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MIXED-OWNERSHIP COMPLEX(ITY)

A CASE STUDY ABOUT THE EFFECT OF THE SALE OF SOCIAL HOUSING ON THE
ENERGY AFFORDABILITY OF HOMEOWNERS LIVING IN MIXED-OWNERSHIP
COMPLEXES IN THE PROVINCE OF GRONINGEN



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Abstract

Currently, energy affordability is a major issue in the province of Groningen. Improving the energy efficiency of one's home by investing in sustainability measures is the most important way to reduce energy bills permanently. However, not everyone is able to invest in this. One group of people struggling with high energy costs are homeowners who bought dwellings in apartment complexes that used to belong to social housing associations. These buyers become members of a homeowners' association (*Vereniging van Eigenaren [VvE]*) consisting of both private homeowners and the housing association as owner of its remaining units, i.e. mixed-ownership complexes. These owners depend on the VvE in order to make sustainability investments. This dependency complicates the process of making a home more sustainable. The aim of this study was to examine the effect of the sale of social housing on energy affordability among homeowners living in mixed-ownership complexes in the province of Groningen. This study also discusses the complex position of housing associations regarding sustainability investments in the context of a VvE.

To accomplish this, a case study has been conducted using a mixed-method research design that employed a policy analysis, semi-structured interviews and a survey. Existing theories on the sale of social housing, sustainability measures and energy poverty served as a framework for this study. The policy context shows that there are currently no specific policies aimed at improving the energy efficiency of homes in mixed-ownership complexes with VvEs. Moreover, the perspective of the housing association regarding sustainability investments when selling social housing was examined. The interview results indicate that housing associations can do little to improve the energy affordability among private homeowners living in mixed ownership complexes. Challenges are created by the existence of the VvE, such as differences in perspectives about sustainability measures between housing associations and other owners, the smaller investment capability of the private owners, high voting quotas in order to agree on sustainability investments, and lack of knowledge about sustainability among VvE members. These all complicate the efforts of housing associations to make their existing mixed-ownership complexes more sustainable.

The experience of VvE homeowners was analysed and compared with that of individual homeowners using survey data of 128 respondents. The survey results show that VvE homeowners experience greater difficulty in paying their monthly energy bills than individual homeowners. In addition, the survey results indicate that fewer sustainability measures have been implemented in the homes of VvE homeowners than in those of individual homeowners. Since other findings of this study demonstrate that sustainability measures have a positive effect on energy affordability, the implementation of fewer sustainability measures may be contributing to the difference in energy affordability between these two groups.

Despite the study's limitations, its findings provide a better understanding of the complexity that being part of a mixed-ownership complex with a VvE entails for housing associations and other private homeowners regarding sustainability investments. Policymakers and practitioners in the field of planning must develop targeted policies addressing VvE-related issues to accelerate sustainability investments in mixed-ownership complexes.

Keywords: *privatising of social housing, mixed ownership, homeowners' association, sustainability measures, energy affordability*

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Anisha Jagernath

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Abbreviations

EPBD	European Energy Performance of Buildings Directive
EPC	Energy Performance Certificate
EU	European Union
EU-SILC	EU Statistics on Income and Living Conditions
LIHC	Low Income High Cost
MJOP	Meerjaren Onderhoudsplan (multi-year maintenance plan)
RTB	Right To Buy
UK	United Kingdom
VROM	Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer (Department of Housing and Spatial Planning)
VvE	Vereniging van Eigenaren (homeowners' association)

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1. Introduction

The effects of the energy crisis are painfully visible all over the world. Many people are unable to pay their energy bills due to rising energy prices. The current war in Ukraine makes the situation even worse, as the rising energy bill is inextricably linked to the war. Consequently, a growing number of people are living in cold homes. In the Netherlands too, the problem of energy poverty continues to grow, as gas and electricity prices have risen substantially in 2022. People who concluded a new energy contract in this period have experienced a sharp rise in their bills (NOS, 2022). Although the Dutch government introduced an energy price cap in January 2023, the further development of the gas price in the coming years is uncertain. In any case, gas prices are expected to remain higher than before the price increase (Ministerie van BZK, 2022a).

Considering the high energy prices, homes need to become more sustainable. However, not everyone has the freedom to invest in sustainability and improve the energy efficiency of their homes. Homeowners who buy dwellings in apartment complexes become members of a homeowners' association (*Vereniging van Eigenaren [VvE]*). One out of six homeowners in the Netherlands is part of a VvE (*Vereniging Eigen Huis [VEH]*, 2022). Despite this high number, these homeowners are often a forgotten group in national policy, and this certainly applies to owners within small VvEs (VEH, 2022). Homeowners within a VvE often run into practical, legal, financial and architectural problems. In addition, not everyone benefits directly from sustainability interventions; for example, roof insulation does little for residents on the ground floor. This makes collaboration between the owners difficult.

The aim of this study is to examine the effect of the sale of social housing on energy affordability among homeowners living in mixed-ownership complexes in the province of Groningen. The sale of public and social housing has been a major component of housing policies in recent decades. The number of sold dwellings in the Netherlands has risen enormously due to privatisation measures and governmental retreat from the housing area (Musterd, 2014; Van Gent & Hochstenbach, 2020). As a result of budget constraints, housing associations were forced to sell part of their houses in order to continue investing in sustainability and liveability (Damen, 2018). Selling social housing comes with drawbacks and involves several risks. A person with a low income may be able to purchase their social housing unit, but then lacks the funds for maintenance. In many cases, housing associations sold parts of their apartment complexes, while retaining ownership of the remaining units. This resulted in complexes with mixed ownership, i.e. owner-occupied housing and social housing in one building. The management of privatised estates with mixed ownership can pose various problems regarding property rights and the quality, organisation and financing of maintenance and renewal (Jones & Murie, 1999, 2006). Mixed-ownership complexes are usually managed by a VvE, just like other complexes where homes are owned by more than one owner. If this VvE contains both private owners and a housing association, neither the housing association nor the private homeowners can decide on their own to start major renovations and maintenance themselves. They are dependent on the VvE when it comes to sustainability investments, but, as will become clear in this study, this is often complicated.

The extent to which rising energy prices affect people's wallets is unevenly distributed in the Netherlands, not only between different social groups, but also between areas. The Northern Netherlands has relatively the most households suffering from energy poverty. Especially in the province of Groningen energy poverty is a big issue, with the municipality Pekela having the highest rate of energy poverty in the Netherlands (TNO, 2021). Even though most people experiencing energy poverty in the Netherlands live in social housing (TNO, 2021), the group of homeowners who suffer energy affordability problems is severely understudied. Furthermore, rising energy costs mean that homeowners have no money left to spend on measures that are needed to reduce their energy bills (Keyser & Schrader, 2022). As a result, for many low-income homeowners, it is impossible to make their homes more energy-efficient, as the value of their homes is often disproportionate to the high costs of making them more sustainable. A major problem in mixed-ownership complexes is that VvEs

often would like to take drastic measures involving the entire complex, while private homeowners have much less to spend than the housing association that owns part of the complex (Keyser & Schrader, 2022).

Situations such as these complicate the process of making mixed-ownership complexes more sustainable, while sustainability is the most effective solution for reducing energy bills and living in more comfort (TNO, 2021). Research and consultancy firm CE Delft (2021) states that the current policies fail to make homes more sustainable. In combination with the continuing rise in energy prices, the number of energy-poor households will rise by a third by 2030 in the Netherlands. In addition, energy poverty threatens the success of the energy transition (CE Delft, 2021). Thus, policymakers in the field of planning need to come up with better strategies to make homes within mixed-ownership complexes more sustainable, as this reduces energy poverty and accelerates the energy transition. Therefore, it is necessary to gain a deeper understanding of the challenges associated with implementing sustainability measures in mixed-ownership complexes.

This study will build on existing theories regarding the sale of social housing, sustainability investments and energy poverty. However, studies concerning privatisation, and in particular its consequences for housing management, are scarce. According to Gruis et al. (2009), literature on the problems of maintenance and management resulting from the sale of social housing is even more scarce in the European context. Furthermore, housing and spatial planning are closely intertwined in the Netherlands. Housing and spatial planning both fall under the jurisdiction of the Department of Housing and Spatial Planning (VROM). Understanding the effects of the sale of social housing is therefore important for Dutch spatial planners. Furthermore, none of the existing studies explicitly explore the link between the sale of social housing and energy affordability. This study tries to fill this gap by exploring the impact of the sale of social housing on the energy affordability of homeowners living in mixed-ownership complexes in the province of Groningen.

The results of this study showcase that there are currently no specific policies aimed at improving the energy-efficiency of properties in mixed-ownership complexes with VvEs. Furthermore, the results indicate that the influence of housing associations on the energy affordability of VvE homeowners is limited, as the existence of the VvE complicates the efforts of the housing association to make properties in its mixed-ownership complexes more sustainable. Other results show that VvE homeowners experience greater difficulty in paying their monthly energy bills than individual homeowners and that fewer sustainability measures have been implemented in the homes of VvE homeowners compared to those of individual homeowners. This study highlights the complexities that being part of a VvE involves for housing associations and private homeowners regarding sustainability investments in complexes with a VvE.

Reading guide

The purpose of chapter 2 is to provide an overview of the literature and to elaborate on the link between the sale of social housing and energy affordability. In chapter 3, data analysis and collection methods are discussed, along with ethical considerations. In chapters 4, 5 and 6 data collected from policy documents and reports, interviews and the survey are analysed. Chapters 7 and 8 summarise the main results and relate them to the literature, and provide reflections and recommendations for future research.

2. Linking the sale of social housing to energy affordability

This chapter links the sale of social housing to energy affordability. In order to achieve this, the existing literature about the sale of social housing, sustainability investments and energy poverty is discussed. Finally, the chapter discusses how energy affordability can be measured.

2.1 The process and rationale behind the sale of social housing

In the past decades, a significant share of social rental housing has been privatised, e.g. sold to sitting tenants or on the private market. This study adopts the definition of Gruis et al. (2009), where 'privatisation' refers to selling social or publicly-owned rental dwellings to private persons. As former communist countries transitioned to a market economy and democratic political system, corresponding market-based housing systems quickly emerged. To achieve this transformation, the public housing stock was privatised en masse. Many publicly-owned dwellings were sold (or in some cases almost given away) to the tenants, resulting in a rapid increase of homeownership in Eastern Europe which reduced the size of the state-owned housing sector significantly (Gruis et al., 2009). At the same time, housing systems in many Western European countries and in Australia were reformed by neoliberal developments characterised by government deregulation, cutbacks in expenditure for (semi-)public services, decentralisation and an overall increase in market orientation in the public sector (Gruis et al., 2009). Such predominantly neoliberal policies have required landlords to focus more on financial risks and the position of their dwellings in the current and future market (Nieboer et al., 2012). This has led, among other things, to the sale of public and social housing rented dwellings (Uitermark, 2003). However, privatisation in 'Western' policies does not necessarily mean the sale of social rental housing, but rather the withdrawal of direct government control by transferring government-owned and operated institutions to the private (shareholder-owned) market (Gruis et al., 2009). Compared to countries in Eastern Europe, the sale of social housing has taken place at a relatively slow pace in Western countries; in many Western countries the sale of such dwellings is non-existent and sometimes even prohibited by the government (Gruis et al., 2009). The sale of social housing has become a significant phenomenon especially in the United Kingdom, the Netherlands, France and Australia, as part of the broader neoliberal policies with which privatisation is associated (Gruis et al., 2009).

Mainly in England, sales of public rented dwellings to individual households occurred on a large scale, as a large part of the social housing stock owned by local authorities was sold to former tenants under this regime (Gruis et al., 2009). The Right To Buy (RTB) scheme in the United Kingdom, introduced in 1979, is by far the largest tenure-mixing operation in the world (Kleinhans & Van Ham, 2013), and has received the most attention in the academic literature. The mechanism for the privatisation of state housing allowed sitting tenants to buy the property they lived in, with some restrictions on the number of years of tenancy and with entitlement to discounts on the market value related to the number of years of tenancy, modified by considerations about historic costs and a discount ceiling (Gruis et al., 2009). This right was later extended to tenants of other social landlords, such as housing associations (Kleinhans & Van Ham, 2013). The initial objective of RTB was to sell public housing and stimulate private ownership. However, creating mixed-tenure neighbourhoods was later seen as a welcome side effect of the policy. Consequently, RTB became a standard policy instrument in urban regeneration programs to create mixed communities (Kleinhans & Van Ham, 2013). However, the specific context of RTB causes potential problems that transcend the investment capacity of individual tenant buyers (Kleinhans & Van Ham, 2013). Furthermore, in apartment complexes, RTB meant mixed ownership at the block level, with profound legal and financial consequences for the maintenance of collective parts of the building, such as roofs and stairways.

There may be a variety of reasons for the sale of social housing. One argument for the justification of sales can be found in political objectives (Gruis et al., 2009). For instance, the introduction of the RTB in the UK was justified mainly in terms of extending opportunities for homeownership to a group otherwise excluded (Murie, 1999). In addition, the mass privatisation of housing associated with the transition to market economies in post-socialist countries is a good example of how sales are related to broader societal developments and political preferences. Diversification of tenure is another argument in favour of the sale. The use of sales may be an effective way to introduce greater diversity in neighbourhoods. Motivation for sales can also be found in the landlords' management objectives; adjustment of the housing stock in relation to tenant (or market) preferences (Gruis et al., 2009). Priemus et al. (1999) state that sales of social housing may also increase because of tendencies among social landlords to develop a more strategic asset management. The sale of social housing can therefore be justified on the basis of several arguments. However, the privatisation of social housing results in new management challenges. Many apartment buildings now consist of a mix of public and private ownership (also known as mixed ownership), presenting legal and financial challenges regarding the division of responsibilities between the owners (Lux, 2003). This will be discussed in more detail in the next section.

2.2 The effects of the sale of social housing on management and maintenance

With situations of mixed ownership come significant challenges in the management and maintenance of these mixed-ownership complexes.

Some examples are the decision-making process for governing such blocks, how to finance repairs using ownership as collateral, how to enforce payment of charges for current and future repairs to common facilities and parts, and how to ensure transparency in governance (Lujanen, 2010). According to Lujanen (2010), two basic legal forms of apartment ownership can be distinguished. The first is called the dualistic system, often referred to as 'condominium ownership'. In this system, individual ownership of an apartment and joint ownership of the land and common parts of the building are combined. Essentially, owners own the space that is defined by the internal walls of the dwelling, which might not be connected to the ground on which it stands, while all owners share the land and common parts. The second legal system is unitary ownership. Among the European countries using this system, Lujanen (2010) mentions Austria, The Netherlands, Norway, and Switzerland. In these countries, the co-owners own a particular share (percentage) of the property, and connected to that share is an exclusive right to use a particular apartment in the building (Lujanen, 2010). Since the right of ownership is not accompanied by a physical property division, this type of co-ownership can be called undivided (Paulsson, 2007).

Most countries manage common parts of the residential complex through homeowners' associations (Lujanen, 2010). Lujanen (2010) states that some other juridical forms may function better than an association, as the legal forms vary greatly (e.g. corporation, trust or association), but the term "homeowners' association" is probably the most common. A homeowners' association (in Dutch: *Vereniging van Eigenaren, VvE*) can be defined as a legal body that has the authority to act on behalf of all the owners of the residential complex. It is a private non-profit organisation with direct democracy, expressed through the right to vote, which is considered essential to safeguard the interest of individual owners, the common ownership, as well as national and municipal interests (Paulsson, 2007). However, different conditions apply within the EU countries when it comes to homeowners' associations. In Austria, the law gives important tasks to homeowners' associations, even though co-ownership can be established without creating a homeowners' association. In Norway, homeowners' associations and any other legal persons representing the co-owners do not exist, but the board represents the co-owners and may sign on their behalf in matters concerning the co-owners' joint rights and obligations (Lujanen, 2010). In the Netherlands and Switzerland, the creation of a homeowners' association in multi-owner settings is compulsory (Lujanen, 2010). Although

the legislation and formal organisation of multi-owner situations in residential complexes may differ, many countries know a form of arrangement for co-ownership concerning decisions of the common parts of the building.

Residential complexes with mixed ownership can pose various problems regarding the organisation and financing of maintenance and renewal. Lujanen (2010) argues that with the mass privatisation and sale of apartments in post-socialist countries, the problem of managing apartment block ownership and administration has come to the forefront. Laws in these cases fail to ensure continuous maintenance and renovation of common parts, including roofs, walls, stairwells and lifts, and of utilities, including water, sewage and electricity systems (Gruis et al., 2009). In Eastern Europe, the shift from direct state intervention to market provision of housing services has resulted in major responsibilities for new owners in housing maintenance and management. Most countries in Eastern Europe face multiple challenges because of this privatised form of housing management. As a result, multi-family housing quality has declined significantly across the region, especially in the housing estates (Gruis et al., 2009). Thus, a series of legal, institutional and financial reforms introduced in the mid-1990s was carried out in Eastern Europe, but the transformation process has failed to define an efficient system.

However, maintenance and management challenges due to mixed ownership also exist in Western Europe. The study of Brook et al. (2006) cites that owners generally take greater care of their properties than tenants and that seeing this also encourages renting residents to take more pride in their dwellings. However, Kleinhans and Van Ham (2013) argue that the reality is harsher with respect to dwelling upkeep by tenant buyers or consecutive buyers. Low-income buyers often struggle with greater-than-expected maintenance costs. Local authorities and other landlords had to deal with individual owners in arranging part of the maintenance, managing the owners' financial inability or reluctance (or both) to let them contribute their share of the maintenance or improvement costs (Kleinhans & van Ham, 2013). Furthermore, challenges are often concerned with a lack of clarity and mutual understanding between social landlords and homeowners about the management and maintenance of the estates (Gruis et al., 2009).

The maintenance and management challenges due to mixed ownership in Western Europe are particularly connected to the existence of homeowners' associations. For any major decision to be approved within an homeowners' association, the majority of owners must agree to the proposal. However, proposals may not receive enough support due to conflicts of interests between owners or financial limitations, for example. Due to this dependency on the homeowners' association, it is difficult for social landlords and private homeowners to maintain and renovate mixed-ownership complexes, including implementing sustainability measures.

Given these difficulties, more and more Dutch housing associations choose to sell their dwellings under the condition that the housing association retains the right to buy back the dwelling when the buyer moves out. This is because social landlords realise that they need to remain responsible for major repairs and refurbishments in the long run, making them more selective in which dwellings and on what terms they sell. For example, many Dutch housing associations choose not to sell more than 49% of the value of the dwellings in a complex, so that they retain the majority of votes within the homeowners' association (Gruis et al., 2009). In this way, they can exert more influence on management and maintenance decisions.

2.3 Increasing the energy efficiency in the built environment

Due to the challenges described in the previous section, it is difficult to make homes within mixed-ownership complexes more sustainable. However, this is essential to reduce energy demand in the built environment. In 2016, agreements were made in Europe to meet the goals of the Paris Climate Agreement. The aim of the Paris Climate Agreement, which took effect in 2020, is to limit global

warming to between 1.5 and 2 degrees Celsius. To meet the goals of the Paris Climate Agreement, EU member states have agreed that the EU should emit at least 55% less greenhouse gases by 2030. By 2050, the European Union wants to be climate-neutral. This means that there will be no net emissions of greenhouse gases. In most European countries, the building sector is one of the sectors with the highest energy consumption and, thus, this sector can contribute most by creating a more sustainable energy demand and making the transition to renewable forms of energy for heating and cooling spaces in buildings (Ghaffarianhoseini et al., 2013). According to Abdellatif and Al-Shamma'a (2015), a large part of the energy delivered to buildings is wasted because of inefficient building technologies. Therefore, significant energy can be saved by making cost-effective efficiency improvements in buildings and their equipment, which will reduce energy consumption and emissions and provide significant economic savings to consumers (Abdellatif & Al-Shamma'a, 2015).

The mandatory introduction of the Energy Performance Certificate (EPC), also known as the energy label, for both new and existing buildings, plays an important role. The energy label is an implementation of the European Energy Performance of Buildings Directive (EPBD) (Ministerie van BZK, 2022a). The EPBD aims to promote improved energy performance for buildings in member states. The energy label indicates the degree of energy efficiency. Energy labels range from A to G, where energy label A is very energy-efficient and energy label G is very energy-inefficient (CBS, 2011). The purpose of the label is to inform the (future) property owner or tenant about the energy performance of the building and to stimulate them to take sustainability measures (Ministerie van BZK, 2022a). For instance, properly insulating homes can reduce energy use, contribute to the affordability of energy bills, and contribute to meeting climate goals. It is therefore a necessary preparation for switching to gas-free energy alternatives (Ministerie van BZK, 2022b).

Significant energy can be saved by increasing the energy efficiency of new and existing buildings. The energy efficiency can be improved by measures on the physical envelope, such as insulation and energy-efficient glazing (Abdellatif & Al-Shamma'a, 2015). Additionally, energy efficiency can be improved through operational aspects, such as energy systems for heating, ventilation and other appliances (Abdellatif & Al-Shamma'a, 2015). Examples are sustainable heat measures, such as installing a (hybrid) heat pump or solar water heater. Making improvements to the fabric of the home – the walls, floors, roof and windows – is widely acknowledged as the best place to start in trying to reduce energy use. However, these large-scale measures require big investments. Subsidies are usually offered for these measures to reduce (part of) the cost. Some investments pay for themselves quickly, while others have a long payback period. In mixed ownership complexes, the implementation of large-scale sustainability measures requires approval. Without the permission of the homeowners' association, residents are prohibited from insulating their cavity walls, installing double-glazing, or placing solar panels on their roofs.

Apart from large-scale measures, there are energy-saving measures that do not cost a lot of money and can be implemented without permission. These small-scale measures can also save energy; for example, sealing gaps and seams, installing radiator foil or a water-saving shower head. Nevertheless, these low-cost measures do not have as much of an impact as large-scale measures on reducing energy demand. See table 1 for the best-known sustainability measures.

Table 1 *Examples of sustainability measures**

Type of sustainability measure	Examples
Large-scale	Insulation measures (wall, floor, roof); double or triple glazing; (hybrid) heat pump, solar water heater; solar panels; connection to heat network.
Small-scale	LED lighting; radiator foil; sealing cracks and seams (e.g. draught strips, letterbox brush); water-saving shower head; smart thermostat.

*Note: this list is not exhaustive.

By investing in sustainability measures, energy use can be reduced and energy bills can be made more affordable. However, not everyone has the same opportunities to invest in large-scale sustainability measures. Low-income households face significant barriers to accessing sustainable technology due to high investment costs. Additionally, the status of tenure is an impediment to investing in sustainability measures. The options available to homeowners, social housing tenants and private sector tenants to invest in sustainability measures differ due to various laws that apply, as well as different types of subsidies that are available. In general, tenants have fewer options than homeowners when it comes to investments, since they lack the legal decision-making power to make their homes more sustainable. Research agency TNO (2021) refers to this situation as ‘choice poverty’. This ‘choice poverty’ means that people living in poorly-insulated houses are not able to change the situation themselves. Two groups can be distinguished: tenants who live in a home with low energy quality and depend on landlords for sustainability measures, and homeowners who live in a home with low energy quality and do not have enough money to invest in sustainability measures themselves (TNO, 2021).

Not every homeowner has the complete freedom to invest in sustainability measures. As explained earlier, ‘mixed ownership’, where private homeowners and housing associations share property in the same complex, can pose barriers to the management and maintenance of the complex. Homeowners within a mixed-ownership complex cannot make their house more sustainable on their own, but are dependent on the homeowners’ association. Making apartment complexes more sustainable is particularly difficult because a large proportion of all co-owners has to agree on sustainability measures (Hoops, 2020). The owners have to give each other permission to maintain their private areas as they wish, while deciding together on the maintenance of common parts of the building. In case of a homeowners’ association, the owners - which in mixed complexes also includes the housing association - have to come to a collective agreement when deciding upon sustainable energy measures (Tiellemans et al., 2022). This complicated decision-making can lead to the so-called ‘Tragedy of the Anticommons’. This problem has similarities with the well-known Commons’ dilemma. Individuals sharing a common resource have the choice between acting selfish and just exploiting the common (free-riding) or to act prosocial and contribute to the maintenance of the shared resource (Tiellemans et al., 2022). The ‘Tragedy of the Anticommons’ refers to a situation where the power to decide is fragmented and thus the decision depends on the consent of so many parties (the Anticommons) that a decision beneficial to all co-owners is not taken (the tragedy) (Hoops, 2020).

To conclude, the implementation of large-scale sustainability measures has a huge impact; properly insulating homes can reduce energy consumption, reduce energy bills, contribute to reaching climate targets, and contribute to the energy transition. By increasing home energy efficiency, significant energy can be saved. However, not everyone has the freedom to implement sustainability measures themselves. This leads to more difficulties in meeting the goals of energy transition policies. Additionally, households that cannot invest in sustainability risk falling into a downward spiral, where they end up in energy poverty, which may then lead to greater problems (Zuidema & Van Geet, 2021). The next section describes what is meant by energy poverty and what its implications are.

2.4 Definitions and effects of energy poverty

Before addressing the definition of energy poverty, the definition of terms needs further discussion. At the European scale, there is inconsistent use of terminology, with the terms ‘energy poverty’ and ‘fuel poverty’ often used interchangeably (Thomson et al., 2016). However, Li et al. (2014) argue that these terms have a slightly different focus, with energy poverty referring to the lack of access to modern energy services in developing countries, and fuel poverty referring to a problem of affordability in some of the world’s most developed countries. As an alternative, these terms can be treated as related concepts, with the distinctions being the fuel types covered by each term. For example, according to Thomson et al. (2016), the European Commission states that energy poverty refers only to gas and electricity, whilst fuel poverty covers all fuel sources used in the home. Finally, the terms can be understood to mean the same thing, and indeed they have been used interchangeably in key EU policy documents (Thomson et al., 2016). Bouzarovski and Petrova (2015, p. 31) make an argument in favour of this latter standpoint, stating that all forms of fuel and energy poverty, in both developed and developing countries, are underpinned by a common condition: “the inability to attain a socially and materially necessitated level of domestic energy services”. Although there is no generally accepted definition of energy poverty, it is commonly defined as the inability of households to ensure their energy needs. High energy bills can arise from high energy prices, poor energy performance of the home (a low level of insulation and/or non-energy-efficient appliances) or high energy needs of the household (CE Delft, 2021). Energy poverty is generally caused by a low income, facing high energy costs, and living in a home with low energy efficiency (Sokołowski et al., 2020). However, it should be noted that, while energy poverty is related to the broader poverty problem, it is not limited to households below the low-income threshold (CE Delft, 2021).

Significant proportions of European and North American households currently live in cold and damp homes, because of the combination of prolonged winters and poor housing stock (Liddell & Morris, 2010). You and Kim (2019) point out that people living in cold homes are not always poor residents living in rented homes. Those living in thermally inefficient housing are in fact predominantly homeowners, while tenants often live in housing with better thermal efficiency. For many low-income homeowners, it is too difficult to make their homes more energy-efficient, as their income is often low and the value of their homes is often disproportionate to the high costs of making them more sustainable. Poor insulation or underconsumption of energy when households want to save on energy bills can lead to low indoor temperatures and problems such as moisture and mould (CE Delft, 2021). Living for long periods in cold and damp conditions can generate significant health risks. Excess winter mortality is one of the main health risks associated with excess cold. In addition, energy poverty may lead to respiratory, heart and vascular diseases (Liddell & Morris, 2010). It not only affects physical health, but also affects mental well-being, for example through stress over high energy bills (CE Delft, 2021). Poorly insulated and ventilated houses not only lead to cold-related health risks, but also to health problems caused by extreme heat in the summer (TNO, 2021). To protect vulnerable citizens from cold- and heat-related health risks, some countries have policies for eliminating energy poverty. For instance, the UK fuel poverty strategy provides funding for improving the energy efficiency of housing stock through more stringent regulations that govern new buildings, and a programme of retrofitting existing homes (Liddell & Morris, 2010).

Against the background of the absence of one commonly agreed definition of energy poverty across the EU, the EU Energy Poverty Advisory Hub does not attempt to define this issue, but instead assists member states by providing them with several ‘indicators’ that can be used to measure the problem (Thema & Vondung, 2020). As there is no universally accepted definition of energy poverty, there are also multiple ways to measure it. The following section discusses the various ways in more detail.

2.5 Measurements of energy affordability

The problem of energy poverty is multidimensional, which means that many factors contribute to this problem. According to Trinomics (2016), the situation regarding energy poverty is influenced by three factors: physical infrastructure (e.g. building stock and the energy infrastructure that supplies the building stock), policy interventions of measures that address energy poverty and protect vulnerable consumers, and demographics that characterise groups who may be at risk of energy poverty for reasons not necessarily linked to income. TNO (2020) also stresses the importance of individual and household characteristics that influence energy demands and behaviour patterns of consumers, and thus influences the vulnerability of households, including gender, family situation, age, health, cultural background, migrant background, employment status, health and housing situation.

To do justice to this multidimensional character, TNO (2021) distinguishes between three dimensions: affordability, housing quality, and the choice and opportunity to participate in the energy transition. First, energy poverty is primarily discussed from an 'affordability' perspective in academic literature. According to this perspective, energy poverty exists if people have high energy bills but are unable to pay for them due to low income. To avoid payment problems, they usually take extreme measures, such as not turning on the heat, wearing thick winter clothes indoors or not showering. To measure the prevalence of energy poverty, this study focuses on the affordability of energy costs. Affordability can be measured objectively, but also subjectively, by asking about people's experiences regarding the payment of energy bills.

However, TNO (2021) states that the problem of energy poverty should not be limited to a payment problem and mentions 'housing quality' as an important second dimension. A poorly insulated house means not only high energy bills, but also lack of comfort and sometimes even health problems. Therefore, traditional tools for reducing energy poverty (focused on reducing energy costs) must be combined with efforts to improve technical conditions. TNO (2021) advocates to reserve the dimension of 'affordability' and 'housing quality' for low-income households, as wealthy homeowners have no problems with the affordability of their energy costs and usually have the means and opportunities to reduce their energy bills by investing in the energy quality of their homes.

Third, lack of choices and possibilities to invest in the energy quality of the house should also be considered an important dimension of energy poverty. This 'choice poverty' means that people living in poorly insulated houses are not able to change the situation themselves. However, a well-insulated house is the most important step towards lower energy bills and greater living comfort. According to TNO (2021), these are tenants who depend on landlords for sustainability measures, or homeowners who live in a house with low energetic quality and do not have enough money to invest in sustainability measures themselves. Especially in the last group, many do not currently have problems paying their energy bills, but they suffer relatively often from a lack of comfort and sometimes even health problems (TNO, 2021). Besides, if energy prices are high for a long period, some of the households in this group may face payment problems in the future. Therefore, TNO (2021) already labels these groups as energy poor even now, in the sense that they cannot independently participate in the energy transition.

Since energy poverty is a multidimensional problem, it is difficult to capture by a single indicator. Therefore, Sokołowski et al. (2020) advocate for a multidimensional index by using a group of objective and subjective indicators independently. This provides a higher level of insight than a single indicator, as it accounts for a diversity of concepts of energy poverty, and presents a broader picture than any single indicator. This is in line with the reasoning of TNO (2020), which also recommends the use of a set of objective and subjective indicators to provide insights into energy poverty in the Netherlands (TNO, 2020). Herrero (2017) stresses the problems associated with the single-indicator approach because of the entrenched understanding of the phenomenon it results in, as well as its restriction under relatively narrow parameters to determine which household typologies deserve support. However, the use of multiple indicators in isolation has disadvantages as well, especially if they are to

be used for social policy, and if the results are different between the indicators (Romero et al., 2018). Such discrepancies pose challenges for policy-makers and can create confusion regarding the rate of energy poverty and the characteristics of energy-poor households (Sokołowski et al., 2020).

Two main approaches for measuring energy poverty can be distinguished: the expenditure and consensual approach, or in other words; a distinction between quantitative (objective) and qualitative (subjective) indicators (Price et al., 2012). The expenditure approach is the most-used approach (Thomson & Snell, 2013). This objective approach looks at the relationship between household income and domestic energy expenditures and often requires the definition of a threshold or energy poverty line beyond which a household is qualified as energy-poor (Herrero, 2017). The most commonly applied quantitative measures are: Low Income, High Cost (LIHC), absolute (fixed) threshold of energy spending in relation to income (e.g. 10%, as in Boardman 1991) and metrics based on median expenditures. The advantage of the expenditure approach is that it uses objective measures based on data that is fairly comparable across time and locations (Trinomics, 2016). However, among the main criticisms of this approach is that setting the threshold is highly arbitrary. To illustrate, when using the 10% threshold, some wealthy households may qualify as energy poor due to the higher cost of heating larger homes. Furthermore, obtaining precise information on energy expenditure may not be easy, as it is not easy to obtain the total value of energy expenditure of a household when energy prices are included in rents or service fees, for example (Trinomics, 2016).

The consensual approach provides the possibility to capture broader elements, such as household experiences and their perceived impacts of experiencing energy poverty (Trinomics, 2016). This subjective approach relies on a household's self-assessment of its living conditions and is meant to account for certain basic goods (e.g. adequate heating facilities) or essential household attributes (e.g. a damp-free, warm home) that are seen as socially perceived necessities (Herrero, 2017). The focus is on how the household experiences comfort or affordability, not necessarily the amount of energy that is sufficient for maintaining the officially recommended temperature in the dwelling. In addition, it can be argued that adequate temperature can be defined based not only on narrow health considerations but also on social norms. These metrics identify households that declare themselves to face difficulties in meeting their basic energy services ('perceived deprivation'). It has often been implemented through three indicators or items of the EU Statistics on Income and Living Conditions (EU-SILC): inability to keep the house adequately warm, arrears on utility bills, and presence of a leaking roof, damp walls, floors or foundation, or rot in window frames or floor (Herrero, 2017). The advantage of this subjective approach is that it reflects consumers' motivation for expenditure levels and can assess whether consumers reduce expenditure because of budget constraints or due to other factors (Trinomics, 2016). However, these metrics can be highly subjective, which makes them more difficult to compare across countries. Still, according to Herrero (2017), it is the only approach that currently allows a consistent comparison across the EU Member States.

In terms of feasibility, this study focuses on measuring energy *affordability*, rather than poverty. Proven subjective indicators to measure energy poverty will be used for this purpose. The methodology section elaborates further on this.

3. Methodology

In this chapter, the methodology of this research is discussed by describing the case selection, the research design, the data collection methods and analysis, and the ethical considerations.

3.1 Research approach

This study used a case study research approach. The case study is focused on the province of Groningen. Case studies allow for a detailed and intensive analysis of a specific research entity (Bryman, 2016, p. 688). The aim is to provide an in-depth examination of the specific case. By choosing a case study, contextual aspects of the sale of social housing and energy affordability in the province of Groningen can be identified. Because the context is specific, the findings of this study and the resulting recommendation will be unique to the province of Groningen.

This study used both qualitative and quantitative methods. A mixed methods research approach was used, so that a more complete answer to the research question can be formed (Bryman, 2016, p. 644). This study is using documentation and interviews to better understand the policy context regarding the sale of social housing, sustainability measures and energy poverty, as well as to gain a better understanding of the complex position of housing associations as they deal with sustainability investments in their mixed-ownership complexes. A survey was used to find out the effect of the sale of social housing on the experience of energy affordability for homeowners living in mixed-ownership complexes. A deductive approach was used, as the study was based on existing literature (Bryman, 2016, p. 23). Existing theories on the sale of social housing, sustainability investments and energy poverty served as a framework for this research.

3.2 Research questions

This study focuses on the effect of the sale of social housing on the energy affordability of homeowners living in complexes with mixed ownership in the province of Groningen. The main question arising from the introduction and theoretical framework is:

How does the sale of social housing affect the energy affordability of homeowners living in mixed-ownership complexes in the province of Groningen?

To answer this main question, the following three sub-questions have been drawn up:

- 1) What is the policy context surrounding the sale of social housing, sustainability investments within mixed ownership complexes, and energy affordability in the province of Groningen?
- 2) What is the influence of housing associations on the energy affordability for homeowners when selling social housing, and what specific challenges do they experience in their mixed-ownership complexes?
- 3) How do VvE homeowners living in mixed-ownership complexes experience energy affordability compared to individual homeowners?

3.3 Conceptual model and expectations

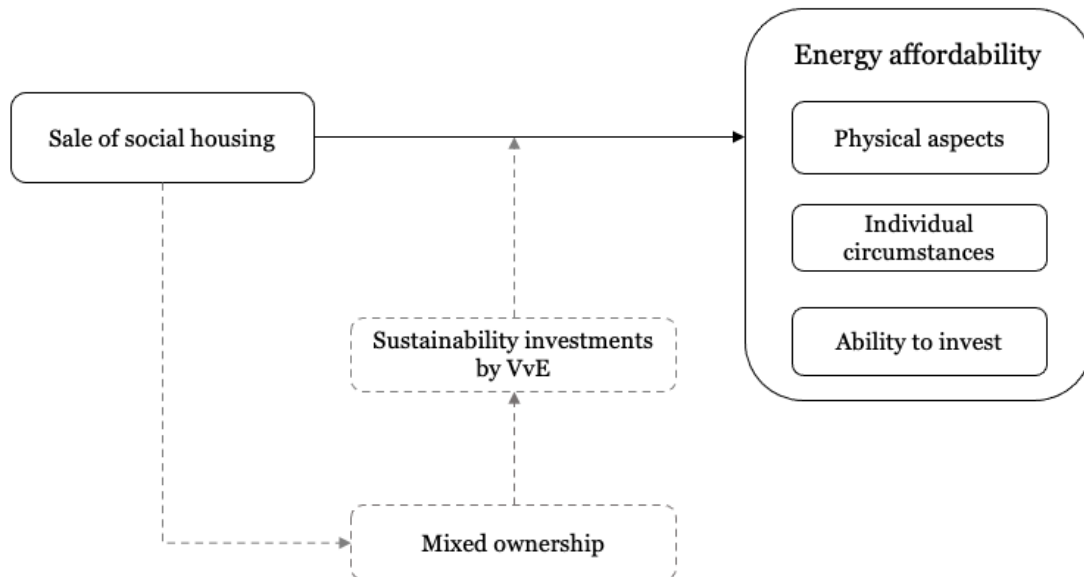


Figure 1 Conceptual model of the study

The arrows between the different concepts represent a causal relation. Based on the theoretical framework (chapter 2), the sale of social housing in a complex by housing associations leads to a situation of mixed ownership. In a mixed-ownership complex, owners depend on the homeowners' association (VvE) when it comes to maintenance or renovation, such as the implementation of sustainability measures. The complexity of VvE structure makes major renovation or maintenance in such complexes more difficult. As the literature has shown, sustainability measures are the structural solution to reduce energy costs. Therefore, it is expected that the complexity of the VvE will have a negative impact on the energy affordability of homeowners living in mixed-ownership complexes.

As described in the literature framework, a distinction can be made between small and large sustainability measures. This study will only look at the implementation of large-scale sustainability investments, since they make the biggest impact; a well-insulated house is the most important step towards lower energy bills and greater living comfort. Furthermore, residents are allowed to install small energy-saving measures themselves, such as draught strips, but are not allowed to insulate their cavity wall, install double-glazing or place solar panels on their roof without permission. Therefore, this study only looks at the implementation of large-scale sustainability measures requiring the approval of the VvE.

While being inspired by discussions on energy poverty, this study focuses on energy *affordability*. According to TNO (2021), a large proportion of homeowners is not experiencing affordability problems currently. However, they do suffer relatively often from a lack of comfort and sometimes even health problems (TNO, 2021). Besides, if the price of gas continues to rise, some of the households in this group may start to face payment problems in the future. Therefore, in practical terms it makes sense to measure the affordability aspect of energy, since it gives more opportunities for a nuanced analysis. Since I am interested in the experiences of homeowners with regard to energy affordability, the choice

was made to use a subjective approach for this study. In addition, objective measures for affordability, such as those that TNO (2021) used, were not possible to use due to a lack of data. Firstly, due to ethical considerations, it was not possible for this study to ask about respondents' income. Furthermore, obtaining precise information on energy expenditure is not easy, because it is not always clear what the total value of energy expenditure for a household is, for example when energy bills are included in VvE fees or service costs.

According to the literature, energy affordability is a multi-dimensional problem, which means that several factors can influence energy affordability. To measure the experience of energy affordability, the following three dimensions are considered: physical aspects, individual circumstances and ability to invest. These dimensions are based on existing literature about energy poverty described in the theoretical framework. Through interviews, the indicators to measure energy affordability were identified. See table 2 below for the operationalisation of key concepts for this research.

Table 2 Operationalisation of key concepts

Concept	Dimension	Indicators	Methods
Sale of social housing	sold units in residential complexes by housing association	regulations and strategies	expert interviews, policy documents and reports
Sustainability investments	large-scale sustainability measures	regulations and strategies	expert interviews, policy documents and reports
Energy affordability	physical aspects	type of dwelling, construction year, type of energy connection, energy label	expert interviews, survey
	individual circumstances	type of energy contract, preferences and behaviour	expert interviews, survey
	ability to invest	implementation experiences	expert interviews, survey

3.4 Methods of data collection and analysis

3.4.1 Joint talks

As part of this study, supervisors prof. George de Kam, dr. Sara Özoğul and dr. Sarah Mawhorter organised an excursion on 20-06-2022 to two housing associations in the province of Groningen. As a privacy precaution, the names of the housing associations are not mentioned in this study. They are referred to as housing associations A and B.

The objective of these joint talks was to pitch our research interest and exchange some ideas with housing association professionals in the work field. On this day, I expressed my interest in energy affordability in the province of Groningen. During these two talks, it became clear that the two housing associations face difficulties when it comes to making their homes in mixed-ownership complexes more sustainable. As a result, the idea of linking the sale of social housing to the experience of energy affordability of homeowners living in mixed-ownership complexes arose.

3.4.2 Document analysis

To understand the policy context regarding the sale of social housing, sustainability investments and energy affordability, (inter)national and local documents from authorities and private agencies (research or consultancy firms) that were publicly available were used. The analysis focused particularly on the themes of the sale of social housing, sustainability investments and energy affordability. This information was then used for the policy context (chapter 4) and to draft the survey questions and questions for the semi-structured interviews. See table 3 for the list of public sector policies and private agency reports used for this research.

Table 3 List of (inter)national and local documents from authorities and private agencies

*Title	Theme	Type of documentation	Organisation	Year of publication
Woningverkoop door Groningse corporaties	Sale of social housing	Private agency report	ABF research	2022
Beleidsprogramma Versnelling verduurzaming gebouwde omgeving	Sustainability investments	Public sector policy	Ministerie van BZK	2022
Nationaal Isolatieprogramma	Sustainability investments	Public sector policy	Ministerie van BZK	2022
Nationale Prestatieafspraken	Sustainability investments	Public sector policy	Ministerie van BZK	2022
Selecting indicators to Measure Energy Poverty	Energy affordability	Private agency report	Trinomics	2016
Energiearmoede en de energietransitie: Energiearmoede beter meten, monitoren en bestrijden	Energy affordability	Private agency report	TNO	2020
De feiten over energiearmoede in Nederland: Inzicht op nationaal en lokaal niveau	Energy affordability	Private agency report	TNO	2021
Energiearmoede in de warmtetransitie: Onderzoek naar beleidsinstrumenten	Energy affordability / Sustainability investments	Private agency report	CE Delft	2021

*for complete citations see references

3.4.3 Expert interviews

A series of semi-structured interviews with housing association and VvE professionals were conducted to gather very specialised subject knowledge about the sale of social housing, sustainability investments and energy affordability problems within mixed-ownership complexes in the province of Groningen that could not be obtained by literature research. All interviews were conducted in the same semi-structured manner, but some questions were skipped or extra follow-up questions were asked

on the fly, based on the expertise of the respondent (see Appendix I for the semi-structured interview guide). These expert interviews were conducted in order to gain a more detailed understanding of the complex position of the housing association and other owners regarding sustainability investments within mixed-ownership complexes. Questions about generic sales and sustainability policies were asked, but also regarding specific policies for VvEs. Moreover, these interviews were conducted to figure out whether homeowners in mixed-ownership complexes face energy affordability issues.

Five professionals were interviewed, of which one joint interview was conducted with two participants at once (see table 4). Among these participants, four are employed by housing associations A or B in the province of Groningen and one by a VvE management company operating in the north of the Netherlands. The VvEs of the two housing associations differ in terms of number and geographical location: whereas housing association A is a member of about a dozen VvEs, housing association B has about a hundred. In addition, while the VvEs of housing association A are mainly located outside the city of Groningen, housing association B has many VvEs in the city.

The interviews with the housing association professionals were arranged with the help of professionals from the housing associations that participated in the joint talks. After contacting three VvE management companies operating in the province of Groningen, one responded to my email request. Ahead of all interviews, the participants were informed about the purpose and terms and conditions of the study through an information sheet. Furthermore, all participants were promised anonymity and asked to sign a participation form. The interviews were conducted online via Microsoft Teams. As shown in table 4, the duration of the interviews varied. To maintain the focus of the participant and the interviewer, the interview was intended to last no more than 30 minutes. The interviews were recorded, transcribed and analysed to summarise the main points. The information and quotes were used for the analysis.

Table 4 List of interview participants

Participant	Position	Date interview	Duration (in minutes)
P1	Senior policy advisor (housing association A)	01-11-2022	35:03
P2	Manager Finance and Support (housing association A)	16-11-2022	26:43
P3	Financial & Portfolio strategist (housing association B)	22-11-2022	50:53
P4	Coordinator VvE (housing association B)		
P5	VvE manager (VvE management company)	29-11-2022	19:29

3.4.4 Survey

An online survey was conducted to determine how homeowners in mixed-ownership complexes perceive energy affordability. The survey was conducted online from 25 November 2022 to 25 January 2023. A targeted approach was needed to recruit respondents, as it is not clear from the outside whether a complex is a mixed-ownership complex. Housing association A provided a list of eleven VvEs spread across the province. In these mixed-ownership complexes, 1000 flyers with a QR code and weblink to the survey were put in the mailboxes. This method, however, did not yield sufficient respondents for meaningful analysis.

In order to increase the response to the survey, it was decided to distribute the survey through online channels as well. A call was placed on the Vinkhuizen neighbourhood website and in multiple Facebook groups for residents of the province of Groningen. Furthermore, I approached a VvE management company operating in the province of Groningen, asking if it could help me distribute the survey. First, permission had to be sought from the VvE boards to share the survey with the VvE members. The VvE manager wrote to seventeen VvE boards, both boards that have already taken steps towards sustainability and boards that are struggling to do so. Thirteen boards responded: eleven wanted to cooperate and two did not. Then, a total of 286 homeowners within these VvEs were contacted via email by the VvE manager with my request to participate in the survey.

All these methods together yielded 179 respondents, 29 of which were tenants of social housing through a housing association, 23 private tenants, 80 regular homeowners, and 48 homeowners within a VvE. In the end, it was decided to only include the homeowners, because tenants depend on their landlord for sustainability investments anyway. In addition, tenants can also theoretically live in VvE complexes, possibly with mixed ownership. Unfortunately, it was not clear from the data collected whether this was the case. Therefore, in order to compare households within a VvE with households outside a VvE as accurately as possible, it was decided to include only the data of homeowners in this study, yielding a total of 128 respondents. See Appendix IV for the socio-economic demographics and other characteristics of these respondents.

The survey, with 32 questions, consisted mainly of multiple-choice questions based on studies about energy poverty with proven indicators (see Appendix III). In addition, one open-ended question was included in the survey that gave the respondents freedom to elaborate on their current energy situation and experiences. The data was collected in Qualtrics and exported to SPSS, a statistical analysis software, that was provided by the University of Groningen. Before statistical analyses were run, the raw data required preparation. Data preparation consisted of translating all data to English, coding all string data to numeric data, and labelling them. As this study focused on categorical variables, the results are used descriptively.

3.5 Ethical considerations

All participants in this study were asked to give informed consent and were asked to confirm that they had received and read the information about the study. It was also made clear that participation was entirely voluntary and that they could decide to stop participating in the study at any time.

The interview participants were informed before the study by an information sheet and were asked beforehand to sign a Participation of Agreement form. The forms provided by the research ethics committee of the University of Groningen were used for this purpose. In addition, the names of the participants and the organisations they work for have been anonymised.

The survey designed for this study was approved by the research ethics committee of the University of Groningen. For the survey respondents, the information and conditions were shared in the introductory text of the survey. In addition, it was mentioned that by completing the survey, they agreed to the terms and conditions. Throughout the research process, all data was collected and analysed anonymously. No collection of personal information took place. However, participants could voluntarily enter their email address at the end of the survey if they were interested in receiving the results of the study. This information was treated confidentially and stored securely. I considered offering a gift voucher to recruit more survey respondents. However, this request had to be approved by the University of Groningen's research ethics committee. Due to time constraints, it was unfortunately not possible to gain approval for this.

4. Policy context surrounding energy affordability, the sale of social housing, and sustainability investments within mixed-ownership complexes in the province of Groningen

This chapter answers subquestion one and zooms in on the Dutch policy context of energy affordability, the sale of social housing, and sustainability investments within mixed-ownership complexes with a specific focus on the province of Groningen. This question was answered using policy documents, research reports, and interview results.

4.1 Sale of social housing in the province of Groningen

Social housing is an important sector of the Dutch housing system. As in other European countries, the public housing sector started developing at the end of the nineteenth century, when idealists and charity organisations wanted more households to be able to live in a decent house, with adequate facilities, and pay affordable rent. With the Housing Act of 1901, public housing became anchored in Dutch law. The state began financing municipal and housing association houses in urban slums to combat unhealthy conditions. Housing shortages after the Second World War stimulated state intervention in housing and instigated a rapid expansion of the public housing sector. By providing subsidies and lending capital, the state and housing associations became firmly linked (Musterd, 2014).

However, from 1990 onwards, the housing associations were cut loose from the Dutch state and were effectively given free reign over their affairs (Van Gent & Hochstenbach, 2020). The 1989 memorandum, *Volkshuisvesting in de Jaren Negentig*, marked a change of direction away from supporting social housing towards the further expansion of owner-occupied housing (Van Gent, 2010). The rental sector had to become self-supporting, relying less on loans and subsidies. The following years saw new regulations for housing associations, giving them more autonomy over their assets and investments (Van Gent & Hochstenbach, 2020). As a result, housing associations adopted more entrepreneurial attitudes (Van der Veer & Schuiling, 2005). Thus, housing associations were brought into their current position, where they have to function more independently from the state, but are still controlled by the state with respect to their social and not-for-profit objectives (Musterd, 2014).

Yet, public unease over executives' wages, failing development projects by the housing associations, and the 2008 financial crisis and its political aftermath prompted further re-regulation of the housing system (Van Gent & Hochstenbach, 2020). In 2011, the Dutch government proposed new housing regulations, which became part of the 2015 Housing Act. As a result of this act, housing associations have fewer options and less autonomy to invest (Van Gent & Hochstenbach, 2020). The act furthermore coincided with a range of other measures diminishing the role of housing associations (Van Gent & Hochstenbach, 2020).

The new housing regulations restricted access to social housing for non-disadvantaged groups, while also putting financial pressure on housing associations and their tenants (Van Gent & Hochstenbach, 2020). It resulted in the residualisation of social housing; the position of the social housing sector in the housing market is getting weaker, while the sector increasingly functions for lower-level socio-economic categories only (Musterd, 2014). In addition to restricting access to social housing, the residualisation of social housing was further pushed by yearly additional rent increases for tenants whose household income exceeds the eligibility criterion for social housing (Van Gent & Hochstenbach, 2020). Together with financial pressures, this resulted in greater numbers of sales of social housing and less investment in new social housing. The continued residualisation of social housing is evident in the declining share of social housing stock (Van Gent & Hochstenbach, 2020).

The effects of national changes in social housing are also visible in the province of Groningen. ABF research (2022) examined for a partnership of housing associations in the province of Groningen the number of homes sold by housing associations in the province in the period from 2013 to 2020. According to this study, housing associations sold 4.305 homes during this period. Of these, 1.420 homes were sold to commercial institutions. The remaining 2.885 homes were sold to legal entities, such as owner-occupiers and private landlords (ABF, 2022). By far the most homes sold to legal entities are in the municipality of Groningen. See table 5 for the absolute and relative numbers for all municipalities in the province of Groningen. Of the sold houses, 72 per cent of the properties were bought by an owner-occupier, while the remaining 28 per cent were sold to a private landlord. In the province of Groningen, houses are more often sold to private landlords than elsewhere in the Netherlands. Additionally, a high percentage of houses that are sold are occupied by elderly people and households with low incomes compared to the whole country.

Table 5 *The share of social housing sold per municipality in the period 2013-2020*

Municipality	Number sold	Housing stock (2018)	Share sold
Groningen	1.940	37.150	5,2%
Haren	60	1.200	5,0%
Zuidhorn	65	1.430	4,5%
De Marne	40	1.130	3,5%
Grootegeest	30	955	3,1%
Marum	25	800	3,1%
Winsum	45	1.450	3,1%
Midden-Groningen	210	8.255	2,5%
Oldambt	105	5.055	2,1%
Eemsmond	45	2.290	2,0%
Bedum	20	1.060	1,9%
Delfzijl	60	3.510	1,7%
Pekela	25	1.525	1,6%
Stadskanaal	75	4.650	1,6%
Leek	30	2.155	1,4%
Loppersum	15	1.240	1,2%
Appingedam	30	2.590	1,2%
Westerwolde	30	2.605	1,2%
Veendam	30	3.075	1,0%
Ten Boer	0	550	0,0%
Total	2.885	82.675	3,5%

Source: CBS-microdata, edited by ABF Research (2022)

Multiple objectives may underlie the sale of social housing in the province of Groningen. During the interviews, both housing associations cite increasing investment capacity and the aim to create a balance in the portfolio strategy as key reasons for selling homes. In addition, housing association A indicates that it sells houses to make an impact on the social environment by changing the social structure, for instance by reducing social problems related to the clustering of low-income tenants. The sales policy for the housing associations is guided by the national performance agreements (*nationale prestatieafspraken*). These agreements are a joint agenda in the light of the major social tasks around the availability of sufficient affordable housing, the sustainability of the built environment, the liveability of neighbourhoods and the affordability of housing. The national performance agreements apply to all housing associations in the Netherlands, though their implementation may differ by local context because of local issues. Therefore, local performance agreements are drawn up between the municipality and tenant organisation. Based on the performance agreements, housing corporations speak with local municipalities in order to find agreement on various ambitions, for instance on the criteria for the social housing units for sale (*verkoopvijver*). The criteria are set at the level of the postcode area. If the criteria are set, housing corporations will not ask for permission from the municipality for the sale of an individual unit. The municipality appreciates receiving the addresses of the units that are given a sale designation by the housing association, but according to participant 1 this is not appropriate, as the municipality would then get insight into the portfolio strategy of the housing association.

Today, these housing associations have a policy of not selling homes in their complexes where they currently have full ownership of all units. The mixed ownership complexes that housing association B has today were created by the sale of units in the past. For housing association A applies that most of its mixed-ownership complexes were established at the time of construction, not because social housing was sold within an existing complex. The current 'ban' on sales in complexes they currently fully own aims to prevent the efficiency problem of 'broken blocks', which makes maintenance and renovation more difficult. Because of this, both housing associations occasionally buy back homes from homeowners in complexes with a few other owners so they retain full ownership and can get out of some VvEs. This makes the process of maintaining and implementing sustainability measures in its residential complexes much easier. Although they do not sell in complexes where they have full ownership, they sometimes put homes on the sale list in complexes where the housing association does not own many units.

4.2 Sustainability investments in mixed-ownership complexes

The government is taking measures to protect the Netherlands from the effects of climate change. The built environment, including the construction sector, is the source of around a third of all greenhouse gases in the Netherlands (Hoops, 2020). Around 13% of all greenhouse gases can be attributed to the heating of around 9 million existing buildings. These emissions are due, on the one hand, to inadequate insulation and thus a waste of energy and, on the other, to the fact that only 8.6% of the energy consumed comes from renewable sources (Hoops, 2020). The built environment in the Netherlands needs to be made more sustainable to reverse greenhouse gas emissions and structurally address energy poverty as soon as possible. An important part of such investments in the built environment is achieving substantial energy savings through home renovation in combination with increasing the use of renewable energy, through such as solar panels, renewable heat options such as heat pumps, and perhaps nuclear energy.

To meet the 2030 targets of the Paris Climate Agreement, the national policy 'accelerating sustainability in the built environment' (*versnelling verduurzaming gebouwde omgeving*) stresses that a combination of behavioural change, application of insulation and more efficient installations is needed (Ministerie van BZK, 2022a). The priority of this programme is to save energy, as saved energy does not have to be generated, transported or paid for. To achieve this, homeowners, VvEs, social

and private landlords are supported by investment opportunities and attractive financing and subsidies for sustainability measures.

An important part of the programme 'accelerating sustainability in the built environment' is the National Insulation Programme (*Het Nationaal Isolatieprogramma*) (Ministerie van BZK, 2022b). The goal of the National Insulation Programme is to insulate 2.5 million homes in the period up to through 2030, focusing on the 1.5 million poorly insulated homes (label E, F and G) with one or more steps being taken towards the home insulation 'standard'. The 'standard' refers to the home insulation rating advice, which indicates whether the home is well enough insulated to stop using natural gas (Ministerie van BZK, 2022a). As part of the National Insulation Programma, all housing associations have until 2028 to phase out their homes with energy label E, F, and G, with the exception of municipal, provincial and national monuments and homes designated for demolition, and homes subject to the consent of 70% of the tenants and the consent of the VvE (Ministerie van BZK, 2022c). This also applies to the housing associations interviewed for this study. According to participant 4, the government cannot currently oblige housing associations to phase out poor energy labels in their mixed-ownership complexes. This is because in these complexes the VvE is responsible for the maintenance and improvement of the building. This will be further explained below.

There are over two million apartment rights in the Netherlands (CBS, 2016). Apartment rights relate not only to habitable apartments, but also to garages, shop premises, gardens or meadows. Once a division into apartment rights takes place, a VvE is established. As this study focuses on mixed-ownership complexes - which are multi-apartment estates -, only VvEs for habitable apartments are considered. According to the Land Registry file, of the nearly 144,000 VvEs, about 125,000 VvEs have at least one dwelling (CBS, 2016). Almost half (48 per cent) of VvEs with dwellings are mixed, meaning they consist of both rental and owner-occupied homes (CBS, 2016). Around 1,2 million dwellings are part of a VvE in the Netherlands (Ministerie van BZK, 2022b). About 72 per cent of all dwellings in VvEs are in mixed-ownership complexes (CBS, 2016). The VvEs with the most dwellings often were constructed in the post-war period (CBS, 2016).

Apartment buyers automatically become members of the VvE when they purchase an apartment. The laws and regulations of VvEs are mainly governed by a deed of division (*splitsingsakte*) with a mandatory property division regulation (*splitsingsreglement*). The property division regulation is important for the owners within the VvE, as they contain, among other things, the ground rules regarding the use, management and maintenance of the building, as well as the rules regarding decision-making (Van der Vleuten, 2020). And those rules are relevant when it comes to sustainability measures. The VvE has two main tasks: it takes care of the upkeep and maintenance of the building and looks after the common interests of the owners. The VvE serves as a consultative structure and a legal entity to regulate matters properly (Van der Vleuten, 2020). The highest body in the VvE is the General Meeting, in which all owners participate. All important decisions about maintenance and the course of events in the complex are made at this meeting, which usually occurs once or twice a year. In addition, every VvE has a board, consisting of one or more VvE members. Participant 2 stated that finding board members for its mixed-ownership complexes is difficult since the residents' average age is relatively high, so participant 2 often fulfils the board's duties. It is the responsibility of the board to manage the VvE's resources and ensure that meeting decisions are implemented (Van der Vleuten, 2020). However, participants 2 and 4 reported that more and more VvEs, especially the large ones, are outsourcing all or part of the VvE board's duties to an external VvE management company. The VvE board is then made up of one or more of the VvE members, but the external manager executes various tasks on behalf of the VvE.

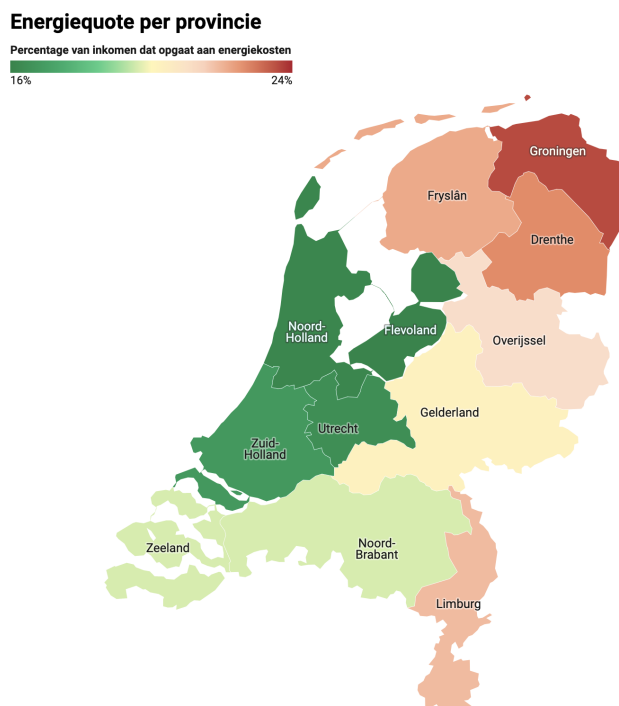
The General Meeting of the VvE decides whether (part of) the apartment complex will be made more sustainable (Hoops, 2020). Changes to common parts - which will usually be necessary for the installation of heat pumps, solar collectors and solar panels - are usually subject to a qualified majority

requirement (Hoops, 2020). According to participants 2 and 4, VvEs of mixed-ownership complexes increasingly combine major maintenance with sustainability measures through a multi-year maintenance plan (*Meerjaren Onderhoudsplan, MJOP*). The MJOP identifies the maintenance activities to be carried out in the future and the associated costs, which provides a guideline for the amount of funds to be available at a given time to carry out the maintenance. In practice, however, many VvEs appear to be unprepared to increase sustainability. VvEs often struggle to get all the different owners on the same page for a sustainability plan. In many cases, for instance, there are insufficient funds saved by the VvE to make modifications, even though the individual residents may have those funds (Ministerie van BZK, 2022b). In order to implement sustainability measures, VvEs often need to take out loans. Due to the fact that the VvE takes out the loan as a legal entity, all owners participate in it. There is currently no opt-out arrangement for owners within VvEs who do not object to the VvE taking out the loan, but do not want to participate in the VvE loan themselves (Van der Vleuten, 2020). However, regular financing options are limited for VvEs. To address this issue, the National Heat Fund (*Het Nationaal Warmtefonds*) started providing financing for VvEs in 2015, but further expansion is needed (Ministerie van BZK, 2022b).

4.3 The Dutch approach to energy affordability

The Northern Netherlands has, relative to its population, the most households suffering from energy poverty (TNO, 2021). Especially in the province of Groningen, energy poverty is a big issue. Zonneplan calculated the average monthly energy costs per municipality and province, set against disposable income per household, adjusted for differences in household size and composition (Breukelman, 2022). As is illustrated in figure 2, residents in the province of Groningen, with relatively large and old homes and low average income, spend as much as 23,6 percent of their income on energy bills (Breukelman, 2022). The municipality Pekela has the highest level of energy poverty in The Netherlands (see figure 3).

Source: Breukelman, 2022.



Bron: Zonneplan • Integreeren • Afbeelding downloaden • Gecreëerd met Datawrapper

Figure 2 Energy ratio by province: percentage of income spent on energy costs, ranging from 16 to 24 percent

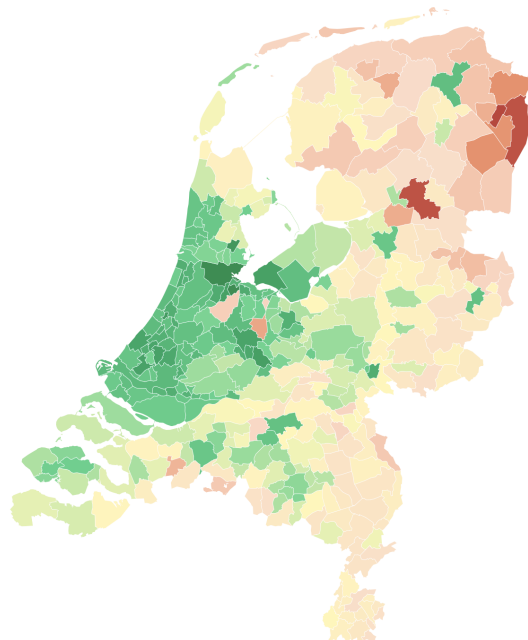
Source: Breukelman, 2022.

Energiequote per gemeente

Gemeente-indeling 2021, meest recente cijfers

Percentage van inkomen dat opgaat aan energiekosten

13% 29%



Bron: Zonneplan • Integreeren • Afbeelding downloaden • Gecreëerd met Datawrapper

Figure 3 Energy ratio by municipality (classification of 2021); percentage of income spent on energy costs, ranging from 13 to 29 percent

The Netherlands lacks a national definition of the term energy poverty. In general, it is defined as households struggling to pay their energy bills and/or unable to invest in energy-saving measures (CE Delft, 2021). Furthermore, unlike the United Kingdom - as described in section 2.4 -, the Netherlands lacks a national climate and energy policy to combat energy poverty specifically. Energy poverty is combated in a fragmented way through small projects that are not integrated into a national framework. The development and implementation of energy poverty policies is assigned almost entirely to local authorities. A large coalition of municipalities is actively developing strategies, action plans and regional agreements, but often with limited financial resources and staff (TNO, 2020). Despite the fact that policy documents on this issue cannot be accessed online (possibly because there is no specific energy poverty policy at the provincial level, as energy poverty is primarily addressed by local authorities), little is known about the approach to combat energy poverty by the province of Groningen. However, the province did introduce a loan for energy measures for low-income households who currently do not qualify for a loan for energy measures. It is possible to apply for a loan of up to 2500 euros on favourable terms (Provincie Groningen, 2021). There are only 1000 loans available in the budget, making it impossible to provide assistance to all households facing energy affordability issues. Thus, it is questionable how much this project of the province of Groningen contributes to solving the energy affordability problem in the province.

Currently, the Dutch government is mainly focused on compensating the costs of energy, including setting a price cap for gas and electricity (Rijksoverheid, 2022). Since early 2023, a price cap on energy applies to households and other small consumers. This means they do not pay more than a maximum price for gas, electricity and district heating, up to a certain usage. Because of this price cap, most households will get a discount on their energy bills. However, according to TNO (2021), this compensation does not solve the problem, as energy is expensive and many homes consume

unnecessary amounts of expensive fossil energy. Therefore, the cost of energy is a structural problem, which requires a structural solution. The incidence of energy poverty will increase if targeted measures are not taken to combat it (CE Delft, 2021). This is due to both high energy prices and the cost of climate measures. CE Delft (2021) states that the number of energy-poor households will rise by a third by 2030 in the Netherlands due to the failure to make homes more sustainable through existing policies, in combination with high energy prices in the long term. Furthermore, energy poverty also threatens the success of the energy transition. Therefore, better policies for making homes more sustainable are important, as these policies reduce energy poverty and at the same time have a beneficial effect on the energy transition (CE Delft, 2021). Additionally, a major contribution will be made in making expensive imported gas redundant, especially from Russia.

5. The influence of housing associations on the energy affordability of homeowners and their specific challenges in mixed-ownership complexes

This chapter answers subquestion two and discusses the influence of housing associations on the energy affordability of homeowners. First, the experience of housing associations regarding sustainability investments when selling social housing is discussed. Next, the specific challenges that housing associations face regarding sustainability investment in their VvE complexes are explained.

5.1 Influence on energy affordability by housing associations

During the interviews, it was found that the participating housing associations sometimes invest in the energy efficiency of single-family homes scheduled for sale, which is an interesting result. This new sales policy was introduced by the interviewed housing associations in 2020. For all single-family homes scheduled for sale - which are always ground-level - sustainability investments will be made for the house to reach at least energy label C. Based on the interviews, an energy label of at least C or higher is considered good: these homes are reasonably well insulated and energy-efficient. According to participant 3, this incentive to market homes with a good energy label is imposed both internally and by the municipality. The reason behind this rule is that the market position of these homes will be maintained in the future and the problem of poorly-insulated houses not be shifted to the (low-cost) owner-occupied sector. In many cases, housing associations sell affordable homes to low-income buyers who lack the financial resources to invest in large-scale sustainability measures. According to participant 1, almost all housing associations in the province of Groningen are now incorporating this strategy. Even though one might argue this strategy leaks wealth from the social housing sector, both housing associations see it as their responsibility to not burden the new homeowner with the problem. In the words of participant 2:

“It is anti-social to put your E-F-G properties on the sale list and say ‘figure it out’” (P2, 16-11-2022).

Thus, both housing associations see it as their moral duty to upgrade the energy efficiency of the single-family homes before the sale. Apart from moral considerations, both housing associations also invest in the energy labels of ground-level properties before sale to ensure livability in the neighbourhood. It can negatively affect the livability of the neighbourhood if the new homeowners do not commit to sustainability investments in their homes, for whatever reason. Therefore, both housing associations are trying to avoid this situation by investing in energy efficiency beforehand. Participant 2 states:

“What do you get when you sell a home with energy label F to someone who can just barely afford it? It becomes a hovel. You as the housing association can make your homes more sustainable and maintain your homes, but the new homeowner cannot keep up. And that property is also in the neighbourhood where you own properties” (P2, 16-11-2022).

Additionally, participants 1 and 2 argue that the investments also raise the market price of the property, thus recouping some of the investments. For instance, participant 1 states that a house with a good energy label yields on an average 50,000 euros more than a house with a poor energy label:

“Homes with a poor energy label may not do as well on the market as those that have already made sustainability gains. And in the past, it didn't matter. Nobody looked at energy labels back then, they just wanted that house. But now there is also the question of what kind of energy bill I will have to deal with later on” (P1, 01-11-2022).

The above quote illustrates that the current energy label of the home is very important due to the high cost of energy nowadays. Therefore, according to participant 1, the argument could also be made that it makes sense to make a home more sustainable first, as the association then realises a higher sales return.

As the housing association invests in the energy efficiency of the single-family homes, the new owners will end up living in a home with a good energy quality. This group of new homeowners benefits from more energy-efficient homes, which has a positive effect on the energy affordability for this group. The conclusion can be drawn that housing associations are attempting to mitigate energy affordability issues by investing in sustainability measures before sale. In that respect, those who bought a single-family home from a housing association from 2020 onwards have a big advantage regarding energy affordability over those who purchased a single-family home from a housing association in the past.

However, as evidenced by the interviews, the housing associations have little to no impact on the energy affordability of homeowners when selling multi-family homes in mixed-ownership complexes. As previously stated in section 4.2.2, housing associations no longer sell homes in complexes where the associations have full ownership, so investment before sale is not applicable here. However, participant 2 of housing association A does indicate that they still sometimes sell homes in mixed-ownership complexes where the housing association currently owns only a few homes in the complex. However, in this case it is not possible to invest in sustainability measures before sale. Like any other owner, the housing association relies on the VvE for sustainability investments in their existing mixed-ownership complexes. Thus, as the housing association cannot invest in sustainability measures on its own, it has little influence on the energy affordability of homeowners living in mixed-ownership complexes. A detailed discussion of the specific challenges that housing associations face regarding sustainability investments in their mixed-ownership complexes is given in the next section.

5.2 Challenges in mixed-ownership complexes regarding sustainability

Having ownership of the entire complex allows a housing association to make sustainable investments on its own. However, the situation is different if other owners own property in a complex along with the housing association, because this creates a situation of mixed ownership. Based on the interviews, housing association A is in a good starting position regarding its mixed-ownership complexes. Participants 1 and 2 indicate that their mixed-ownership complexes are relatively new and well-insulated. However, according to participants 3 and 4, housing association B also has older properties with poor energy labels in its mixed-ownership complexes. It is keen to make these homes more sustainable. But, like any other owner, the housing associations depend on the VvE when it comes to making these complexes more sustainable:

“In a VvE you depend on each other and that's where the challenge lies” (P3, 22-11-2022).

This dependency on the VvE regarding sustainability investments comes with several challenges. First of all, the perspective of housing associations and other homeowners may differ regarding sustainability investments. If residents do not expect to live at an address for a long time, they are often unlikely to invest in sustainability measures that require a big investment with a long payback period. Examples are people who anticipate moving soon or elderly people who do not expect to live very long. Participant 2 said the following:

“Homeowners with an average age of 80 are not going to invest 30.000 euros in sustainability measures now, which have an average payback period of 10 or 15 years. They think: in 10 years I won't be here anyway” (P2, 16-11-2022).

The above quote shows that elderly residents often have more immediate needs, resulting in a short-term perspective. This short-term perspective regarding sustainability investments sharply contrasts

with the perspective of the housing association. The housing association focuses on long-term goals as part of its organisational objectives, according to participant 2.

Second, getting approval for sustainability measures is a complex and time-consuming process within a VvE. Any changes to the building envelope must be approved by the General Meeting of the VvE. For any important decision to be approved, a qualified majority of votes must be obtained. Here, 'qualified' means that the majority of votes must meet certain conditions to approve a decision. In this case it means that at least two-thirds of the number of votes must be present at the General Meeting and of that number two-thirds must vote in favour of the proposal. According to participant 4, housing associations need the approval of 70% of their tenants in the complex as well. Participant 5 stated that because of this high voting ratio, it is difficult to agree on concrete plans within a VvE to improve sustainability. A solution would be to change the voting ratio to make investment in sustainability measures less complicated. However, that does not seem like a good idea to the participants either. A lower threshold would make it easier for homeowners to implement measures. The building can be negatively affected by this, according to participant 5. Additionally, participant 2 thinks the current process of getting approval regarding sustainability measures is a good one. Nevertheless, participant 2 believes that the board of the VvE should have some legal means to deal with obstructionist members, if that is operationally the right decision for everyone.

However, based on the interview results, housing associations often already hold the majority of votes in their mixed-ownership complexes. According to participant 1, this majority of votes allows them to have more influence on decisions regarding maintenance and the implementation of sustainability measures. Theoretically, they can push decisions through, yet they do not want to abuse their majority. For example, participant 2 indicates that it is important to think about how the housing association can get the other owners on board as well. This is especially the case with the implementation of sustainability measures, as it requires big investments. Furthermore, if the interests of the minority are not taken into account enough, the court may annul the decision. Participant 4 states if the housing association fails to get the support of the other owners, the housing association will follow the votes of the rest.

Third, housing associations differ greatly from other property owners when it comes to the financial resources available to implement sustainability measures. According to the property division regulation (*splitsingsreglement*), all owners are responsible for the costs of sustainability measures and the costs are distributed using an allocation key (*verdeelsleutel*). However, the financial possibilities of housing associations are much bigger than those of other homeowners. Therefore, the housing association cannot demand every owner to cooperate with sustainability initiatives, as they cannot look into every owner's wallet. According to participant 5, monthly VvE contributions are usually around 128 euros to a maximum of 180. However, much more money is required for sustainability measures to be implemented. In order to invest in sustainability, either one-off investments by the owners or an increase in monthly VvE contributions are needed. According to participant 5, homeowners usually have to pay about 5000 euros, sometimes more, as their personal contribution. Due to the high costs of sustainability measures, the VvE can even be forced to take out a loan. Participant 4 states that every owner wants to make their home more sustainable, but that funding is very expensive:

"Everyone wants to invest in sustainability. The prices of energy are skyrocketing, but so are the interest rates for financing sustainability measures." (P4, 16-11-2022).

As a result, it is often the high financial costs for sustainability measures that cause owners to vote against these. Of course, as participant 1 says: "... yes, you get the investment back in a lower energy bill, a better-maintained building or added value of your home of course. However, it has to suit your wallet" (P1, 01-11-2022).

Lastly, a lack of expertise and knowledge about sustainability may contribute to a lack of support for sustainability measures within a VvE. According to participant 5, the goal of a VvE is to maintain the building. As noted in the management agreement, the VvE takes care of the management and maintenance of the common parts of the apartment building. Since sustainability often involves changing the building envelope, this needs to be approved by the VvE. However, the topic of sustainability is still fairly new. There is often little knowledge on how to make the building more sustainable within the VvE. Therefore, participants 2 and 4 often voluntarily advise VvE boards in their mixed-ownership complexes on sustainability measures and assist with their supplier and contractor networks. According to participant 4, this lack of knowledge is due the fact that most VvEs have a MJOP without a NEN 2627 condition measurement. This condition assessment states whether all building components included in the MJOP may need immediate maintenance. The cycle of a MJOP only examines the average lifespan of a building component, not its current state. As a result, the VvE can get a distorted picture and may face unforeseen high costs for which they do not reserve enough funds for. To increase the knowledge about sustainability within a VvE, participants 2 and 4 recommend bringing in external expertise. For example, participant 4 advises that every VvE has a sustainability scan performed by a professional company that is translated into MJOP with a condition measurement. According to participant 4, however, this sustainability scan alone can cost around 36,000 euros, which not all VvEs can afford. Consequently, decisions regarding sustainability measures are often delayed or even refused due to a lack of knowledge and expertise.

6. The experiences of energy affordability of homeowners living in mixed-ownership complexes

This chapter answers the subquestion three and examines how VvE homeowners living in mixed-ownership complexes perceive energy affordability, compared to individual homeowners not living in complexes with a VvE. To answer this question, both the interview results with experts and results of the survey distributed among homeowners are used. The experience of energy affordability is measured by looking at three dimensions: physical aspects of the home, individual circumstances, and the ability to improve the home's energy efficiency. Paragraph 6.2 compares the experience of VvE homeowners with that of individual homeowners. The most interesting results are discussed below.

6.1 Factors influencing energy affordability

6.1.1 Physical aspects

Interview results revealed that different physical aspects, such as type of dwelling, construction year and type of energy connection have an impact on energy efficiency and therefore play an important role in energy affordability for homeowners. These physical aspects, among others, are included in the energy label that expresses the energy quality of the home (CBS, 2011). Therefore, these three aspects and their effect on the experience of energy affordability are discussed in more detail first. Next, the relationship between the energy label of a dwelling and the experience of energy affordability will be discussed.

The construction year of the house itself may impact the homeowners' energy affordability. Participant 1, of housing association A, for instance, indicated that its VvE complexes are relatively new, and therefore well insulated, resulting in relatively energy-efficient homes. Therefore, households in these new VvE complexes generally do not experience affordability problems with regard to paying for energy.

The effect of the construction year of the house on energy affordability was examined using six construction periods: before 1920, 1920-1944, 1945-1969, 1970-1989, 1990-2009 and 2010-present. Before 1920, houses were built rapidly because there was a housing shortage in the Netherlands. Due to poor insulation, energy consumption in these houses is relatively high and the many wooden elements make the house very high-maintenance (Hubbs, 2019). In the period 1920-1944, houses were built with high-quality materials (De Vries, 2016). In addition, the cavity wall made its appearance in this period. Due to the intense housing shortage after the Second World War, many houses had to be built. Therefore, between 1945 and 1969 the emphasis was on quantity, so houses from this period are not of high quality. From 1970 onwards, low-maintenance materials were used, which makes the maintenance costs of these houses relatively low. In addition, these houses often have good insulation: double glazing and roof and cavity insulation were standard (De Vries, 2016). After 1990, the Building Code (*Bouwbesluit*) was introduced, setting building standards and regulations. As a result, houses from this construction period are of high quality. These houses are also built with low-maintenance building materials and heating costs are low. Houses built after 2010 until the present can be characterised as newly built houses. While many aspects can be determined by the owner, heating costs are generally low, and renovations will not be necessary soon (Hubbs, 2019).

First, the distribution of construction periods among all homeowners was examined. According to figure 4, there are respondents for every construction period. However, most respondents indicated their home was built in the period 1945-1969 (30,8%) or 1970-1989 (30%).

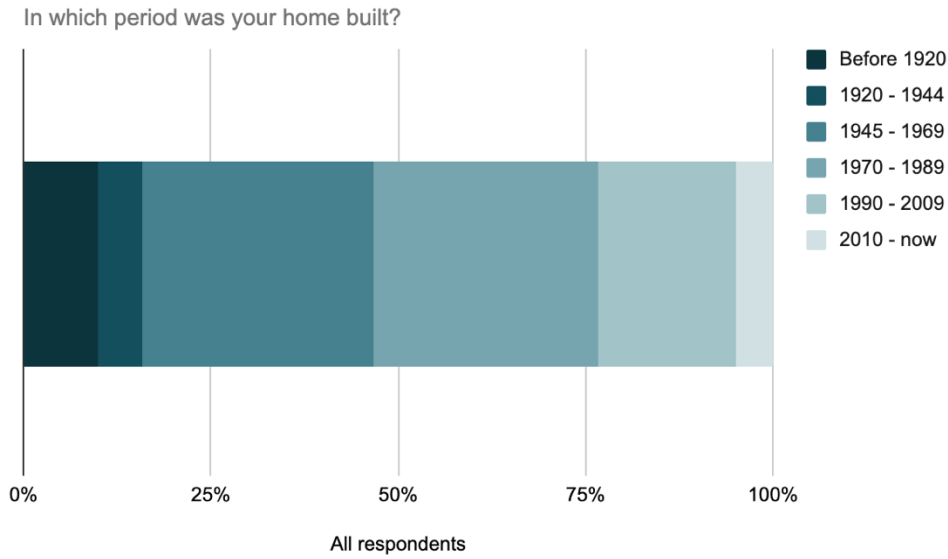


Figure 4 Distribution of respondents by home construction period

Then, the experience of energy affordability was examined by year of construction (see figure 5). Interestingly, 50 percent of respondents living in a pre-1920 home indicated that they could not afford to keep their home adequately warm. As described above, this may be due to the poorly insulated homes of this era, which leads to relatively high energy consumption. For the period 1920-1944, the majority of homeowners can afford to keep their homes adequately warm. This number decreases slightly for the period 1945-1969, possibly due to the fact that the houses built in this period are of poorer quality. However, from 1970 onwards, the number of people who can financially afford to keep their homes adequately warm increases. From houses dating 2010 until present, all respondents can afford it. Using the more nuanced question whether homeowners can afford to pay their energy bills, the same picture appears (see figure 6). Thus, this result seems to confirm the argument of participant 1 that the construction year has an impact on homeowners' energy affordability.

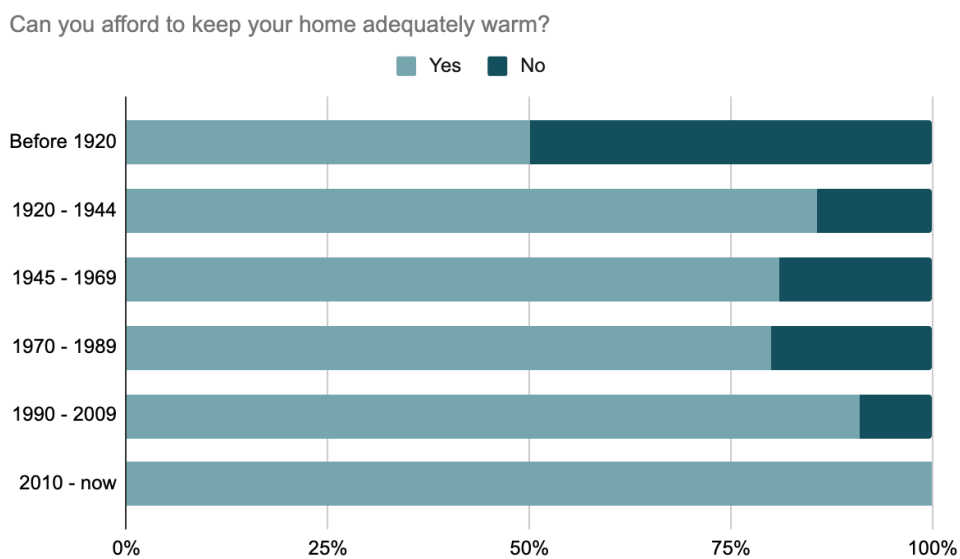


Figure 5 Percentage of homeowners that can or cannot afford to keep their home adequately warm, by construction period

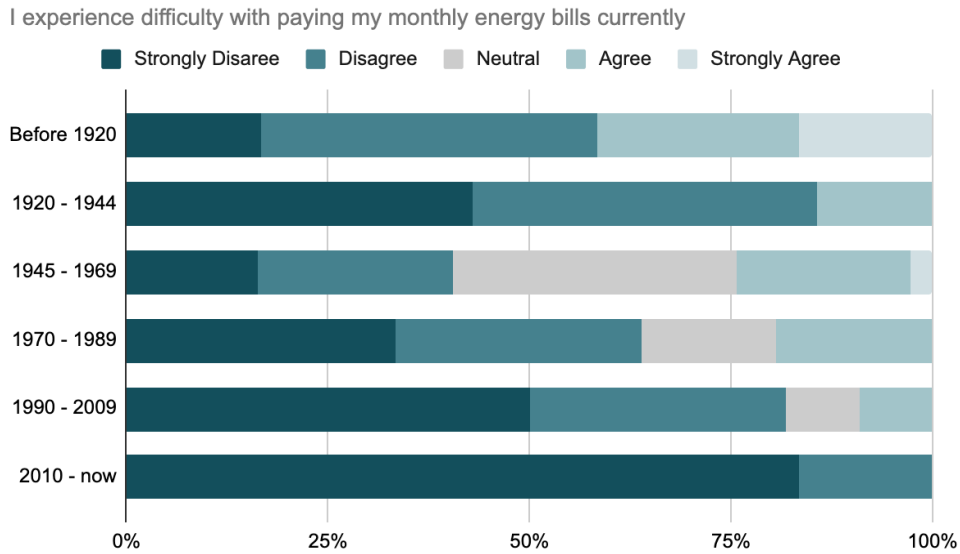


Figure 6 Percentage of respondents indicating whether or not they have difficulty paying their monthly energy bill, by construction period

Next, the type of owner and year of construction were compared (see figure 7). A total of 27% of individual homeowners live in a house that is poorly insulated and of poor quality (before 1920 and 1945-1969). Remarkably, the majority of VvE homeowners (63%) lives in a house built in 1945-1969, as shown in figure 7. As described earlier, these houses are not of very good quality and not well insulated. Based on the results of figure 5 and 6, this may negatively affect their experience of energy affordability. The fact that the majority of VvE homeowners indicates that they live in a house from the period 1945-1969 could be explained by the fact that most dwellings with VvEs were built in the post-war period, as discussed in the policy context. Interestingly, most individual homeowners in this survey (66,3%) live in homes constructed after 1970 with good insulation.

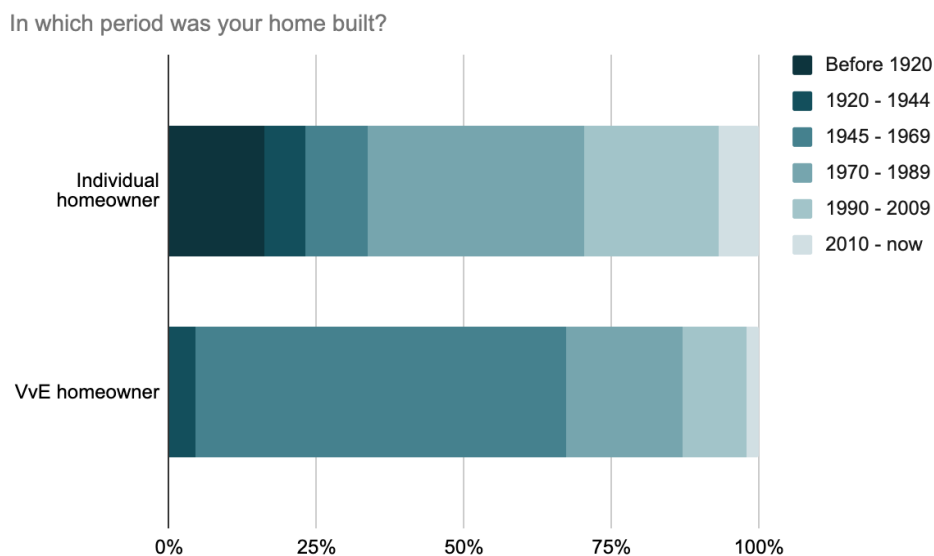


Figure 7 Distribution of home construction period, by tenure type

According to the interviews, the type of dwelling appears to play an important role in the degree of energy efficiency. Participant 1 indicated that the problem of energy affordability certainly exists among their households in single-family homes. According to participant 1, their single-family homes generally have a higher energy use, as these homes tend to be a bit larger than their multi-family homes. Single-family homes are ground-level houses, such as detached houses, terraced houses and semi-detached houses. In this study, a multi-family home is defined as a stacked dwelling: a part of a building with multiple dwellings, such as apartments. Furthermore, participant 1 states that households living in single-family homes may be affected by cooling from multiple or all sides due to the wind, and cannot take advantage of the heating behaviour of neighbours, as apartment dwellers can.

Thus, dwelling type may impact the energy affordability for homeowners. The survey investigated whether the type of dwelling indeed affects the experience of energy affordability for homeowners and therefore tests this interview result. Figure 8 shows how the type of dwellings is distributed among the respondents. The vast majority of respondents indicated they live in a terraced house (32,2%) or multi-family home (39,7%). Most respondents reported living in a multi-family home (39,7%).

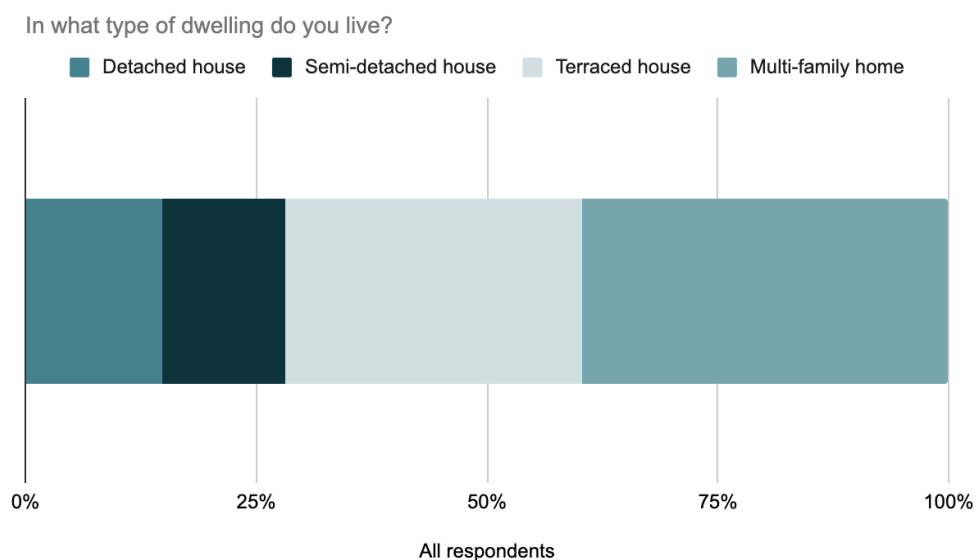


Figure 8 *Distribution of respondents by dwelling type*

Based on the interview results, it was decided to compare homeowners living in single-family homes (respondents indicated living in a terraced house, semi-detached house or detached house combined) with homeowners living in multi-family homes. Using a binary question, the difference in dwelling type does not seem to affect the experience for homeowners regarding energy affordability (see figure 9). For both single-family and multi-family homes the vast majority of homeowners can currently afford to keep their homes adequately warm and the results are about the same (80,6% compared to 80,9%). Since the difference between these two categories is negligible, this result cannot confirm the statement of participant 1. Thus, based on this survey result, it cannot be determined that there are more energy affordability problems among households living in single-family homes.

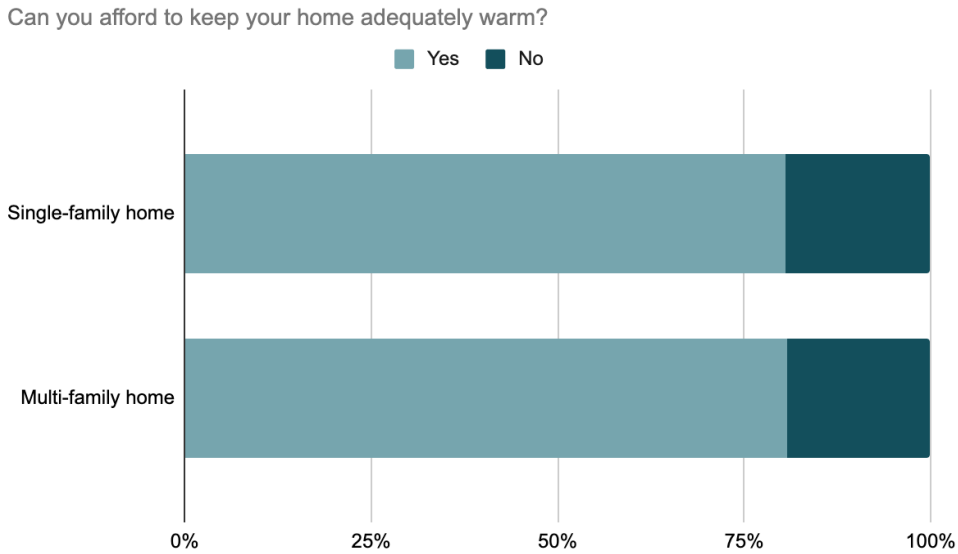


Figure 9 Percentage of respondents that can or cannot afford to keep their home adequately warm, by dwelling type

The statement of participant 1 was also checked with a Likert-scale question to gain a more nuanced understanding. This graph gives a completely different picture and does not appear to reflect the earlier statement that energy affordability problems are more prevalent among households in single-family homes, as indicated by participant 1. The vast majority of homeowners living in single-family homes is not experiencing any difficulty with paying their monthly energy bills (see figure 10). In fact, this percentage is significantly higher than among homeowners living in multi-family homes (71,2% compared to 50%). Compared with figure 9, figure 10 shows a very different picture of energy affordability among homeowners based on dwelling type. This may be due to the fact that this question is more nuanced than the one in figure 9.

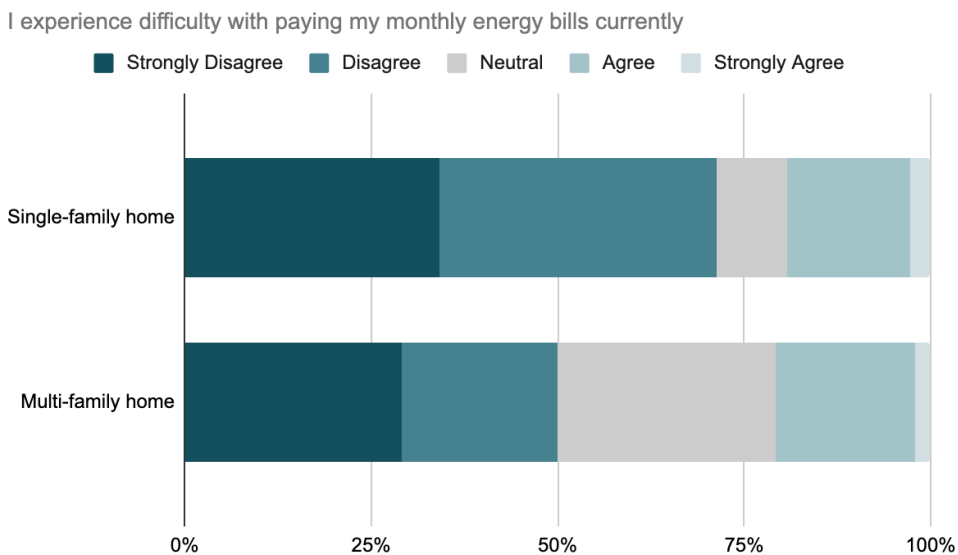


Figure 10 Percentage of respondents indicating whether or not they have difficulty paying their monthly energy bills, by dwelling type

Lastly, the distribution of the type of dwelling by type of homeowner was examined (see figure 11). Almost all individual homeowners indicated they live in a single-family home (94,6%) and almost all VvE homeowners indicated they live in a multi-family home (93,6%). As explained in the policy context, this study focuses on VvEs for habitable apartments. Apartments are classified as multi-family homes. Therefore, all VvE homeowners should have indicated that they live in a multi-family home. However, a few VvE owners indicate they live in a single-family home, such as a terraced or semi-detached house. However, single-family homes do not share façades, installations or roofs according to the Dutch government's definition of a VvE (Rijksoverheid, n.d.). Perhaps these respondents consider themselves to be VvE homeowners because their communal garden or garage has a VvE. In this case, respondents may have misinterpreted the question, but no definitive statements can be made.

Based on figure 10, homeowners in multi-family homes experience more difficulty with paying their monthly energy bills. Given the fact that almost all VvE homeowners indicated they live in a multi-family home (figure 11), this suggests that the type of dwelling has a negative impact on their experience of energy affordability.

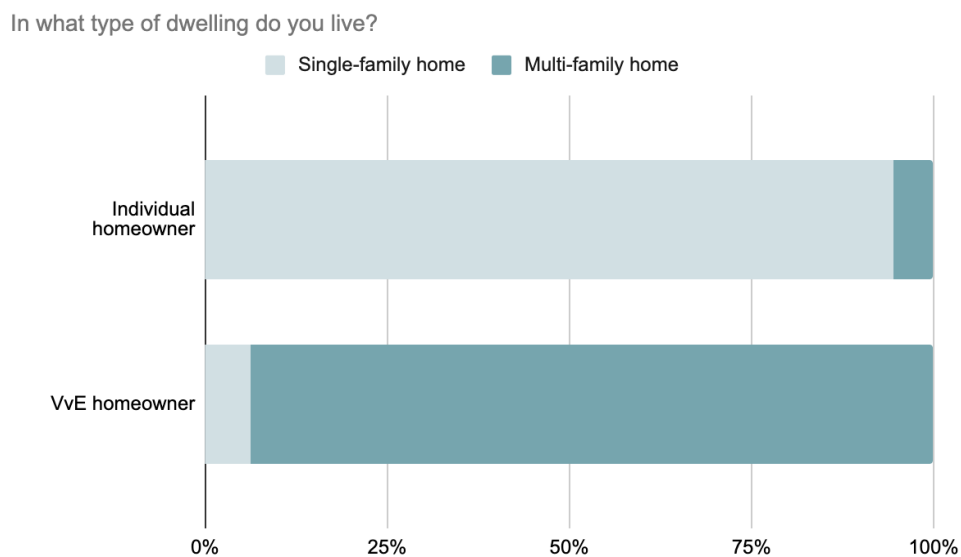


Figure 11 Distribution of dwelling type, by tenure type

Furthermore, the interview results revealed that the type of energy connection has an impact on energy affordability. Two types of energy connection can be distinguished: individual energy connection or a collective heating system. An example of an individual energy connection is a personal heating boiler. District heating and block heating are examples of collective heating systems. Participant 5 indicates that energy affordability problems occur among homeowners living in VvE complexes on block heating:

“There, they often have an average of 50 people paying for one energy bill. Those are often the properties where the people live who do not have the highest income, but they are expected to be able to pay the energy bill because the energy allowance is not available for this group at the moment ... I have VvEs that have gone from 50 euros to 270 euros for their monthly advance payments for block heating. Well, you just have to be able to afford that and it's often in those kinds of complexes where it's just not possible.” (P5, 29-11-2022)

People living in VvE complexes with collective heating systems are tied to the energy contract and type of energy supplier chosen by the VvE and do not have the freedom to choose their own energy supplier. As shown by the survey respondents' experience, this situation results in dissatisfaction:

"We have district heating and we can't get rid of that either." (VvE homeowner, 01-01-2023)

"We depend on communal heating with a variable-rate energy contract via the VvE. I would like to have my own central heating boiler for which I can have my own energy contract." (VvE homeowner, 19-12-2022)

Owners in VvEs with a collective heating system with a variable-rate energy contract face high energy prices at present. They do not have the freedom to switch energy suppliers. This is not favourable in times of high energy prices and can be an explanation for their dissatisfaction. Additionally, the non-transparency of the usage statement also causes dissatisfaction:

"You get a 1.5-year usage statement, and it is so incredibly unclear that you don't understand anything about your usage. And in the interim, there is no information at all, so you have no idea what the usage is, and you have no idea if any sustainability measures taken have any effect. Furthermore, you don't have any info on which tariff applies; old gas prices or variable or whatever." (VvE homeowner, 19-12-2022).

According to participant 5, homeowners on collective heating systems have more energy affordability problems. Consequently, it was checked whether the survey reflected this interview result. First, the distribution of energy connection types among the respondents was examined. Based on figure 12, the vast majority of the homeowners said they have an individual energy connection (89,1%). Thus, when interpreting the results of the following analysis, it should be kept in mind that the number of respondents connected to a collective heating system is not large in absolute terms.

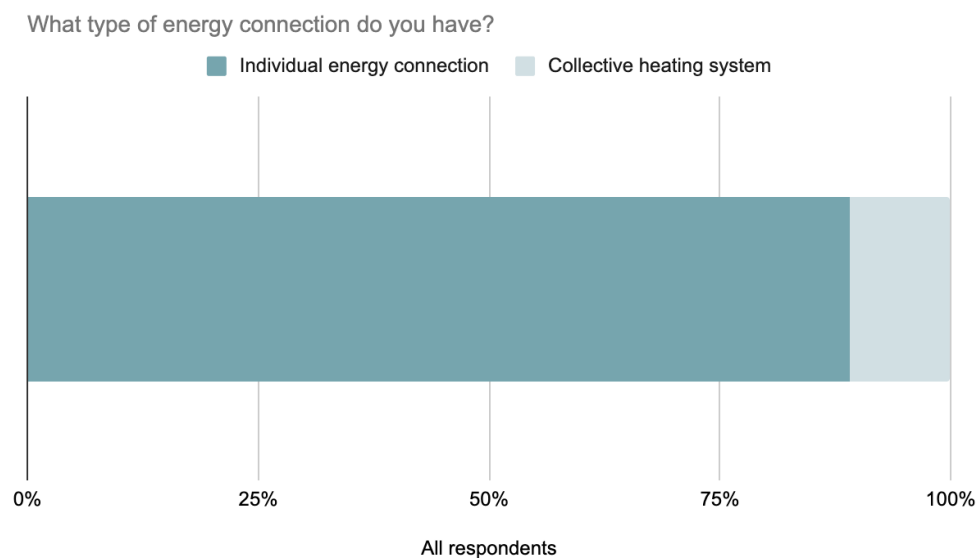


Figure 12 Distribution of respondents by type of energy connection

Using a binary question, it emerged that the majority of homeowners for both types of energy connections can currently afford to keep their homes sufficiently warm (see figure 13). However, the percentage of homeowners with a collective heating system who indicate they can afford to keep their home adequately warm is lower than that of owners with an individual energy connection (61,5% compared to 83%).

Can you afford to keep your home adequately warm?

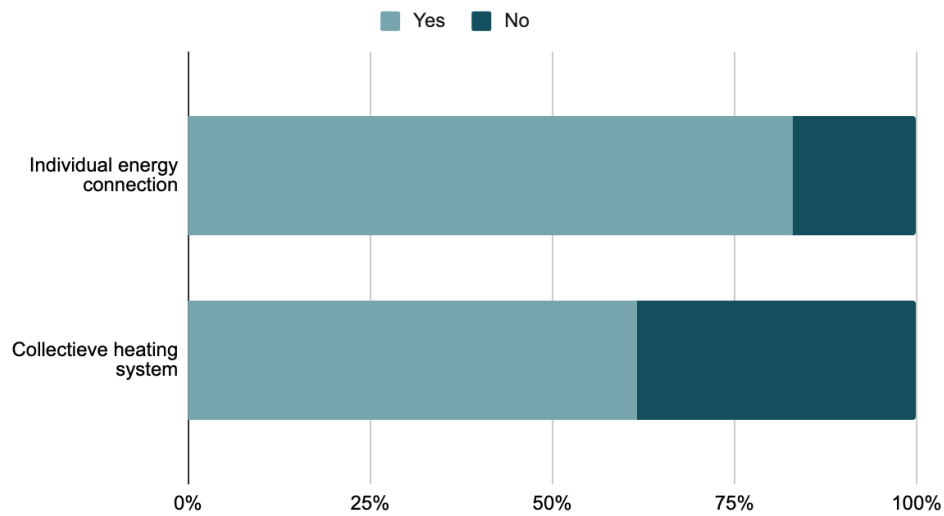


Figure 13 Percentage of respondents that can or cannot afford to keep their home adequately warm, by type of energy connection

According to figure 14, the majority of homeowners with an individual energy connection (68,8%) indicates that they do not experience any problems paying the monthly energy bill at the moment. The majority of households connected to a collective heating system indicates that they are neutral (46,2%), i.e. neither have difficulties nor find it easy to pay. However, a large proportion of homeowners connected to a collective heating system currently experiences difficulty paying their monthly energy bills (38,5%).

I experience difficulty with paying my monthly energy bills currently

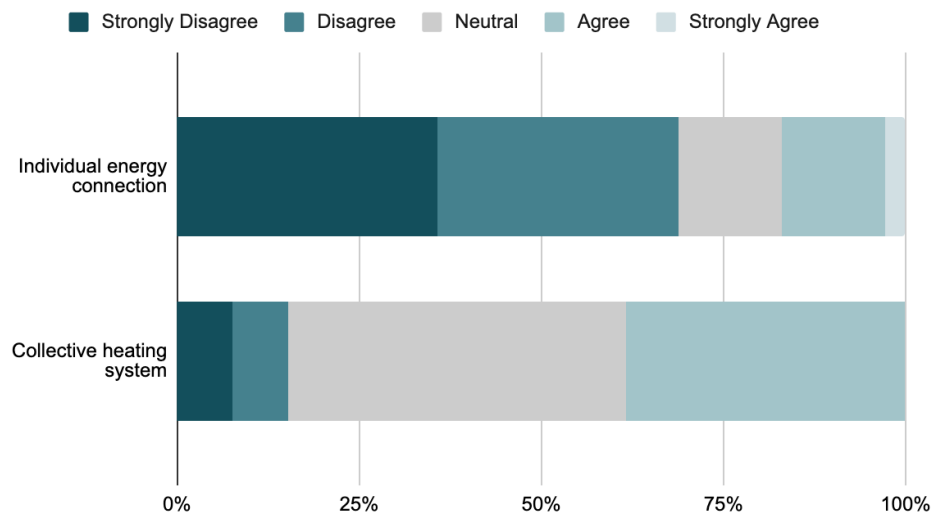


Figure 14 Percentage of respondents indicating whether or not they have difficulty paying their monthly energy bills, by type of energy connection

Looking at the distribution of the type of energy connections among both types of homeowners, it should be noted that the majority of homeowners have individual energy connections. There is, however, a greater proportion of VvE homeowners connected to a collective heating system (26,7%) compared to individual homeowners (1,4%) (see figure 15). Based on the results of figure 13 and 14,

the experience of affordability for VvE homeowners may be negatively impacted by having a collective heating system.

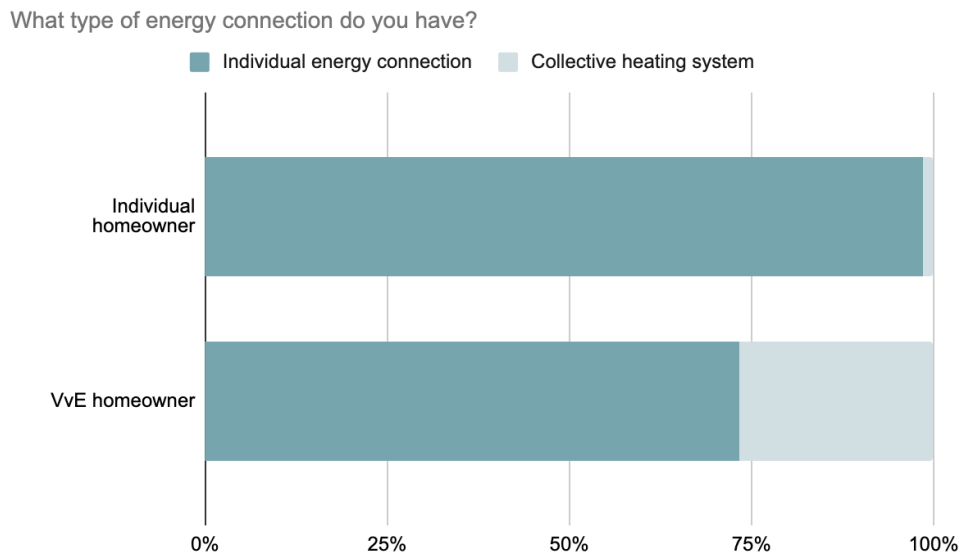


Figure 15 *Distribution of type of energy connection, by tenure type*

During the interview, participant 1 stated all their mixed-ownership complexes are relatively new and have good energy labels (usually B or A). Because these are energy-efficient complexes, participant 1 does not expect homeowners in these mixed-ownership complexes to experience many affordability issues related to energy. Using the survey results, the statement of participant 1, that whether a good energy label leads to fewer energy affordability problems, was checked.

The first step was to examine how energy labels were distributed among the respondents. Based on figure 16, most homeowners reported having an energy label of C or higher (54,3%). This means that the majority of the homeowners that participated in this study have a good energy label at the moment. The answers to the open question of the survey showed that not everyone currently has or is able to obtain an energy label for their home (for example, because they live in a monumental building). It should therefore be taken into account that a few owners may have only given an estimate of their energy label.

What is the current energy label of your home?

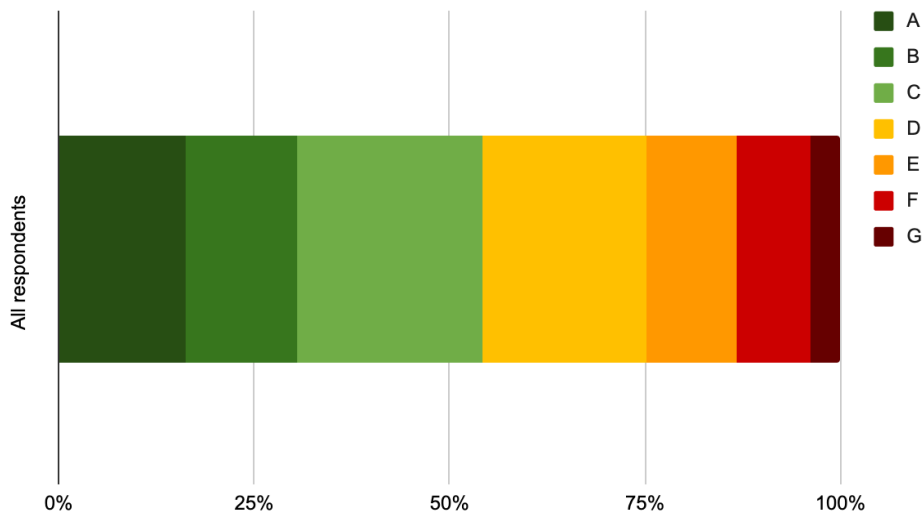


Figure 16 Distribution of respondents by type of energy label

Then, the extent to which the energy label affects the homeowners' energy affordability was examined. That the degree of energy efficiency affects the affordability of energy bills is confirmed by the survey results. Figure 17 clearly shows that almost all homeowners with a good energy label (C or higher) can currently afford to keep their homes adequately warm. The majority of homeowners who say they cannot afford it live in homes with energy labels D or lower. Interestingly, 75% of homeowners living in a property with energy label G said they cannot afford to keep their homes adequately warm. The more nuanced question presents the same picture: the higher the home's energy label, the fewer problems homeowners experience in paying their energy bills (see figure 18).

Can you afford to keep your home adequately warm?

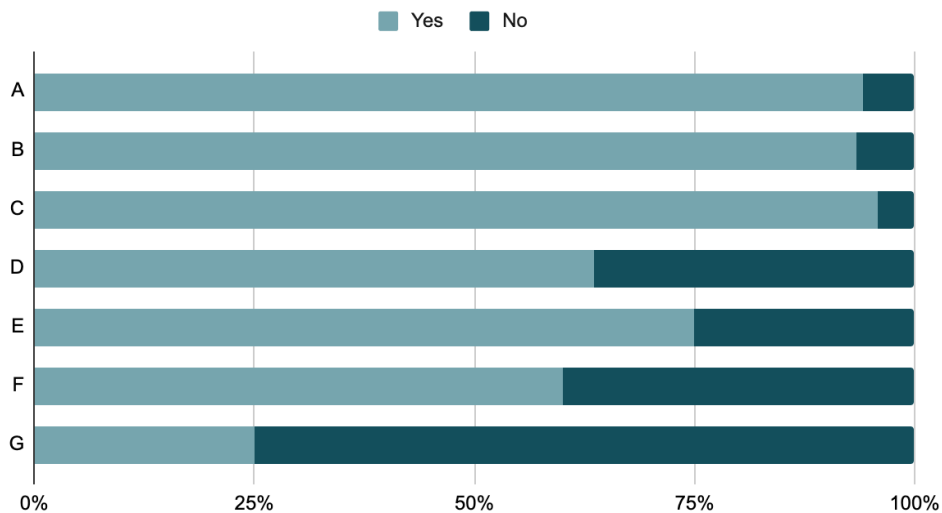


Figure 17 Percentage of respondents that can or cannot afford to keep their home adequately warm, by type of energy label

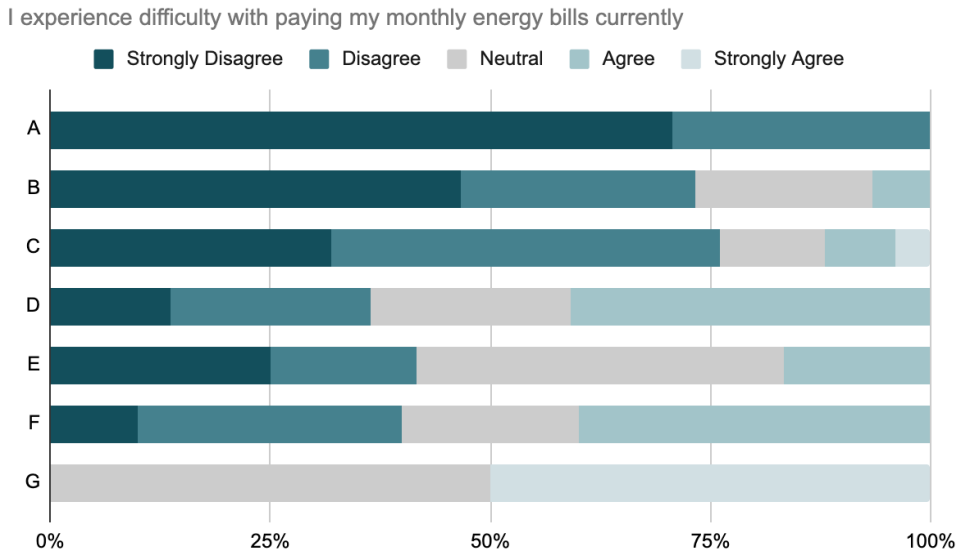


Figure 18 Percentage of respondents indicating whether or not they have difficulty paying their monthly energy bills, by type of energy label

According to figure 19, the majority of the individual homeowners live in a home with a good energy label (C or higher), namely 57,8%. Almost half of VvE homeowners (48,8%) indicate they live in a house with a good energy label. Despite the fact that there is a difference between the two groups, it is not very large. Therefore, no firm conclusions are drawn about this difference. Nevertheless, a large percentage of both individual homeowners and VvE homeowners currently lives in energy-efficient homes.

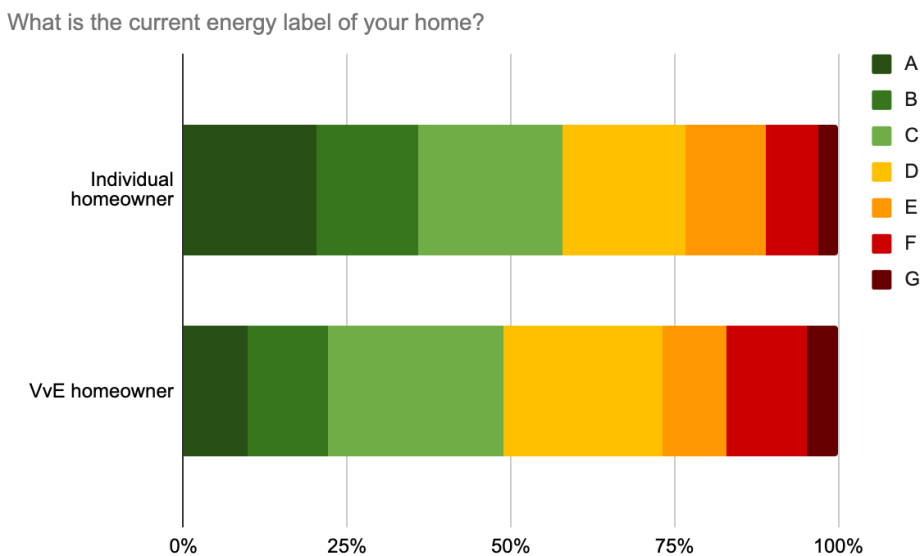


Figure 19 Distribution of type of energy label, by tenure type

6.1.2 Individual circumstances

The expert interviews revealed that individual circumstances also play an important role in energy affordability for homeowners within VvEs. For instance, respondent 2 indicated that energy affordability is not an issue in their VvEs, as all of their homes are relatively new and well-insulated. In addition, there are fixed-term energy contracts until 2023 for common areas in their VvE complexes. Finally, it comes down to individual energy use, which differs from person to person. Depending on the situation, some homeowners may have to sign up for a new indefinite contract with variable tariffs, while others may still have a fixed-term contract with fixed tariffs. Given that energy costs have risen considerably at time of data collection, taking out a new energy contract will certainly affect energy affordability.

Keeping this in mind, the survey also asked about the type of energy contract of the respondents: fixed-term or indefinite. Subsequently, the affordability of energy bills was investigated according to the type of energy contract a homeowner had concluded. Because this comparison is about individual energy use, it was decided to include only those homeowners who have an individual energy connection.

According to figure 20, 52,8% of the homeowners have a fixed-term energy contract, 39,6% have an indefinite contract and 7,5% of owners do not know what kind of contract they have. This means that a slight majority of homeowners currently has a fixed-term energy contract. During these times of rising energy prices, this is very advantageous.

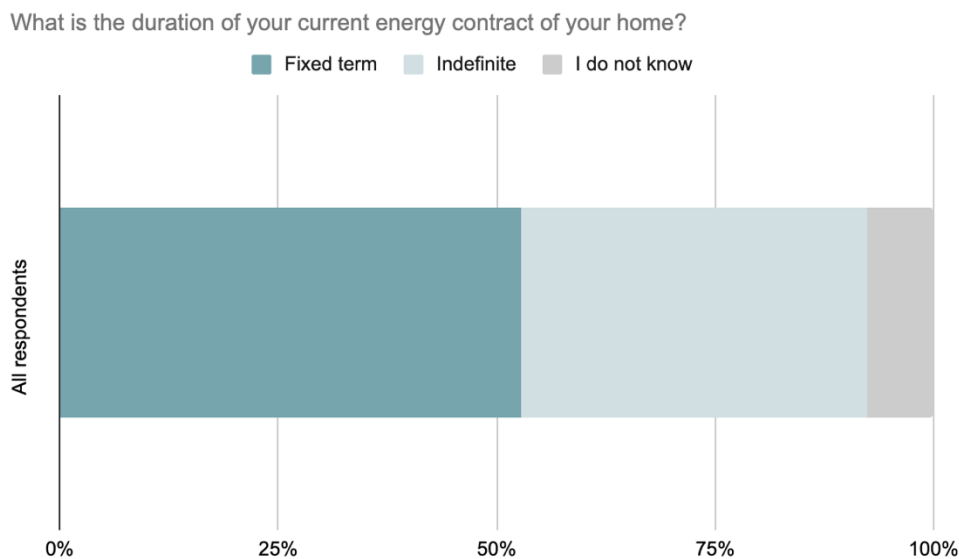


Figure 20 Distribution of respondents by energy contract duration

The vast majority of homeowners is currently able to afford to keep their homes adequately warm (see figure 21). The same picture emerges with a more nuanced question, as for both types of energy contracts, the majority of households currently experiences no difficulty in paying their monthly energy bills (see figure 22). However, for both questions, the share of households with an indefinite contract that indicated 'yes' or '(strongly) disagree' is (slightly) lower than that of households with a fixed-term contract (77,6 compared to 87,9%; 53,1 compared to 74,1 %). These results suggest that homeowners with a fixed-term contract experience fewer energy affordability problems, maybe because they have not had to deal with sharply risen energy prices yet.

Usually, indefinite contracts have variable tariffs and fixed-term contracts have fixed tariffs. Since the Netherlands also allows fixed-term energy contracts with variable tariffs (though this is less common), a comparison was made for the type of tariff. However, the comparison of type of tariff with energy affordability gave the same results as the comparison with type of energy contract, so this was not included in the results. The type of energy contract can differ from one person to another. Therefore, it was decided to not make a comparison between individual and VvE homeowners.

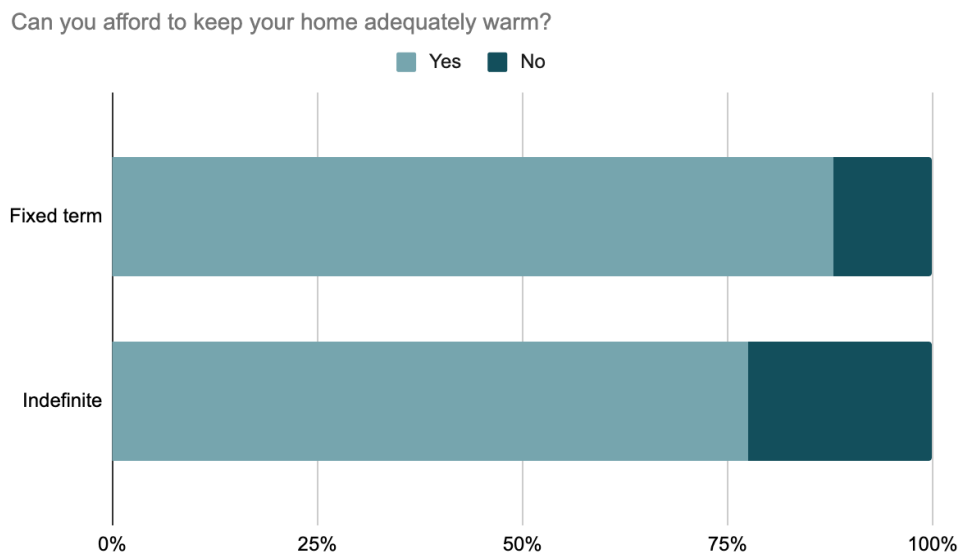


Figure 21 Percentage of respondents that can or cannot afford to keep their home adequately warm, by energy contract duration

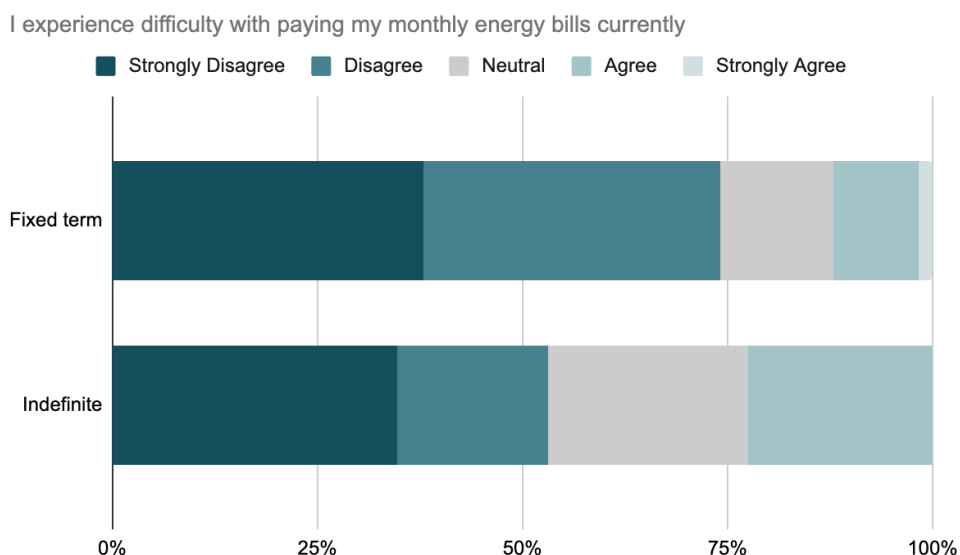


Figure 22 Percentage of respondents indicating whether or not they have difficulty paying their monthly energy bills, by energy contract duration

Further, it should also be taken into account that personal preferences and behaviour influence the amount of energy use and therefore may impact energy affordability. For instance, the higher the temperature of the thermostat, the higher the energy use and costs. Preferences and behaviour differ

per person, so energy use may vary from person to person. Consider, for example, the preferred temperature of the thermostat. Participant 2 states the following:

“In terms of energy consumption, you are at different levels. This ranges from ‘I am never at home because I am always babysitting my grandchildren’, to ‘I like to have my thermostat at 22 degrees because of my osteoarthritis’.” (P2, 16-11-2022).

So, the ideal temperature can vary for everyone and is highly subjective. For this reason, this section does not compare individual owners with VvE homeowners. Although the ideal temperature is subjective, the World Health Organization recommends a minimum indoor temperature of 21 degrees in living rooms, and 18 degrees in all other rooms (WHO, 2007). In general, older people experience the thermal environment differently from younger people due to physiological, behavioural and psychological differences (Van Hoof & Hensen, 2006). As a consequence, a temperature of 18 degrees may be sufficient for a younger adult, while older people often find it more pleasant to maintain a temperature of at least 20 degrees in the house.

Figure 23 illustrates how people experience temperature differently. Overall, it can be concluded that the higher the temperature, the more comfortable homeowners feel. Nevertheless, this remains very subjective. For instance, although most people say they do not feel comfortable at a temperature below 18 degrees (47%), there is also a fair proportion of homeowners who do feel comfortable at this temperature (32,4%).

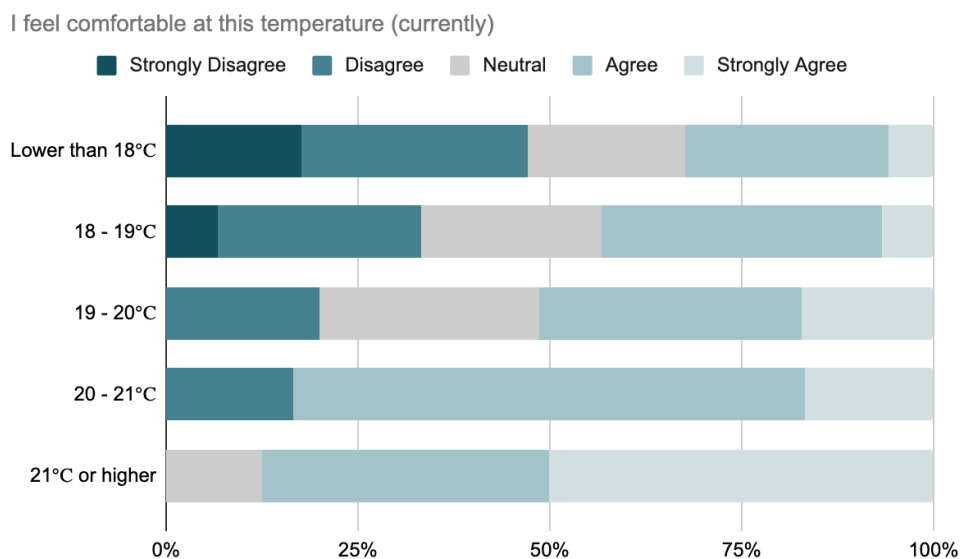


Figure 23 Percentage of respondents indicating whether or not they feel comfortable at their current average room temperature

When looking at table 6, the survey results also show that in general, seniors (65 or older) keep their home at a higher temperature on average, when they are at home during daytime, compared to younger age groups.

Furthermore, according to academic literature, gender also plays a role, as women prefer higher room temperatures than men (Karjalainen, 2007). This was checked in the survey. From table 6, this difference is not clear when looking at the current situation: the average temperature is about the same for both genders. Last winter, however, women put the thermostat at higher average temperatures than men, as shown in table 6. However, it is notable that for all age groups and genders, the average temperature this year has gone down compared to last winter. This can be most likely explained by the high energy prices currently, which have led homeowners to adjust their behaviour and use energy

more sparingly. The fact that the survey respondents are more energy-conscious and turn down the temperature this year is also confirmed by the open-ended survey question responses. A few examples are:

“We have the central heating on low at home, and heat locally via infrared panels” (VvE homeowner, 16-12-2022).

“I only heat the ground floor” (VvE homeowner, 12-12-2022).

“By both working full-time and being quite willing to sit on the sofa with a blanket afterwards, our energy costs as well as water etc. (regardless of the current crisis) have always been low. We have been living quite frugally for quite some time” (Individual homeowner, 15-01-2023).

“I use air conditioning to heat my home” (Individual homeowner, 04-12-2022).

“I filled in that we have no payment problems, but that is because we have turned down the thermostat substantially. If we used our thermostat 'normally' we would probably be in trouble though” (Individual homeowner, 06-12-2022).

These quotes reveal that several homeowners have changed their heating behaviour and are more conscious of their energy use. So, it could very well be that these homeowners do not experience affordability problems because they have deliberately turned their thermostats down a few degrees, decided not to heat certain rooms, or use other methods of heating such as infrared panels, an air conditioning system or small electric heater. Perhaps if they lived 'normally', they might experience affordability problems. Thus, behaviour may have a significant impact on energy affordability.

Table 6 Comparison average room temperature (when at home, during daytime), by age category and gender

Average temperature by age category (when at home, during daytime)	currently	last winter
18-24	18,33	20,33
25-34	16,69	18,00
35-44	18,09	19,00
45-54	17,22	19,45
55-64	17,93	19,23
65-74	18,90	20,28
75+	19,31	20,25
Average temperature by gender (when at home, during daytime)	currently	last winter
Male	17,70	18,89
Female	17,76	19,39

Moreover, as found in the literature and interviews, receiving an energy allowance also has a significant effect on energy affordability. However, not everyone is eligible for the government’s energy allowance. For example, participant 5 indicated that VvE owners who are connected to block heating are not eligible. Only 16 out of 128 of all respondents indicated they had received an energy allowance. Due

to the small absolute number of respondents, the effect of an energy allowance on energy affordability was not further investigated.

6.1.3 Ability to invest

As discussed in the theoretical framework section 2.3.3, tenure status plays an important role in the opportunities to invest in sustainability measures. According to the interview results, being in a VvE poses many obstacles when it comes to making homes more sustainable (as discussed in section 5.2). Similarly to housing associations, other owners depend on the VvE when it comes to the implementation of big sustainability measures in their homes. VvE homeowners' responses to the open question also confirm that sustainability is difficult in (mixed ownership) complexes with a VvE. A few examples are:

“In a VvE it is very complicated to decide how and where we can put solar panels on our roof in such a way that every resident (owners and tenants) will benefit from them” (VvE homeowner, 16-01-2023).

“Within a VvE, you have little to no say. No say in what happens, whether there will be solar panels or insulation. There is always someone against it and the bureaucracy is obstructive” (VvE homeowner, 01-01-2023).

“Being part of a VvE makes it much more complex to improve the sustainability/energy situation of my apartment” (VvE homeowner, 19-12-2022).

Therefore, it was investigated what kind of impact tenure status has on the implementation of sustainability measures, by comparing the situation of individual homeowners with VvE homeowners. The first step was to determine whether sustainable measures were implemented. A note accompanying the question clarified that it was about the implementation of large sustainability measures. As Figure 24 illustrates, fewer sustainability measures were implemented in the homes of VvE homeowners than in those of individual homeowners (68,9% compared to 86,3%).

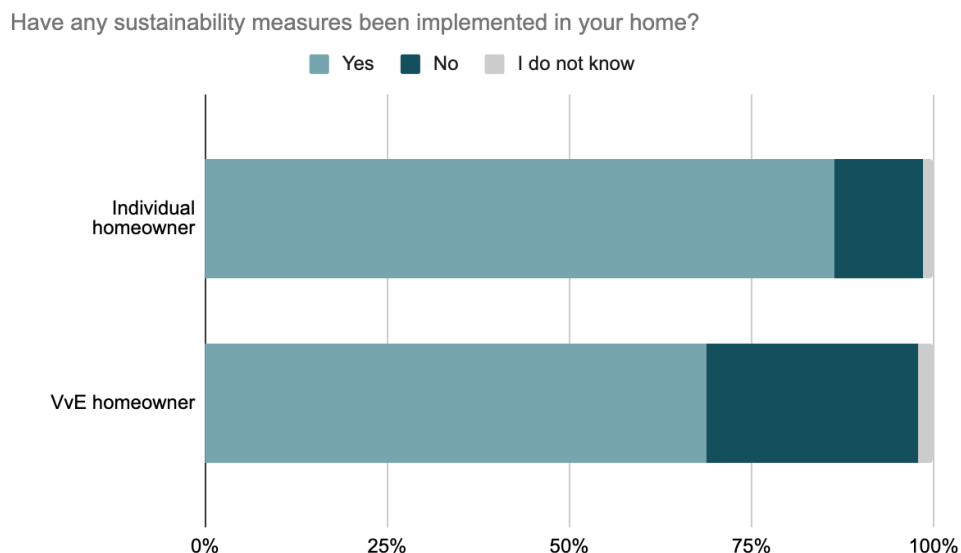


Figure 24 Sustainability measures implemented or not, by tenure type

Since these measures could also have been implemented before the owners bought the house, the extent to which measures have been implemented in the home since they have lived there was also investigated. Figure 25 indicates that fewer sustainability measures were implemented in homes of

VvE homeowners than in those of individual homeowners (37,8% compared to 60,3%). Therefore, figures 24 and 25 may suggest that homeowners within a VvE may have more difficulty implementing sustainability measures in their homes than individual homeowners.

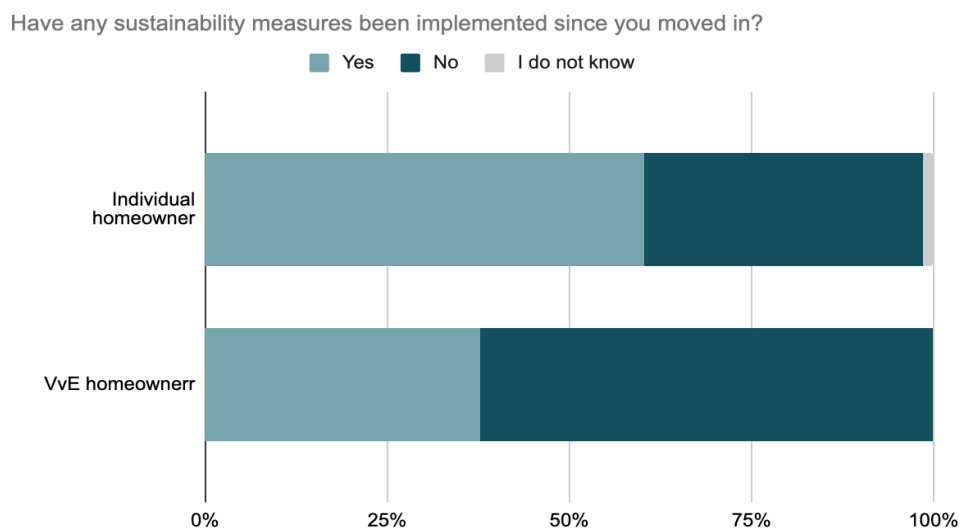


Figure 25 Sustainability measures implemented or not implemented since moved in, by tenure type

Financial reasons may explain why fewer sustainability measures have been implemented in the homes of VvE homeowners than in those of individual owners. In many VvEs, funds are insufficient and financing options are limited, as discussed in the theoretical framework and policy context. Perhaps it is easier for individual owners to get financial support (loans, subsidies etc.) than for VvE homeowners and for that reason they have implemented more measures. Therefore, the question was asked whether they had obtained financial support for the implementation of sustainability measures. Interestingly, the results were almost the same for both types of homeowners: the vast majority indicated that they did not receive any financial support (see figure 26). Based on this result, it cannot be said that the availability of financial support is the reason that fewer measures are implemented in the homes of VvE homeowners than in those of individual homeowners.

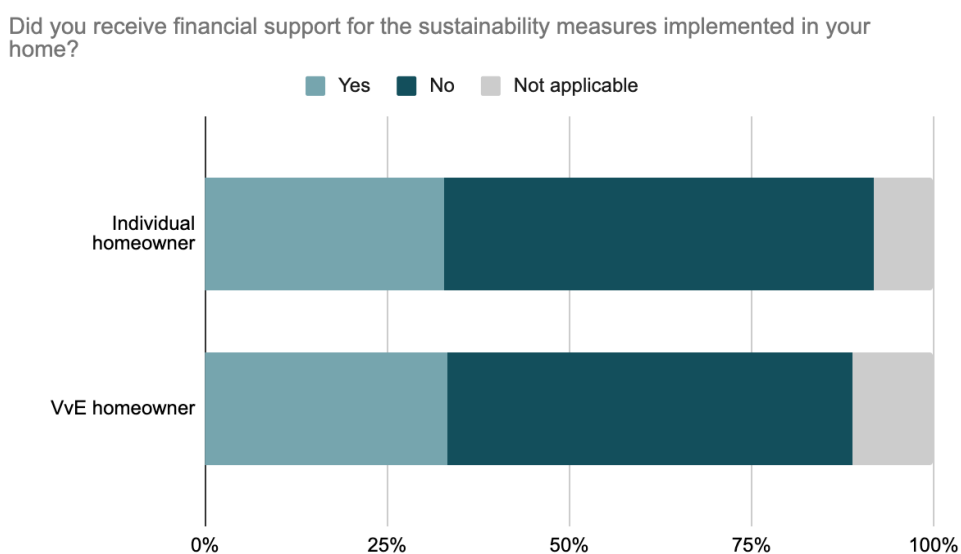


Figure 26 Financial support received or not, by tenure type

As described in section 5.2, the implementation of sustainability measures is challenging within a VvE. Consequently, it was investigated how homeowners experience cooperation with others with regard to making their homes more sustainable. This question was clarified by adding a note that it was about the cooperation with their neighbours and/or VvE. The homeowners within a VvE depend on the VvE for sustainability measures. Although individual homeowners experience more freedom with regard to the implementation of sustainability measures, they may sometimes still need some cooperation from their neighbours. For example, a neighbour may oppose a homeowner placing solar panels on their own roof, because the neighbour does not like the look. Figure 27 shows that the majority of individual homeowners give a neutral answer. This can perhaps be explained by the fact that individual homeowners are often independent when it comes to the implementation of sustainability measures. However, it is evident that homeowners within a VvE are less satisfied with the level of cooperation than individual homeowners (33,4% compared to 8,8%). The fact that VvE homeowners are more dissatisfied may perhaps be explained by the fact that fewer sustainability measures have been implemented in their homes than in those of individual owners.

How satisfied are you with the cooperation with the people around you when it comes to making your home more sustainable?

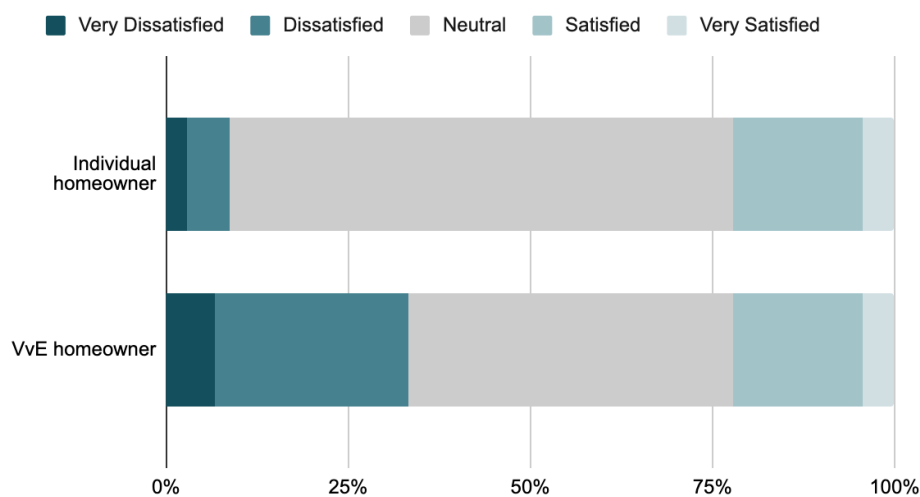


Figure 27 Level of satisfaction with cooperation regarding the implementation of sustainability measures, by tenure type

Figures 24 and 25 show that fewer sustainability measures have been implemented in the homes of VvE owners compared to those of individual owners. But how might this affect their energy affordability? As discussed in the theoretical framework, sustainability measures improve the energy efficiency of the home and are therefore the most permanent and efficient solution to bringing down energy bills. Therefore, the implementation of such measures was expected to have a positive impact on energy affordability. This expectation was examined by looking at the experiences of survey respondents who have implemented sustainability measures. Looking at figure 28, the majority indicated that the sustainability measures have helped increase their living comfort (72,8%). The majority also indicates that the measures have helped to reduce their energy bills (54,4%), although this proportion is lower compared to the effect on living comfort. Thus, the fact that fewer measures have been implemented in the homes of VvE homeowners compared to individual homeowners may have a negative impact on the experience of energy affordability of VvE homeowners.

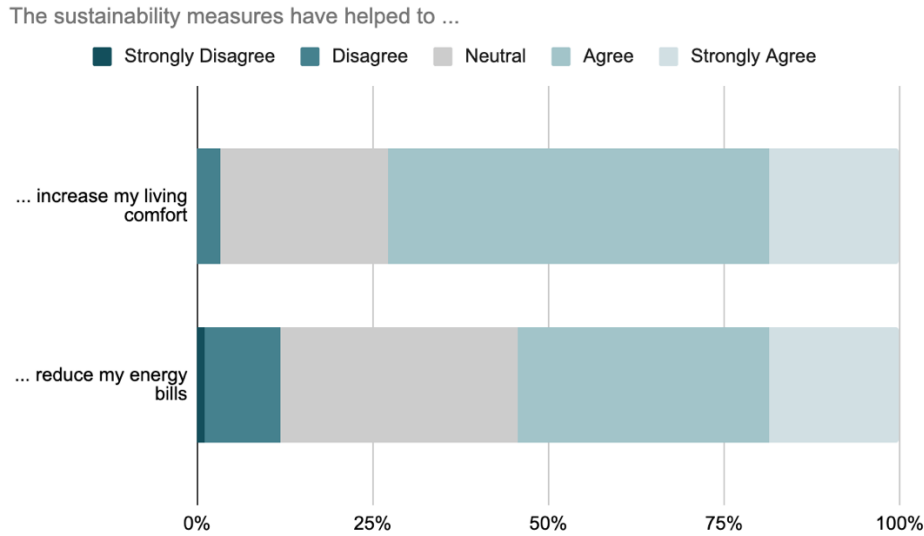


Figure 28 The effect of the implementation of sustainability measures on living comfort and energy bills

6.2 Comparison between VvE and individual homeowners

Section 6.1 covered several dimensions of energy affordability. Using the survey results of all respondents, the impact of different aspects on the experience of energy affordability was examined. But do VvE homeowners experience energy affordability differently than individual homeowners? This section attempts to answer this question by looking at the extent to which the experience of energy affordability differs between individual homeowners and VvE homeowners.

Figure 26 shows that when energy affordability is measured with a binary question, the results are somewhat similar for individual and VvE homeowners. The vast majority of both types of homeowners is able to afford to keep their homes adequately warm; the proportion of VvE homeowners indicating 'yes' is slightly higher than for individual owners (82,2% compared to 79,7%). Due to the small difference, no conclusions can be drawn from this result.

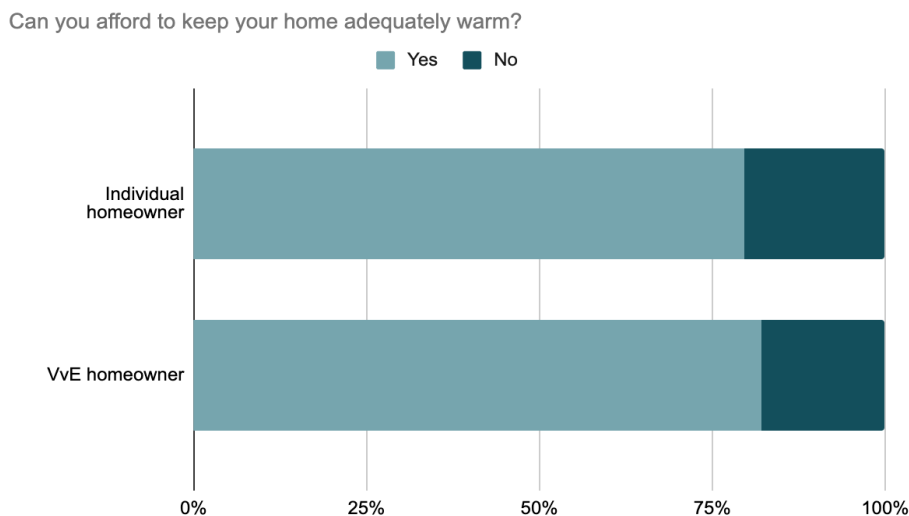


Figure 29 Percentage of respondents that can or cannot afford to keep their home adequately warm, by tenure type

However, when asked if they are experiencing difficulty paying their monthly energy bills, a different picture emerges. It is clear that the majority of individual owners disagrees or strongly disagrees (see figure 30). This number is significantly higher than for homeowners within a VvE (68,8% compared to 50%).

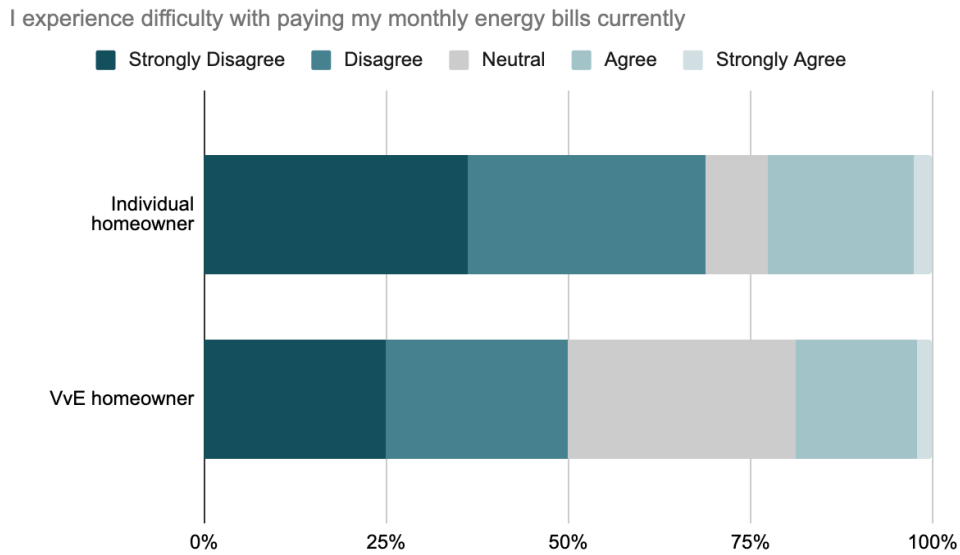


Figure 30 Percentage of respondents indicating whether or not they have difficulty paying their monthly energy bills, by tenure type

Because energy prices have skyrocketed recently, last winter's situation (2021-22) was also examined. As figure 31 shows, the majority of both types of homeowners did not experience payment problems last winter. The results are about the same for both types of owners. This can be explained by the lower energy prices last winter. According to figures 30 and 31, both types of owners find it more challenging to pay their monthly energy bills today than they did a year ago.

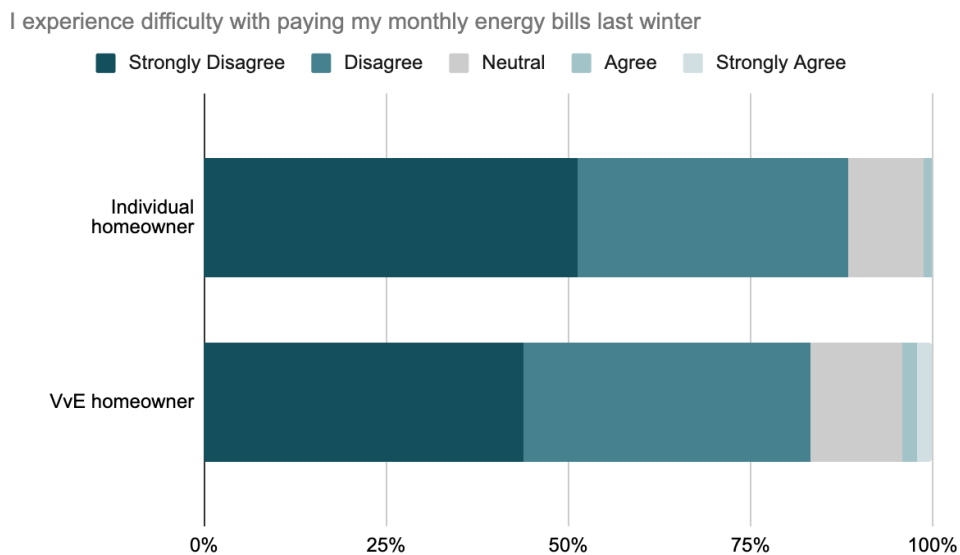


Figure 31 Percentage of respondents indicating whether or not they had difficulty paying their monthly energy bills last winter, by tenure type

Since energy prices were rising rapidly at time of data collection, the situation in the future was also considered. For both owner types, the majority agrees or strongly agrees that they are concerned about the affordability of energy bills in the future (see figure 32). A possible explanation for this can be that energy prices sharply rose in 2022 and continued to do so at the time the survey was conducted (November 2022 - January 2023). Moreover, most respondents had not yet heard that the Dutch government would introduce an energy price cap, which was introduced on 1 January 2023. In addition, VvE owners are slightly more worried about paying their monthly energy bills in the future than individual owners (58,3% compared to 54,4). Based on the VvE homeowners' quotes cited earlier, a possible explanation may be that VvE homeowners connected to collective heating systems cannot influence their type of energy contract and the associated tariffs, which may result in more concerns during times of high energy prices.

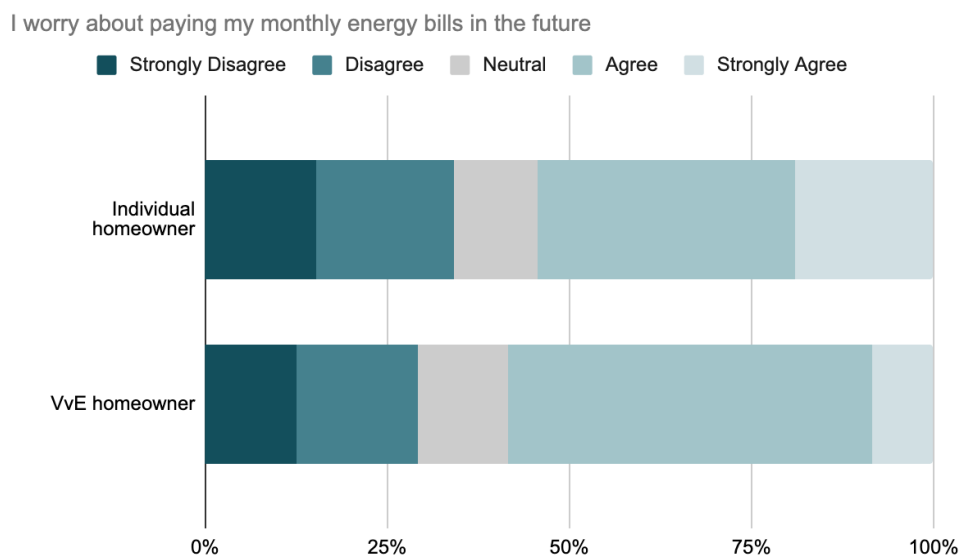


Figure 32 Percentage of respondents indicating they worry or do not worry about paying their monthly energy bills in the future

7. Discussion

This chapter discusses the main results of the study in light of the literature. It also indicates what new insights this research has yielded. The weaknesses and strengths of the study are discussed in more detail, so that it is clear which issues the reader should take into account when interpreting the results.

The 2015 Housing Act significantly reduced Dutch housing associations' investment opportunities (Van Gent & Hochstenbach, 2020). As a result, selling homes became a necessity for many housing associations in the Netherlands to increase their investment capacity, in order to be able to continue investments in liveability and sustainability (Damen, 2018). The results of this study confirm this. Based on the interviews with housing associations, the main reasons for selling social housing are increasing investment capacity, creating balance in portfolio strategies, and changing neighbourhood social structures. Literature cites the same reasons given by housing associations in this study. For instance, Priemus et al. (1999) state that sales increase because of tendencies to develop a more strategic asset management. Additionally, Gruis et al. (2009) argue that sales may be an effective way to introduce greater diversity in neighbourhoods. However, it should be noted that the landlord levy is abolished from 1 January 2023 (Eerste Kamer der Staten-Generaal, 2022), which will structurally reduce the burden on housing associations by around €1.7 billion per year. This abolition may affect Dutch housing associations' sales policies in the coming years. Sales of social housing may be less necessary due to improved investment capacity.

The sale of homes by housing associations in complexes can lead to a situation of mixed ownership, where private homeowners and housing associations share property in the same complex. The management of privatised estates with mixed ownership can pose various problems regarding the organisation and financing of maintenance and renovation (Jones & Murie, 1999, 2006). As the results of the interviews confirm, housing associations have to deal with these challenges when it comes to the implementation of sustainability measures in their mixed-ownership complexes. There are efficiency problems associated with this situation of 'broken blocks,' and therefore housing associations no longer want to create new mixed-ownership complexes by selling properties in complexes they currently fully own.

In a mixed-ownership complex, the VvE is responsible for implementing sustainability measures. Based on the interview results, the housing associations often have the majority of votes within a VvE. However, they do not want to abuse this power, as sustainability measures require large investments. If they cannot get the rest of the owners on board, they follow what the majority of the other owners vote for. Interestingly, this result is in contrast to Gruis et al. (2009), who state that many Dutch housing associations consciously choose not to sell more than 49% of the value of the dwellings in mixed-ownership complexes, so they retain responsibility for major repairs and refurbishments in the long term. In other words, they aim to retain the majority within the VvE - which implies housing associations do make use of their power.

The complexity of the VvE system for sustainability investments in mixed-ownership complexes may prevent sustainability measures from being implemented at all. This situation can be linked to 'The Tragedy of the Anticommons' described by Hoops (2020). The 'Tragedy of the Anticommons' refers to a situation where the power to decide is very fragmented, so that any decision depends on the consent of so many parties that a decision beneficial to all co-owners (and society) is not taken (Hoops, 2020). In this case, even though investing in sustainability benefits all co-owners, fragmented power may prevent decisions regarding sustainability measures from being made. The study results also reflected this 'tragedy'. For example, participant 2 argues that obstructionists prevent VvEs from making decisions that are operationally the best for everyone. And right now, there are no legal means of dealing with obstructionists.

Dutch housing associations have until 2028 to phase out their homes with poor energy labels. However, according to document analysis and interview results, because the VvE is responsible for the organising and financing of sustainability investments within mixed-ownership complexes, there is currently no mandatory policy for housing associations to phase out their properties with poor energy labels in mixed-ownership complexes. Indeed, housing association B reported having properties with poor energy labels in its mixed complexes that it wishes to improve. However, the VvE situation makes this very complicated. Making homes in mixed-ownership complexes sustainable takes a long time, or no investments are made at all. This is a major issue, as sustainability is the structural solution to bring down energy costs and to contribute to the energy transition. In fact, 72 percent of all dwellings in VvEs are part of mixed-ownership complexes (CBS, 2016). This means that the problem is urgent and the issue of sustainability investments in mixed-ownership complexes requires more attention from the Dutch government.

According to the interview results, many mixed-ownership complexes lack the financial resources and expertise to implement sustainability measures. Currently, the government is primarily focused on increasing financing options for sustainability measures in VvEs. However, current Dutch government policies fail to take into account the lack of specialist knowledge within VvEs, which also hinders the implementation of sustainability measures. Therefore, the government should develop policies that will increase knowledge about sustainability in VvEs. For example, all VvEs might receive a free sustainability scan performed by an external professional, who also translates the results into a sustainability MJOP with a NEN 2627 condition measurement. In this way, VvEs are better prepared to deal with sustainability measures and unforeseen costs can be avoided. The development of better policies addressing issues related to VvEs, such as policies that contribute to increasing knowledge about sustainability within VvEs, is crucial to accelerate the improvement of the energy quality of properties within mixed-ownership complexes.

TNO (2021) stresses that it is important that people are able to independently participate in the energy transition and make their house more sustainable, as this is an important dimension of energy affordability. TNO states that people who cannot do this are either homeowners without sufficient capital to make their homes more sustainable or tenants unable to make their homes more sustainable because they cannot decide on sustainability measures themselves. However, homeowners in complexes with a VvE also cannot decide on sustainability measures themselves. The existence of a VvE limits the ability to invest. Yet this group is not mentioned in the report of TNO (2021). VEH's (2022) statement that VvE homeowners are often forgotten in national policy is confirmed by this lack of attention. Despite the fact that TNO (2021) does not acknowledge this, the results of this study show that homeowners within VvEs also experience 'choice poverty'. This study provides some first insights into the issue of 'choice poverty' among VvE homeowners, but there is need for more research in this area.

Strengths and limitations of the study

As discussed in the theoretical section, energy affordability is a multi-dimensional problem (e.g. Sokolowski et al., 2020; Herrero, 2017). As a result, energy affordability depends on a variety of factors. The factors that influence energy affordability go far beyond those examined in this study. It is therefore impossible to determine whether investment ability explains the difference in energy affordability between VvE homeowners and individual homeowners (even though the results show that energy costs can be reduced through the implementation of sustainability measures). Due to the time constraints and the size of the study, it was decided to only examine the factors that emerged from the interviews with the survey results and compare them according to tenure type. By comparing individual homeowners (not dependent on a VvE) with VvE homeowners, a better picture of the effect of the VvE on the implementation of sustainability measures was obtained. Another strength of this

study is that it provides insight into what factors are important for the energy affordability among VvE homeowners.

Furthermore, it should be noted that the consensual approach used in this study to measure energy affordability is highly subjective and therefore more difficult to compare. However, it is the only approach that currently allows for consistent comparison between EU member states (Herrero, 2017). Despite its limitations, this approach was chosen because it provides more detailed information on energy affordability experiences. In this way, the study identified homeowners who may not currently live in energy poverty according to objective indicators, but may be at risk of energy poverty.

In addition, this study also has some other limitations. The vast majority of individual homeowners and VvE homeowners reported being able to keep their homes adequately warm. However, VvE homeowners currently experience more difficulty paying their monthly energy bills than individual homeowners. This difference in result may be explained by the nuanced nature of this question in contrast to the binary question. Discrepancies between results when using multiple indicators to measure energy affordability could be expected in light of the literature. Although multiple indicators can be useful for measuring the multidimensional problem of energy poverty, they can also present challenges for policymakers due to possible discrepancies between indicators (Herrero, 2017; Romero et al., 2018; Sokołowski et al., 2020). Due to the different results, it is difficult to draw firm conclusions about whether VvE homeowners experience greater energy affordability problems than individual homeowners.

A methodological limitation occurs with regard to the survey distribution. The survey was intended for VvE homeowners in mixed-ownership complexes and individual homeowners who bought a home from the housing association. Reaching VvE homeowners living in mixed-ownership complexes proved to be very difficult, as it is not visible from the outside of the property what complexes have mixed ownership. To reach the VvE homeowners in mixed-ownership complexes, 1,000 flyers were distributed in the mixed-ownership complexes of housing association A. It was difficult to recruit enough respondents in this way. Housing association B was unable to share information about the location of its mixed-ownership complexes. Because physical distribution yielded too few respondents for this study, it was decided to distribute the survey through online channels. Because the initial plan was to only physically distribute flyers in mixed-ownership complexes, unfortunately, no question was included in the survey asking VvE homeowners if they live in a mixed-ownership complex, and it was too late to add this question to the survey. It may therefore be the case that VvE homeowners who do not live in a mixed-ownership complex, but in complexes that are completely owner-occupied, completed the survey. However, in these non-mixed complexes, the same problem regarding the ability to invest occurs, and these homeowners are also dependent on their VvE.

To examine the impact of the sale of social housing on the energy affordability of VvE homeowners, the survey also asked whether they bought the property from a housing association. However, only 14 (4 individual homeowners and 10 VvE homeowners) out of 128 respondents in this study bought the property from a housing association. Because these are not enough respondents, it was decided to also include respondents in this study who did not buy their home from a housing association. Examples include homeowners who bought their property from private individuals or real estate developers. Moreover, the interviews revealed that mixed-ownership complexes can arise not only after sale, but also during construction. Housing association A, for instance, indicated that almost all of its mixed-ownership complexes with corresponding VvEs were created in this way. This was not taken into account in the study. Therefore, the survey data does not provide enough information to make reliable statements about the effect of the sale of social housing on energy affordability. This should be taken into account when interpreting the survey results.

8. Conclusion

This mixed-methods study has provided a deeper understanding of the effect of the sale of social housing on the energy affordability of homeowners living in mixed-ownership complexes in the province of Groningen. The three sub-questions that have been formulated to answer the main question have been answered as follows:

- 1) *What is the policy context surrounding the sale of social housing, sustainability investments within mixed-ownership complexes, and energy affordability in the province of Groningen?*

The sales policy of housing associations in the province of Groningen is mainly determined by the national performance agreements that are implemented locally. The housing associations currently do not sell properties in complexes they fully own, to avoid creating more mixed-ownership complexes. Although there is a national policy for housing associations to phase out their homes with poor energy labels before 2028, there is no specific policy aimed at phasing out homes with poor energy labels in mixed-ownership complexes. Furthermore, there is no national policy to address energy poverty; this is mainly addressed locally through small projects. In addition, a lot of attention is paid to compensating citizens for high energy costs, while little attention is given to regulations that can help to make homes more sustainable.

- 2) *What is the influence of housing associations on the energy affordability for homeowners when selling social housing, and what specific challenges do they experience in their mixed-ownership complexes?*

The influence of housing associations on the energy affordability of homeowners when selling social housing in a mixed-ownership complex is limited: housing associations depend on the VvE for sustainability investments in existing mixed-ownership complexes. The dependency on the VvE makes it difficult for housing associations to make their properties in mixed-ownership complexes more sustainable. Important challenges they face are: differences in perspectives with other homeowners about sustainability measures, high voting quotas, lack of investment capability among the private owners, and lack of knowledge about sustainability within VvEs.

- 3) *How do VvE homeowners living in mixed-ownership complexes experience energy affordability compared to individual homeowners?*

The results confirm that energy affordability of homeowners is positively or negatively influenced by several factors (physical aspects, individual circumstances and investment ability). It is notable that significantly fewer sustainability measures have been implemented in the homes of VvE homeowners compared to those of individual homeowners. Though both individual and VvE homeowners say they can currently afford to keep their homes adequately warm, VvE homeowners have greater difficulty paying their monthly energy bills than individual homeowners. Despite the fact that energy affordability is a multi-dimensional problem, the interview and survey results indicate that the implementation of sustainability measures has a positive effect on energy affordability. Thus, this difference in the experience of energy affordability between individual and VvE homeowners may be explained by the fact that fewer measures are implemented.

The main question of this study was formulated as followed:

How does the sale of social housing affect the energy affordability of homeowners living in mixed-ownership complexes in the province of Groningen?

Unfortunately, the limitations of the survey described in the discussion prevent a complete answer to the main question. The findings of this study indicate, however, that the influence of housing associations on the energy affordability of homeowners in mixed-ownership complexes is limited. Due to the mixed-ownership situation, sustainability measures are not the responsibility of housing associations, but of the VvE. According to this study, being part of a VvE limits the implementation of sustainability measures. This is indeed why the housing associations in this study no longer sell units in complexes they fully own. Thus, the study provided a better understanding of the complexity that being part of a VvE entails for housing associations and other private homeowners regarding sustainability investments in VvE complexes, either mixed or non-mixed. Furthermore, the results showed that fewer sustainability measures were implemented in the homes of VvE homeowners than in the homes of individual homeowners, and that sustainability measures improved the affordability of energy. In light of these findings, it could therefore be expected that the sale of social housing has a negative impact on the energy affordability of homeowners living in mixed-ownership complexes in the province of Groningen.

Future research

The best way to study the effect of the sale of social housing on the energy affordability of homeowners living in mixed-ownership complexes further is to form a partnership with several housing associations in the province of Groningen. In this way, more respondents can be recruited, as it has been shown that VvE homeowners living in mixed-ownership complexes are difficult to reach. Furthermore, the policy context showed that the problems with energy affordability in the municipality of Pekela are the greatest in the province of Groningen. The survey of this study did not include respondents in Pekela. For further research, it would be interesting to focus only on Pekela. However, it may also be interesting to investigate this effect in contexts outside the province of Groningen. As discussed in the policy context, there are a relatively large number of large homes in the province of Groningen. It would therefore also be interesting to examine this effect in highly urbanised areas, such as the Randstad, where the average home is smaller than in the rest of Netherlands (CBS, 2018).

In order to study this effect more closely, it is important to distribute the survey only to VvE homeowners living in mixed-ownership complexes created by the sale of units by housing associations after the construction of the complex, not at the time of construction. In this way, the impact of the sale of social housing on energy affordability may be better examined. Interviewing VvE homeowners may also be helpful for further research. This might allow a more detailed look at their investment possibilities and the factors underlying their experience of energy affordability, allowing a deeper understanding of how the implementation of sustainability measures and the experience of energy affordability are linked.

Furthermore, according to the interview and survey results, being connected to a collective heating system has a significant influence on VvE homeowners' experience of energy affordability. It would be interesting to examine the effect of collective heating systems on energy affordability of VvE homeowners further. Moreover, this study only examined whether large-scale sustainability measures were implemented and did not ask what type of measures were implemented. It would be beneficial to distinguish between different types of large-scale sustainability measures and examine their impact on energy affordability. In addition, the importance of individual and household characteristics affecting energy use was not investigated due to time constraints and the size of this study. Further research could explore the effect of socio-economic demographics and household characteristics on energy affordability in more detail.

Finally, given the scope of this study, only the perspective of owners (owner-occupiers and housing associations) in mixed-ownership complexes was examined. The experiences of energy affordability among social housing tenants living in mixed-ownership complexes may be an interesting topic for

further investigation. Examining different contexts and perspectives could advance our knowledge and understanding of the effect of the sale of social housing in residential complexes on energy affordability.

Recommendation

This study showed that implementing sustainability measures is a very challenging process for VvEs. The further development of gas prices in the coming years is uncertain, but energy prices are expected to remain high. Energy poverty, leading to sustainability measures not being implemented, threatens the success of the energy transition. Improving the energy efficiency of the built environment is needed to solve problems with energy affordability structurally. Therefore, policymakers and practitioners in the field of planning should pay more attention to the issues related to sustainability investments within mixed-ownership complexes. Targeted policies to make homes within mixed-ownership complexes more sustainable, such as policies that increase knowledge about sustainability within VvEs and simplify the decision-making structure, are essential to reduce energy poverty and accelerate the transition to a sustainable energy future.

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Appendices

Appendix I: Semi-structured interview guide

Question	Theme
1. Can you describe your position and tasks?	general
2. What are the characteristics of your mixed-ownership complexes? - How many VvEs (with homes)? - What kind of dwellings? How many floors? - What is the tenant/buyer distribution (majority of votes?)	general
3. To what extent do national or local regulations affect your sales policy? - Do you have freedom to set your own sales policies? Any external requirements?	sale of social housing
4. What are the main reasons for selling social housing?	sale of social housing
5. Do you work together with local authorities when it comes to selling social housing?	sale of social housing
6. On what grounds are properties selected for sale?	sale of social housing
7. Are there any quality requirements for social housing sales? - Are sustainability investments being made in homes scheduled for sale?	sale of social housing / sustainability investments
8. How sustainable are your mixed-ownership properties?	sustainability investments
9. Are there enough financial resources available within your VvEs to invest in sustainability?	sustainability investments
10. What challenges do you face when it comes to making homes more sustainable in VvE complexes? - Any practical examples?	sustainability investments
11. What measures can you take to improve the sustainability of properties in mixed-ownership complexes? - Any practical examples?	sustainability investments
12. What do you think is needed to improve the sustainability of properties in mixed-ownership complexes?	sustainability investments
13. Is energy affordability an issue among homeowners living in mixed-ownership complexes?	energy affordability
14. In the context of energy poverty, do you expect stricter regulations regarding the sale of social housing? - Do you think sustainability investments and sales of social housing should be better regulated?	energy affordability / sale of social housing / sustainability investments

Appendix II: Flyer for survey



rijksuniversiteit
 groningen

ONDERZOEK NAAR DE BETAALBAARHEID VAN ENERGIE RESEARCH ON ENERGY AFFORDABILITY

Kunt u er nog warmpjes bij zitten deze winter?



SCAN ME



Over dit onderzoek

Met dit onderzoek proberen we in kaart te brengen hoe huishoudens in de provincie Groningen de betaalbaarheid van energie ervaren. Het invullen van de enquête kost ongeveer 5 minuten en de resultaten worden volledig anoniem verwerkt. Helpt u mee? Scan de QR-code of gebruik de weblink. Alvast bedankt!

About this research

With this research, we are trying to examine how households perceive energy affordability in the Province of Groningen. Completing the survey will take about 5 minutes and the results will be processed completely anonymously. Would you help me with this research? Scan the QR-code or use the weblink. Thank you in advance!

QR-CODE

Heeft u vragen? Questions?

Anisha Jagernath | MSc student
Society, Sustainability and Planning
ajagernath@student.rug.nl

Weblink:

https://rug.eu.qualtrics.com/jfe/form/SV_ebcZ83x5dWN0oWW



Appendix III: Survey questions

Energy affordability tenants & homeowners

Introduction

Dear resident,

Thank you for your interest in participating in this study! By completing this questionnaire, you will help me conduct research on how tenants and homeowners perceive energy affordability. There are no right or wrong answers; it is all about your opinions and experiences. Completing this questionnaire will take about 5 minutes. This questionnaire is part of my master's thesis for the Social, Sustainability and Planning programme at the University of Groningen.

By completing this questionnaire, you give me permission to use your answers for this study. All results will be processed anonymously and shared only with me and my supervisors Dr. Sara Özogul and Dr. Sarah Mawhorter. Furthermore, the results of this study may be published in articles or books. You are participating in this research entirely voluntarily and you can stop your participation at any time.

If you change your mind about your participation after completing it, please let me know by contacting me at the following e-mail address: a.jagernath@student.rug.nl

Kind regards,

Anisha Jagernath

PART I: GENERAL

First, we ask you some general questions about you and your household that give us background information for the analysis.

Q1 In which municipality do you live?

- Eemsdelta (1)
- Groningen (2)
- Het Hogeland (3)
- Midden-Groningen (4)

- Oldambt (5)
- Pekela (6)
- Stadskanaal (7)
- Veendam (8)
- Westerkwartier (9)
- Westerwolde (10)

Q2 Please indicate the extent to which you agree or disagree with each statement:

<p>I am experiencing difficulty paying my monthly energy bills currently. (1)</p>	<input type="radio"/> Strongly disagree (1)	<input type="radio"/> Disagree (2)	<input type="radio"/> Neutral (3)	<input type="radio"/> Agree (4)	<input type="radio"/> Strongly agree (5)
<p>I experienced difficulty paying my monthly energy bills in the past winter. (2)</p>	<input type="radio"/> Strongly disagree (1)	<input type="radio"/> Disagree (2)	<input type="radio"/> Neutral (3)	<input type="radio"/> Agree (4)	<input type="radio"/> Strongly agree (5)
<p>I am worried about paying my monthly energy bills in the future. (3)</p>	<input type="radio"/> Strongly disagree (1)	<input type="radio"/> Disagree (2)	<input type="radio"/> Neutral (3)	<input type="radio"/> Agree (4)	<input type="radio"/> Strongly agree (5)

Q3 In which year did you move into your current home?

year (1) _____

Q4 Are you a tenant or a homeowner?

Tenant of a housing association (1)

Tenant of a commercial landlord (private landlord or investor) (2)

Owner of my property (3)

Owner of my property within a homeowners' association (VvE) (4)

Q5 What is your gender?

Male (1)

Female (2)

Other: (3) _____

Q6 What is your age?

18-24 years (1)

25-34 years (2)

35-44 years (3)

45-54 years (4)

55-64 years (5)

65-74 years (6)

75+ years (7)

Q7 What is your highest completed education level?

Less than high school (1)

High school (2)

MBO (3)

HBO (4)

WO (Bachelor's degree) (5)

Master's degree or higher (6)

Other: (7) _____

Q8 Which of the following categories best describes your work situation?*

*You can select multiple answers.

Salaried employed (1)

Self-employed (2)

Volunteer / unpaid employed (3)

Unemployed and seeking for work (4)

Unemployed and not looking for work (5)

Retired (6)

Student (7)

Q9 Which of the categories below best describes your living situation?

I live alone (1)

I live with my partner (2)

I live with my partner and children (3)

I live with my children (4)

I live with my parents or older relatives (5)

I live with roommates (6)

Other: (7) _____

Q10 How many people make up your household (including yourself)?

Number of adults 18 years or older (1)

Number of children under 18 years (2)

Q11 Were you the former tenant of your current owner-occupied house?

Yes (1)

No (2)

Not applicable: I rent (3)

Q12 Did you buy your current house from the housing association?

Yes (1)

No (2)

Not applicable: I rent (3)

PART II: DWELLING CHARACTERISTICS

Now we ask you a few questions related to your home.

Q13 What kind of dwelling do you live in?

*multi-family dwelling = a stacked dwelling (part of a building with multiple dwellings). For example, an upstairs or ground floor apartment, flat, apartment, gallery flat, storey house, porch house or maisonette.

Single-family detached (1)

Semi-detached/2-units attached/Duplex (2)

Terraced house (3)

Multi-family dwelling* in a building with 2-4 units (4)

Multi-family dwelling* in a building with 5-9 units (5)

Multi-family dwelling* in a building with 10-19 units (6)

Multi-family dwelling* in a building with 20-49 units (7)

Multi-family dwelling* in a building with 50+ units (8)

Other: (9) _____

Q14 In which period was your house built?

Before 1920 (1)

1920 - 1944 (2)

1945 - 1969 (3)

1970 - 1989 (4)

1990 - 2009 (5)

2010 - present (6)

Q15 What energy label does your house currently have?

*If you do not know the current energy label of your house, you can look it up via the following link: [uw energielabel](#)

A (1)

B (2)

C (3)

D (4)

E (5)

F (6)

G (7)

Q16 How satisfied or dissatisfied are you with the energetic quality of your house (energy efficiency) at the moment?

- Very dissatisfied (1)
- Dissatisfied (2)
- Neutral (3)
- Satisfied (4)
- Very satisfied (5)

PART III: ENERGY AFFORDABILITY

With the following questions, we try to get a better picture of how you perceive energy affordability.

Q17 Which of the following statements applies to you:

- My house has an individual energy connection (e.g. its own central heating boiler) (1)
- My house is connected to a collective heating system (e.g. block heating/district heating/heat network) (2)
- I do not know (3)

Q18 What is the duration of your current home energy contract?

- Fixed term (e.g. 1, 2, 3 or 5 years) (1)
- Indefinite (2)
- I do not know (3)

Q19 What tariff applies to your current home energy contract?

*Fixed tariffs do not change during the term of the energy contract. Variable tariffs can be changed by the energy supplier. This generally happens twice a year: in January and July.

However, since 2022, more suppliers are changing their variable tariffs more frequently or even monthly. Dynamic tariffs change every day based on supply and demand on power exchanges.

- Fixed tariff (1)
- Variable tariff (2)
- Dynamic tariff (3)
- I do not know (4)

Q20 At how many degrees* do you **currently** set your thermostat during the day when you are at home and awake?

*average temperature, 0 = heating not on

- In °C (1) _____

Q21 I feel comfortable at this temperature.

- Strongly disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly agree (5)

Q22 **Last winter**, at how many degrees* did you set your thermostat to during the day when you were at home and awake?

*average temperature, 0 = heating not on

- In °C (1) _____

Q23 I felt comfortable at this temperature.

Strongly disagree (1)

Disagree (2)

Neutral (3)

Agree (4)

Strongly agree (5)

Q24 Can you financially afford to keep your home adequately warm?

Yes (1)

No (2)

Q25 Have you received energy allowance*?

*Note: this does **not** include the recent allowance of €190 per month in November and December 2022 for all small consumers with their own energy connection.

Yes (1)

No (2)

PART IV: SUSTAINABILITY MEASURES

Finally, we will ask you a few questions related to making your home more sustainable.

Q26 Have sustainability measures* been installed in your home?

*Sustainability measures refer to major energetic measures. Examples include insulation measures (e.g. floor, roof or cavity wall insulation or double glazing), a sustainable heating system (e.g. heat pump) or solar panels.

Yes (1)

No (2)

I do not know (3)

Q27 Have any sustainability measures* been installed in your home **since you moved in**?

*Sustainability measures here refer to major energetic measures. Examples include insulation measures (e.g. floor, roof or cavity wall insulation or double glazing), a sustainable heating system (e.g. heat pump) or solar panels.

Yes (1)

No (2)

I do not know (3)

Q28 *The following question may not apply to you. Please choose 'not applicable' if you are a tenant or the first owner of the property.*

Did the **previous owner** install sustainability measures* in your house before you **bought** it?

*Sustainability measures here refer to major energetic measures. Examples include insulation measures (e.g. floor, roof or cavity wall insulation or double glazing), a sustainable heating system (e.g. heat pump) or solar panels.

Yes (1)

No (2)

Not applicable (3)

I do not know (4)

Q29 Please indicate the extent to which you agree or disagree with each statement:

--

The sustainability measures have helped increase my living comfort. (1)

Strongly disagree (1)

Disagree (2)

Neutral (3)

Agree (4)

Strongly agree (5)

The sustainability measures have helped reduce my energy bills. (2)

Strongly disagree (1)

Disagree (2)

Neutral (3)

Agree (4)

Strongly agree (5)

Q30 Have you used financial support from the government or other agencies, such as grants or loans, for sustainability measures* for your home?

*Sustainability measures here refer to major energetic measures. Examples include insulation measures (e.g. floor, roof or cavity wall insulation or double glazing), a sustainable heating system (e.g. heat pump) or solar panels.

Yes (1)

No (2)

Not applicable (3)

Q31 How satisfied or dissatisfied are you with the cooperation* with the people around you when it comes to making your home more sustainable?

*For example your landlord cooperating with your request to install double glazing; or agreement with members within your Homeowners' Association (VvE) on insulating the roof; or a joint investment in solar panels with your neighbours.

Very dissatisfied (1)

Dissatisfied (2)

Neutral (3)

Satisfied (4)

Very satisfied (5)

Q32 Anything else you would like to share about your energy situation?

If you are interested in the results of this research, please enter your e-mail address below (**optional**). Otherwise, please click 'next' to finish this questionnaire.

END

Appendix IV: Descriptive statistics table survey

Respondents in the analytic sample	Total sample (N = 128)	
<i>Socio-economic demographics and household characteristics</i>		
Tenure type	Freq.	%
Individual homeowner	80	62,5
VvE homeowner	48	37,5
Residential location	Freq.	%
Eemsdelta	6	4,95
Groningen	92	74,8
Het Hogeland	7	5,7
Midden-Groningen	10	8,1
Oldambt	2	1,6
Pekela	0	0,0
Stadskanaal	0	0,0
Veendam	1	0,8
Westerkwartier	3	2,4
Westerwolde	2	1,6
Gender	Freq.	%
Male	46	35,9
Female	82	64,1
Age	Freq.	%
18-24 years	3	2,3
25-34 years	29	22,7
35-44 years	17	13,3
45-54 years	31	24,2
55-64 years	23	18,0
65-74 years	17	13,3
75+ years	8	6,3
*Education	Freq.	%
Secondary school or less	15	11,7

MBO	27	21,1
HBO	49	38,3
WO bachelor's degree	10	7,8
Master's degree or higher	27	21,1

Employment status	Freq.	%
Salaried employed	80	63,0
Self-employed	9	7,1
Volunteer / unpaid	2	1,6
Unemployed and seeking	6	4,7
Unemployed and not seeking	5	3,9
Retired	26	20,5
Student	2	1,6

Living situation	Freq.	%
I live alone	36	28,3
I live with my partner	50	39,4
I live with my partner and children	32	25,2
I live with my children	5	3,9
I live with roommates	4	3,1

**Household size	Freq.	%
1 person	36	28,1
2 persons	57	44,5
3 or more persons	35	27,3

**Household with children < 18 years	Freq.	%
Yes	25	19,5
No	103	80,5

Bought home from housing association	Freq.	%
Yes	14	10,9
No	114	89,1

Physical aspects

Type of dwelling	Freq.	%
-------------------------	-------	---

Detached house	18	14,9
Semi-detached house	16	13,2
Terraced house	39	32,2
Multi-family house	48	39,7

Construction period	Freq.	%
Before 1920	12	10,0
1920 - 1944	7	5,8
1945 - 1969	37	30,8
1970 - 1989	36	30,0
1990 - 2009	22	18,3
2010 - now	6	5,0

Type of energy label	Freq.	%
A	17	16,2
B	15	14,3
C	25	23,8
D	22	21,0
E	12	11,4
F	10	9,5
G	4	3,8

Type of energy connection	Freq.	%
Individual energy connection	106	89,1
Collective heating system	13	10,9

Individual circumstances and preferences

Duration energy contract	Freq.	%
Fixed term	58	48,7
Indefinite	49	41,2
I do not know	12	10,1

Tariff energy contract	Freq.	%
Fixed tariff	47	39,5
Variable tariff	65	54,6
Dynamic tariff	1	0,8
I do not know	6	5,0

Received energy allowance	Freq.	%
Yes	16	13,4
No	103	86,6

Average temperature now (during the day, when awake)	Mean	SD
	17,74	3,43

I feel comfortable at this temperature	Freq.	%
Strongly disagree	8	6,7
Disagree	27	22,7
Neutral	25	21,0
Agree	43	36,1
Strongly agree	16	13,4

Average temperature last winter (during the day, when awake)	Mean	SD
	19,22	3,00

I felt comfortable at this temperature	Freq.	%
Strongly disagree	1	0,8
Disagree	4	3,4
Neutral	9	7,6
Agree	81	68,1
Strongly agree	24	20,2

Ability to invest

Sustainability measures implemented	Freq.	%
Yes	94	79,7
No	22	18,6
I do not know	2	1,7

Sustainability measures implemented since move	Freq.	%
Yes	61	51,7
No	56	47,5
I do not know	1	0,8

The sustainability measures have helped increase my living comfort	Freq.	%
Strongly disagree	5	4,4
Disagree	3	2,7
Neutral	38	33,6
Agree	50	44,2
Strongly agree	17	15,0

The sustainability measures have helped reduce my energy bills	Freq.	%
Strongly disagree	6	5,3
Disagree	10	8,8
Neutral	46	40,7
Agree	34	30,1
Strongly agree	17	15,0

Used financial support for sustainability measures	Freq.	%
Yes	39	33,1
No	68	57,6
Not applicable	11	9,3

Satisfaction level collaboration regarding implementation of measures	Freq.	%
Very dissatisfied	5	4,4
Dissatisfied	16	14,2
Neutral	67	59,3
Satisfied	20	17,7
Very satisfied	5	4,4

Energy affordability

Can you afford to keep your home adequately warm?	Freq.	%
Yes	96	80,7
No	23	19,3

I experienced difficulty paying my monthly energy bills last winter	Freq.	%
Strongly disagree	61	48,4
Disagree	48	38,1
Neutral	14	11,1
Agree	2	1,6
Strongly agree	1	0,8

I am experiencing difficulty paying my monthly energy bills currently	Freq.	%
Strongly disagree	41	32,0
Disagree	38	29,7
Neutral	22	17,2
Agree	24	18,8
Strongly agree	3	2,3

I worry about paying my energy bills in the future	Freq.	%
Strongly disagree	18	14,2
Disagree	23	18,1
Neutral	15	11,8
Agree	52	40,9
Strongly agree	19	15,0

*This categorical variable is recoded. Education variable: categories 'less than high school' and 'high school' are recoded into the category 'secondary school or less'.

**The categorical variables 'household size' and 'household with children <18' were created based on the answers of the respondents on question 11 where they had to report the number of children (<18) and adults within the household.

Appendix V: Results open question survey

	<i>Wilt u nog wat kwijt over uw huidige energiesituatie?</i>	Type huiseigenaar
1.	Huidige slechte isolatie vh huis duurt langer ivm overbelasting beroepen die kunnen helpen bij isolatieverbetering (ramen, muur en dakisolatie, zonnepanelen)	Individueel
2.	Ik verwarm alleen de benedenverdieping	VvE
3.	Het wordt onbetaalbaar	Individueel
4.	Bezig met verduurzamen, maar de wachttijden zijn lang	Individueel
5.	Ik vind het verschrikkelijk wat er gaande is. We worden gigantisch belazerd door onze eigen overheid	Individueel
6.	Ik kijk uit naar mijn pensioen zodat ik elders kan overwinteren	Individueel
7.	Contract voor bepaalde tijd loopt eind december af, dan veel duurdere variabele tarieven.	Individueel
8.	Ik heb mijn energietoeslag NOG NIET ontvangen.	Individueel
9.	Ik gebruik een airco om te verwarmen.	Individueel
10.	Energielabel is nog niet aangepast.	VvE
11.	We gaan verhuizen naar een andere koopwoning met een betere energielabel B.	Individueel
12.	Ons vaste energiecontract is net afgelopen. Nu de eerste 2 maanden krijgen we de 190 euro tegemoetkoming. En daarna is het energieplafond. Dit is de reden dat ik mij nu geen zorgen maak.	Individueel
13.	Er is nog geen energielabel voor mijn woning heb maar wat ingevuld om verder te kunnen...	VvE
14.	Mijn VVE bestaat uit meer dan 100 woningen die misschien worden verduurzaamd komend jaar. Ik zeg misschien omdat dit afhangt van de voor stemmen van de VVE. Er kan geen toekomstbeeld worden geschetst in deze situatie omdat het een combinatie is van de eventuele toekomstige situatie en de energiecontracten die de bewoners hebben afgesloten. Mijn situatie is comfortabel met vaste tarieven. Uitzicht op het kopen van een andere woning (nieuwbouw). Succes met je onderzoek!	VvE
15.	Oud appartementencomplex. Er wordt door bestuur VVE gewerkt aan plan voor verduurzaming. (Tot nu toe alleen de oudere versie van dubbel glas). Subsidie is noodzakelijk en wordt onderzocht.	VvE
16.	Er is al een aantal jaar sprake over een grootschalige verbouwing aan het appartementencomplex. Dit is helaas steeds vooruitgeschoven door bijvoorbeeld covid en de stijgende bouwkosten. Gelukkig zal er begin 2023 gestart worden met de verbouwing, waardoor de energiekosten bijna naar €0 gaan, alleen de VVE kosten zullen stijgen	VvE
17.	De verhoging van de energieprijzen weerspiegelt de waardering die wij voor deze bron moeten hebben.	Individueel

18.	Wellicht is het buiten de scope van het onderzoek. Maar de vragen gaan eigenlijk alleen over het nu en niet over eventuele plannen om de woning energiezuiniger te maken. Dat is in onze VvE wel het geval.	VvE
19.	Geen problemen	VvE
20.	In een VvE is het erg ingewikkeld om te bepalen hoe en waar we zonnepanelen kunnen plaatsen op ons dak op zo'n manier dat iedere bewoner (eigenaars en huurders) er baat bij heeft	VvE
21.	Woning is monument, geen energielabel en beperkte mogelijkheden tot verduurzaming	Individueel
22.	Kan het betalen, maar weiger te werken om alleen energie te kunnen betalen. Energie moet weer vanuit de staat geregeld worden. Staatsbedrijf weer worden (net als Vattenfall, een Zweeds staatsbedrijf is)	Individueel
23.	Wij wonen in een monumentaal pand zonder energielabel	Individueel
24.	Ik begrijp niet dat de kosten zo enorm hoog zijn, gezien de prijzen in omliggende landen, het feit dat er nota bene in onze provincie gas gewonnen wordt en het feit dat de energiebedrijven enorme winsten maken en opstrijken	Individueel
25.	hoe moet dit opgelost worden dat de mensen geen eens meer warm kunnen zitten in hun huis omdat ze het niet kunnen betalen	Individueel
26.	Ik heb nog een contract tot januari 2024. Het isoleren van mijn vloer heeft me het afgelopen jaar een besparing van 50% van mijn gasverbruik opgeleverd. BELANGRIJK: Mijn huis heeft momenteel geen energielabel! Ik heb B ingeschat en ingevuld. Ik heb een benedenwoning, dubbel glas en een geïsoleerde vloer. Voor mijn 90m2 woonoppervlak gebruik ik 600 kuub gas per jaar. Ik kook ook op gas en mijn warmwater komt uit de cv-ketel.	VvE
27.	Door beide fulltime te werken en daarna best met een dekentje op de bank te willen zitten, zijn onze energielasten evenals water etc.(onafhankelijk van de huidige crisis) altijd al laag. We leven al geruime tijd best zuinig.	Individueel
28.	Wij zitten in een sloop-nieuwtraject in Ten Post. Daardoor hebben wij de laatste 6 jaar niks meer gedaan aan onze woning qua isolatie (we wachten al 6 jaar). Dat betekent dus slechte isolatie en hoge energiekosten. Ik ben gastouder dus de kachel staat de hele dag aan	Individueel
29.	De prijs is te hoog	Individueel
30.	Binnen een VvE heb je weinig tot niets te zeggen. Geen invloed op wat er gebeurt, of er zonnepanelen komen en of er geïsoleerd wordt. Er is altijd wel iemand tegen en de bureaucratie is obstruerend. Wij hebben stadsverwarming en daar kunnen we ook niet vanaf.	VvE
31.	Ons VvE beheer zit in Groningen en heeft deze enquête rondgestuurd. Wij hebben een aflopend 3-jaars contract dat op 6 januari 2023 overgaat in een variabele prijzen overeenkomst. We zijn nu al enkele maanden aan het oefenen met een (nog) energiezuiniger leefstijl. Onze VVE staat nu echt aan het begin van het onderzoeken welke integrale maatregelen in een groot gebouw (80 appartementen met eigen energie aansluitingen voor gas en licht) genomen kunnen worden.	VvE
32.	I think for the fees we pay the VVE (PandGarant) we should be expecting more initiatives apart from organising a yearly meeting and a spreadsheet. Especially in these times were everyone is willing to go the extra mile on getting more energy efficient I would expect it would be of great help if PandGarant uses their position to organise a project for all the separate VVE's where a few chosen contractors step in.	VvE

- It would definitely be a way to get some discount. A big organisation as PandGarant can make a big influence with all those VVE's combined
33. Heb nu blokverwarming en stappen binnenkort over naar stadsverwarming of het beter wordt weet ik niet. Als goed is kunnen we van gas af. Individueel
 34. Wij zijn afhankelijk van de blokverwarming in het appartementencomplex waarvoor een variabel energiecontract loopt via de VVe. Ik zou graag een eigen cv-ketel hebben waarvoor ik zelf een energiecontract kan afsluiten. Bovendien zou ik graag zien dat de VVe zonnepanelen laat installeren. VvE
 35. Wij hebben nu nog een vast contract voor energie, maar zitten in een vve en daardoor is verduurzamen lastig en een lang proces VvE
 36. Being part of a VvE makes it much more complex to improve the sustainability/energy situation of my apartment. VvE
 37. Het invullen van deze enquête was voor mij lastig: ik verhuur dit appartement en moest het dus ' namens de inwoners invullen' hetgeen wat vreemd overkomt. Mij was gevraagd als eigenaar dat de enquête ging over duurzaamheid en vve en wat daar verbeterd kan worden. Ik ben een 'betrokken en maatschappelijk verantwoorde huurbaas', althans: dat probeer ik te zijn, door mij in te zetten bij de VVE voor verduurzaming. Ik vind blokverwarming een 'blok' aan het been bij verduurzaming: pas anderhalf jaar na de maand juni krijg je een 1,5 jaar oud verbruiksoverzicht en dat is dan ook nog zo ontzettend onduidelijk dat je niets begrijpt van het verbruik. En tussentijds is er geen enkele informatie, dus je hebt geen idee wat het verbruik is, je hebt geen idee of een verduurzamingsmaatregel die genomen is, of dat enig effect heeft. Verder heb je geen info welke inkoop er van toepassing is (oude gasprijzen of variabel of wat ook). Ik vind dat echt niet meer kunnen in deze tijd. Heb daar op de vve vergadering gewag van gemaakt, maar nog geen reactie op vernomen. Ik zal er nog een officiële brief van maken, want dit werkt slim omgaan met energie en duurzaamheid niet in de hand. En wat betreft de rol van de gemeente: die zou er goed aan doen om elke vve een (bijna) gratis duurzaamheid-scan (incl. warmtebeeld) aan te bieden en een paar uur een adviseur die de scan (en de gemaakte keuzes door de VVE) om kan zetten naar een Duurzaam-MJOP. Dat is de enige effectieve hulp die een gemeente kan geven. Want daar schort het bij de VVE's aan: aan die specifieke kennis. Verder zou de gemeente kunnen helpen bij gemakkelijke VVE-duurzaamheidslening (evt met een bank of zo). Ook dat is een hobbel die veel VVE's niet kunnen nemen, waarbij het optioneel moet zof eigenaren het zelf meteen kunnen betalen of dat ze het lenen bij een vertrouwde VVE-leningspartij. Verder zou gemeente (bijna) gratis draagconstructie-berekeningscheck moeten aanbieden aan VVE's die zonnepanelen zouden willen plaatsen en de mogelijkheid aanreiken om dit eventueel met een lokale energiecoöperatie uit te voeren. Coöperaties zijn op zoek naar geschikte daken en die zijn er genoeg bij VVE's. Ze moeten elkaar alleen weten te vinden en weten dat het een 'vertrouwde of bekende constructie is' met een bekende partij er achter. Mocht u nog verder willen spreken over dit onderwerp, dan kunt u mij via mail contacteren. VvE
 38. Er zijn geen mogelijkheden om verder te isoleren: geen spouwmuur en fietsenschuurtjes onder de woning (geen vloerisolatie mogelijk). Toch wel hoog energieverbruik bij 19 gr overdag en 15 's nachts. Individueel
 39. We hebben thuis de cv laag staan, maar verwarmen lokaal via infrarood VvE
 40. Ik verwarm alleen de benedenverdieping VvE
 41. Ik heb ingevuld dat we geen betalingsproblemen hebben, maar dat komt omdat we dus de thermostaat fors lager hebben gezet. Als we dit wel 'normaal' zouden doen zouden we waarschijnlijk wel in de problemen komen. Individueel