interviewee L1, L2. And L3). Interviewee L4 mentioned that she was not aware before she started the renovation but could find enough information online and at a municipal organization to decide which measures, she wanted to implement. Interviewee L5 said that he was not so sure. However, his owner's association was very aware of potential measures. He trusts them in advising him (Interviewee L5).

Inequalities within association of owners

Interviewee L2 indicated that he only performs interventions that he can decide for himself without consulting the owner's association. He said: "you know how that goes, someone proposes something, another person disagrees, and in the end, no one feels like taking the initiative anymore" (Interviewee L2).

Other landlords (Interviewee L1, L3, L4, L5, and L6) were less negative about cooperation within the owner's association. So far, they have always been able to find consensus due to the mandatory roof insulation and double glazing. This provides less room for discussion they argued (Interviewee L1, L3, and L6). In addition, they mentioned that they can perform most of the other measures proposed on the energy performance certificate without permission of the owner's association (Interviewee L1, L3, L4, L4, L5, and L6). However, when was asked what they meant with other measures, only one of them mentioned the installation of renewable energy sources.

Split incentive

Landlords said they felt responsible to provide their tenants with a comfortable home (Interviewee L1 – L6). Adequate insulation and a well-maintained heating system are all part of this, they stated. According to them, the investments they had to make for this are part of the job and are also important to maintain the quality of the apartments (Interviewee L1, L2, L3, L4, L5, and L6). Interviewee L4: "In my eyes, I will always recoup an investment the moment I sell the apartment again". However, there was only one landlord that considers installing solar panels (Interviewee L1). All the other landlords did not see the added value of installing solar panels, heat pumps or other forms of generating renewable energy (Interviewee L2, L3, L4, L5, and L6). Interviewee L3 stated: "Maybe it sounds a bit harsh, but I do not know why I would install solar panels honestly. That is an investment that I will never recoup with the small rent increase I can ask for". Interviewee L2 stated: "Renting out these apartments is my retirement, so yes, I am not going to make investments that do not pay me anything. Of course, I must do maintenance, that is part of it, I want to be a neat landlord. But I am not going to take measures just to be sustainable". From the interviewees it can be obtained that landlords feel the incentive to maintain their apartments. However, increasing the energy efficiency alone is not a reason to make an investment.

Tenants indicated very clearly that investing in someone else's house was not an option for them (Interviewee R5, R6, R7, R8, R9, and R10). They were not convinced that such an investment would pay back itself quickly enough (Interviewee R5, R6, R7, R8, R9, and R10). Other tenants did not had the financial resources to even think about paying for energy efficiency renovations themselves (Interviewee R1, R2, R3, and R4).

High upfront costs

Interviewees L1, L3, and L6 stated that the investments costs are high, but that is not a barrier for them not to do it. Interviewee L1 stated: "That is no barrier for me, only I have to say that I do not know how much sustainability measures cost. For a new kitchen or bathroom, I can make quite a good estimation. But we will find out. Eventually, I believe that every investment will come back at us".

Interviewee L2, L4, and L5 were somewhat more cautious in their investments. They said that, although they were willing to invest in some energy efficiency measures, they had to do it step by step. They said they did not have enough savings to take on too much risk (Interviewee L2, L4, and L5).

Rent increase

Tenants' reaction to an increase in rent was mixed. Tenants who saw their flat more as a temporary residence were reluctant to a rent increase. They preferred to keep their rent as it was. They thought the physical status of their house was fine as a temporary residence (Interviewee R7, R8, and R9). Some argued that they preferred to save as much money as possible to buy their own house soon (Interviewee R5 and R7). Interviewee R7 stated: "I would prefer to buy a house as soon as possible, so this house is temporary. This is also why I would only want to have works done of things that really bother us. Otherwise, I would rather have them done after we moved". High energy costs were solved by dressing warmer and taking shorter showers. However, they would understand an increase in rent if the quality of their home increases (Interviewee R5, R7, and R9). Interviewee R7 said: "I would really understand, only I would regret it because I would rather save that money for a house. I do not mind dressing a bit warmer and taking short showers" (Interviewee R7).

Interviewees R8 and R10 find a rent increase unreasonable. They both felt that investing in energy efficiency is part of maintaining a house and this is the landlord's responsibility (Interviewee R8 and R10). Interviewee R10 said: "My landlord had the windows replaced seven years ago. I am very happy about that, only I would not want to pay extra for it. My landlord increases the rent every year according to indexation, which is fine. Actually, I think renting out a house should always include making sure the house is well maintained and if it is, you can index. Maybe that is not how it works officially but that is the feeling I have. If my house still had single-glazing windows, I would have found it unreasonable if my rent was indexed". Interviewee R8 said: "Landlords make a lot of money. It would have to be a very high investment to make me feel that I should contribute anything to that. And I would also want to know very precisely what it would earn me".

Lastly, there were also tenants that would understand an increase but fear they cannot afford it (Interviewee R1, R2, R3, R4, and R9). Interviewee R9 said: "If my apartment is renovated, it will be an apartment in a completely different market segment. This is something I have discussed with my landlord. I expect he would almost double the rent. Besides, I only have a gas stove in the living room now. After the renovation, this will be a full heating system. Small chance that I will consume less energy".

Interviewee L1, L2, L4 and L5 stated that they would not necessarily increase the rent if they perform renovation works. They think that this is part of maintaining a rented property (Interviewee L1 and L2). Interviewee L1 said: "Renovation is part of the job. That does not have to translate into the rent". Interviewee L2 said: "Rent increases will always depend on the market. I can only increase my rent if my apartment really falls into a different market segment".

Interviewee L3 renovated his apartments last year. This renovation was so drastic that the tenants had to move out of the flat. He said he did consider in his decisions what tenants were willing to pay a higher rent for. In this, he indicated that a nice bathroom, a good kitchen, and a good energy performance certificate were the most important. The rents have significantly gone up in his case but that is not only due to the investment in energy efficiency measures. The quality of the whole apartments improved.

4.2.2 Planning phase

Varying energy efficiency targets

When landlords were asked what they perceive as energy efficiency targets for their apartments, they all referred to increasing their energy performance certificate (Interviewee L1 – L6). None of them had the experience that the targets for energy efficiency were unclear or often changing (Interviewee L1 – L6).

Time-consuming and complex process

Tenants considered the renovation process to be the landlord's responsibility (Interviewee R5, R9, and R10).

For interviewees L1, L3, L5, and L6 a time-consuming and complex process was not a barrier. Interviewee L1 stated: "No, it certainly is not a barrier, the people are basically ready to do the works, I have the plans ready, the only problem is that the tenants still live in the apartments". Interviewee L2 stated: "Well as a self-employed person, every hour is a lost hour if you look at it rationally. On the other hand, I do want my apartments to be well maintained". He tries to limit the time he is spending on maintaining the apartments but understands that some maintenance must be done.

Disagreement on the energy efficiency effect of measures

Tenants were not always convinced that energy efficiency renovations would reduce their energy costs (Interviewee R9 and R10). Interviewee R9 stated: "In our case, it is not clear whether this will reduce our energy costs because we only heat the living room with a gas stove now. With a new heating system, we are likely to consume more because we will heat multiple rooms. On the other hand, perhaps double-glazing would compensate for that again".

Other tenants confirmed that comfort is the principal reason for taking energy efficiency measures. If they wanted to reduce their energy bills, they could dress a little warmer or replace their lights (Interviewee R4, R5, and R9).

Landlords were confident that the measures proposed on their energy performance certificate will increase the energy efficiency of their apartments (Interviewee L1 – L6). However, some landlords had their doubts on the measure that states that they had to insulate their walls. For interviewee L1 and L2, this measure was too drastic. Interviewee L3 stated that: "insulating walls will only cause moisture problems unless you do it on the outside. But that is not very realistic in the case of small apartment blocks". In addition, interviewee L1 and L3 indicated that they prefer to carry out an energy efficiency renovation in one go instead of the proposed steps as indicated on the certificate (Interviewee L1 and L3).

Limited rights to renovate

Tenants do not feel that they had any say in the execution of works (Interviewee R1 – R10). Some tenants therefore considered it the full responsibility of the landlord to take the initiative in an energy efficient renovation (Interviewee R6 and R10). Whether tenants wanted to take the initiative often depended on the necessity of the renovation and the relationship with the landlord (Interviewee R1, R2, R3, R4, R6, R8 and R9).

Multiple tenants stated that they do not want to risk their relationship with their landlord (Interviewee R1, R3, R4, R6, R8, and R9). Interviewee R6 said: "I do not dare just ask my landlord if he wants to do something. I do not want to come across as whiny and keep a good relationship". Interviewee R8 stated: "What I run into is that I do not really know what I could ask and if I were to ask something I think I should come up with something concrete". For interviewee R2, the urgency of a renovation was very high. Therefore, he was less worried about their relationship. He approached his landlord multiple times, but the landlord refused to take energy efficiency measures. He said that he preferred that the tenant leaves (Interviewee R2).

Landlords had the feeling that they are the ones who are responsible for the renovation and the ones who can decide to perform a renovation (Interviewee L1 – L6). However, some argued that it is harder to decide to perform energy efficiency measures when you must discuss with tenants when they are home (Interviewee L4 and L6). Interviewee L1, L2 an L3 stated that they prefer to perform energy efficiency renovations in between tenants. Meaning that the tenants must move out when they want to take energy efficiency measures. That is legally not always possible. In this case, this slows them down in taking energy-efficiency measures (Interviewee L1, L2, and L3).

Complex stakeholder structures

Both landlords and tenants did not mentioned complex stakeholder structures as a barrier during the planning phase of EERs (Interviewee L1 – L6 and R1 – R10). However, some interviewees mentioned this barrier implicitly. These statements are very much related to the barrier "limited rights to renovate". Tenants were not always aware of their role within the EER process (Interviewee R6, R9, and R10).

4.2.3 Decision phase

Finding reliable professional

As stated in the previous section, finding reliable professionals adds to the complexity of the process but it was for landlords no reason to stop the energy efficiency renovation (Interviewee L1, L2, and L3).

Mistrust in governmental policies

Mistrust in governmental policies appeared to be no barrier for both landlords and renters (Interviewee L1 – L6 and R1 – R10).

4.2.4 Executing phase

Disturbance caused by renovation works

Tenants found disturbance annoying but no reason to demonstrate against the renovation works (Interviewee R1 – R10). Interviewee R5, R6, R9, and R10 mentioned that they hoped that their landlord would discuss when the work would take place. Disturbance would become a greater barrier for these tenants if they had no say in the moment the works will take place. In addition, their home must remain livable (Interviewee R5, R6, R9, and R10).

For landlords, disturbance was not a barrier. However, interviewee L3 advised to do the works all at once, this also minimizes disturbance for neighbors as well (Interviewee L3).

Temporary move

A temporary move was for both landlords and tenants perceived as a big barrier to perform renovation works (Interviewee R1 – R10, and L1 – L6). Tenants found it very annoying but in most cases were willing to cooperate. Interviewee R5 and R6 stated that for two weeks, they could think of going on vacation during the renovation works. But for a longer period, a very good alternative has to be offered. All the other tenants perceive a temporary move as the responsibility of their landlords (Interviewee R1, R2, R3, R4, R7, R8, R9, and R10). He must offer a convenient temporary home, a moving service and a place to storage furniture. Interviewee R10 said: "For me, this is almost unrealistic. I need a lot of help to move. I certainly expect help from my landlord". Both interviewee R7 and R8 stated that they would really prefer that the renovation works would take place when they moved out of the house, so in between tenants".

For interviewee L1, moving out the tenants was the biggest barrier to perform the renovation works. He stated that he cannot do the works when the tenants still rent the apartment. He said: "We are now trying to do as much as possible on the outside of the apartment, so the roof has been insulated, the boilers have been replaced. But there are still a lot of things we want to do for which we really have to go in the apartments and then the tenants really must get out. Not for a while but forever because after such a renovation we are looking for another profile. Only what I am having trouble with, I do not know if my tenants can find another place. They are now in a spacious apartment at a good location for a relatively low price" (Interviewee L1).

Interviewee L2 also stated that he preferred to do renovation works in between tenants. So far, his tenants cancel the contract often around five years. This gives him the opportunity to perform maintenance works in between tenants (Interviewee L2).

Interviewee L3 has terminated the contract with its tenants to carry out renovation works. “It is legally stipulated that you can cancel a rental contract if the renovation works will cost more than, I think fifteen times the rent. I had to be able to prove that, but I did and then I was able to cancel the contract without any problems. The tenants also responded well to that” (Interviewee L3).

4.2.5 Evaluation phase

Bad experiences (of others)

For both tenants and landlords, bad experiences of themselves or others were no barrier to perform renovation works (Interviewee R1 – R10, and L1 – L6). Interviewee L6 stated: “of course there are people with bad experiences, including we, but that would never be a reason not to do it. It is also not the case that if you have been to a bad hairdresser, you suddenly never go to the hairdresser again”.

Tenants and landlords related bad experiences mostly to bad experiences occurring during the EERs (Interviewee R1 – R10 and L1 – L6). Besides the improvement in comfort, they found it hard to evaluate the energy savings of an energy efficiency renovation. For landlords, the improvement was hard to measure since they did not know if and how their tenants changed their behavior after a renovation (Interviewee L1 and L4). Tenants argued that with fluctuating energy prices, it was hard to notice improvements (Interviewee R5 and R6).

4.2.6 Summary of the evaluations

Table 21-25 show an overview of how landlords and tenants evaluate the barriers identified from literature study per phase.

Considering phase

Stakeholder	Discrepancies between actual and realized savings	Lack of information	Inequalities within association of owners	Split incentive	High upfront costs	Rent increase
R1	N/A	+	N/A	+	N/A	++
R2	N/A	+	N/A	+	N/A	++
R3	N/A	+	N/A	+	N/A	++
R4	N/A	+	N/A	+	N/A	++
R5	N/A	-	N/A	+	N/A	+
R6	N/A	-	N/A	+	N/A	O
R7	N/A	-	N/A	+	N/A	+
R8	N/A	-	N/A	+	N/A	++
R9	N/A	-	N/A	+	N/A	+
R10	N/A	-	N/A	+	N/A	++
L1	--	--	--	--	--	--
L2	--	--	++	+	-	--
L3	O	--	--	+	--	-
L4	O	-	--	--	-	--

L5	--	-	--	-	-	--
L6	O	-	--	-	--	-

Table 21 Overview barriers considering phase (source: author).

From Table 23 can be obtained that landlords interviewed in this research do not necessarily perceive barriers in the considering phase to perform EERs. When analyzing their arguments mentioned during the interviews, it can be stated that landlords are willing to perform EERs if they feel like an investment is "necessary". However, their vision on "necessary measures" is not determined by energy efficiency ambitions. Moreover, this is determined by obligations or unavoidable maintenance.

Tenants in a lower income group that were on the waiting list for social housing, did not have the feeling that they had a good understanding of potential energy measures that could reduce their energy bill. Nevertheless, they were in contact with energy auditors from Ecohuis who help them to take measures to lower their energy bills. This contact came about on the initiative of Ecohuis. Other tenants stated that they did not have the idea that they know a lot about energy efficiency renovations but, they had the idea that there is sufficient information available online. However, they did not understand why that information could be relevant for them because they feel like an energy efficiency renovation is the responsibility of their landlord.

For tenants, rent increase was a barrier for several reasons:

1) Young tenants (21-30) saw rent increase as a barrier because they prefer to save money to buy their own house soon. They preferred to dress warmer or lower the temperature of their heating system to save money and did not believe that energy savings could compensate for the rent increase.
2) Tenants argue that it is unreasonable to increase rent because energy efficiency measures are part of the regular maintenance works.
3) Tenants cannot afford an increase. Especially tenants that are on the waiting list for social housing were hesitant for rent increase. Since they pay social tariff, they expect that energy bills will not lower enough to compensate for rent increase.

However, when landlords were asked if they would increase the rent if they performed energy efficiency measures, their answer was no. Only, if they would renovate the complete apartment including interior changes, they assumed that they would increase the rent a little bit. However, in that case the current tenant must (temporary) move out because the renovation is too drastic.

The split incentive issue can be interpreted as a fairly important barrier for tenants since they argued that it is unreasonable to invest in EERs as a tenant since energy savings will not pay back the investment quickly enough.

To summarize, tenants do not feel responsible to initiate or to contribute financially to EERs. Therefore, they do not search actively for information. In addition, they are not aware of the financial benefits they can possibly take advantage of, even if their rent increases.

Planning phase

Stakeholder	**Varying energy efficiency targets**	**Time-consuming and complex process**	**Disagreement on the energy efficiency effect of measures**	**Limited rights to renovate**	**Complex stakeholder structures**	**Do not want to risk relation with landlord**

R1	N/A	O	-	+	-	+
R2	N/A	O	-	+	-	--
R3	N/A	O	-	+	-	+
R4	N/A	O	-	+	-	+
R5	N/A	--	-	+	-	O
R6	N/A	O	O	-	O	++
R7	N/A	O	O	+	-	O
R8	N/A	O	O	+	-	++
R9	N/A	--	+	+	O	+
R10	N/A	--	++	-	O	--
L1	--	--	-	-	-	N/A
L2	--	-	+	-	-	N/A
L3	--	--	+	-	-	N/A
L4	--	O	--	+	-	N/A
L5	--	--	--	-	-	N/A
L6	--	--	--	+	-	N/A

Table 22 Overview barriers planning phase (source: author).

The empirical study shows that landlords interviewed in this research are not deterred by the complexity of the renovation process. However, some landlords stated that it is a little harder to renovate their rented home in comparison to the home that they occupy themselves. Furthermore, some measures on the EPC road map are not suitable for specific situations which might result in disagreement on the energy efficiency effect of certain measures such as wall insulation.

For tenants, the most important barriers are the limited rights to renovate and that they do not want to risk their relationship with their landlord. From the empirical study can be obtained that tenants do not want to interfere with renovation works. In addition, they are not convinced that renovation works will always be beneficial for them. This results in tenants taking measures that do not require them to contact their landlords. These measures might reduce their energy bill but will not increase the energy efficiency of their building.

Decision phase

Stakeholder	**Finding reliable professional**	**Mistrust in governmental policies**
R1	N/A	--
R2	N/A	--
R3	N/A	--

R4	N/A	--
R5	N/A	--
R6	N/A	--
R7	N/A	--
R8	N/A	--
R9	N/A	--
R10	N/A	--
L1	--	--
L2	--	--
L3	--	--
L4	-	--
L5	-	--
L6	-	--

Table 23 Overview barrier decision making phase (source: author).

Mistrust in governmental policies and finding a reliable professional are not confirmed by the empirical study. This suggests that there is a lot of trust in the Flemish government and there is little corruption in Belgium.

Execution phase

Stakeholder	**Disturbance caused by renovation works**	**Temporary move**
R1	-	++
R2	-	++
R3	-	++
R4	-	++
R5	-	+
R6	-	+
R7	-	++
R8	-	++
R9	-	++
R10	-	++
L1	--	++

L2	--	++
L3	--	--
L4	--	++
L5	--	++
L6	--	++

Table 24 Overview barriers execution phase (source: author).

For one landlord, moving out tenants was the biggest barrier to perform renovation works. He had everything ready to perform the renovation works, but he did not want to end the contract with his tenants. According to him, the renovation was too drastic to let the tenants live in the apartments. All the other landlords stated that they preferred to do the renovation works in between tenants. Temporarily moving the tenants was not perceived as a realistic option since the landlords could not offer an alternative to their tenants. It is noteworthy that the landlords did not perceive any legal constraints in terms of evicting the tenants. This can be explained by the fact that landlords have the option to terminate a contract early if the renovation cost more than two years of rent (Vlaanderen, 2021).

Tenants perceive a temporary move as very annoying but are willing to cooperate for a maximum of two weeks. If the renovation takes longer, they stated that the landlord is responsible for a good alternative including a moving service. Especially young renters indicated that they preferred that the renovation is carried out after they moved to another house. These young renters hoped to buy their own house within a few years. As landlords share this preference, it appears that the transaction moment might be an essential point to target in regulatory interventions.

Tenants found disturbance caused by renovation works annoying but no reason to demonstrate against renovation works. However, tenants expected their landlord to consult with them regarding the timing of the renovations. Failure to do so would increase the importance of the barrier of disturbance.

Evaluation phase

Stakeholder	**Bad expierences (of others)**
R1	--
R2	--
R3	--
R4	--
R5	--
R6	--
R7	--
R8	--
R9	--
R10	--

L1	--
L2	--
L3	--
L4	--
L5	--
L6	--

Table 25 Overview barriers evaluation phase (source: author).

Although landlords and tenants understood why bad experiences might be a barrier to perform EERs. However, they did not experience this as a barrier for themselves.

4.3 Policy instruments and their evaluation

In the empirical study, policy instruments are identified and evaluated by stakeholders. This section discusses the identified policy instruments and their evaluation. Landlords, tenants, and experts were asked to evaluate the policy instruments identified in the literature study. However, the policy instruments were mostly focused on landlords. For some policy instruments this resulted in tenants not having an opinion on certain policy instruments, or tenants that were not familiar with certain policy instruments. That is why the opinion of tenants is not always included in every policy instrument.

4.3.1 Considering phase

My renovation premium – Flanders

Interviewee L1, L2, L3, and L6 stated that the premiums for renovations are so low, that for them, it does not create an incentive to perform a renovation. Interviewee L3 argued: "I had to pay 22.000 euros on my roof insulation. I received 900 euros as a premium. That is such a small part that it does not really make a difference". Interviewee L1, L2, L3, and L6 stated that they would always do the effort to receive the premium, but it does not influence their decision.

Interviewee L4 and L5 thought that the premiums could help them because their wealth limits their ability to take energy efficiency measures. However, since the premium is paid out a year after you apply for it, the premium does not provide a solution for them to act faster. They stated that they would apply for the premium but that they must save first before they can take additional measures (Interviewee L4 and L5).

Interviewee E5 was very positive about the premium. The premium had already been requested twice as many times than expected (Interviewee E5). He expects that the reason for this is that the My Renovation Premium combines all previous premiums. A central platform is created to find all the information you need regarding energy efficiency renovation works. This should make it easier to apply for a premium (Interviewee E5). Interviewee E5 also finds it positive that the premium is much requested by lower income groups. This is what the premium was intended for (Interviewee E5). Interviewee E5 admits that with a premium tied to income groups, the private tenant will be left out. He does not think that this is a big issue because this premium was mainly meant to encourage lower income groups (Interviewee E5). Interviewee E5 also indicated that the premium has been requested so often (70.000 times) that it will be a challenge for the minister to complete the budget. Interviewee E3 was less convinced of the premium's success. Despite being widely applied for, the premium is still not applied for enough to meet the 2030 and 2050 renovation targets (Interviewee E3). This should be five times higher (Interviewee E3). Interviewee E2 criticized the different premiums per target group. According to her, this makes it even more difficult to reach a consensus within an owner's association.

Interviewee E4 noted that in the Netherlands, renovations premiums are currently not widely sought after. According to interviewee E4, this is not primarily due to the separate application process for these premiums, as opposed to the My Renovation Premium. Instead, interviewee E4 believes that private landlords are currently awaiting clarity regarding minimum energy efficiency requirements.

Renovation premium for landlords in Antwerp – Antwerp

The municipality of Antwerp noticed that, like interviewee E5 admitted, a private landlord little benefits from the My Renovation Premium since private landlords belong automatically to the highest income group. The renovation premium for landlords should ensure that landlords enjoy equal support as the middle-income group in the My Renovation Loan. Including private landlords is important for the city of Antwerp since 70% of the people lives in the private rental sector (Interviewee E2). Interviewee E1, noted that the premium is just implemented. It is so far unclear what the effect of the premium will be (Interviewee E1). Interviewee E1 expected that the effect can be evaluated after one year. The landlords interviewed for this research were not aware of this premium yet (Interviewee L1 – L6). Landlords (Interviewee L1, L2, L3, and L6) stated that they first decide to take a measure and then, search for premiums.

My renovation loan – Flanders

Like the My Renovation premium, the My Renovation Loan was also requested more often than expected (Interviewee E5). However, this loan was a lot less requested by private rental landlords (Interviewee E5). Interviewee E5 declared this because landlords using the renovation loan must implement a rent reduction. This affordability complement should ensure that lower income groups are not pushed out of their homes by rent increases (Interviewee E5).

Landlords said they are not interested in using the My Renovation Loan that would allow them to implement energy efficiency measures (Interviewee L1-L6). Landlord L5 could imagine that he might do so if he could not afford mandatory measures. Still, he thought it would then be more realistic to sell his rented apartment (Interviewee L5).

Index limitations – Flanders

The energy performance certificate bound indexation, is a regulation that is introduced following the energy crisis (Interviewee E3 and E5). The rule is only valid this year (Interviewee E3 and E5). However, both the landlords (Interviewee L1 – L6), and the policy experts (Interviewee E1 – E5) were positive about this regulation. Interviewee L2 indicated that this felt like a logical and feasible regulation. In addition, it also gave him motivation to take energy efficiency measures (Interviewee L2). Despite not having indexed this year, interviewee L1 was not aware of this scheme. His apartments do not currently have an energy performance certificate and so would not be compliant. He thinks this is a reasonable scheme and thought an energy label D was a reasonable minimum (Interviewee L1). However, he was critical on increasing minimum requirements. The required investments must remain feasible for landlords (Interviewee L1). Otherwise, additional financial support is required from the government (Interviewee L1).

Tenants were not aware of the index limitations (Interviewee R1 – R10). When they were explained what these indexation limits meant, they were positive about this development (Interviewee R1 – R10). When it was asked whether they would sue their landlord if their landlord indexed unfairly, their response was mixed. Interviewee R2, R7, R8 and R10 indicated that they would speak to their landlord about this anyway. They would find it unfair if their rent was indexed and, besides, they could imagine that their landlord was also unaware of the measure (Interviewee R2, R7, R8, and R10). Interviewee R1, R3, R4, R5, R6, and R9 were more hesitant. Either they did not felt comfortable enough about their knowledge about this measure (Interviewee R1, R3, and R4) to confront their landlords or they did not want to risk their relationship with their landlord (R5, R6, and R9).

Policy experts are thinking about continuing to implement the energy performance bound indexation regulation in the coming years as well (Interviewee E3 and E5). Though, it is questionable whether this regulation was constitutionally allowed. Currently, proceedings are ongoing in the constitutional court since a landlords' association disagreed with this measure (Interviewee E5).

Investment and savings calculation tools – discrepancies between actual and realized savings

Policy experts, tenants and landlords were not familiar with tools offered by banks to calculate renovation costs and savings. They expect that it could be helpful (Interviewee E2 and E3). Nevertheless, they are satisfied that market players are also taking responsibility for increasing the speed of energy efficiency renovations (Interviewee E2, E3, and E4). Interviewee E4 says: "Renovating the entire building stock is very expensive and it is impossible for governments to pay for it all. Help from commercial parties is necessary to reach the European targets".

Energy performance certificate required on transaction – Flanders

The energy performance certificate does not always seem to give tenants a good picture of their actual energy consumption (Interviewee R9 and R10). Interviewee R9 says: "my energy consumption is very likely to increase when renovations are carried out here since I do not have a complete heating system at the moment". Also some landlords questioned the added value of the energy performance certificate. Interviewee L2 was not convinced that the value of his apartments would increase If they had a higher energy performance certificate.

On the other hand, there were also tenants and landlords who did see the importance of the energy performance certificate. Tenants particularly felt that comfort in an apartment with a good energy performance certificate is higher (Interviewee R1 – R8). Landlords L1, L3, L4 and L5 were convinced that the value of their apartments would increase if they invested in a higher energy performance certificate. This is confirmed by policy expert E3. The increase in value from a label E to a label B would be 12%.

According to interviewee E5, the energy performance certificate is an important instrument to steer towards an energy efficient building stock. In addition, it is an obligation for every member state imposed by the European Commission (Interviewee E3 and E5). Changing this method would not only be unrealistic but also cause a lot of confusion and perhaps anger (Interviewee E5). "It cannot be that people who have just invested in meeting the requirements now, suddenly do not meet them tomorrow" says interviewee E5. "There will always be disadvantages and advantages to the methods we use" adds interviewee E5. Interviewee E5: "It is not helpful to create turmoil around an issue that not everyone is yet convinced is important". Interviewee E3 also thinks that the energy performance certificate is a useful methodology to get insight into the energy efficiency of buildings. Nevertheless, he can imagine that the parameters in the method will still be slightly adjusted in the coming years. For instance, he expects that renewable energy will have to weigh more heavily in the future (Interviewee E3).

Renovation obligation – Flanders

For the tenants and landlords interviewed for this research, the renovation obligation does not apply (Interviewee E3). This obligation applies for anyone buying a house from 2023 onwards. Policy experts expect that for investors, buying apartments with poor energy performance certificates might be less attractive (Interviewee E3 and E5). This could decrease the value of houses with poor energy performance certificates. Interviewee E3 finds this a positive development for three reasons: 1) it gives starters more chance on the market, and 2) the added value of improving energy performance certificates increases which creates a better business case to invest in energy efficiency measures (> 12% from label E to B), and 3) with this measure, you can very well estimate how much houses are in scope because the trend of houses being sold is quite stable. In 2023, 40.000 houses will be sold, meaning that in 2027

40.000 houses should have an energy label D. This regulation will become stricter in 2028 and so forth (Interviewee E3).

Housing quality requirements – Flanders

At this moment, roof insulation and double-glazing are part of the minimum housing quality requirements. This indicates the minimum requirements that a private rented home must meet to be rented out (Interviewee E3 and E5). According to interviewee E5, this is a far-reaching instrument because failure to comply with the requirements leads to criminal prosecution. The idea is to add minimum energy performance certificate requirements to the minimum housing quality requirements (Interviewee E3 and E5). According to interviewee E5, it is crucial to exercise caution in making decisions regarding energy efficiency renovations in the private rental sector, to avoid disruption of the market. Specifically, excessive regulation could prompt landlords to sell their homes, exacerbating the already limited availability of rental properties. This apprehension is supported by interviewees L1 and L2, who noted that additional requirements could make real estate a less appealing option as a retirement investment. In contrast, interviewees E3 and E4 expressed less concern, positing that these homes could be readily sold to other landlords or tenants who may not have been able to purchase a home previously.

During the interviewees with the tenants, it stood out that almost all the houses had an insulated roof and double glazing, even if the quality was very substandard (Interviewee R1, R2, R3, R4, R5, R6, R7, R8, and R10). Interviewee E1 confirmed that these regulations are taken very seriously and that he is satisfied with the outcome of this.

Rent compensation – Flanders

The Flemish Housing Rental Decree includes a clause that allows landlords who invest in energy-efficient measures to increase rent during the contractual period if it can be demonstrated that the property value has significantly increased (Interviewee E5). This is expected to incentivize landlords to be more receptive towards investing in energy-efficient measures (Interviewee E5). In practice, the feasibility of this clause is contingent on the relationship between the landlord and tenant (Interviewee E5). If both parties have a good rapport, they are more likely to reach consensus. However, in situations where the tenant is uncooperative, a disagreement may arise (E5). If a resolution cannot be reached, both parties can resort to the Peace Court (E5).

Both landlords and tenants interviewed for this research did not have experience with this (Interviewee L1 – L6 and R1 – R10). However, as already mentioned, tenants experience rent increase as an important barrier while landlords did not expect to increase their rent after they performed an EER (Interviewee L1 – L6 and R1 – R10).

Higher premiums for landlords that let via social rental agencies – Flanders

In Flanders, private landlords are encouraged to rent through social rental agencies (Interviewee E1, E3, and E5). These agencies arrange for a tenant for the property and ensure a constant payment of rent. In Flanders, there is a huge shortage of social housing (Interviewee E3). By making it easy for private landlords to rent out socially, the Flemish Government is trying to increase the supply of social housing (Interviewee E3). The policy on energy-efficient renovations also aims at this objective. Private landlords who rent through a social rental agency can take advantage of higher premiums for energy efficiency renovations. This should lead to an increase in energy efficiency renovations and at the same time, an expansion of the social housing sector (Interviewee E3 and E5).

The viewpoint of interviewee L1 appears to undermine this idea. This landlord states that, precisely after having carried out the renovations, he wants a different target group in his apartments. The social rental sector is not the target group he has in mind. Interviewee E5 responds by saying that this is almost a sociological prejudice about the social tenant that does not necessarily hold true. Interviewee E1 noted that it is unrealistic to think that private landlords will rent in the social rental sector due to higher

premiums. Private landlords that rent in the social rental sector to this out of idealism or laziness (Interviewee E1).

Point system – The Netherlands

Interviewee E4 reported that energy efficiency requirements will soon be incorporated into the point system developed for private rental in the Netherlands. This point system is intended to ensure that rental prices are less determined by the market and more by the quality of a property. By including minimum requirements for the energy performance certificate in the point system, as with the minimum housing quality requirements in Flanders, the value of a property will increasingly depend on its energy performance certificate. According to interviewee E4, this is a positive development because it will lead to a more relaxed housing market. This stands in contrast to the argument made by interviewee E5, who indicated that the implementation of minimum requirements would lead to disruption of the private rental market.

4.3.2 Planning phase

Energy efficiency road map on energy performance certificate - Flanders

When landlords were asked if they ever looked at the advice on their energy performance certificate, they indicated that they certainly did (Interviewee L1 – L6). They rated these recommendations as clear, but according to some landlords (Interviewee L1 and L3), not always relevant. There was criticism on the recommendation to insulate walls. Interviewee L3 says: "I find all the recommendations clear, except for the advice to insulate walls. Do not start with filling cavity walls, it only causes problems and it is not healthy for a building. If you want to insulate, it should be done on the outside to keep the building healthy. This may not be allowed in many cases and is not clearly explained on the certificate". According to policy experts, the advice on an energy performance certificate is very useful (Interviewee E2, E3, E4, and E5). However, they also point out that "it is of course true that if you really want the works to be carried out, you need to hire an expert for additional legal advice and calculation of the costs" (Interviewee E3).

FOSSTER-project – Europe

The FOSSTER-project is a European project in which the municipality of Antwerp and Mechelen participate. The aim is to clarify the customer journey, because currently when a customer approaches the government for energy efficiency measures, the customer is often referred to multiple other departments (Interviewee E2). The goal is to create a very clear customer journey, based on the principle of a one-stop-shop, so that the customer does not stop or require assistance every time the process becomes too difficult (Interviewee E2). Interviewee E2 expresses a great deal of confidence in the FOSSTER-project. She believes that there could be an improvement in information provision. Currently, outdated information is sometimes still available on websites, which can be confusing. Additionally, she notes that people who are not particularly interested in climate or the construction sector, do not always have the energy to navigate through a maze of information (Interviewee E2).

Since, the FOSSTER-project is still under development, tenants and landlords do not have experience with this project yet. However, landlords mentioned that they could imagine that this project would help them finding sufficient information more easily (Interviewee L2, L4, L5 and L6).

Right of initiative – The Netherlands

Interviewee E4 stated that the Netherlands is currently working on the "right of initiative". This means that tenants are allowed to propose to their landlord to invest in renewable energy and/or energy efficiency in exchange for a rent increase. The rent increase should be lower than the saved energy costs (Interviewee E4). As a result, the tenant will ultimately pay less, and the landlord will earn more. Interviewee E4 considers this a positive development because it makes tenants more equal to owner-occupiers. Interviewee E1, does not see how this right of initiative works in practice. He has the

experience that for tenants, it is very hard to approach their landlords because of their vulnerable position (Interviewee E1). In addition, Flanders tried to implement the tenants premium which provided a fixed premium to tenants if they initiated a renovation a few years ago. This premium has never gained significant traction of widespread adoption (Interviewee E1).

4.3.3 Execution phase

Mobile homes – Flanders

For the social housing sector, the Flemish government has acquired mobile homes (interviewee E5). These homes can be used to temporarily accommodate people living in social rental homes when their apartment building is being renovated (Interviewee E5). Interviewee E5 views this as a positive development because temporary relocation is a major barrier to carrying out renovations. E5 indicated that these mobile homes are not available to private tenants because such projects cannot be coordinated by the government.

4.3.4 Evaluation phase

Open house day

On the initiative of the organization "Zoekeenarchitect.be" a yearly renovation day is organized (Zoekeenarchitect.be, 2022). During this day, everyone can visit renovated homes in their neighborhood to gather information about energy efficiency renovations (Zoekeenarchitect.be, 2022). The aim is to stimulate people to make their homes more sustainable (Zoekeenarchitect.be, 2022). Landlords mentioned that it might be inspiring to see renovated homes (Interviewee L1 – L6). However, they knew what a renovated sustainable home looks like (Interviewee L1 – L6). Interviewee L1 stated that it is more interesting to understand how to get there.

4.3.5 All phases

Like in the literature review, no specific policy instruments were identified for the decision-making phase. However, some instruments were identified for all phases.

Support offered by energy houses –Antwerp/Flanders

All tenants and landlords were familiar with Ecohuis Antwerpen (Interviewee R1 - R10 and L1 - L6). Interviewees R1 – R4 are currently supported by Ecohuis Antwerpen. These tenants are waiting for social housing and are currently facing energy poverty. As tenants, they have no influence on the energy efficiency of their apartments. Ecohuis supports these tenants by implementing LED lights, water saving shower heads, a moisture meter, and explains how behavior can reduce their energy bills (Interviewee R1 – R4, and E1). Additionally, Ecohuis checks that the minimum quality requirements are met. If a tenant wants to take action on this, Ecohuis helps with this conversation (Interviewee E1). These tenants were very thankful for this help offered by Ecohuis.

Ecohuis is not only available for vulnerable target groups. Every landlord and tenant can ask for advice (Interviewee E1). This was not clear to all landlords and tenants (Interviewee L3, L4, L5, L6, R6, R8, and R9). They feel a barrier to ask for help. Rather, they search for information on the internet.

Policy experts stated that energy houses, such as Ecohuis, are very busy currently (Interviewee E2 and E3). They need more financial and human resources to meet the current demand (Interviewee E2). Negotiations are currently taking place to allocate financial resources to energy houses (Interviewee E2). Interviewee E2 expects this to lead to a reduction of resources for the municipality of Antwerp. This worries her because there is already a shortage. In addition, she feels it is important to play a pilot role as the city of Antwerp (Interviewee E2). Interviewee E1 is not afraid for a reduction in resources. He noted that minister Demir of Justice and Enforcement, Environment, Energy, and Tourism, want to focus more on energy houses. This leads to an increase in the global number of resources. It is possible that the resources for Antwerp will decline in percentage terms, but certainly not in absolute terms (Interviewee E1).

Consultants that offer support during the renovation process

For tenants, searching for consultants that offer support during the renovation process felt irrelevant (Interviewee R1 – R10). The interviewees argued that is felt as a very big step to approach a consultant (Interviewee R1 – R10). In addition, as stated earlier, they do not want to interfere with the EER process.

Landlords argued that approaching a consultant feels a little excessive (Interviewee L1 – L6). For interviewee L1 and L3 it was also irrelevant to approach a consultant since they had a clear view on what they would like to do and how to do it. In addition, the landlords mentioned that they did not want to spend money to receive advise (Interviewee L3, L5 and L6). They stated that the advice on the EPC should be sufficient. Especially, since they also paid for this certificate. If they decided to take the measures, they mentioned that they would ask the contractors or constructors for additional advice (Interviewee L3, L5, and L6).

Interviewee E2 confirms this. She has the experience that for most landlords, paying for the EPC sometimes already feels unreasonable (Interviewee E2). That is why it is important that the advice on this certificate is already sufficient to use (Interviewee E2).

4.3.6 Summary of the evaluation of the policy instruments

Table 26-30 show an overview of how policy experts, landlords and tenants evaluate the policy instruments identified from literature study and empirical study per phase.

Considering phase

Policy instrument	E1	E2	E3	E4	E5	L1	L2	L3	L4	L5	L6	R1	R2	R3	R4	R5	R6	R7	R8	R9	R 10
My Renovation Premium	O	--	-	-	++	--	--	--	O	O	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Renovation premium for landlords	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
My Renovation Loan	O	O	O	-	O	--	--	--	--	O	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Index limitations	+	O	+	+	+	O	++	+	+	+	+	+	++	+	+	+	+	++	++	+	++
Calculation tools	O	+	+	+	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EPC required on transaction	+	+	++	+	++	+	--	+	+	+	O	+	+	+	+	+	+	+	+	-	-
Renovation Obligation	+	O	++	+	+	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Housing quality requirements	++	O	++	++	O	-	-	O	O	O	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rent compensation	O	O	O	O	+	O	O	O	O	O	O	-	-	-	-	-	-	-	-	-	-
High premiums via SVK	--	O	O	O	++	--	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Point system	O	O	O	++	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 26 Evaluation policy instruments consideration phase (source: author).

According to landlords, the My Renovation Premium was not an incentive to perform energy efficiency renovation for two reasons:

1) Landlords had the experience that premiums are so low that they do not make a significant difference for the investment costs.
2) Premiums are provided one year after the renovation works. Therefore, they do not solve the problem of high upfront costs.

Policy experts agreed that private landlords are not targeted by the My Renovation Premium. However, this was not necessarily the intention either. The aim was to target low-income groups and that goal has been achieved.

In contrast to the My Renovation Premium, the renovation premium for landlords should target the landlords in Antwerp. This premium has only recently been available. During this research, landlords were not aware of this premium yet. Therefore, the premium could not be evaluated by both landlords and policy experts yet.

Like the My Renovation Premium, the My Renovation Loan is not intended to target private landlords. Moreover, private landlords must lower their rent if they make use of the Renovation Loan to assure affordability for tenants. This makes the loan even less attractive for landlords.

The indexation limitations are only valid in 2023. Both landlords and policy experts were positive about this regulation. Policy experts are considering long-term implementation. However, policy experts were convinced that this should be done gradually to give landlords time to adjust.

Policy experts consider the EPC to be an important instrument for directing renovation obligations and providing certainty for property owners. Although there may be criticisms of the methodology, the widespread use of the instruments means that changes to the methodology are likely to generate opposition. Additionally, the EPC is a mandatory requirement from the European Commission. To provide direction to property owners, it appears to be important to highlight the positive value of the instrument.

Tools that can calculate the investments and savings of a renovation need further development and promotion. Although their usage is still unknown, they are believed by policy experts to potentially contribute to the stimulation of renovations.

Renovation obligations can lead to the following developments:

1) The value of houses with poor energy performance certificates decreases. This might give starters more chance on the market.
2) Landlords do not perceive investing in real estate as profitable and sell their houses which could lead to more tightness in the private rental market.
3) The added value of improving energy performance certificates increases.
4) It can be very well estimated how much houses are in scope of this regulation.

This shows that when implementing measures in the private rental sector, it should be estimated what the effect will be on the market.

Like the renovation obligation, housing quality requirements could influence the private rental market. Again, it should be considered at what speed new regulations should be implemented to reach the aimed effect. At the same time, there is a prevailing notion that landlords will not renovate on their own. Thus, implementing obligations seems indispensable.

Rent compensation is expected to incentivize landlords to perform energy-efficient renovations. The effectiveness of this policy depends on the relationship between the landlord and the tenant. Additionally, this policy contradicts to the rent reduction policy for landlords that renovated using the My Renovation Loan.

Higher premiums for landlords that let via social rental agencies aim to bring together energy efficiency renovations and energy poverty. By offering higher premiums, private landlords should be encouraged to perform an energy efficiency renovation and to rent in the social housing sector to reduce the scarcity in this market. Although the idea behind this measure seems to lead to reaching the Flemish Renovation Strategy targets, based on the findings of this study, it is not expected that this measure motivates landlords to perform energy efficiency renovations due to the following reasons:

1) Private landlords appear to be less responsive to premiums.
2) After renovation, private landlords often seek tenants who do not fit within the social housing sector.
3) Motivations for private landlords to rent in the social sector are out of idealism or laziness.

The Dutch point system is comparable to the energy performance certificate bounded indexation or the minimum quality requirements in Belgium. The effect of the point system could thus be that the value of homes with a poor energy performance certificate decreases and that it becomes less attractive for landlords to rent these homes out. In the Netherlands, there is less concern about this effect because there is a high demand for affordable homes. This difference highlights the importance of carefully considering the context in which a measure is implemented.

Planning phase

Policy instrument	**E1**	**E2**	**E3**	**E4**	**E5**	**L1**	**L2**	**L3**	**L4**	**L5**	**L6**	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R 10**
Road map on EPC	++	++	++	++	++	O	+	--	+	+	+	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FOSSTER-project	N/A	++	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Right of initiative	--	O	O	++	O	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 27 Evaluation policy instruments planning phase (source: author).

As stated earlier in this chapter, the energy performance certificate is perceived as an important instrument to give guidance to reach an energy efficient building stock. Landlords consider the road map added to the energy performance certificate useful. However, it might be relevant to make the road map more specific to a building by including legal limitations in the advice.

The FOSSTER-project may offer a solution to the complicated search process of people who would like to perform an energy efficiency renovation. Though, this project is currently under development. So far, the idea is promising but the effect cannot be measured yet.

The right of initiative is seen as an important development in the Netherlands because it makes tenants more equal to owner-occupiers. If tenants would like to take initiative, with this regulation they are able to do so. Currently, there are no plans to implement this right in Flanders. The low response to the tenant premium that was implemented a few years ago in Flanders, does not encourage the implementation of the right of initiative in Flanders.

Execution phase

Policy instrument	E1	E2	E3	E4	E5	L1	L2	L3	L4	L5	L6	R1	R2	R3	R4	R5	R6	R7	R8	R9	R 10
Mobile homes	N/A	N/A	N/A	N/A	++	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 28 Evaluation policy instruments execution phase (source: author).

Mobile homes provide a solution to temporary moves. However, this solution is not available for the private rental sector yet since such projects cannot be coordinated by the government. In addition, the surroundings of small apartment blocks often do not provide enough space to place temporary mobile homes.

Evaluation phase

Policy instrument	E1	E2	E3	E4	E5	L1	L2	L3	L4	L5	L6	R1	R2	R3	R4	R5	R6	R7	R8	R9	R 10
Open house day	N/A	N/A	N/A	N/A	N/A	--	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 29 Evaluation policy instruments evaluation phase (source: author).

Open House Day targets only landlords. Although the landlords think it might be interesting to visit Open House Day, they are not convinced that it either stimulates or supports them in performing EERs. They prefer to get insight into the process instead of the result.

All phases

Policy instrument	E1	E2	E3	E4	E5	L1	L2	L3	L4	L5	L6	R1	R2	R3	R4	R5	R6	R7	R8	R9	R 10
Support offered by energy houses	++	++	++	++	++	O	O	+	+	+	O	++	++	++	++	++	++	++	++	++	++
Consultants that offer support	N/A	N/A	N/A	N/A	N/A	--	O	--	O	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 30 Evaluation policy instruments all phases (source: author).

The high demand for energy-efficient homes demonstrates the significance of energy houses in disseminating information on energy efficiency renovations. Therefore, limiting financial resources for energy houses in Antwerp would be an illogical and risky development for the Flemish Government, especially for low-income groups.

Consultants that offer support during the renovation process felt irrelevant for tenants. Landlords were hesitant in approaching consultants and prefer to ask more information from constructors and contractors. According to them, the road map on the EPC should give sufficient information to initiate an EER.

4.4 PESTEL-analysis

The empirical study provides input for the PESTEL- and the SWOT-analysis. Table 31 shows the input for a PESTEL-analysis gathered from the empirical study. In Appendix I, a SWOT-analysis is included that summarizes the strengths, weaknesses, opportunities, and threats identified from the empirical results.

Political	• The municipality of Antwerp has a pilot role in encouraging energy efficiency renovations (E2). • Policy measures are regularly adapted in Flanders. This creates an uncertain political landscape for both local governments and residents (E2). • Energy houses in Flanders are very different currently. The Flemish government aims for more uniformity resulting in less financial support for the Flemish municipality (E2). • The next elections take place in 2024. This creates pressure for governmental actors and less time for developing policies on energy efficiency renovations (E2). • Municipality of Antwerp worked hard on the topic affordable living. However, since little is included about this in policy notes of the current coalition, the municipality is not allowed to work on this topic (E2). • There is little difference in the renovation rate and regulations between the three regions (E3).
Economical	• Renting out homes in the private rental sector, is the pension of many self-employed people in Belgium (E3). This makes the tightening of measures a sensitive subject in Belgium (E4). • The high energy prices ensure that the split incentive for the government no longer exists. Either the government pays money to reduce energy costs, or the government pays money for renovations (E4). • The high energy prices ensure that there is more room to solve the split incentive by investing in energy efficiency measures as a landlord in exchange for rent increase (E3) • An energy performance certificate improvement from label E to B results in a value increase of 12% in the current economical context. When more energy efficiency requirements will be implemented, this value increases (E3). • It is very difficult for starters to buy a house in the current market (E3). • Half of the Flemish population does not have the investment capacity to invest in energy efficiency measures. This number excludes people that are eligible for a loan (E3). • The return on rental properties in Belgium is not high (E3). • In comparison to the Netherlands, the real estate market in itself is fairly solid and the housing market as well. There are certainly problems but if you compare it with the Dutch housing market, they are much less acute and much less volatile (E5). • There is a tightness in the private rental market, but this tightness is even greater in the social rental market (E3).
Social	• Approximately, 170.000 extra social rental homes should be built in Flanders (E3).

	• Support for carrying out energy-efficient renovations is currently mainly dependent on high energy prices (E3). • Landlords have a higher social profile and income. They are more concerned with climate and building policies anyway (E5). • It is mandatory to install a syndic in a VVE when a VVE consists of more than two dwellings. However, in small apartment blocks this is often not the case (E2).
Technical	• It is not yet technically possible to share renewable energy in old apartment buildings without major technical adjustments (E2). • As soon as sufficient renewable energy is generated, the focus of energy efficiency of buildings could shift more to the use of renewable energy instead of insulation (E3). • The housing stock in Belgium is very diverse and divided among many different owners (E3). This makes it more complex to renovate (E3). • The capacity of the building sector is too small (a shortage of 40 – 50 thousand people) to perform enough renovations to meet the Flemish targets (E3). • 95% Of the patrimony requires radical renovation (E5). • 71% of the dwellings in Antwerp are apartment units (E2). • Ventilation has become more important in Belgium due to the more extreme weather conditions caused by climate change (E4).
Environmental	• The reuse of materials is not yet included in the analysis of the sustainability of a building (E2). • 400.000 times per year should the My Renovation Premiums be applied for to meet the European targets (E3).
Legal	• Syndics are mandatory for apartments blocks owned by more than two owners. Nevertheless, that is often not the case in small apartment blocks (E2). • No legal agreements are made around sharing renewable energy in apartment buildings (E2). • Policy instruments should raise awareness, provide information, provide financial support, and should support execution (E3). • Regulations for the private rental sector are being implemented with restraints to prevent further tightness in an already tight market (E5).

Table 31 PESTEL-analysis based on empirical study.

Chapter 5

Discussion

5 Discussion

Based on the findings in the literature review and the empirical study, this section discusses how policy instruments can be implemented to reach the Flemish targets for reducing energy usage in buildings by energy efficiency renovations and alleviating energy poverty in the private rental sector. This is done by discussing the main concepts, contextual factors, the alignment of the policy instruments and the barriers, and how policy instruments can be implemented on the levels of policy intervention which are introduced in the literature study.

5.1 Main concepts

This section discusses the main concepts introduced in the literature study in comparison to the empirical study.

5.1.1 Energy efficiency renovations

Both in the literature study and in the empirical study, is often referred to "energy efficiency renovations". However, no clear definition is given to this concept. In literature, energy efficiency renovations refer to renovations that increase the energy efficiency and the use of renewable energy sources in buildings. Multiple ways to measure this improvement can be used. In the empirical study, all policy experts refer to increasing the energy performance certificates of buildings as main goal of energy efficiency renovations. Measuring energy efficiency renovations in this methodology, is done by looking at the improvement of the label (f.e. from label F to C). This label refers to the theoretical annual primary energy consumption. The popularity of this framework can be explained by the fact that the European Union expects from member states to develop an energy performance certificate framework. In addition, policymakers in Flanders strive to develop a clear framework that guides citizens in the same direction. The energy performance certificate methodology does not include the behavior of tenants. Therefore, it is a suitable methodology to objectively compare buildings. Although, the EPC methodology is sometimes critically reviewed because it does not represent the real energy consumption, it is a methodology that provides guidance and is fundamentally understandable for everyone.

Nevertheless, the latest revision of the EPBD allows to use real energy performance data (EUR-Lex Europe, 2021). Based on the empirical results of this research, it can be argued that including real energy performance data might have some positive and negative effects on steering towards an energy efficient building stock. When policy experts, landlords, and tenants were asked what their vision was on the EPC methodology, it appeared that for both landlords and tenants, this methodology offers an understandable framework which helped landlords to determine the next steps for improving the energy efficiency of their house (Interviewee L1, L2, L4, L5, and L6). This was confirmed by policy experts. Policy experts were very hesitant in adjusting this framework (Interviewee E3, E4, and E5). Although they acknowledged that the framework is not always complete, they feel it is of greater importance that there is a workable methodology available that is understood and supported by citizens (Interviewee E3, E4, and E5). They stated that changing this methodology would undermine the trust in the framework (Interviewee E5). In addition, real energy savings are very much related to the tenant's behavior and therefore hard to compare. Positive effects of incorporating real energy performance data might be that it allows to measure real energy savings. Real energy savings result automatically in financial savings. This might reduce the distrust around the effect of an improved EPC on the energy savings.

According to the literature study, the renovation rate can be measured by counting the number of permits that is requested to perform a renovation. However, a permit is not always required to take measures that improve an energy performance certificate. This makes it challengeable to determine the renovation rate. In 2022, 18.717 renovation permits were requested (Statistiek Vlaanderen, 2023b). Yearly, 95.000 dwellings should be renovated to an energy label A (VEKA, 2020). From these figures, it cannot be analyzed whether these renovations improved the EPC of a dwelling. From the empirical study, policy experts confirmed that when developing policy instruments, it is important to consider how the effect of the policy instrument can be measured (Interviewee E3 and E5). Therefore, policy experts expect a shift

from stimulating instruments to forcing instruments since this helps to define the scope and impact of an instrument. For example, the renovation obligation. This measure states that every residential building should be improved to an energy label D within five years after transaction. This is a forcing measure. Since the transaction rate per year is known, the minimum number of residential buildings with an energy label D in 2027 can be estimated. The transaction rate in Flanders between 2010 and 2015 was 70.000 dwellings per year and has increased since then (Statistiek Vlaanderen, 2023c). In 2022, 98.000 dwellings were sold (Statistiek Vlaanderen, 2023c). This means that by 2027, at least 350.000 dwellings will have an energy label D. By tightening this measure, it is possible to steer towards an energy label A in 2050. This is easier said than done because policy experts are afraid of distorting the market. Moreover, the Flemish government cannot only depend on this specific measure since 95.000 of the Flemish dwellings should be renovated to an energy label A yearly (VEKA, 2020). This goal is eminently not met with the renovation obligation alone.

Other stimulating measures can contribute to analyzing the number of energy efficient renovated buildings as well. Last year, 70.000 My Renovation Premiums were requested (Interviewee E3). These premiums can only be used for renovations works that increase the energy efficiency of a building. Still, it is unclear what the improved EPCs of the renovated buildings are.

5.1.2 Energy poverty

Like in the literature study, the empirical study verifies that energy poverty can be measured by the "Woonquote" and the "Budgetnorm". In the private rental sector, 52% of the Flemish citizens has a "Woonquote" above average. 32,3% Has a "Budgetnorm" below average. Besides from the income bounded premiums to stimulate EERs in lower income groups, policies focus on increasing the social rental building stock. For example, policy instruments are implemented to stimulate private tenants to let their property via social rental agencies. Landlords that let via a social rental agency can make use of the highest premiums for energy efficiency renovations. This instrument should reduce energy poverty since less people have to wait for social housing. In addition, it increases the energy efficiency of the Flemish building stock. Nevertheless, only between 1.000 and 1.500 homes were rented out through social rental offices in 2022 (Vlaanderen Sociaal Woonbeleid, 2023). This is only a very small proportion of the 175.309 houses that make up the entire Flemish social rental sector (Vlaanderen Sociaal Woonbeleid, 2023). Furthermore, based on the interviews with the policy experts and landlords, it can be argued that it is unrealistic to think that landlords will rent out their apartment through social rental offices due to premium benefits (Interviewee E1 and L1). According to interviewee E1, landlords rent out their apartments out of idealism or laziness.

In recent years, there have been ongoing developments in the field of education aimed at mitigating excessive energy consumption. Empirical research reveals the presence of three distinct types of energy poverty:

1) Normal energy consumption but not enough income to pay for it.
2) Higher consumption than estimated leads to high energy bills in the annual statements and not enough savings to pay these bills.
3) Excessive consumption due to ignorance or poor condition of the house.

For families experiencing financial difficulties, there is a fund available at the Public Centre for Social Welfare (Vlaanderen, 2023a). This fund supports families who, despite having a normal energy consumption, lack sufficient financial resources to pay their energy bills. For a long time, there has been little focus on reducing ignorance surrounding energy consumption. This can be attributed to the long period of stable and low energy prices. However, with the increased significance of climate issues, there is now a growing demand for greater knowledge about energy consumption. The question arises as to who is responsible for providing this knowledge (Interviewee E1). Currently, local energy houses are taking the lead in addressing this need. Energy coaches are available for consultation by anyone at any time. Energy houses are still in the early stages of development, and their roles and functions within a

city vary significantly. From the empirical study, it is evident that the energy house in Antwerp has a pilot role in Flanders (Interviewee E1 and E2). The success of this energy house was confirmed by the positive responses from both landlords and tenants regarding its existence. Therefore, based on this study, the planned increased resources for energy houses from the Flemish government (Interviewee E1) appears to be a positive development that contributes to enhancing knowledge about energy consumption and, consequently, reducing energy poverty.

5.2 Contextual factors

Based on the literature study and the empirical results, a PESTEL- and a SWOT-analysis is developed. The PESTEL-analysis can be viewed in Appendix J.

When looking into the PESTEL-analysis, there are some main policy issues that should be dealt with by governance actors to increase the renovation rate and to minimize energy poverty. These issues can be described as weaknesses. According to the SWOT-analysis, strategies can be developed by combining weaknesses to opportunities and threats. The next sections discuss a weakness discovered from the PESTEL-analysis that should be dealt with by governance actors and describes a strategy based on opportunities and threats that derive from the PESTEL-analysis as well.

Regularly changing Flemish Strategy

Local authorities highlighted that the regularly changing Flemish Renovation Strategy makes it hard for them to continue adapt. Also, it sometimes leads to a waste of their time. For example, the municipality of Antwerp invested time on research on energy poverty. Due to changing this strategy, they cannot implement their findings.

Opportunities - Careful consideration	**Threats - Be aware and adapt**
It is important that the Flemish Renovation Strategy adapts based on the latest European targets presented in the most recent version of the EPBD (EUR-Lex Europe, 2021). Therefore, it is not an option for the Flemish Renovation Strategy to undergo fewer changes. A potential opportunity for local authorities is to ensure their flexibility in adapting to the Flemish Government. The municipality of Antwerp has already taken steps in this direction by compiling an overview of legislation they anticipate from the Flemish Government, enabling them to respond promptly (Interviewee E2). To alleviate the workload, municipalities could collaborate on this task. Additionally, with the development of energy houses, municipalities have increasingly become more autonomous in shaping the implementation of measures. As intermediaries between legislation and implementation, municipalities can also play a crucial role in providing feedback to regional authorities.	An important threat for municipalities trying to provide feedback to the Flemish Government is that the Flemish Government does not prioritizes this feedback. Policy experts interviewed in this research highlighted that EERs is just one point among all others during the weekly meeting among the municipality of Antwerp and the Flemish Government (Interviewee E2). In addition, the elections in 2024 also require a lot of attention of regional governance actors, leaving even less time to address policies around EERs.

No specific renovation strategy for the private rental sector

In the literature review, it was found challenging to identify policies and policy instruments specifically targeting the private rental sector. This finding was further confirmed during the empirical study. Policy experts expressed significant reluctance to implement policies within the private rental sector, despite its poor performance in terms of energy efficiency compared to the owner-occupied sector.

Opportunities - Careful consideration	**Threats - Be aware and adapt**
To minimize disruption of the private rental market, implemented policy instruments can be	Contrary to the views of policy experts, landlords expressed a preference for one-time

limited to incentivizing instruments. However, from the empirical study it became clear that incentivizing instruments such as premiums do not motivate landlords sufficiently to invest in EERs. To stimulate landlords to invest in EERs, statutory regulations appeared to be necessary. Policy experts argue that a step-by-step roadmap that shows the upcoming regulations to meet the 2050 targets, should be available to prepare landlords and to minimize disruption of the market. This also contributes to the stability for local governments.	comprehensive renovations instead of gradual steps towards achieving an EPC label A. A roadmap outlining a phased approach to regulation does not necessarily align with their preferences. However, a roadmap can still encourage landlords to implement measures during a deep renovation that they anticipate will become mandatory in the future. This approach can increase the renovation rate. Another potential threat is the possibility of accelerated or modified legislation from the European Commission, which may require adjustments to the roadmap. Any confusion regarding adjustments should be minimized. In addition, renting out homes is the pension of many landlords. This makes the implementation of statutory regulations sensitive for discussion. However, from the empirical study it derived that landlords understood that the energy efficiency of the building stock should increase. If they are not rushed in taking energy efficiency measures, and there is a clear long-term strategy available, they stated that they were willing to cooperate in the future.

Support for carrying out EERs is currently mainly depended on high energy prices

Policy experts highlighted that the current support for carrying out EERs is mainly depended on high energy prices. When energy prices drop, the demand for EERs might decrease which might decrease the renovation rate.

Opportunities - Careful consideration	**Threats - Be aware and adapt**
According to the empirical study, high energy prices are often not a reason for landlords to invest in EERs since tenants pay for their energy prices themselves. Landlords invest in EERs because they think it is part of the regular maintenance works or because they want to increase the quality of their homes to rent within another segment. This makes the decision of landlords to invest in EERs less sensitive to energy prices. In addition, landlords of existing buildings must compete with landlords of newly built buildings. Newly built buildings must be nearly energy neutral. This often leads to newly built buildings having lower energy costs and a higher monthly	When energy prices decrease, the value of an energy efficient home might decrease for renters. This may lead to renters that are less willing to pay more rent for an energy efficient dwelling. This also decreases the value of the dwelling itself. However, since climate change is still an issue, creating more awareness on this issue should increase the demand for energy efficient houses. Energy houses can play a significant role in this since they educate people on the energy efficiency of their home.

rent in comparison to older buildings, which is attractive for landlords. Finally, it is investigated that the value of a dwelling increases with 12% if an EPC is improved from label E to B. This shows that besides the possibility to increase the rent, the value of a dwelling increases as well.	

Young people live in the oldest apartments

Form the literature study, it appeared that young tenants are an important target group in the Flemish private rental sector. They represent the largest percentage of people living in the private rental sector and they live in the oldest apartments. From the literature study it derives that the old apartments have on average a poor EPC in comparison to recently built buildings. Furthermore, young tenants prefer that EERs are performed in between contracts since they prefer to not be disturbed and they often rent temporarily to save for their home.

Opportunities - Careful consideration	**Threats - Be aware and adapt**
Temporary contract durations with young tenants offer the opportunity to perform EERs in between tenants which was preferred by both landlords and young tenants according to the empirical study. Since young tenants live in the oldest dwellings it is important to target this group with policy instruments that stimulate EERs. Focusing policy instruments on transaction moments can help to speed up energy efficiency renovations in this specific target group.	It is highly likely that young tenants rent older houses because they cannot afford newer, and likely more expensive, homes. However, renovating older houses may lead to a shortage of affordable housing options for young tenants. Nevertheless, improving the overall quality of the private rental sector is necessary, which will ultimately reduce the value of a renovated house as there will be an abundant supply of energy-efficient homes available.

5.3 Alignment of policy instruments and barriers

In the literature review, an overview of policy instruments that might be of influence on energy efficiency renovations was established. This overview is evaluated and complemented based on the findings of the empirical study. In addition, barriers identified in the literature review are evaluated and complemented in the empirical study as well. The evaluations of the policy instruments and the barriers provide insight into the most important barriers that should be reduced and policy instruments to stimulate energy efficiency renovations.

The barriers that were found in literature and are confirmed as an important barrier in the empirical study are shown in Table 32. Barriers are identified as important if the barrier was rated with an + or ++ on average.

Phase	**Landlords**	**Renters**
Considering phase	• Landlords did not confirm the barriers identified from literature. If they feel like an investment is necessary, they are willing to invest. However, landlords call an investment necessary if it is determined by obligations or unavoidable maintenance.	• Rent increase is perceived as an important barrier due to several reasons: 1) Unable to afford rent increase; 2) It feels unreasonable; 3) Preferred to save money.
Planning phase	• The barriers identified in the literature review were not confirmed by the empirical study.	• Limited rights to renovate made tenants feel not responsible. • Tenants do not want to risk their relationship with their landlord through interfering with the EER process.
Decision-making phase	• The barriers identified in the literature review were not confirmed by the empirical study.	• The barriers identified in the literature review were not confirmed by the empirical study.
Execution phase	• Moving out tenants.	• Moving out.
Evaluation phase	• The barriers identified in the literature review were not confirmed by the empirical study.	• The barriers identified in the literature review were not confirmed by the empirical study.

Table 32 Barriers confirmed by the empirical study.

In the considering phase, it does not seem clear to the tenants and landlords what the financial benefits of EERs might be in the future for them. In the planning phase, tenants seem to not feel responsible and afraid to risk their relationship with their landlord through interfering. During the execution phase, moving out tenants seems to be a very important barrier for both landlords and tenants.

Since the barriers presented in Table 32 are identified as the most important barriers according to landlords and tenants in this research, it is important to investigate the policy instruments that could minimize these barriers. The literature review already proposes some policy instruments that could minimize some barriers. According to the literature review, the identified policy instruments should minimize the following barriers (see Table 20):

- High upfront costs;
- Split incentive issue;

- Discrepancies between estimated costs and savings;
- Varying energy efficiency targets;
- Disagreement on the energy efficiency effect of measures;
- Lack of information;
- Finding a reliable professional.

In this assumption of the literature review, none of the most important barriers was minimized. This could suggest the following things:

- The assumption in the literature review on how policy instruments are related to the minimization of barriers is correct and the policy instruments have the aimed effect on minimizing these barriers. Therefore, these related barriers were not experienced as important barriers by landlords and tenants in the empirical study.
- The assumption of the literature review on how policy instruments are related to the minimization of barriers is correct. However, the policy instruments do not have an effect on minimizing barrier but the barriers are still not important. In this situation, policy instruments focus on the wrong barriers.
- The assumption in the literature on how policy instruments are related to the minimization of barriers is incorrect. Therefore, these barriers are not minimized. However, these barriers are not identified as important.

In all the assumptions, it should be investigated whether these policy instruments can minimize the barriers that are identified as important.

The assumptions above can be investigated by looking into the evaluation of the policy instruments in the empirical study. When a policy instrument is positively evaluated, it is plausible that the policy instrument reduces a certain barrier.

Table 33 shows the barriers and policy instruments and how these were evaluated.

Policy Instrument	**Barrier that should be minimized according to literature review**	**Evaluation policy instrument**			**Evaluation barrier**	
		PE	**L**	**T**	**L**	**T**
My Renovation Premium	High upfront costs	**-**	**--**	**N/A**	**--**	**N/A**
Renovation Premium for Landlords	High upfront costs	**N/A**	**N/A**	**N/A**	**--**	**N/A**
My Renovation Loan	High upfront costs	**O**	**--**	**N/A**	**--**	**N/A**
Index limitations	Split incentive issue	**+**	**+**	**++**	**-**	**+**
Investment & savings calculation tools	Discrepancies between estimated costs and savings	**+**	**N/A**	**N/A**	**-**	**N/A**
EPC required on transaction	Varying energy efficiency targets	**++**	**+**	**+**	**--**	**N/A**
Road map on energy performance certificate	Varying energy efficiency targets;	**++**	**+**	**+**	**--**	**N/A**

	Disagreement on the energy efficiency effect of the measures				--	-
Consultants that offer support during the renovation process	Lack of information;	**N/A**	-	**N/A**	-	-
	Finding a reliable professional				--	**N/A**
	Discrepancies between estimated costs and savings				-	**N/A**
Support offered by energy houses	Lack of information	++	+	++	-	-
	Finding a reliable professional				--	**N/A**

Table 33 Alignment evaluation policy instruments and barriers identified in the literature study.

From this table, the following conclusions can be drawn:

- Policy instruments that are positively evaluated (+ or ++) that are related to barriers that are evaluated as unimportant barrier (- or --) can minimize the perceived barrier. These policy instruments are index limitations, EPC required on transaction, the road map on the energy performance certificate, and support offered by energy houses.
- Policy instruments that are negatively evaluated (- or --) that are related to barriers that are evaluated as unimportant barriers (- or --) do not target the private rental sector. These policy instruments are the My Renovation Premium, the My Renovation Loan, and support offered by consultants.
- Policy instruments that are positively evaluated (+ or ++) that are related to barriers that are evaluated as important barriers (+ or ++) or policy instruments that are negatively evaluated (- or --) that focus on barriers that are positively evaluated (+ or ++) do not exist in Table 36.
- Policy instruments that could not be evaluated by stakeholders (N/A) do not target these specific stakeholders or are still under development. Policy instruments that are still under development are investment and calculation tools and the Renovation Premium for landlords.

To summarize, policy instruments identified in the literature study that are implemented successfully are:

- Index limitations;
- EPC required on transaction;
- Road map on the energy performance certificate;
- Support offered by energy houses.

Policy instruments that need further development are:

- Investment and calculation tools;
- Renovation Premium for Landlords.

Barriers that are probably reduced successfully are:

- Split incentive issue;
- Discrepancies between estimated costs and savings;
- Varying energy efficiency targets;
- Disagreement on the energy efficiency effect of measures;
- Lack of information;

- Finding a reliable professional.

Next, it should be investigated if and how policy instruments, including the policy instruments that are identified in the empirical study can minimize the most important barriers.

Additional policy instruments identified in the literature study and their evaluation are shown in Table 34.

Policy instrument	**Evaluation policy experts**	**Evaluation landlords**	**Evaluation tenants**
Renovation obligation	++	N/A	N/A
Housing quality requirements	+	O	N/A
Rent compensation	O	O	-
High premiums via SVK	O	-	N/A
Point system	O	N/A	N/A
FOSSTER-project	N/A	N/A	N/A
Open house day	N/A	-	N/A
Mobile homes	N/A	N/A	N/A

Table 34 Additional policy instruments identified from the empirical study.

Some policy instrument above can be divided into policy instruments that need some further development and implementation. These policy instruments are the renovation obligation, the point system, and the FOSSTER-project.

Other policy instruments do not seem to be successful. These policy instruments are rent compensation, housing quality requirements, high premiums via SVK and the open house day.

Table 35 shows an overview of how positively evaluated policy instruments and policy instruments that need some further development that might reduce the most important barriers and how.

	Willingness to invest (L)	**Rent increase (T)**	**Limited rights (T)**	**Risk relationship (T)**	**Moving out tenants (L)**	**Moving out (T)**
Index limitations	The landlords that were aware of this policy instrument evaluated this instrument positively and felt more motivated to invest in EERs. However, this regulation was not known by	This regulation limits rent increase for houses with a poor EPC. Nevertheless, it will not protect tenants from a rent increase after an EER.	N/A	N/A	N/A	N/A

	most of the landlords. In addition, it is uncertain whether this regulation remains in place.					
EPC required on transaction	An EPC required on transaction increases the value of a good EPC. This might increase the willingness to invest in EERs.	N/A	N/A	N/A	N/A	N/A
Roadmap on EPC	N/A	N/A	N/A	N/A	N/A	N/A
Support energy houses	Education offered by energy houses could highlight the benefits and importance of energy efficiency renovations.	N/A	Energy houses can support tenants in initiating energy efficiency renovations to their landlords.	Energy houses can support tenants with conversations with their landlords.	N/A	N/A
Investment and savings calculation tools	Might highlight the benefits of EERs to landlords.	Can calculate whether the rent increase is compensated by the energy savings	N/A	N/A	N/A	N/A
Renovation premium landlords	Might increase the willingness to invest. However, landlords mentioned that premiums are not a reason to perform EERs.	N/A	N/A	N/A	N/A	N/A
Renovation obligation	Might not increase the willingness, however it forces landlords to perform EERs.	N/A	Gives tenants the opportunity to confront landlords with the obligation to renovate. However, they might	N/A		N/A

			risk their relationship by doing so.			
Point system	Might stimulate landlords to invest in EERs. However, this measure overlaps with the index limitations and minimum renting requirements.	This regulation limits rent increase for houses with a poor EPC. Nevertheless, it will not protect tenants from a rent increase after an EER.				
FOSSTER-project	N/A	N/A	N/A	N/A	N/A	N/A
Mobile homes	N/A	N/A	N/A	N/A	Currently only available for the social rental sector. Implementation in the private rental sector might offer a solution.	Currently only available for the social rental sector. Implementation in the private rental sector might offer a solution.

Table 35 Suggestions on how positively evaluated policy instruments or policy instruments that are under development can minimize the most important barriers.

To summarize, all the most important barriers can be minimized by the following policy instruments if these instruments are implemented in the right way:

- Index limitations
- EPC required on transaction
- Roadmap on EPC
- Support energy houses
- Investment and saving calculation tools
- Renovation premium landlords
- Renovation obligation
- Point system
- Mobile homes

5.4 Implementation policy instruments

This section discusses the advantages (opportunities) and disadvantages (threats) of the policy instruments based on the input from the literature review. In addition, this section discusses how the policy instruments should be implemented based on the level of policy intervention.

5.4.1 Threats and opportunities of the policy instruments

In the literature, a distinction was made between approaches to governance: direct regulatory interventions, collaborative governance, and voluntary programs and market driven governance. These different approaches had their own advantages and disadvantages. The policy instruments proposed in the previous section can be divided into the different types of governance.

Table 36 shows an overview of the advantages and disadvantages and the proposed policy instruments related to the approaches to governance.

Approach	**Advantages according to literature review**	**Disadvantages according to literature review**	**Proposed policy instruments**
Direct regulatory interventions | statutory regulation	• Can prevent harmful events. • Can steer behavior.	• Requires sufficient support from citizens. • Might disrupt the free market.	• EPC required on transaction • Renovation obligation.
Direct regulatory interventions | direct subsidies	• Protect citizens. • Change attitude towards behavior.	• Not always realize equality. • Not always reach their goal → waste of money. • Sometimes unclear which targets need to be supported.	• Renovation premium landlords.
Direct regulatory interventions | economic instruments	• Steer behavior.	• Can create illusion that not contributing is accepted.	• Index limitations. • Point system.
Collaborative governance	• Government can gather information. • Non-governmental parties can exert influence. • Non-governmental parties feel more responsible for results.	• Harder to reach consensus. • Sometimes experienced as too ideological. • Might lead to manipulation by stronger stakeholders.	• Roadmap on EPC. • Support energy houses.
Voluntary programs and market driven governance	• Based on the idea that businesses and citizens can better decide for themselves how to reach a desired end goal.	• Governments depend on businesses for successful implementation.	• Investment and savings calculation tools. • Mobile homes.

	• Reduces pressure on governmental actors.	• Only successful if interests of business and government overlaps.	

Table 36 Advantages and disadvantages of the approaches to governance related to the proposed policy instruments.

The next sections discuss how stakeholders can implement the policy instruments based on the advantages and disadvantages identified from the literature review.

5.4.2 Implementation of policy instruments on the levels of policy interventions

In the literature review, the responsibilities per level of intervention were discussed. The proposed instruments can be divided among these levels of interventions. The policy instruments should be implemented on the regional level, municipal level, energy distribution grid managers and by other organizations and actors. Aspects that should be considered during the implementation are discussed in the following sections. These aspects are based on the correlation between the Flemish and the European targets, the PESTEL- and SWOT-analysis, the analysis of the alignment of the barriers and policy instruments, and the advantages and disadvantages of the approaches to governance.

5.4.2.1 Flemish government

According to the literature study, the Flemish ambitions for 2030 and 2050 stated in the Flemish renovation strategy, are lower than the European ambitions for 2030 and 2050. This is not confirmed by the empirical study. According to the empirical study, the Flemish ambitions are aligned with the European ambitions stated in the EPBDs. One possible reason for the disparity in results between the literature review and the empirical study can be that the European Ambitions have recently been increased. The Flemish Renovation Strategy was developed in 2020. The Flemish Energy and Climate Agency is currently working on a new proposal that should correspond to the new European targets. However, proposals for the Flemish Renovation Strategy are sometimes weakened due to political discussions. These discussions are mostly related to the extent to which the government dares to disrupt the private rental sector. Therefore, it is possible that the European ambitions and the Flemish ambitions will be the same in the new strategy developed by The Flemish Energy and Climate Agency, but that these new ambitions cannot be reached with the policy instruments proposed in the strategy. However, eventually the targets of the European Union should be met. Therefore, it is important for the Flemish government to implement measures that effectively speed up EERs and minimize energy poverty. From the opportunities and threats that were discussed based on the PESTEL-analysis, it became clear that it is important that the Flemish Government offers a predictable environment for both municipalities and landlords regarding policy regulations. In addition, the Flemish government should make a shift from incentivizing measures to statutory regulations. However, these statutory regulations should not disrupt the market and should therefore be presented in a roadmap towards 2050. These statutory interventions might focus on transaction moments since both landlords and tenants prefer to perform EERs in between contracts. For example, additional energy performance standards are required when a transaction moment takes place. Or regulations should allow that it is easier to end a contract to renovate. It should be considered that this might create an uncertain environment for tenants. Also, this could stimulate that low-income households are pushed out of their apartments.

A risk of implementing a roadmap to 2050 for the Flemish government is that changes to this roadmap might reduce the trust of citizens in the regional government. The Flemish government should carefully consider how these changes are communicated. It is crucial for citizens to clearly understand that these adjustments are necessary to meet the European objectives. Furthermore, providing an easily comprehensible explanation of the current renovation rate can contribute to enhanced understanding.

According to the empirical study, an instrument that appeared to create an incentive for landlords to invest in EERs is the EPC bounded indexation limitation. This economic instrument steers behavior by rewarding the landlord for implementing energy efficiency measures. However, the EPC bounded index limitation is only valid in 2023. It is an opportunity to implement this measure in the coming years as well. Instruments that force landlords to adjust their behavior are the EPC required on transaction and the renovation obligation. These statutory obligations ensure that targets will be reached and allow to measure the effect of the instruments. However, the renovation obligation might also disrupt the market. This is an important threat identified in the PESTEL-analysis. To avoid this, this instrument should be added to the long-term roadmap. The point system used in the Netherlands, could be used by the Flemish government as well. However, the housing quality requirements and the renovation obligation offer a good alternative to reach a comparable effect.

Support from energy houses is very positively evaluated and is valuable during the whole energy efficiency process. However, there might be a chance that the financial resources for the energy houses in Antwerp will soon be limited. From the barriers can be obtained that both landlords and tenants demand for more information about the costs and savings of an energy efficiency renovation. It is advisable to either keep the financial resources available or, to try to find support from the market parties to provide information to landlords and tenants.

4.4.2.2 Municipalities

Municipalities play a significant role in implementing the Flemish renovation strategy. Since this strategy is regularly changing, municipalities should be ready to adapt their activities whenever necessary. Working together with other cities might help to investigate future changes.

Especially in their collaboration with energy houses, municipalities support and stimulate both tenants and landlords to perform EERs. If the Flemish government allows energy houses to further develop their role in supporting citizens, it is advisable that municipalities try to stimulate energy houses to work on programs that educate tenants on their energy consumption. This should reduce energy poverty and should show tenants the (financial) benefits of EERs which might reduce their fear for rent increases. In addition, the support of energy houses in conversations between landlords and tenants is valuable to minimize the barrier of tenants that do not want to risk their relationship with their landlord through interfering with the EER process. An external party that advises landlords might reduce the importance of this barrier.

One of the policy instruments municipalities can introduce are premiums. Looking at the evaluation of the policy instruments implemented in the considering phase, multiple instruments did not seem to target the private rental sector. The My renovation Premium, the My Renovation Loan, and the high premiums for landlords that rent out via social rental agencies do not target private rental landlords. Either the current premiums are too low or, making use of these instruments impacts the rent negatively. This does not create a financial incentive for landlords to change their behavior. However, the municipality of Antwerp recently implemented a new premium that specifically targets landlords.

The renovation premium for landlords could become an important premium in Antwerp since this premium specifically focuses on landlords. However, landlords mentioned that premiums are currently not an incentive to perform a measure since they first decide to take a measure and then, search for premiums. Creating more awareness around this premium could increase the impact of this instrument.

The proposed policy instruments, such as additional informational support, would represent a significant investment for municipalities, both in terms of time and financial resources. Therefore, it is crucial to assess with municipalities whether this is realistic and desired. According to the interviewed policy experts currently working for the municipality, there is no indication that municipalities are unwilling to invest in EERs (Interviewee E1 and E2). In fact, municipalities are eager to work on this topic further. However, this depends on the financial support offered by the Flemish government to municipalities. Additionally, it is important to ensure sufficient recruitment of personnel.

4.4.2.3 Energy distribution grid managers

As described in the literature study, energy distribution grid managers can offer premiums to stimulate their clients to invest in EERs as part of their energy savings plan. From this research, it appears that the current premiums do not target the private rental sector. Energy distribution parties can review the success of the premium that is specifically introduced for landlords and is offered by the municipality of Antwerp. If this premium proves to be a success, energy distribution managers can consider to introduce a premium for landlords that covers the whole Flemish region.

4.4.2.4 Other organizations and actors

Other organizations and actors are relevant to include in this research since these stakeholders can minimize the pressure on governmental actors. The roadmap on the EPC was positively evaluated by both landlords and policy experts. However, some improvements can be made to the roadmap. For instance, the roadmap can be improved by further specifying the advice to the analyzed building. Additional information on the EPC roadmap can be provided by both collaborative governance, and voluntary programs and market driven governance. Since collaborative governance is initiated by the government, the government should have enough resources available to provide this information. From the PESTEL- and SWOT-analysis can be obtained that this is not necessarily the case. Therefore, for governmental actors it might be wise to stimulate energy auditors to make the roadmap more specific. In addition, it might be attractive for market parties to provide this additional information. For example, banks could offer free energy audits. This helps banks to sell renovation loans.

Selling renovation loans can also be done by creating investment and saving calculation tools. Calculation tools offered by banks could be a solution to provide sufficient information to both landlords and tenants. In addition, it could lower the required resources for energy houses. However, currently, both landlords and tenants are not familiar with these tools. This should be improved by making these tools more visible to citizens.

Market parties could think about business models that allow for offering temporary housing. This could be comparable to The Social Hub. This hotel developer develops hotels where students can live temporarily during the low season (The Social Hub, 2023). The student pay a market-compliant price for their rooms (The Social Hub, 2023).

4.4.2.5 Landlords and tenants

All the policy instruments proposed to this research are related to the various legislation levels. Nevertheless, since it is appealing for governmental actors that landlords and tenants take the initiative in EERs themselves, this section discusses what landlords and tenants can currently do in comparison to when the policy instruments proposed in this study are implemented.

From the empirical study it appeared that willingness of landlords to invest in EERs depends on whether they perceived a renovation as necessary. Necessary measures were described as measures that were necessary to meet new minimum quality standers or measures needed for unavoidable maintenance and did not had anything to do with improving the energy efficiency. However, there are also landlords who are willing to undertake energy efficient renovations. Currently, landlords have the autonomy to determine the extent to which they want to improve their EPC, apart from insulating the roof and installing double glazing windows. Landlords can assess their available budget for renovation and the interventions they can undertake within that budget. Available premiums will have little impact on this budget. It is advisable for landlords to seek advice from the local energy house. The likely outcome will be that the landlord invests in measures that are expected to enhance the overall quality of the property. For minor interventions, renovations can take place while the tenant is still occupying the dwelling. However, for major interventions, landlords will typically renovate only when the tenant terminates the lease agreement.

If the scenario where the policy instruments proposed in this study are implemented, a landlord has less freedom to decide which measures should be implemented. The landlord can consult the roadmap to 2050 to determine the minimum requirements that need to be met in the upcoming years. A specific explanation on their EPC will provide direct insight into the specific application of these measures to their building. Online calculation tools can assist the landlord in creating a business case and demonstrate the financial benefits of an EER to the tenant. This may increase the tenant's willingness to temporarily reside elsewhere, enabling faster execution of the renovation. If it turns out that the renovation does not yield financial advantages for the tenant, this could signal to the landlord not to increase the rent. This study revealed that landlords did not consider rent increases as a requirement for performing renovations. The likely outcome is that a landlord invests in measures that allow them to index the rent and comply with future mandatory regulations. Additionally, the Flemish government can make a more accurate assessment of the condition of renovated properties.

From the empirical study it appeared that tenants did not felt responsible to initiate EERs and did not understand the potential benefits of an EER. In addition, they do not want to interfere in the EER process and they do not want to risk their relation with their landlord. However, there are tenants that feel responsible to initiate EERs. In the current situation, tenants can ask a local energy house to support them in taking measures that reduce their energy bill without having to ask permission from their landlord. The result is that tenants that demand for energy savings, will not stimulate to increase the energy efficiency of their building.

In the scenario where the policy instruments proposed in this study are implemented, tenants can approach energy houses for assistance in engaging their landlords regarding minimum obligations. The fear of rent increase can be mitigated by utilizing online calculation tools to determine the financial benefits of energy-efficient measures. If this is too complicated, energy houses can support them in using these tools. The resulting savings could offset any potential rent increase. The result would be that tenants can provide landlords with insights and become aware of the benefits of EER. This stimulates to increase the energy efficiency of their building.

5.5 Research limitations

This section discusses the limitations of this research based on the sample size, data collection, data analysis, study design, external validity, and the interpretation of the results.

5.5.1 Sample size

For this study, 21 participants were interviewed. Although this is an above-average number of participants for a master's thesis, these participants had to represent multiple targets groups. Specifically, these 21 participants had to represent tenants, landlords, and policy experts, who themselves can be further subdivided into different types. For tenants, the main target group in the private rental sector appeared to be young tenants. Although this research included other groups as well, in the analysis extra attention was paid to this group.

The representation of multiple target groups makes it likely that in a replication of this study, different barriers will be identified. Nevertheless, the responses from the various tenants, landlords, and policy experts often agreed with each other. In cases where this was not the case, the differences can be related to the characteristics of these participants which can be found in the tables presented in the research approach.

This study included a survey for tenants, that should investigate the relationship between the characteristics of tenants and the barriers that they perceived as important. Unfortunately, the response rate of this survey is not high enough to use the results in this study. However, the results of the survey did confirm the expectations from the interviews about the relation between the characteristics and the barriers perceived by the renters. The answers of the survey and the interviews suggest that young renters (< 35) rent for a shorter period than older tenants (> 50). This was also confirmed by two of the policy experts (E4 and E5). In addition, young renters have an on average higher education level than older renters. Older renters perceive disturbance and temporary move as a more important barrier. And lastly, older renters are more vulnerable to energy poverty. The relation between the income and the perceived barriers was less clear than expected. Of course, rent increase was for tenants in the lowest income group an important barrier. However, tenants in higher income groups perceived this as an important barrier as well. Although, the argumentation was different. For tenants in lower income groups a rent increase was financially impossible. Tenants in higher income groups thought a rent increase was unreasonable.

5.5.2 Data collection

The data collected in this research is based on participants living within the municipality of Antwerp. This could influence the outcome of this research. Therefore, it should always be considered how the context of this research differs from the context these finding will be applied on. For example, from the PESTEL-analysis can be obtained that within Antwerp, most premiums do not focus on stimulating the acceleration of EERs in the private rental sector while this sector is in the poorest condition. Germany is an example of a country with a private rental sector that is known for its good quality and where private landlords can make use of premiums. In addition, the average rent to income ratio is below 30% which is the average in Belgium (German Federal Statistical Office, 2023). The German rental market is characterized by strong tenant protection laws, high-quality housing stock, and a well-regulated rental sector. The government offers various incentives, such as subsidies and tax benefits, to encourage landlords to invest in EERs and improvements (Luko, 2023). It might be interesting to perform this study in Germany as well to assess how these policy instruments are evaluated by German tenants and landlords.

To give another example, in Belgium, the role of energy houses differs per municipality (Interviewee E1). As we saw in the previous sections, energy houses can play an important role in speeding up energy efficiency renovations and alleviating energy poverty. Typical of the energy house in Antwerp is that the energy house is situated in the middle of the city. This makes the energy house an accessible place for people living in Antwerp (Interviewee E3). In Limburg, there is only one energy house to cover the

entire province (Mijn energiehuis, 2023). This may affect the role of an energy house because it is a bigger step for residents to go to an energy house (Interviewee E3).

The interviews in this research are all conducted and analyzed by the same researcher. This could influence the reliability of this research. However, all the interviewees reviewed the results and confirmed if the interviews were correctly interpreted.

In addition, it is important to note that the barriers are evaluated by tenants and landlords. However, we saw in the literature review that there are other stakeholders that might be relevant to steer the process. Interesting stakeholders to interview might have been syndics of owners' associations. For example, interviewee E2 mentioned that premiums that differ per income group, make it complex for owners' associations to manage EERs in apartment buildings. It might have been interesting to dive deeper into the barriers that owners' associations perceive. The policy instruments are evaluated by policy experts, landlords, and tenants. Here, it might have been of value to add additional stakeholder groups to the interviews. For example, landlords and tenants living in other contexts might have provided insights that could be used to reflect on the interviews proposed in this research. From the interview with the Dutch policy experts, it became clear that the context of a study has an important impact on the importance of barriers and the influence of certain policy instruments. This difference could have been investigated further.

5.5.3 Data analysis

The data is analyzed by using ATLAS.ti. The codes to analyze the data are discussed in the research approach. Since this is a qualitative research, results are based on overlapping findings in different interviews. If a response deviated from other results, this response is always supported by reasoning as to why a result could differ. However, the results of this research could be even more valuable if the research was supported by quantitative data that showed the relationship between characteristics of participants and the barriers they identified.

5.5.4 Study design

This study is conducted in a limited time period. This limits the scope of this research. Many topics are related to energy efficiency renovations. This study focuses on aligning barriers and policy instruments. However, topics that are of influence but are not included in this research are for example technical feasibility, capacity of the building sector, behavioral sciences, and analysis of business models that could reduce the split incentive. These topics could offer new insights to align barriers to policy instruments. Future research could investigate this further.

5.5.5 Interpretation of the results

The results of this research are all interpreted by one researcher. Bias of the researcher might have influenced the interpretation of the results which limits the conclusions of this research.

5.5.6 Future research directions

This research contributed to the existing literature by investigating the most important barriers and useful policy instruments in the private rental sector in Flanders specifically. Moreover, this study offers a research design that can be used the study the alignment between policy instruments and barriers in various contexts. In addition, this study gives particular advice to the Flemish Government, the municipality of Antwerp, energy distribution grid managers, other organizations such as banks, landlords, and tenants.

Future research can be performed on the relation between characteristics of tenants and landlords in the private rental sector in Antwerp and the barriers that they perceive. Other studies can be performed on the applicability of these findings to Brussels and Wallonia, or other countries by using this research design. In addition, it can be investigated how barriers can be related to the characteristics of landlords and tenants. The discussion suggests that more attention needs to be paid to costs and savings of energy efficiency measures for both landlords and tenants. Future research could investigate the costs and

savings of energy efficiency renovations for both landlords and tenants. This research could also investigate how this information can be shared with landlords and tenants. Other research could investigate business models for temporary housing. For example, this research could investigate if hotels have sufficient rooms available in low season to accommodate tenants temporary and for which price. In addition, it could investigate whether tenants are willing to live in a hotel and for which price. Finally, it can be investigated if landlords feel motivated to perform an energy efficiency renovation if they know that their tenants can be temporary accommodated.

Chapter 6

Conclusion

6 Conclusion

This section answers the main research question based on the answers to the sub-questions.

SQ1: How are energy efficiency renovations and energy poverty included in the Flemish renovation strategy to meet the European energy efficiency renovation targets?

Policy instruments implemented in the Flanders or Antwerp context, should always aim to reach the European energy efficiency targets stated in the most recent version of the energy efficiency of buildings directive. The effect of policy instruments that stimulate energy efficiency renovations can be measured by the increase of good energy performance certificates. The closer the energy performance certificate is to an energy label A, the better the certificate and the lower the expected primary energy consumption. Though, it should be mentioned that the energy consumption is not necessarily lower since this is determined by the behavior of the tenant. In the latest revision of the EPBD, it is stated that real energy consumption can be used as new methodology to calculate an EPC. This has the advantage that the EPC can be related to the real energy consumption of a user and therefore the real energy savings. However, disadvantages are that changing the methodology might lead to confusion and distrust. In addition, real energy consumption is very much dependent on the behavior of the tenant and therefore hard to compare.

The speed of the renovations taking place in Flanders can be measured by the number of permits that is requested. However, this number will be lower than the actual number of renovations since permits are not always required to perform an energy efficient measure. It is preferred to implement policy instruments that allow for measuring the current quality of the Flemish building stock. Policy instruments that allow for measuring the current quality are statutory regulations. These regulations force landlords to take measures within a certain time-period. This makes it possible to estimate the effect of a measure upfront.

Energy poverty is measured by the "Woonquote" and the "Budgetnorm". To reduce energy poverty, policy instruments should increase the number of dwellings within the social sector to make sure that people that have an average energy consumption but are still unable to pay their energy bills, can live in a suitable house. In addition, the number of people with an excessive energy consumption due to their own behavior should be reduced by education on efficient energy consumption. It is important to mention that energy poor people might be hard to reach. During this study, a pilot program was implemented by the municipality of Antwerp, actively targeting disadvantaged neighborhoods through the energy house in Antwerp. Households, in these areas received a voucher in their mailbox, enabling them to request free advice from an energy coach at the Eco House. Thus far, this pilot program has received significant responses from the intended energy-poor households and might therefore be a great example for future education projects.

SQ2: What are barriers before and during the energy efficiency renovation process of private rented apartments according to stakeholders?

To stimulate energy efficiency renovations, policy instruments should reduce multiple barriers. In the considering phase high upfront costs result in landlords taking measures step by step while they prefer to do the renovation all at once. This slows down improving the energy efficiency of the building stock. Additionally, landlords perceive not all energy efficiency measures as "necessary". Especially implementing renewable energy sources are not considered by landlords. Most tenants stated that they do not feel responsible for energy efficiency renovations and are not always convinced that an energy efficiency renovation is beneficial for them. During the planning phase unsuitable advice on the EPC roadmap withholds landlords from implementing a measure. Tenants do not want risk their relationship with their landlords through interfering with energy efficiency/maintenance works. Finally, during the

execution phase, moving out tenants is a big barrier for both landlords and tenants. Landlords and tenants prefer to perform all at once renovations in between tenants.

SQ3: What policy instruments are implemented to stimulate energy efficiency renovations and to alleviate energy poverty in the Flemish context?

Policy instruments that are implemented but do not seem to target the private rental sector specifically are the My Renovation Premium, the My Renovation Loan, high premiums for private landlords that rent via social rental agencies, and mobile homes for temporary moving out tenants (because they are currently only available for the social rental sector). Policy instruments that offer an opportunity to stimulate energy efficiency renovations but are still under development are the Renovation Premium for Landlords, calculation tools offered by banks, the point system, the FOSSTER-project, and the right of initiative. Policy instruments that target the private rental sector but might disrupt the private rental market if implemented too quickly or too unexpected are Index Limitations, EPC required on transaction, the Renovation Obligation, and minimum housing quality requirements. Finally, policy instruments that currently offer sufficient support to landlords are support offered by energy houses, rent compensation, and the EPC roadmap.

SQ4: How are policy instruments to stimulate energy efficiency renovations and to alleviate energy poverty in the private rental sector aligned to the barriers according to stakeholders?

From the analysis wherein the alignment of policy instruments and barriers is analyzed, could be obtained that index limitations, EPC required on transaction, the roadmap on the EPC and support offered by energy houses are successfully implemented. They probably reduce the barriers: split incentive, discrepancies between estimated costs and savings, varying energy efficiency targets, disagreement on the energy efficiency effect of measures, lack of information, and finding a reliable professional. Policy instruments that need further development are investment calculation tools and the renovation premium for landlords.

Policy instruments that have the potential to minimize the most important barriers if implemented the right way are:

- Index limitations
- EPC required on transaction
- Roadmap on EPC
- Support energy houses
- Investment and saving calculation tools
- Renovation premium landlords
- Renovation obligation
- Point system
- Mobile homes

SQ5: How can the Flemish context be leveraged to increase energy efficiency renovations and to alleviate energy poverty considering its strengths, weaknesses, opportunities, and threats?

The specific Flemish context offers opportunities for policy instruments to stimulate EERs and reduce energy poverty. For example, municipalities should become flexible in adapting to the rapidly changing strategies of the Flemish government. In addition, they are starting to play a crucial role in providing feedback to regional authorities.

Also, it is found that current policy instruments do not focus on the private rental sector since regional governments are afraid to disrupt the private rental sector. Focusing on incentivizing measures instead of forcing measures sounds like a solution. However, from the empirical study it appeared that incentivizing measures do no target private landlords. A step-by-step roadmap might stimulate EERs.

While implementing or adjusting policy instruments, it should be considered that currently the awareness of landlords and tenants towards energy efficiency renovations is mostly related to the energy crisis. There is a chance that energy prices will lower again, and although this will reduce energy poverty, it is still important to carry out energy efficiency renovations to reach the European targets of 2030 and 2050. It is important to constantly stimulate raise awareness around climate change. In addition, landlords must compete with newly built rental houses. If these houses must be energy neutral, landlords are more willing to invest in renewable energy sources.

Lastly, the Flemish private rental sector is characterized by young renters, living in the oldest apartments, that are currently saving to buy a house within a few years. Both landlords and tenants prefer to perform a renovation all at once in between renters. The temporary contract with young renters might offer an opportunity to renovate the oldest apartments in the private rental sector sooner than expected.

The answers to the sub research questions make it possible to formulate an answer to the main research question:

How can policy instruments be implemented to reach the Flemish targets for reducing energy usage in buildings by energy efficiency renovations and alleviating energy poverty in the private rental sector?

The policy instruments should be implemented on the regional level, municipal level, by energy distribution grid managers, and by other organizations and actors such as banks.

The Flemish government should provide a predictable environment for landlords and municipalities by providing a roadmap with regulations until 2050. In addition, the Flemish region can play a significant role in alleviating energy poverty by providing sufficient (financial) resources to energy houses and including energy poverty ambitions in their energy and housing policy. Policy instruments that should be implemented by the Flemish government are mostly direct regulatory interventions of which the effect can be measured. The EPC bounded index limitation that was positively evaluated by all stakeholders, steers landlords towards EERs. The EPC required on transaction and the renovation obligation are forcing measures to stimulate EERs even more. However, the renovation obligation might disrupt the market and should therefore be carefully implemented by making it part of the Flemish roadmap towards 2050. Creating a Flemish roadmap towards 2050 might be risky for the Flemish government since changes might lead to distrust from landlords. Therefore, changes should be carefully communicated and referring the changes imposed by the European Commission to increase understanding.

Municipalities must be flexible to adapt for changes on the European and therefore regional level. Especially the collaboration with energy houses is important for municipalities to stimulate EERs since this is an important source of information for both landlords and tenants. It should be considered that offering additional support requires more financial and human resources from municipalities. The municipality of Antwerp recently implemented a new premium that specifically targets landlords. Although other premiums were poorly evaluated by landlords, this premium might become of importance since it specifically targets landlords. However, promotion of this premium is important to increase the chance of success. Energy distribution parties can assess the success of this premium. If this premium is proven to be successful, energy distribution parties can offer a similar premium to the Flanders region.

Support from market parties in offering information about the benefits of energy efficiency renovations reduces the pressure on energy houses. Market parties such as banks, could offer free energy audits to sell renovation loans, the FOSSTER-project could improve the journey towards an energy efficiency

renovation for landlords and tenants, direct regulatory interventions could focus on transaction moments, and market parties could think of business models to offer temporary housing.

Finally, by implementing the proposed instruments, the role of landlords and tenants might change. Landlords may prefer to implement measures that are required according to the Flemish roadmap towards 2050, and measures that allow them to index their rent yearly. In addition, landlords may be able to show the financial benefits of an EER to tenants which might reduce discussions among rent increase. By implementing the proposed measures, tenants will be better able to demonstrate the benefits and obligations around energy efficient measures to their landlord using energy houses. In addition, by being able to calculate the benefits to tenants, it is likely that tenants will be more willing to incentivize EERs instead of taking measures that reduce their energy bills but do not increase the energy efficiency of their homes.

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APPENDIX A | INTERVIEW PROTOCOL TENANTS AND LANDLORDS

Instelling: Technische Universiteit Delft
Geïnterviewden (titel en naam): …..
Interviewer: Floor Rekers
Gebruikte enquête sectie:

A: Achtergrond informatie
B: Belang en zeggenschap renovatie
C: Barrières renovaties
D: Ondersteuning renovaties

Onderwerp

Dit interview wordt afgenomen als onderdeel van een onderzoek naar energie efficiënte renovaties binnen de private huursector. Het doel van dit interview is dat de visie van huurders en verhuurders op energie efficiënte renovaties in kaart wordt gebracht. Hiertoe wordt er gevraagd naar uw ervaring, uw behoeften en uw wensen rondom dit thema.

Analyse

Dit interview zal samen met minstens 10 andere interviews geanalyseerd worden. Uw antwoorden zullen nooit individueel in het rapport gepresenteerd worden en uw antwoorden zullen ook nergens worden gepubliceerd op een manier waarop het duidelijk is dat u het antwoord heeft gegeven. Daarnaast mag u tijdens het interview altijd aangeven dat u wil stoppen of dat u een vraag niet wil beantwoorden. Uw antwoorden zullen alleen beschikbaar zijn voor mij en worden vernietigd na analyse.

Toestemming opname

Tot slot wil ik u vragen of u het goed vindt dat het interview wordt opgenomen. Dit helpt mij bij het analyseren van de interviews. Nadat ik de interviews heb geanalyseerd, zal de opname meteen vernietigd worden. Alleen de onderzoeker (Floor Rekers) zal tijdelijk toegang hebben tot de opname.

O Kruis aan als u er mee akkoord gaat dat het interview wordt opgenomen.

Ik wil benadrukken dat alle informatie vertrouwelijk zal worden behandeld, dat uw deelname vrijwillig is, dat u te allen tijde kunt stoppen en dat het niet mijn bedoeling is u schade te berokkenen. Als u niet over een bepaald onderwerp wilt praten, kunt u ook weigeren over dat onderwerp te praten.

Dank u voor uw deelname.

Agenda

Ik heb een aantal vragen voorbereid die ik in één uur tijd wil stellen. Als de tijd begint te dringen, kan het zijn dat ik u moet onderbreken om aan het tijdschema te voldoen.

A: Achtergrondinformatie
B: Belang en zeggenschap renovatie
C: Barrières renovaties
D: Ondersteuning renovaties

Handtekeningen

Naam: Floor Rekers	Naam: ……..
Datum: ……	Datum: ……..

Handtekening: …….. Handtekening: …….

APPENDIX B | INTERVIEW PROTOCOL POLICY MAKERS AND EXPERTS

Instelling: Technische Universiteit Delft
Geïnterviewden (titel en naam): …..
Interviewer: Floor Rekers
Gebruikte enquête sectie:

A: Achtergrond informatie
B: Belang en zeggenschap renovatie
C: Barrières renovaties
D: Ondersteuning renovaties

Onderwerp

Dit interview wordt afgenomen als onderdeel van een onderzoek naar energie efficiënte renovaties binnen de private huursector. Het doel van dit interview is dat de visie van beleidsexperts op beleidsinstrumenten om de energie efficiëntie van de Vlaamse Woonvoorraad te verhogen in kaart wordt gebracht. Hiertoe wordt er gevraagd naar uw ervaring, kennis en visie op dit thema.

Analyse

Dit interview zal samen met minstens 5 andere interviews geanalyseerd worden. Uw antwoorden zullen nooit zonder toestemming individueel in het rapport gepresenteerd worden en uw antwoorden zullen ook nooit zonder toestemming worden gepubliceerd op een manier waarop het duidelijk is dat u het antwoord heeft gegeven. Daarnaast mag u tijdens het interview altijd aangeven dat u wil stoppen of dat u een vraag niet wil beantwoorden. Uw antwoorden zullen alleen beschikbaar zijn voor mij en worden vernietigd na analyse.

Toestemming opname

Tot slot wil ik u vragen of u het goed vindt dat het interview wordt opgenomen. Dit helpt mij bij het analyseren van de interviews. Nadat ik de interviews heb geanalyseerd, zal de opname meteen vernietigd worden. Alleen de onderzoeker (Floor Rekers) zal tijdelijk toegang hebben tot de opname.

O Kruis aan als u er mee akkoord gaat dat het interview wordt opgenomen.

Ik wil benadrukken dat alle informatie vertrouwelijk zal worden behandeld, dat uw deelname vrijwillig is, dat u te allen tijde kunt stoppen en dat het niet mijn bedoeling is u schade te berokkenen. Als u niet over een bepaald onderwerp wilt praten, kunt u ook weigeren over dat onderwerp te praten.

Dank u voor uw deelname.

Agenda

Ik heb een aantal vragen voorbereid die ik in één uur tijd wil stellen. Als de tijd begint te dringen, kan het zijn dat ik u moet onderbreken om aan het tijdschema te voldoen.

A: Achtergrondinformatie
B: Evaluatie huidige beleidsinstrumenten
C: Evaluatie interviews huurders en verhuurders

Handtekeningen

Naam: Floor Rekers	Naam: ……..
Datum: ……	Datum: ……..

Handtekening: …….. Handtekening: …….

APPENDIX C | INTERVIEWS TENANTS

A. Achtergrondinformatie (10 min)

1. Kunt u iets over uzelf vertellen?

- Leeftijd
- Huishouden
- Studie/werk

2. Kunt u mij meer vertellen over uw woonsituatie?

- Vloeroppervlak
- Relatie met verhuurder
- Duur van het contract

3. Heeft u ervaring met energie efficiënt renoveren van uw huis?

- Goed/slecht/waarom?

B: Belang en zeggenschap renovatie

4. Wil(de) u uw huis verduurzamen?

- Waarom wel/niet?
  - Temperatuur
  - Energiekosten
  - Schimmel
  - Verleden renovatiewerken

5. Welke maatregelen zou u willen nemen/welke maatregelen heeft u genomen?

- Wandisolatie
- Dakisolatie
- Vloerisolatie
- Ramen vervangen
- Verwarmingssysteem vervangen
- Zonnepanelen

6. In hoeverre denkt u dat u belang heeft bij het implementeren van energie efficiënte maatregelen?

7. Heeft u het idee dat u kan bepalen of er een energie efficiënte renovatie plaatsvindt?

- Waarom wel/niet?
- Zou u meer inspraak willen?

C: Barrières renovatie

8. Zijn er barrières die u ervan weerhouden om een energie efficiënte renovatie te initiëren?

- Te weinig kennis/informatie
- Huurverhoging
- Geen recht om te renoveren
- Complex en tijdroven proces
- Overlast verbouwing
- Tijdelijke verhuizing
- Slechte ervaring (van anderen)

D: Ondersteuning renovaties

9. Door welke partijen verwacht u ondersteund te worden tijdens de renovatie?

- Huurbaas
- Vlaamse overheid
- Uw gemeente
- Energy service companies
- Adviesbureaus
- Energiehuizen
- Huurdersorganisaties
- Vrienden en familie

10. Welke vorm van ondersteuning helpt voor u?

- Ondersteuning in planning en organisatie
- Extra informatie
- Financiële ondersteuning
- Duidelijke renovatiedoelstellingen
- Juridische ondersteuning
- Voorbeeldprojecten

APPENDIX D | INTERVIEWS LANDLORDS

A: Achtergrondinformatie (10 min)

1. Kunt u iets over uzelf vertellen?
    - Leeftijd
    - Sinds wanneer verhuurder
    - Waarom heeft u daar destijds voor gekozen
2. Kan u mij iets meer vertellen over de appartementen die u verhuurt?
    - Vloeroppervlak
    - Relatie met de huurder
    - Duur van het contract
3. Heeft u ervaring met het energie efficiënt renoveren van uw huis?
    - Met welke reden heeft u toen een aanpassing gedaan?
        i. Noodzakelijk
        ii. Duurzaamheid verhogen
        iii. Verzoek van de huurder

B: Belang en zeggenschap renovatie

4. Heeft u het idee dat u als verhuurder baat kan hebben bij het verduurzamen van uw verhuurde appartementen?
   Waarom wel/niet?

5. Heeft u het idee dat u als verhuurder veel zeggenschap heeft in het wel of niet verduurzamen van de uw verhuurde appartementen?
    - Waarom wel/niet?

6. Wat betekent de mening en visie op verduurzaming van uw huurder voor u?
    - Zou u rekening houden met de visie van uw huurder?

C: Barrières renovatie

7. Bent u van plan om in de komende jaren te renoveren en wat zou u willen renoveren?
8. Zijn er barrières die u ervan weerhouden om de verduurzaming te starten?
9. In hoeverre spelen de volgende barrières een rol?

    - Onduidelijkheid kosten/baten
    - Weinig informatie
    - Hoge investering die u zelf terugverdient / split incentive
    - Hoge kosten op voorhand
    - Andere eigenaren in de VVE
    - Onduidelijke energie efficiënte targets
    - Tijdrovend en complex proces
    - Weinig subsidies
    - Limiterende regelgeving
    - Geen aannemers beschikbaar
    - Huurders zouden tijdelijk ergens anders moeten wonen om te kunnen reageren
    - Slechte ervaring
    - Slechte ervaring van anderen

D: Ondersteuning renovaties

10. Vindt u dat de Vlaamse overheid of de gemeente Antwerpen u meer zouden moeten ondersteunen bij het renovatie proces? En op welke manier?

11. Bent u bekend met andere partijen die ondersteuning bieden? Maakt u hier gebruik van? (verhuurdersbond, Ecohuis Antwerpen, etc.)

12. Welke ondersteuning zou voor u waardevol zijn?

    - Ondersteuning in planning en organisatie
    - Extra informatie
    - Financiële ondersteuning (subsidies)
    - Duidelijke renovatiedoelstellingen
    - Juridische ondersteuning
    - Voorbeeldprojecten

13. Bent u bekend met de volgende beleidsinstrumenten en wat is uw visie op deze instrumenten in relatie tot uw eigen behoeften?

    a. Renovatiepremie - Vlaanderen
    b. Renovatielening - Vlaanderen
    c. Renovatiepremie verhuurders - Antwerpen
    d. EPC gebonden indexering - Vlaanderen
    e. EPC verplichting bij verkoop of verhuur – Vlaanderen
    f. Minimaal EPC label D na 5 jaar – Vlaanderen
    g. Support door Ecohuis Antwerpen/huurdersbond/verhuurdersbond – Antwerpen
    h. Verplichting geïsoleerd dak en dubbel glas bij huizen die worden verhuurd – Vlaanderen

APPENDIX E | INTERVIEWS POLICY MAKERS AND EXPERTS

Voorbereiding Interview VEKA – Roel Vermeiren

A: Achtergrondinformatie

Om uw antwoorden in context te kunnen plaatsen zou ik eerst graag een aantal vragen over uw loopbaan en algemene visie willen stellen.

1. Zou u mij kunnen vertellen over uw loopbaan?
2. Welke ontwikkelingen heeft u de afgelopen jaren op het gebied van energie efficiënte renovaties zien plaatsvinden?
3. Wat is uw ervaring met privaat verhuurde appartementen in Antwerpen als het gaat om energie efficiënte renovaties?
4. Welk belang en zeggenschap vindt u dat u heeft binnen uw job met betrekking tot het energie efficiënt renoveren van privaat verhuurde appartementen in Vlaanderen?
5. Hoe sluit wat u betreft lokaal beleid aan bij regionaal beleid? En hoe sluit het woonbeleid aan bij het energiebeleid?

B: Evaluatie huidige beleidsinstrumenten

In de literatuur worden beleidsinstrumenten beoordeeld op basis van de ervaring van stakeholders. Ik heb aan huurders en verhuurders gevraagd wat hun visie is op een aantal beleidsinstrumenten. Deze visie zou ik graag willen vergelijken met de visie van experts.

2. Bent u bekend met de volgende beleidsinstrumenten en wat is uw visie hierop?
    a. Renovatiepremie - Vlaanderen
    b. Renovatielening - Vlaanderen
    c. Renovatiepremie verhuurders - Antwerpen
    d. EPC gebonden indexering - Vlaanderen
    e. BTW-tarief 6% voor renovaties - België
    f. EPC verplichting bij verkoop of verhuur – Vlaanderen
    g. Minimaal EPC label D na 5 jaar – Vlaanderen
    h. Support door Ecohuis Antwerpen/huurdersbond/verhuurdersbond – Antwerpen
    i. Verplichting geïsoleerd dak en dubbel glas bij huizen die worden verhuurd – Vlaanderen
3. Wat zijn wat u betreft de belangrijkste beleidsinstrumenten en initiatieven op dit moment om energie efficiënte renovaties binnen de private huursector te stimuleren en waarom?

C: Evaluatie visie huurders/verhuurders en de Vlaamse Renovatiestrategie

1. Huurders en verhuurders gaven aan twijfels te hebben over het naleven van de wetgeving. Tijdens mijn bezoeken aan de appartementen zag ik dat deze minimale vereisten wel altijd waren nageleefd, zelfs als het appartement verder in slechte staat was. Wat is uw visie op de controle van wetgeving?
2. In de Vlaamse renovatiestrategie staat: “Om het aantal éénmalige renovaties tot label A te verhogen, zullen we eigenaars daartoe zoveel mogelijk activeren op sleutelmomenten, zoeken naar manieren om de kosten te reduceren, effectieve financiële en/of fiscale ondersteuning bieden, wijzen op de voordelen inzake waarde en comfort van de woning en haalbare normen invoeren. Daarnaast moeten we garanderen dat alle renovaties, zowel diepgaande als

gefaseerde, worden gerealiseerd conform de doelstelling 2050". Er wordt dus gezegd dat er wordt ingezet op sleutelmomenten. Uit de interviews blijkt ook dat huurders en verhuurders een sterke voorkeur hebben voor renovaties zonder dat een appartement bewoond is.

   a. Hoe zet wetgeving op dit moment in op activeren op sleutelmomenten en ziet u al verandering sinds deze wetgeving is ingesteld?

4. Er was geen enkele verhuurder die overwoog om zelf grote investeringen te doen om hun gehuurde huis energie efficiënter te maken. In hoeverre vindt u dat een huurder de mogelijkheid zou moeten hebben om zijn of haar huis energie efficiënter te maken?
5. Een hogere EPC leidt in sommige gevallen niet tot een lagere energierekening. Een hogere EPC kan in sommige gevallen tot een hogere verkoop of verhuurprijs leiden. Wetgeving zet in op het verhogen van een EPC. Tijdens de interviews bleek dat huurders niet direct geïnteresseerd waren in het verhogen van hun EPC, liever namen ze maatregelen die direct invloed hadden op hun energierekening zoals het vervangen van lampen, minder gebruik maken van de verwarming en een zuinige douchekop. Verhuurders gaven alleen aan hun EPC te willen verhogen als dit de waarde van het huis verhoogde of als het noodzakelijk was. In de Vlaamse Renovatiestrategie wordt met name gefocust op het EPC.
   a. Wat is uw visie op de EPC methodologie?
   b. De adviezen in het EPC rapport blijken niet altijd technisch en wettelijk realistisch aan te sluiten bij de specifieke kenmerken van een gebouw. Hoe zou dit verbeterd kunnen worden?
6. Vanuit de verhuurders was er kritiek op subsidies. Ook gaven verhuurders aan dat het niet aantrekkelijk is om een lening af te sluiten. De subsidies zouden niet goed zijn afgestemd op de doelgroep en ook verwaarloosbaar zijn ten opzichte van de kosten die een energie efficiënte renovatie zou moeten hebben (900 euro voor het vervangen van een dak dat in totaal 22.000 euro kostte bijvoorbeeld).
   a. Vindt u dat subsidies goed aansluiten bij de huidige vraag. Waarom wel/niet?
   b. In de renovatiestrategie wordt gezegd dat premies moeten worden gekoppeld aan inkomen. Hoe wordt bepaald wat de hoogte van een premie moet zijn om zinvol te zijn voor een bepaalde doelgroep?
   c. Hoe denkt u dat subsidies kunnen bijdragen aan het behalen van doelstellingen?
   d. Waarom is de totaalrenovatiebonus begrenst voor appartementen (p. 45)?
7. De zichtbaarheid van informatieve ondersteuning rondom energie efficiënte renovaties werd erg positief beoordeeld. Zowel de verhuurders als huurders waren ervan overtuigd dat ze voldoende informatie konden vinden. In de Vlaamse Renovatiestrategie wordt hierop ingezet door middel van Energiehuizen. Hoe vindt u dat er op dit moment informatie wordt verstrekt?
8. Uit de interviews met de verhuurders bleek dat zij het idee dat hadden dat ze een goede inschatting kunnen doen van de kosten voor het renoveren van een keuken of badkamer. Over de kosten voor energie efficiënte ingrepen was veel onduidelijkheid. Denkt u dat het VEKA hier een rol in kan spelen en hoe zou het VEKA dat kunnen doen?
9. Uit de interviews bleek dat verduurzamen van verhuurde appartementen altijd een financieel voordeel moet leveren. Duurzaamheid op zichzelf was nooit een reden om te willen renoveren. In de renovatiestrategie staat dat er wordt ingezet het vergroten van het bewustzijn over waarom er moet worden gerenoveerd.
   a. Hoe wordt dit gedaan?
   b. Wat zou dit bewustzijn moeten veranderen?

Voorbereiding interview Veva Roesems

A: Achtergrondinformatie

Om uw antwoorden in context te kunnen plaatsen zou ik eerst graag een aantal vragen over uw loopbaan en algemene visie willen stellen.

6. Kan u mij vertellen welke rol u op dit moment heeft met betrekking tot het stimuleren van energie efficiënte renovaties vanuit de Stad Antwerpen en BE REEL!?
7. Wat is uw ervaring met energie efficiënte renovaties de afgelopen jaren geweest?
8. Hoe zou u recente ontwikkelingen rondom energie efficiënte renovaties omschrijven?
9. Hoe kijkt u naar de privaat verhuurde appartementen in Antwerpen als het gaat om energie efficiënte renovaties?
10. Welke power en interest vindt u dat u heeft met betrekking tot het energie efficiënt renoveren van privaat verhuurde appartementen?
11. Wat is volgens u de rol van regionaal beleid en hoe sluit dit aan bij lokaal beleid?

B: Evaluatie huidige beleidsinstrumenten

In de literatuur worden beleidsinstrumenten beoordeeld op basis van de ervaring van stakeholders. Ik heb aan huurders en verhuurders gevraagd wat hun visie is op een aantal beleidsinstrumenten. Deze visie zou ik graag willen vergelijken met de visie van experts.

10. Bent u bekend met de volgende beleidsinstrumenten en wat is uw visie hierop in relatie tot lokaal beleid?
    a. Renovatiepremie - Vlaanderen
    b. Renovatielening - Vlaanderen
    c. Renovatiepremie verhuurders - Antwerpen
    d. EPC gebonden indexering - Vlaanderen
    e. BTW-tarief 6% voor renovaties - België
    f. EPC verplichting bij verkoop of verhuur – Vlaanderen
    g. Minimaal EPC label D na 5 jaar – Vlaanderen
    h. Support door Ecohuis Antwerpen/huurdersbond/verhuurdersbond – Antwerpen
    i. Verplichting geïsoleerd dak en dubbel glas bij huizen die worden verhuurd – Vlaanderen
11. Wat zijn wat u betreft de belangrijkste beleidsinstrumenten en initiatieven op dit moment om energie efficiënte renovaties binnen de private huursector te stimuleren en waarom?
12. Bent u bekend met initiatieven in Antwerpen die inzetten op energiearmoede?

C: Evaluatie visie huurders/verhuurders

Aan de hand van de interviews met de huurders en verhuurders leg ik u een aantal dilemma's voor.

1. Huurders en verhuurders gaven aan twijfels te hebben over het naleven van de wetgeving. Tijdens mijn bezoeken aan de appartementen zag ik dat deze minimale vereisten wel altijd waren nageleefd, zelfs als het appartement verder in slechte staat was. Wat is uw visie op de controle van wetgeving?
2. Een hogere EPC leidt in sommige gevallen niet tot een lagere energierekening. Een hogere EPC kan in sommige gevallen tot een hogere verkoop of verhuurprijs leiden. Wetgeving zet in op het verhogen van een EPC. Tijdens de interviews bleek dat huurders niet direct geïnteresseerd waren in het verhogen van hun EPC, liever namen ze maatregelen die direct invloed hadden op hun energierekening zoals het vervangen van lampen, minder gebruik maken van de verwarming en een zuinige douchekop. Verhuurders gaven alleen aan hun EPC te willen verhogen als dit de waarde van het huis verhoogde of als het noodzakelijk was. Wat is uw visie op de EPC methodologie?

3. Er was geen enkele verhuurder die overwoog om zelf grote investeringen te doen om hun gehuurde huis energie efficiënter te maken. In hoeverre vindt u dat een huurder de mogelijkheid zou moeten hebben om zijn of haar huis energie efficiënter te maken?
4. Vanuit zowel de verhuurders als de huurders bleek dat renovaties tijdens het bewonen van een appartement niet wenselijk zijn. Voor verschillende redenen hadden beiden de voorkeur de renovaties tussen huurders in uit te voeren. Wat is uw visie op het meer inzetten op wetgeving die specifiek focust op het transactiemoment waarin huurders wisselen?
5. Vanuit de verhuurders was er kritiek op subsidies. De subsidies zouden niet goed zijn afgestemd op de doelgroep en ook verwaarloosbaar zijn ten opzichte van de kosten die een energie efficiënte renovatie zou moeten hebben (900 euro voor het vervangen van een dak dat in totaal 22.000 euro kostte bijvoorbeeld). Voor wie en hoe zouden subsidies wat u betreft ingezet moeten worden?
6. De zichtbaarheid van informatieve ondersteuning rondom energie efficiënte renovaties werd erg positief beoordeeld. Zowel de verhuurders als huurders waren ervan overtuigd dat ze voldoende informatie konden vinden. Heeft u zelf het idee dat er voldoende informatie en de juiste informatie beschikbaar is en waarom?
7. Uit de interviews met de verhuurders bleek dat zij het idee dat hadden dat ze een goede inschatting kunnen doen van de kosten voor het renoveren van een keuken of badkamer. Over de kosten voor energie efficiënte ingrepen was veel onduidelijkheid. Wat is uw visie hierop en welke oplossing zou u hiervoor hebben?

Afsluitende vraag:

Welke veranderingen op het gebied van initiatieven rondom energie efficiënte renovaties zijn wat u betreft het belangrijkste?

Voorbereiding interview Simon Gheysen

A: Achtergrondinformatie

Om uw antwoorden in context te kunnen plaatsen zou ik eerst graag een aantal vragen over uw achtergrond en uw ervaring binnen de beleidscontext woningrenovaties willen stellen.

1. Zou u mij kunnen vertellen hoe u Adjunct- Kabinetschef Wonen bij Kabinet van Vlaams minister Matthias Diependaele bent geworden?
2. Hoe zou u recente ontwikkelingen rondom energie efficiënte renovaties omschrijven?
3. Hoe groot acht u het belang van het renoveren van privaat verhuurde appartementen in Vlaanderen?
4. Hoe groot acht u uw zeggenschap in het energie efficiënt renoveren van de Vlaamse Woonvoorraad? Wat is de rol van een verhuurder en een huurder?
5. Wat is de rol van lokale gemeentes en hoe sluit lokaal beleid aan bij Regionaal beleid?

B: Evaluatie huidige beleidsinstrumenten

In de literatuur worden beleidsinstrumenten beoordeeld op basis van de ervaring van stakeholders. Ik heb aan huurders en verhuurders gevraagd wat hun visie is op een aantal beleidsinstrumenten. Deze visie zou ik graag willen vergelijken met de visie van experts.

1. Bent u bekend met de volgende beleidsinstrumenten en wat is uw visie hierop in relatie tot woonbeleid?
    a. Renovatiepremie - Vlaanderen
    b. Renovatielening - Vlaanderen
    c. Additionele renovatiepremie verhuurders - Antwerpen
    d. EPC gebonden indexering - Vlaanderen
    e. BTW-tarief 6% voor renovaties - België
    f. EPC verplichting bij verkoop of verhuur – Vlaanderen
    g. Minimaal EPC label D na 5 jaar – Vlaanderen
    h. Support door One-stop-shops/huurdersbond/verhuurdersbond – Vlaanderen
    i. Verplichting geïsoleerd dak en dubbel glas bij huizen die worden verhuurd – Vlaanderen
2. Wat zijn wat u betreft de belangrijke beleidsinstrumenten en initiatieven op dit moment om energie efficiënte renovaties binnen de private huursector te stimuleren en waarom?

C: Evaluatie visie huurders/verhuurders en beleidsnota wonen.

Aan de hand van de interviews met huurders en verhuurders en de beleidsnota leg ik een aantal dilemma's voor.

1. In de beleidsnota wordt verwezen naar comformiteitsonderzoeken (p. 16) om te testen of woningen aan de minimale vereisten voldoen. Huurders gaven aan tijdens interviews twijfels te hebben over het naleven van de wetgeving rondom energie efficiëntie van woningen. Desondanks zag ik tijdens de interviews dat de minimale vereisten (geïsoleerd dak en dubbel glas, wel altijd waren nageleefd). Betere communicatie en naleving wordt in de beleidsnota als doel gesteld.
    a. Hoe is betere communicatie en naleving veranderd sinds 2019 en welke rol speelt duurzaamheid binnen deze kwaliteitseisen?
    b. Comformiteitsonderzoeken kunnen worden aangevraagd door de verhuurder of op initiatief van de gemeente. Is het een bewust keuze dat een huurder dit niet kan aanvragen en waarom?
    c. Ziet u kansen bij het verhogen van de zeggenschap van huurders om energie efficiënte maatregelen te nemen?

2. In de beleidsnota staat: “naast de verplichting tot dakisolatie en dubbele beglazing wordt de maximale EPC-score richting 2050 gradueel bepaald, rekening houdend met de woningtypologie” (p. 17).
    a. Op welke termijn kunnen we vervolgstappen verwachten en wat zouden deze stappen inhouden?
    b. Uit literatuur, de interviews en onderzoek van Steunpunt Wonen blijkt dat een betere EPC niet altijd leidt tot een lagere energierekening maar wel huurverhoging. Dit maakt verplichtingen rondom EPCs niet altijd aantrekkelijk voor huurders. Zij focussen liever op maatregelen die hun energierekening direct verlagen (waterbesparende douchekop, led verlichting, etc.). Bij verhuurders heerst veel onduidelijkheid op het effect van een hogere EPC op de waarde van hun woning. Desondanks, spitst wetgeving zich volledig toe op het verhogen van EPCs. Wat is uw visie hierop?
    c. Verhuurders gaven aan dat de investeringen van duurzame ingrepen onrealistisch hoog zijn en subsidies ontoereikend. Hoe worden de doelgroepen en de hoogte van subsidies bepaald?
    d. Waarom worden er in de beleidsnota vooral ingezet op renovatievoordelen voor private verhuurders die huren via een SVK?
3. Uit de interviews blijkt dat verhuurders het moeilijk vinden om een inschatting te doen van de kosten van energie efficiënte maatregelen in tegenstelling tot het vervangen van een badkamer of keuken.
    a. Ziet u kansen om hier meer (informatieve) ondersteuning in te bieden?
4. Uit de interviews bleek dat zowel huurders als verhuurders een renovatie tijdens het bewonen van een appartement niet wenselijk vonden. In de beleidsnota wordt de vraag naar noodopvang en herhuisvestigingsmogelijkheden ook benoemd als dé schakel waarmee woningkwaliteitsbeleid staat op valt (p.18). “De eerste stap hierin is het in kaart brengen van noodopvang- en huisvestigingscapaciteit van de gemeente”.
    a. Is er al meer bekend over deze capaciteit en eventuele vervolgstappen?
    b. Ziet u andere mogelijkheden om meer in te zetten op renovatievoordelen tijdens transactiemomenten?
5. Ook in het nieuwe Huurdecreet wordt renovatie binnen de private huursector gestimuleerd door huurindexering afhankelijk te maken van het EPC label, mogelijkheid tot herziening van huurprijs als er energiebesparende maatregelen zijn genomen en opzegging huurcontract voor renovatiewerken.
    a. Uit de interviews blijkt dat verhuurders de gelimiteerde huurindexering als een belangrijke reden zien om energie efficiënte maatregelen uit te voeren. Ziet u zelf al resultaat van deze nieuwe regelgeving en zo ja, welke veranderingen ziet u?
    b. Ziet u al resultaat van de andere regelgeving?

Voorbereiding Interview Zeno Winkels

Achtergrondinformatie:

1. Welke ontwikkelingen heeft u de afgelopen jaren op het gebied van energie efficiënte renovaties zien plaatsvinden?
2. Welk belang en zeggenschap heeft u binnen uw baan op energie efficiënte renovaties met betrekking tot de private huursector?
3. Hoe sluit wat u betreft lokaal en regionaal beleid op elkaar aan in Nederland?

Evaluatie beleidsinstrumenten:

1. Renovatiepremies
2. Renovatieleningen
3. EPC gebonden indexering
4. BTW-tarief 6% voor renovaties
5. EPC verplichting bij verkoop en verhuur
6. Minimaal energielabel D 5 jaar na verkoop
7. Support vanuit energiehuizen
8. Verplichting geïsoleerd dak en dubbel glas bij verhuur
9. Welk instrument vindt u zelf erg waardevol wat op dit moment in Nederland wordt gebruikt?

Evaluatie visie huurders/verhuurders:

1. De Vlaamse regering is erg bang om in te grijpen in de private huursector. Veel beleidsinstrumenten gelden voor sociale verhuur en eigenaar bewoners maar niet voor de private huursector. Heerst die angst ook in Nederland en snapt u die angst?
2. Ziet u dat in Nederland wetgeving wordt nageleefd? Hoe is de controle op wetgeving?
3. De Vlaamse overheid wil meer inzetten op wetgeving rond sleutelmomenten. Dus extra verplichtingen op het moment dat een huis opnieuw verhuurd wordt of verkocht. Ziet u hier kansen?
4. De EPC methodologie lijkt de split incentive niet altijd te verminderen. Energiekosten worden niet perse lager en verhuurders hebben niet het idee dat de investering ook de waarde van hun huis voldoende verbetert. Wat is uw visie op deze methodologie?
5. Verhuurders en huurders gaven aan dat het wel duidelijk te vinden is wat er moet gebeuren. Het is alleen onduidelijk wat dit precies gaat kosten en opleveren. Snapt u dit en ziet u hier een oplossing voor?
6. In ons vorige gesprek gaf u aan dat het grootste probleem is dat mensen gewoon niet willen renoveren. Ziet u dit in de komende jaren veranderen en waarom wel/niet?

Belangrijkste punten:

- In Nederland worden premies niet goed ontvangen → commerciële partijen willen eerst weten wat de nieuwe verplichtingen zijn
- Puntensysteem waarin EPC wordt meegenomen
- Meeste huurders in de private sector willen uiteindelijk een huis kopen

Voorbereiding Interview Sven

A: Achtergrondinformatie

1. Zou u mij wat kunnen vertellen over uw functie bij Ecohuis Antwerpen?
2. Zou u mij kunnen vertellen welke ontwikkelingen u de afgelopen jaren heeft gezien op het gebied van energie effciente renovaties binnen de private huursector?
3. Zou u mij kunnen vertellen welke ontwikkelingen u de afgelopen jaren heeft gezien op het gebied van energiearmoede?
4. Heeft u het idee dat u zelf invloed heeft het versnellen van energie effciente renovaties en het verminderen van energiearmoede?
5. Verschilt de Antwerpse context van de Vlaamse context?

B: Evaluatie beleidsinstrumenten:

1. Wat vindt u van de volgende instrumenten:
    a. Renovatiepremie - Vlaanderen
    b. Renovatielening - Vlaanderen
    c. Renovatiepremie verhuurders - Antwerpen
    d. EPC gebonden indexering - Vlaanderen
    e. BTW-tarief 6% voor renovaties - België
    f. EPC verplichting bij verkoop of verhuur – Vlaanderen
    g. Minimaal EPC label D na 5 jaar – Vlaanderen
    h. Support door Ecohuis Antwerpen/huurdersbond/verhuurdersbond – Antwerpen
    i. Verplichting geïsoleerd dak en dubbel glas bij huizen die worden verhuurd – Vlaanderen
2. Wat zijn wat u betreft de belangrijkste beleidsinstrumenten en initiatieven op dit moment om energie efficiënte renovaties binnen de private huursector te stimuleren en waarom?
3. Wat zijn wat u betreft belangrijke instrumenten die inzetten op het verminderen van energiearmoede en waarom?

C: Evaluatie visie huurders/verhuurders op Vlaamse renovatiestrategie

1. Oplossing voor huis onbewoonbaar of ongeschikt verklaren?
    a. Ziet u dit vaak gebeuren?
    b. In wat voor huizen komen mensen dan terecht?
2. Zou beleid meer op verschillende doelgroepen gefocust moeten worden. Bijvoorbeeld de groep private huurders die wacht op een sociale huurwoning? Hoe zou dit in zijn werking kunnen gaan?
3. Wat is wat u betreft het toekomstperspectief van sociale huurders? Blijven die voor altijd in sociale huur?
4. Wat verwacht u dat er gebeurt als de energieprijzen weer heel erg dalen en hoge energierekeningen weer een kleiner probleem worden?
5. Wat mag wat u betreft niet ontbreken in de conclusie van mijn onderzoek?

APPENDIX F | SURVEY TENANTS (ALSO AVAILABLE IN DUTCH)

Thesis - energy efficiency renovations in the private rental sector

U kunt de Nederlandse versie van deze survey hier vinden: https://forms.office.com/e/2gumDwb6KX

Hello all,

For my master's thesis of the study Management in the Built Environment at TU Delft, I am doing research on energy efficient renovations of privately rented flats. In this survey, I investigate tenants' views on renovating their apartment for the purpose of increasing energy efficiency. You help me immensely by sharing your views in this survey. Answers from tenants with both experience and no experience of renovating their homes are relevant to my research.

Thank you in advance for your help!

Survey protocol:
- All information collected through this survey is accessible only to the researcher (Floor Rekers);
- The results of this survey will be used to test hypotheses based on a literature review. Subsequently, in-depth interviews will be conducted based on this survey to qualitatively examine the results of this survey.
- All results of this survey will be destroyed after analysis;
- You have the option not to answer questions or to stop completing the survey at any time;
- It is possible to complete the survey completely anonymously by not sharing your email address at the end of this survey;
- The results will never be presented individually in the survey report.

Kind regards,

Floor Rekers

Sectie 1

Background information

This section consists of two questions that should show whether you belong to the target group for which this survey was designed.

1. You are...

- ◯ a private renter
- ◯ a social renter
- ◯ owner of your house

2. You live in...

- ◯ an apartment
- ◯ a detached house
- ◯ a semi-detached house
- ◯ a terraced house

3. Do you live in the municipality of Antwerp?

- ◯ Yes
- ◯ No

Sectie 2

Experience energy efficiency renovations

In this section, you will be asked whether you have experience in energy-efficient home renovations. Subsequent questions will be adjusted according to this answer.

4. Have you, as a renter, experienced energy efficiency renovations in your home?
Energy efficiency renovations include all the measures that are taken to improve the energy efficiency of your home (such as insulation of floors/walls, replacement of heating systems, etc.).

- ◯ Yes
- ◯ No

Sectie 3 ...

No experience

This is the section that should be filled in by everyone who never experienced an energy efficiency renovation.

5. Are you interested in improving the energy efficiency of your house?

- ◯ Yes
- ◯ No

6. Are you interested in improving the energy efficiency of your home?

Voer uw antwoord in

7. What kind of measures would you like to implement?

- ☐ Wall insulation
- ☐ Roof insulation
- ☐ Floor insulation
- ☐ Window replacement
- ☐ Efficient heating system
- ☐ Solar panels

8. You feel like you have an interest in implementing these measures.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

9. You feel like you can decide whether these measures could be implemented.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

10. You want to have more power in the implementation of energy efficiency measures.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

11. To what extent do the following barriers prevent you from initiating an energy-efficient renovation?

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Not applicable
Lack of information	○	○	○	○	○	○
Rent increase	○	○	○	○	○	○
No right to renovate	○	○	○	○	○	○
Time consuming and complex processes	○	○	○	○	○	○
Disturbance	○	○	○	○	○	○
Temporary move	○	○	○	○	○	○
Past experiences (of others)	○	○	○	○	○	○

12. What other barriers could play an important role?

Voer uw antwoord in

13. What parties do you expect to support you during the renovation process?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Unknown
Your landlord	○	○	○	○	○	○
Flemish Government	○	○	○	○	○	○
Your municipality	○	○	○	○	○	○
Energy service companies	○	○	○	○	○	○
Energy desks	○	○	○	○	○	○
Energy houses	○	○	○	○	○	○
Tenant organisations	○	○	○	○	○	○

14. Is there another party from who you would expect support?

Voer uw antwoord in

15. What kind of support would you prefer?

	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Not applicable
Support in planning and organisation	○	○	○	○	○	○
Provision of information	○	○	○	○	○	○
Financial support	○	○	○	○	○	○
Clear renovation targets	○	○	○	○	○	○
Legal support	○	○	○	○	○	○
Inspirational projects	○	○	○	○	○	○

16. Is there other support that would be beneficial?

Voer uw antwoord in

Sectie 4 ...

Experience

This is the section asking for your views on energy-efficient renovations based on your experience.

17. Were you interested in improving the energy efficiency of your house?

- ◯ Yes
- ◯ No

18. Why? Why not?

Voer uw antwoord in

19. What measures have been taken?

- ☐ Wall insulation
- ☐ Roof insulation
- ☐ Floor insulation
- ☐ Window replacement
- ☐ Efficient heating system
- ☐ Solar panels

20. You had an interest in implementing these measures.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

21. You could determine whether the energy efficiency measures were implemented.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

22. You wanted more participation in the implementation of energy efficiency measures.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

23. To what extent did the following barriers play a role during the energy-efficient renovation?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Not applicable
Lack of information	○	○	○	○	○	○
Rent increase	○	○	○	○	○	○
No right to renovate	○	○	○	○	○	○
Time consuming and complex processes	○	○	○	○	○	○
Disturbance	○	○	○	○	○	○
Temporary move	○	○	○	○	○	○
Past experiences (of others)	○	○	○	○	○	○

24. What other barriers played an important role for you in initiating energy efficiency renovations?

Voer uw antwoord in

25. What parties supported you during the renovation process?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Your landlord	○	○	○	○	○
Flemish Government	○	○	○	○	○
Municipality of Antwerp	○	○	○	○	○
Energy service comapnies	○	○	○	○	○
Energy desks	○	○	○	○	○
Energy houses	○	○	○	○	○
Tenant organisations	○	○	○	○	○

26. Was there any other party from whom you expected support? Did you receive this support?

Voer uw antwoord in

27. What support would be helpful during an energy-efficient renovation?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Not applicable
Support in planning and organisation	○	○	○	○	○	○
Provision of information	○	○	○	○	○	○
Financial support	○	○	○	○	○	○
Clear renovation targets	○	○	○	○	○	○
Legal support	○	○	○	○	○	○
Inspirational projects	○	○	○	○	○	○

28. Is there any other form of support that could help you?

Voer uw antwoord in

Sectie 5 ...

Background information

Thank you very much for your answers so far.
Here is a section to help me analyse the answers to previous questions. Please feel free to (partially) skip this section and submit the survey without these answers. The previous answers are already helping me tremendously with my research.

29. What is your age?

Voer uw antwoord in

30. What is your household typology?

- ○ Single
- ○ Single with children
- ○ Couple
- ○ Couple with children
- ○ Room mates

31. If applicable, what is the duration of your contract?

- ○ 1 year
- ○ 3-6-9 year
- ○ Undetermined

32. What is your gender?

Voer uw antwoord in

33. What is your education degree?

Voer uw antwoord in

34. To what income scale do you belong (bruto yearly)?

- ◯ < 13.540 euro
- ◯ 13.541 - 29.300 euro
- ◯ 29.301 - 41.360 euro
- ◯ > 41.360

35. What is the construction year of your house?

- ◯ < 1900
- ◯ 1900 - 1920
- ◯ 1921 - 1940
- ◯ 1941 - 1960
- ◯ 1961 - 1980
- ◯ 1981 - 2000
- ◯ 2001 - 2020
- ◯ > 2021

36. What is the total floor area of your house?

- ◯ < 30 m2
- ◯ 31 - 50 m2
- ◯ 51 - 70 m2
- ◯ 71 -90 m2
- ◯ 91 - 110 m2
- ◯ 111 - 130 m2
- ◯ 131 - 150 m2
- ◯ > 150 m2

37. Where is your house located?

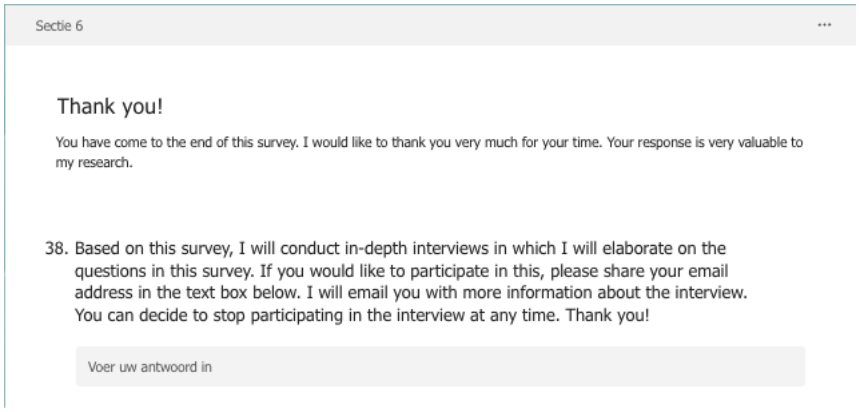
- ◯ Urban environment
- ◯ Sub-urban environment
- ◯ Rural environment

36. What is the total floor area of your house?

- ◯ < 30 m2
- ◯ 31 - 50 m2
- ◯ 51 - 70 m2
- ◯ 71 -90 m2
- ◯ 91 - 110 m2
- ◯ 111 - 130 m2
- ◯ 131 - 150 m2
- ◯ > 150 m2

37. Where is your house located?

- ◯ Urban environment
- ◯ Sub-urban environment
- ◯ Rural environment


Sectie 6
Thank you!
You have come to the end of this survey. I would like to thank you very much for your time. Your response is very valuable to my research.
38. Based on this survey, I will conduct in-depth interviews in which I will elaborate on the questions in this survey. If you would like to participate in this, please share your email address in the text box below. I will email you with more information about the interview. You can decide to stop participating in the interview at any time. Thank you!
Voer uw antwoord in

Energy efficiency renovations in privately rented apartment blocks: can tenants take responsibility?

0. Administrative questions

1. Name of data management support staff consulted during the preparation of this plan.

My faculty data steward, Diana Popa.

2. Date of consultation with support staff.

0202-01-19

I. Data description and collection or re-use of existing data

3. Provide a general description of the type of data you will be working with, including any re-used data:

Type of data	File format(s)	How will data be collected (for re-used data: source and terms of use)?	Purpose of processing	Storage location	Who will have access to the data
Personal data (age, household typology, working status, barriers to perform energy efficiency measures) renters	.pdf or .excel	survey and Interviews	To know characteristics renters	TU Delft data storage, Onedrive	my first and second mentor and me.
Personal data (age, household typology, working status, barriers to perform energy efficiency measures) landlords	.pdf or .excel	survey and Interviews	To know characteristics renters	TU Delft data storage, Onedrive	my first and second mentor and me.
Personal data (name, function) experts and policy makers.	.pdf or .excel	Interviews and focus groups	To know roles of policy makers and experts	TU Delft data storage, Onedrive	my first and second mentor and me.
Interview and focus group recordings	.mp3	Recording on phone	To transcribe interviews	Onedrive	me
Interview and focus group transcripts	.pdf	Transcription from recording	To analyse the interviews by coding in Atlas.TI	Onedrive	My first and second mentor and me.

4. How much data storage will you require during the project lifetime?

- 250 GB - 5 TB

II. Documentation and data quality

5. What documentation will accompany data?

- Methodology of data collection
- README file or other documentation explaining how data is organised

III. Storage and backup during research process

6. Where will the data (and code, if applicable) be stored and backed-up during the project lifetime?

- OneDrive
- Project Storage at TU Delft

IV. Legal and ethical requirements, codes of conduct

7. Does your research involve human subjects or 3rd party datasets collected from human participants?

- Yes

8A. Will you work with personal data? (information about an identified or identifiable natural person)

If you are not sure which option to select, ask your Faculty Data Steward for advice. You can also check with the privacy website or contact the privacy team: privacy-tud@tudelft.nl

- Yes

8B. Will you work with any other types of confidential or classified data or code as listed below? (tick all that apply)

If you are not sure which option to select, ask your Faculty Data Steward for advice.

- Yes, data which could lead to reputation/brand damage (e.g. animal research, climate change, personal data)

9. How will ownership of the data and intellectual property rights to the data be managed?

For projects involving commercially-sensitive research or research involving third parties, seek advice of your Faculty Contract Manager when answering this question. If this is not the case, you can use the example below.

All the data will be gathered by my own empirical research. This data will be owned by me and is only accessible by me, and my first (Erwin Mlecnik) and second (Queena Qian) mentor.

10. Which personal data will you process? Tick all that apply

- Other types of personal data - please explain below
- Data collected in Informed Consent form (names and email addresses)
- Gender, date of birth and/or age
- Email addresses and/or other addresses for digital communication
- Names and addresses

Audio recordings of the interviews and focus groups.

11. Please list the categories of data subjects

Landlords that rent out private rented apartments.
Renters that rent private rented apartments.
Experts that work for energy houses in Antwerp.
Policy makers that design policies on energy efficiency renovations in the Flemish region or the city of Antwerp.

12. Will you be sharing personal data with individuals/organisations outside of the EEA (European Economic Area)?

- No

15. What is the legal ground for personal data processing?

- Informed consent

16. Please describe the informed consent procedure you will follow:

All the interviewees will be asked for their written consent before taking part in the study. The informed consent will include the following:
- Introduction to the research
- Length of the interview
- Set up and topics that will be discussed in the interview
- Disclaimer that every interviewee can stop the interview process whenever they prefer to do so.

17. Where will you store the signed consent forms?

- Other - please explain below

The consent forms will only be stored in the TU Project Storage.

18. Does the processing of the personal data result in a high risk to the data subjects?

If the processing of the personal data results in a high risk to the data subjects, it is required to perform a Data Protection Impact Assessment (DPIA). In order to determine if there is a high risk for the data subjects, please check if any of the options below that are applicable to the processing of the personal data during your research (check all that apply).
If two or more of the options listed below apply, you will have to complete the DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to receive support with DPIA.
If only one of the options listed below applies, your project might need a DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to get advice as to whether DPIA is necessary.
If you have any additional comments, please add them in the box below.

- None of the above applies

22. What will happen with personal research data after the end of the research project?

- Anonymised or aggregated data will be shared with others

25. Will your study participants be asked for their consent for data sharing?

- Yes, in consent form - please explain below what you will do with data from participants who did not consent to data sharing

V. Data sharing and long-term preservation

27. Apart from personal data mentioned in question 22, will any other data be publicly shared?

- All other non-personal data (and code) underlying published articles / reports / theses
- All other non-personal data (and code) produced in the project

29. How will you share research data (and code), including the one mentioned in question 22?

- All anonymised or aggregated data, and/or all other non-personal data will be uploaded to 4TU.ResearchData with public access

30. How much of your data will be shared in a research data repository?

- 100 GB - 1 TB

31. When will the data (or code) be shared?

- At the end of the research project

32. Under what licence will be the data/code released?

- CC BY-ND

VI. Data management responsibilities and resources

33. Is TU Delft the lead institution for this project?

- Yes, the only institution involved

34. If you leave TU Delft (or are unavailable), who is going to be responsible for the data resulting from this project?

The TU Delft is the leading institution in this project. When I leave the TU Delft I will be responsible for the personal data but the TU Delft will be responsible for all the other data.

35. What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?

Findable
This research will be published on the Delft University of Technology repository. Here, the research can easily be found by searching for keywords, author name and title of the research. In addition, the data that is empirically acquired will be published as an anonymised data set which makes it easier to use for studies that are related to this research.

Accessible
The research is publicly accessible through the Delft University of Technology repository. No authentication is required to find and assess this research. In this published version, all the data that is related to individuals will be anonymised.

Interoperable
The data that derives from this research will be anonymously available in a file that can easily be used for further research (.excel for example). In addition, all the data that is used in the research will include a reference. Lastly, the research is written in English to increase the interoperability.

Reusable
The methodology is explained in the method section, and references are used to ensure the reusability of this research. In addition, the research includes a section with all the limitations of the research.

APPENDIX H SWOT-analysis literature review

	3.1: Correlation between the European and Flemish targets	**3.2 Barriers and policy instruments concerning energy efficiency renovations in the private rental sector**	**3.3 Contextual factors**
Strengths	• The European targets of 2020 were reached (EUR-Lex, 2022b). • The Flemish renovation strategy 2020 – 2050 offers a guideline towards renovating the Flemish building stock (VEKA, 2020). • The Flemish renovation strategy 2020-2050 contributed a section to energy poverty (VEKA, 2020). • The Flemish government designed an energy poverty program (VEKA, 2020).	• There are statutory regulations for minimum energy performance requirements (VEKA, 2020). • The Flemish government offers subsidies for energy efficiency renovations (VEKA, 2023e). • Governmental actors offer multiple policy instruments that support the considering phase (VEKA, 2023f; City of Antwerp, 2023; VEKA, 2023b). • The standard contract duration is 9 years (VEKA, 2019). • Energy houses offer support to tenants and landlords for energy efficiency renovations (Ecohuis Antwerpen, n.d.).	• Flanders introduced multiple policy instruments to speed up energy efficiency renovations in the last years (VEKA, 2022). • Reports show the focus on increasing energy efficiency renovations (VEKA, 2020).
Weaknesses	• The large reduction that made Europe reach their targets was due to the Covid-19 pandemic EUR-Lex, 2022b). • The Flemish renovation strategy is less ambitious than the European strategy (EUR-Lex, 2010; EUR-Lex, 2018; EUR-Lex, 2021, Papantonis et	• A tenant relies on their landlord's initiative to perform energy efficiency renovations (Middlemiss et al., 2015). • In Flanders, investing in private rental is seen as risky. Therefore, there is a strong tendency to selecting tenants based on their	• 52% pays a percentage of their income to their rent higher than the "Woonquote" (Diependaele, 2020). • Fluctuating energy prices (CREG, 2023). • High renovation costs (VEKA, 2023a).

	al., 2022; EUR-Lex, 2021; VEKA, 2020). • A good Energy performance certificate does not necessarily lead to a decrease in energy usage (VEKA, 2023c). • Almost the whole Flemish building stock (96,5%) needs to be renovated (VEKA, 2020). • Energy efficiency renovations are often driven by technical need instead of energy savings (Thuvander et al., 2012). • Unclarity about the definition of energy efficiency renovations in policy reports (Femenias & Granath 2022; Thuvander et al., 2012). • The private rental sector is vulnerable to energy poverty (Diependale, 2020). • A European wide metric for energy poverty does not exists (Karpinska et al., 2020). • 15,9% of the people living in the Flemish region phase energy poverty (VEKA, 2020).	financial situation (Winter et al., 2010). • In private rented apartment blocks, all the owners have to agree on big investment decisions regarding energy efficiency renovations (Berghs, 2022).	• Very old building stock (in comparison to other European countries and in comparison to other sectors in Flanders) (Dreesen et al., 2021). • Very diverse building stock (in comparison to other European countries) (Dreesen et al., 2021). • There is a shortage of private rented homes (Diependaele, 2020). • Belgium belongs to the top four countries with the highest per capita fossil fuel usage in buildings (Nijs et al., 2021).
Opportunities	• The European targets are still reachable with	• Collaborative Governance projects that focus on supporting energy	• The biggest percentage of people living in the Flemish building

	additional measures (EUR-Lex, 2022b). • All the residential buildings should reach label A according to the Flemish Renovation Strategy 2020-2050 (VEKA, 2020).	efficiency renovations (Van der Heijden, 2014; CondoReno, 2023; VEKA, 2022c). • Voluntary programs such as ESCOs (Van der Heijden, 2014). • Energy distribution parties can offer subsidies (ENGIE, 2023; Fluvius, 2023b). • Banks offer renovation loans (ING, 2023). • Banks offer supporting renovation tools (ING, 2023). • My renovation premium offered by the Flemish Government (VEKA, 2023f). • My renovation loan offered by the Flemish Government (VEKA, 2023b). • Renovation premium for landlords offered by the Municipality of Antwerp (City of Antwerp, 2023). • Index limitations set by the Flemish Government (VEKA, 2023b). • EPC requirements on transactions determined by the Flemish Government (VEKA, 2023). • Road map on energy performance certificate (VEKA, n.d.-e)	stock is young. The younger the tenant, the less sensitive the tenant is to noise, disturbance, or temporary move caused by renovation works (Femenías et al., 2018). • The older the building, the worse the physical state, the easier the cost benefits can be estimated (Palm et al., 2018).
Threats	• People with a profile vulnerable to energy poverty	• Discrepancies between estimated	• The older the building stock (Census, 2011), the

	appeared to live in less efficient homes (Dreesen et al., 2021).	and realized savings (Palm et al., 2020). • Lack of information (Papantonis et al., 2022). • Rent-increase (Femenías et al., 2018). • Split incentive issue (Maciosek et al., 2022; Papantonis et al., 2022). • High upfront costs (Papantanois et al., 2022). • Varying energy efficiency targets (Palm et al., 2020). • Limiting rights to renovate (Murphy et al., 2012). • Disagreement on the effect of measures (Palm et al., 2020). • Time-consuming and complex process (Papantonis et al., 2022). • Complex stakeholder structures (Palm et al., 2018). • Mistrust in governmental policies (Palm et al., 2020). • Lack of reliable professionals (Palm et al., 2020). • Disturbance renovation works (Femenías et al., 2018). • Temporary move (Femenías et al., 2018). • No profits for contractors (Palm et al., 2020). • Bad experiences of others	deeper renovations are required, the higher the upfront costs.

		(Ebrahimigharehbaghi et al., 2019).	

APPENDIX I SWOT-analysis empirical results

	4.1: Correlation between the European and Flemish targets	**4.2, 4.3, 4.4 Barriers and policy instruments concerning energy efficiency renovations in the private rental sector**	**4.5 Contextual factors**
Strengths	• The Flemish Renovation strategy continuously developed in order to meet the European most recent European Targets (E3).	• Tenants had the feeling that they could find sufficient information about energy efficiency renovations online if necessary (R5 – R9). • Landlords were confident about their knowledge, or they knew where to find sufficient information (L1 – L6). • Landlords perceive energy efficiency renovation works as part of their job if it contributes to the maintenance of the building (L1 – L6) • Landlords did not perceive finding consensus in their owner's association as a barrier (L1 – L6). • Tenants are convinced that energy efficiency measures increase comfort (R4, R5, R9). • Landlords were confident that the measures proposed on their energy performance certificate will increase energy efficiency (L1 – L6). • Landlords did not perceive a time consuming and complex process as a	• The municipality of Antwerp has a pilot role in encouraging EERs (E2). • In comparison to the Netherlands, the Belgian housing market is fairly solid (E5). • Regulations for the private rental sector are being implemented with restraints to prevent further tightness in an already tight market (E5).

		barrier to perform energy efficiency renovations, however, it could slow down the process (L1 – L6). • Finding a reliable professional was not perceived as a barrier to perform renovation works (L1, L2, L3). • For both tenants and landlords, disturbance was not perceived as an important barrier to energy efficiency renovations (L1 – L6 and R1 – R10). • High upfront costs is not perceived as an important barrier for landlords (L2, L4, L5). • Bad experiences (of others) were not perceived as an important barrier by tenants and landlords (L1-L6 & R1-R10). • EPC bounded indexation motivates landlords to take measures (L1-L6). • Support offered by energy houses is often used by low income households (R1-R4). • The renovation obligation gives insight into the number of buildings that will be renovated in the coming years (E3).	
Weaknesses	• Strategy proposals are weakened due to political discussions (E3).	• Contributing to the energy efficiency of the building stock is not a motivation to	• Policy measures are regularly adapted in Flanders. This creates an uncertain

	• There is a tendency to be hesitant in implementing measures for the private rental sector (E3 & E5).	perform energy efficiency renovations according to landlords (L1 – L6). • Vulnerable tenants were not aware of energy efficiency measures (R1 – R4). • Tenants did not feel responsible for energy efficiency renovations at all (R1, R2, R3, R5, R6, R7, R8, R9, R10). • Installing renewable energy sources is not perceived as a relevant measure according to landlords (L2, L3, L4, L5, L6). • Tenants are not convinced that energy efficiency measures could reduce their energy bill (R9, R10). • One landlord, doubted the description on insulating walls on the EPC (L3). • For a tenant, initiating renovation works strongly depends on the relation with their landlord (R1 – R4, R6, R8, R9). • The biggest barrier to energy efficiency renovations is according to both tenants and landlords "temporary move" (L1-L6 & R1 – R10). • Premium do not create incentives for landlords to perform	political landscape for both local governments and residents (E2). • Current policy notes do not include much policies on affordability meaning that the municipality of Antwerp cannot work on this topic at the moment. • It is very hard for starters to buy a house in the current market (E3). • Half of the Flemish population does not have the investment capacity to invest in energy efficiency measures. This number excludes people that are eligible for a loan (E3). • The return on rental properties in Belgium is not high (E3). • There is a tightness in the private rental market. This tightness is greater in the social rental market (E3). • It is not yet technically possible to share renewable energy in old apartment blocks without major technical adjustments (E2). • The housing stock in Belgium is very diverse and divided among many different owners

		energy efficiency measures (L1 – L6). • Renovation premiums should not target landlords (E5). • Landlords were not aware of the renovation premium for landlords offered by municipality of Antwerp (L1-L6). • Premiums are paid one year after the investment which does not solve the issue of high upfront costs (L4 & L5). • Landlords appeared to be not interested in a renovation loan (L1-L6). • Landlords are not convinced that improving their EPC would increase the value of their property (L2, L6). • Tenants were not convinced that their energy bills decrease when their EPC is improved (R9, R10). • Tenants and landlords, not living in energy poverty, feel a barrier to ask help from Ecohuis Antwerp (Interviewee L3, L4, L5, L6, R6, R8, R9). • Renovating the entire building stock is too expensive for the Flemish Government (E4). • The clause to increase rent is contingent to the relationship between	(E3). This makes it more complex to renovate (E3). • The capacity of the building sector is too small (a shortage of 40 – 50 thousand people) to perform enough renovations to meet the Flemish targets (E3). • 95% Of the patrimony requires radical renovation (E5). • Syndics are mandatory for apartments blocks owned by more than two owners. Nevertheless, that is often not the case in small apartment blocks (E2). • No legal agreements are made around sharing renewable energy in apartment buildings (E2).

		the landlord and tenant (E5). • Mobile homes bought by the government are not available for the private sector (E5). • No supporting policy instruments are implemented for the decision, execution and evaluation phase.	
Opportunities	• Creating a long-term strategy to prepare landlords for additional regulations (E5). • Stimulate landlords to rent via social rental agencies by attractive renovation premiums (E3 & E5).	• Energy efficiency renovations are perceived as part of the maintenance of a building (L1, L2, and L5). • Energy efficiency renovations should not be earned back by rent increase according to landlords (L1, L2, L4 and L5) • Tenants that do not belong to the lowest income group, understand a rent increase if the quality of the house increases (R5, R7, R9). • To reduce the barrier of disturbance, landlord L3 advised to perform the renovation works at once (L3). • A landlord can terminate a contract if he performs renovation works that cost more than 15 times the rent (L3). • The renovation premium for landlords in Antwerp should incentivize EERs.	• High energy prices ensure that the split incentive for the government no longer exists. Either the government pays money to reduce energy costs, or the government pays money for renovations (E4). • High energy prices ensure that there is more room to solve the split incentive by investing in efficiency measures as landlord in exchange for rent increase (E3). • Landlords have a higher social profile and income and are more concerned with climate and building policies anyway (E5). • As soon as sufficient renewable energy is generated, the focus of energy efficiency of buildings could shift more to the use of renewable energy instead of insulation (E3). • Policy instruments should raise

		• The renovation loan requires rent reduction should reduce energy poverty (E5). • Continuing the implementation of EPC bounded indexation (E1 – E5). • It is proven that the value of a property increases with 12% if the energy label goes from E to B (E3). • Energy houses need more financial and human resources to meet the demand (E2). • Calculation tools offered by market parties could give more insight in costs and savings (E2, E3, E4). • The renovation obligation can give starters more chance to enter the market and increase the value of a good EPC. • Landlords can increase rent if they can show that the value of the apartment has increased significantly (E5). • Tenants can make use of higher premiums for renovations if they rent via a social rental agency. This can stimulate energy efficiency renovations and reduce energy poverty (E3 and E5).	awareness, provide information, provide financial support, and should support execution (E3).

		• The FOSSTER-project may increase the customer journey towards an EERs (E2). • The right of initiative could make tenants more equal to owner-occupiers (E4).	
Threats	• Fear to disrupt the private rental market (E5). • Investing in real estate might not be attractive anymore leading to a more tighten private rental market (E5). • Low-income households might be pushed out of their house due to rent increase (E5).	• For tenants who see their rented house as a temporary place to live, rent increase is a barrier to energy efficiency renovations (R7, R8, R9). • Tenants can be hesitant towards a rent increase if the energy efficiency measures feel like this is part of necessary maintenance (R8 & R10). • For lower income groups, a rent increase due to renovation works makes their home unaffordable (R1, R2, R3, R4, R9). • Lower income groups pay a social tariff for their energy costs, this makes a rent increase in exchange for a lower energy bill less attractive. • Landlords with less financial resources must perform renovation measures step by step even though they prefer to do this in one go (L2, L4, L5). • Tenants do not want to risk their relation	• Less financial resources for the the municipality of Antwerp to support EERs (E2). • The elections might add additional pressure on politicians resulting in less time to work on EERs policies (E2). • Renting in the private sector is the pension of many self-employed people in Belgium. This makes tightening of measures a sensitive topic in Belgium (E3 & E4). • Support by landlords and tenants for carrying out EERs seems to be mainly dependent on the current energy crisis (E3).

		with their landlord to initiate energy efficiency measures (R1, R3, R4, R6, R8, R9). • Landlords felt inhibited to perform energy efficiency measures due to the agreements they have to make with their tenants (L1, L2, L4, L6). • A landlord's association started proceedings against the EPC bounded indexation regulation (E5). • Changing the EPC method could cause confusion (E5). • There might be a chance that the Flemish Government reduces financial resources for the energy houses in the municipality of Antwerp (E2). • Adding minimum energy efficiency requirements might tighten the private market more (E5). • Landlords do not aim for social tenants after performing a renovation (L1 & E5).	

Political	• Responsibility for renovation strategy is subsumed per region. • Policy measures are regularly changing. • The regularly changing Flemish Renovation strategy makes it hard for municipalities to continue adapt. • Strong focus on energy efficiency renovations. • No specific strategy for the private rental sector. • Municipality of Antwerp has a pilot role. • Municipality of Antwerp worked hard on affordable living. However, little goals for affordable living are included in policy notes of the current coalition. Therefore, the municipality is not allowed to work on this topic. • The next elections take place in 2024. This creates pressure for governmental actors and less time for developing policies on energy efficiency renovations. • Little difference in renovation rate and regulations between the three regions. • Energy houses are growing and are playing an important role in implementation of policy instruments.
Economical	• Apartment share in housing stock is increasing (20% → 25%). • 52% private renters > Woonquote. • 31,2% < budget norm. • High energy prices ensure that the split incentive no longer exists for the government. Either the government pays money to lower the energy prices, or the government pays money for renovations. • High energy prices create more room for business models. • Renting out homes is the pension of many landlords in Flanders which makes the private rental sector a sensitive sector to implement policies regarding energy efficiency renovations. • An energy performance certificate improvement from label E to B results in a value increase of 12% in the current economical context. When more energy efficiency requirements will be implemented, this value increases. • The return on rental properties in Belgium is not high according to policy experts and landlords. • In comparison to the Netherlands, the real estate market itself is fairly solid and the housing market as well. There are certainly problems but if you compare it with the Dutch housing market, they are much less acute and much less volatile.
Social	• Number of households increases. • Households become smaller. • The private rented sector is characterized by small households. • The private rented sector is characterized by young households. • The private rented sector has an average education degree in comparison to other sectors. • Average share of working people. • Young people live in the oldest and smallest apartments. • 71% of the dwellings in Antwerp are apartment units. • There is a tightness in the private rental market, but this tightness is even greater in the social market.

	• Approximately, 170.000 extra social rental homes should be built in Flanders. • Support for carrying out energy-efficient renovations is currently mainly depended on high energy prices.
Technical	• 15,9% Of the private rental dwellings is in a very bad state. • Only 3,5% of the Flemish buildings has an energy label A. • The physical state of dwellings cannot be related to income quantile. • Older houses have on average a lower energy label. • It is not yet technically possible to share renewable energy in old apartment buildings without major technical adjustments. • As soon as sufficient renewable energy is generated, the focus on energy efficiency of buildings could shift more to the use of renewable energy instead of insulation. • The housing stock in Belgium is very diverse and divided among many owners. This makes it more complex to renovate. • The capacity of the building sector is too small to perform enough renovations to meet the Flemish targets. • 95% Of the patrimony requires radical renovation.
Environmental	• Belgium belongs to the top four European countries that have the biggest per capita fossil fuel usage in buildings. • Belgium is obliged to meet the European targets. • 400.000 Premiums would have to be applied for to meet the European targets. • Residential heating has a share of 14,9% in the total emissions of Belgium.
Legal	• The legal framework can be divided into minimum requirements stated in the “Codex Wonen” (Vlaanderen, 2021) and additional regulations. • Syndics are mandatory for apartment blocks owned by more than two owners. Nevertheless, that is often not the case in small apartment blocks. • No legal agreements are made around sharing renewable energy in apartment buildings. • Regulations for the private rental sector are being implemented with restraints to prevent further tightness in an already tight market. • Newly-built houses must have renewable energy sources to be energy neutral.