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ENERGIZING JUSTICE THEORY

A justice sensitive journey towards sustainable renovations for homeowners associations

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EXECUTIVE SUMMARY

The pace at which energy-efficient renovations are made to the existing housing stock must increase if the Netherlands is to reach the energy goals outlined in the nation's climate mitigation policy. Currently, implementation of energy transition measures is found to be complex within dwellings that part of a homeowners association. As shared ownership requires majority votes among these homeowners, the participation of all residents is essential for decision-making. The current energy-crisis has reopened a discussion regarding policies that may enable this group to partake in the energy transition. A discussion in which tensions between the competing goals of economics, sustainability objectives and social equity arise.
Scholarship offers the concept of energy justice by which to analyze these tensions. Energy justice pertains to equity and fairness regarding the role of energy in our society. However, a gap exists between academics and practise. Tools for practical applications of energy justice theory on local scale are non-existent. Therefore the main research question addressed in this study is as following:

How can the process of decision-making, in regard to sustainable renovation within homeowners associations (VvEs), be facilitated by intermediaries to foster a just energy transition?

The aim of this research is to examine what strategies intermediary actors can deploy to facilitate VvEs in the collective decision-making processes of sustainable renovation through the design of a justice-cognizant user journey. This challenge is addressed with a novel approach to enact energy justice. The objective of which is to produce a unique tool that can be used by intermediary actors to facilitate VvEs. Through the combination of prevailing energy justice frameworks with the service design tool of user journey mapping, a conceptual framework is developed. First, the energy justice framework is operationalized for this purpose through thematic analysis of related literature. Secondly, the framework builds on existing research with the construction of a 'universal' sustainable renovation user journey for VvEs. The conceptual framework combines these two approaches and determines how this thesis is embedded in existing literature. The framework defines key concepts and theories and provides the analytical basis of the empirical research.

This framework was then applied in empirical research with the objective to uncover where, in the collective decision-making processes, injustices may occur. Through a case study of a homeowners association of 200 households in Numansgors and 8 semi-structured interviews with experts in the Netherlands data was collected. The data were analyzed through exploratory and thematic analyses as the conceptual framework was applied.
The results illustrate the utility of this conceptual framework. Insight is gained into the alignment of the occurrence of (in)justices align with the lived-experiences of VvE members, in the form of junctures in the user journey. With these insights, the objective is to develop strategies through which intermediary actors can facilitate a VvE in two ways. First, to overcome process barriers and second to increase their capacity to enact energy justice.

The result of analysis verified the identified steps of the conceptual framework. And several junctures between the formulized energy justice indicators and the user journey steps were revealed. Furthermore, it was found that a VvE's user journey is a combination of individual homeowners' decision-making journeys as well as a collective one. Additionally, findings indicated that a misalignment of VvE members positions in their

individual journeys presents a barrier for the collective. This recognition-based issue calls for additional attention to be paid to the diverse information needs of individual VvE members. Finally, this work distinguishes between three intermediary roles in the VvE user journey; The *user intermediary*, the *process intermediary* and the *niche intermediary*. For each role, strategies are found in facilitating a VvE to proceed in their user journey.

(1) The user intermediary intermediates between the individual VvE members' user journey and the collective user journey. In the case study, this role was fulfilled by a dedicated sustainable renovation committee. This level of intermediation advances the user journey by translating technologies and financing schemes to individual members. Additionally, user-level intermediation communicates the lived experiences and preferences to other stakeholders.

(2) Process intermediaries are specifically established or tasked to intermediate the collective process of sustainable renovation. For example, this actor can be a sustainability consultant or VvE maintenance expert. In the case study, no single actor fulfilled this role. Process intermediaries facilitate the renovation process without individual agenda, in support of the goals or vision set by the VvE.

(3) The role of niche intermediary supports the sustainable renovation process through the provision of a supportive environment. This actor intermediaries within the niche of collective sustainable renovation, by connecting different initiatives on municipal or national scale. This role is best suited to be fulfilled by a municipality.




Niche-Intermediary Touchpoints

Niche Level Intermediary | Support Environment

Process-Intermediary Touchpoints

Sensitize

Advice

Collect and preselect

Coördinate

THE CONCEPTION PHASE

Reason to initiate Journey

THE ORIENTATION PHASE

- Knowledge of financing
- Knowledge of measures
- How to acquire information
- Communication in VvE
- Resident involvement
- Presence of a Leader

THE DIVING IN PHASE

- Knowledge of financing
- Professional support
- How to judge information
- Negotiating market parties
- Communication in VvE
- Resident involvement

THE FEASIBILITY VOTE

- Knowledge of measures
- How acquire information
- Knowledge financing
- Communication in VvE
- Resident involvement
- Presence of leader
- Individual pace in decision-making process
- Resident attendance GM
- Process of agreeing

VvE Collective Sustainable Renovation Journey

1A	1B	1C	1D	2A	2B	2C	2D	3A	3B	3C	4A	4B	4C	4D
Becoming Aware	Introducing topic to VvE Board	Formation Dedicated Committee	Discourse with residents	Explore possibilities of measures	Building Inventory	Explore financial options	Analysis of legal structure	Contact external actors an gather quotes	Form business case	Formulate most promising scenarios	Presentation of results	Presentation of scenarios	Answering Questions	Vote in general meeting

User-Intermediary Touchpoints

VvE members' individual sustainable renovation Journey

Awareness → Orientation → Consideration → Financing → Decision-making

Related Energy Justice Indicators

- Expression of concerns
- Responsibilities
- Group Composition
- Engagement Activities
- Awareness of energy needs
- Communication
- Services Offered
- Awareness of energy needs
- Distribution of Burdens & Risks
- Awareness of energy vulnerability
- Financial Benefits & Burdens
- Accessibility of information
- Distribution of Burdens & Risks
- Awareness of energy needs
- Communication
- Transparency
- Use of Jargon
- Explanations
- Distribution of Burdens & Risks
- Financial Benefits & Burdens
- Awareness of energy vulnerability
- Awareness of energy needs
- Transparency & Understandability
- Use of Jargon
- Explanations
- Expression of concerns
- Voting procedures
- Consideration
- Engagement activities

Legend

- Indicator distributional Justice
- Indicator Recognition Justice
- Indicator Procedural Justice
- Step in User Journey
- Transition Cost Barriers
- Decision-making Barriers

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Dear reader,

Before you lies my final thesis for the Master Industrial Ecology at Leiden University and Delft University of Technology. The thesis is a combination of a theoretical research with practical applicability. A combination which I think reflects my education trajectory as well as my personal ambitions, as an industrial designer as well as an industrial ecologist.

Throughout the writing of this thesis, I have received a great deal of support and assistance. In the first place, I owe a word of gratitude to my supervisory team from the TU Delft and Zoë from Wageningen University. And a special thanks to Anna, for many long discussions over coffee and cake. Secondly, I would like to thank my friends and brother for their support and the way they provided me with energy and optimism to finish this thesis. They were always there when I needed to blow of some steam. Thirdly, I would like to thank my girlfriend for putting up with the tired ball of stress that has replaced my personality over the course of this project.
A special word of gratitude is definitely in order for my mom who actually read this enormous document and has unconditionally supported me not just through this project over the entire course of studying. I'm sure she mirrors my joy as this course has now come to its end.

Enjoy

List of Abbreviations

Abbreviation	Full Concept	Meaning of Concept
VvE	Homeowners Association in the Netherlands	Self-organized institution that represents the common interest of a group of homeowners.
NG	Numansgors	Homeowners association in the Municipality located in Numansdorp. Subject of case study.
HW	Municipality of Hoeksche Waard	Municipality located in the province of South Holland in which Numansdorp is located.
GM	General Meeting of members of a Homeowners Association	The 'organ' VvE meeting; the highest body within a VvE, which that takes all important decisions in the VvE. A periodic (annual) meeting in which the home owners (VvE members) discuss all current issues of the VvE (annual accounts, maintenance, etc.)
CE	Community Energy	Communities shaped by citizen involvement in the energy market.
EB	Executive Board	Elected volunteer officials are responsible for all operations of the homeowners association and ensuring the community governing documents are followed and enforced.
TC	Transition Cost Barrier	A barrier in the User Journey Map, which occurs due to 'costs' that the user must pay in order to participate in transition. A barrier must be overcome to move onto the next step or phase.
DM	Collective Decision-Making Barrier	A social barrier, that occurs due to the collective decision-making processes in the User Journey Map. A barrier must be overcome to move onto the next step or phase.
CBS	Centraal Bureau voor de Statistiek	Central Bureau for Statistics in the Netherlands
PBL	Planbureau voor de Leefomgeving	Environmental Assessment Agency in the Netherlands.
MLP	Multi-Level Perspective	A prominent transition framework. That recognizes interaction processes at three analytical levels: niches, socio-technical regimes and a socio-technical landscape

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1 | INTRODUCTION

In November 2021 a group of enthusiastic residents presented their energy transition related query to the Wageningen University & Research Science Shop. This 'Science Shop' collaborates with non-profit organizations in civil society, such as foundations, associations or interest groups, by organizing research projects that answer their questions, free of charge. With the goal to engage societal groups in scientific research and create immediate, positive change together.

The residents are a delegation of the homeowners association of Numansgors, a waterfront neighborhood in the province of South-Holland, who share a desire for collective action to increase the sustainability of their residence. The board of the association prefers this on a collective basis approach to avoid fragmentation of the uniform appearance of the houses. But it seems not all of the 201 households who share ownership of collective property, also share their vision. Any efforts that have been made thus far have not resulted in any affirmable action due to the diversity in opinions among residents.

The Wageningen University research team has answered this query with the organization of a research project for graduation students. This project aims to take an holistic approach to the formulated which strives to include ecological and social values to the mostly technical and financial questions raised. Thus the research team has commissioned the project for thesis research of graduate students from various disciplines from landscape architecture to industrial ecology. The Numansgors project is therefore the inspiration for this thesis research project, and the products of the proposed research project will be offered directly to the residents of Numansgors and the Wageningen University Research team.

1.1 | PROBLEM CONTEXT

In this chapter, homeowners associations in the process of sustainable renovation is introduced as the problem to be investigated in this study. Subsequently, literature is consulted to enhance the understanding of the topic in the broader context of energy transition in the Netherlands which outlines the research objective of this thesis. In the following section 1.2, a more in-depth exploration of the topics is conducted through literature study.

1.1.1 | Problem introduction

We find ourselves in a time of experiencing an 'energy crisis', where energy and gas prices are reaching new heights daily. In September 2022, the price of gas on the Dutch energy market has doubled and even increased by tenfold in comparison to the previous year (van den Dool, 2022). The Dutch government recently announced a temporary 'price ceiling' for gas and electricity, as a measure to assist households in covering energy bills (Rijksoverheid, 2022b). Looking beyond the direct mitigation measures, Minister Adriaansens of Economic Affairs and Climate emphasizes the need for long term adaptation as a solution of the current energy related problems: "Enhancing sustainability is the answer, reducing the amount of energy we consume will relieve us of so much of the crisis that we are experiencing" (Webredactie, 2022). For much of the discussion of the mitigation of the high household energy costs, improving the energetic quality of the Dutch housing stock by phasing out natural gas and improving energy efficiency in buildings is mentioned as a determining factor of mitigation (Halleck Vega et al., 2022).

Sustainable renovation of the Dutch housing stock is not just important in the light of the current energy prices, but an unavoidable element in achieving the Climate Goals (Rijksoverheid, 2022a). Sustainable renovation involves measures such as increasing insulation of homes, renewable energy generation and decreasing the use of fossil fuels. The implementation of such measures proves to be difficult for homeowners whose property is part of a home owners' association (VvE). A very recently published report, commissioned by Vereniging Eigen Huis, stipulates that three out of every ten apartment owners are unable to implement sustainable improvements to their homes due to the inability of the owners' association to come to an agreement (Huis, 2022;).

Building maintenance is the core task of a VvE and while any large scale maintenance can be combined with sustainability measures, in practice, many VvEs are not prepared for this additional task. Within this collective structure any improvements beyond regular maintenance is subject to collective decision-making as measures are also collectively paid for which complicates the implementation of sustainability measures (Vereniging Eigen, 2019). In many cases VvE's does not have enough resources or savings to make the adjustments, even if the individual residents do. In contrast to a private homeowner, a VvE member does not have complete autonomy of their home but shares responsibility and authority with all residents of the complex.

This so-called 'apartment right' determines that homeowners must make joint decisions regarding expenses for building maintenance, thus also for (sustainable) improvements. Home owners' associations are obligated to a qualitative majority or even unanimous agreement regarding building-improvement decisions such as sustainable improvements to the roof, facades or windows of a residential complex. In a quarter of the associations, this joint decision-making leads to conflicts, which severely delays or even ends the sustainable renovation process (Huis, 2022;).

Moreover, opinions can very heavily between members because not all homes equally benefit from all types of sustainable interventions (Huis, 2022;). For example, improved roof insulation makes little difference to the energy bill of residents on the ground floor, yet all members are required to pay for all measures together through periodic membership contributions. A sense of urgency of implementing sustainable measures has increased among homeowners and 64 percent of apartment owners indicated they would like to improve the energetic quality of their homes in the VEH research (VEH, 2022b).

The required investments will translate to a significant increase of the periodic membership contributions, therefore not everyone may be able to afford to vote in favor of such proposed measures. Reportedly, general voting meetings can get very emotional (Keyser & Schrader, 2022) especially as low renovation rates appear among households with lower incomes and unemployment (Brom et al., 2019). The current climate of rising energy costs, high inflation rates and increase of general cost of living, may threaten individuals' access to affordable and reliable energy services.

1.1.2 | Problem context

The latest IPCC reports show that it is becoming increasingly difficult to control global warming of the earth within the boundary of 1.5 degrees Celsius, and even within that scenario the consequences for future generations significant (Masson-Delmotte et al., 2021). The report underlines the urgency to reduce Western Europe's reliance on natural gas for reasons beyond geopolitical dependence or as a direct response of protection against rising fossil energy prices. Currently the EU housing stock has a considerable share of forty percent in overall energy consumption and over ninety percent of homes are still heated by fossil fuel based energy (Rijksoverheid, 2022a). Thus, to achieve the set targets as agreed upon with signing the Climate Act in July 2019 sustainable renovation in the built environment needs accelerate significantly (Long Term Strategy on Climate Mitigation The Netherlands, 2019). The government approach prioritizes energy demand reduction with the launch of the National Insulation Programme (Nationaal Isolatie programma). This program contains goals to be reached by 2030 such as insulation of 2.5 million homes and to install 1 million hybrid heat pumps in existing buildings (Rijksoverheid, 2022a). However, problems such as described in section 1.1.1 cause uncertainty of achieving those targets and renovation rates are considered to be low (Ebrahimigharehbaghi et al., 2019). According to (European Commission, 2020), only 1% of the houses in EU are renovated annually, and only 0.2% have implemented a renovation that reduces energy consumption by more than 60%.
Aimed at tackling these low numbers, the Dutch government has introduced the policy program of 'Acceleration Sustainability of the Built Environment', which is self-described as a combination of behavioral change, implementation of insulation measures and more efficient installations (Rijksoverheid, 2022a).

Nevertheless, without mandatory regulations, active involvement of citizens in the transition process is crucial (Haarbosch et al., 2021). Conversely, research regarding Dutch energy policies reveals that social aspects are rarely specifically mentioned in the context of energy transition nor do they stress the central role played by citizens in energy transitions (Haarbosch et al., 2021). Central government and by extension local municipalities, are challenged to incentivize home owners to invest in making their homes more sustainable which generally adhere to informative campaigns and the provision of subsidies (Rijksoverheid, 2022b). Several municipalities offer information through a so-called sustainability counter (Duurzaamheidsloket), some of which are specifically focused on VvEs. These institutions can offer services from information regarding subsidies to process guidance. However, recent research reveals a failure of EU renovation programs to address vulnerability to so-called energy poverty, referring to a household's insufficient access to domestic energy services to participate meaningfully in society (Gillard et al., 2017). In response, scholars call for the integration of energy justice in renovation policies (Mangold et al., 2016; Lithmaa et al., 2018; Seebauer et al., 2019). This aligns with the EU's renovation strategy "the Renovation Wave (2020)" in which seven principles for policies in built environment, including affordability, energy efficiency and decarbonisation frame the priority of a 'just transition' towards a climate neutral Europe by 2050 (Commission, 2020). In section 1.2.4 the concept of energy justice is further explained through literature review.

1.1.3 | The Forgotten entity

About 1.2 million in the Netherlands are part of split property regulated by a VvE, which corresponds to one in six homeowners in the Netherlands who are subject to decision-making structures of a VvE in order to partake in home energy transitions (Vereniging Eigen, 2019). As such a significant portion of the housing stock the inclusion of VvEs in renovation policy is crucial in the overall success. Contrastingly VvEs have been heavily overlooked in literature as well as policy and have even been named as a 'forgotten entity' in EU policy documents (Paradies & Beekman, 2017). An example of this can be found in the rate outlines of the aforementioned temporary 'price ceiling' which only apply to a predetermined amount of electricity and gas used to discourage excessive energy consumption (Rijksoverheid, 2022b). This consumption ceiling is based on the average household energy use and enforced per household through the connection of the energy supplier. This poses an issue for many VvEs, such as those in apartment buildings, utilizing 'block-heating' in which all homes are connected through the same central heating boiler. Energy suppliers aren't able to recognize individual households thus the entitled parties lose their access to the energy price ceiling. The motion in which this issue was addressed described how a lack of recognition of VvEs in policy would result in the exclusion of 450,000 largely vulnerable households from this mitigation measure. The government has to work on a solution as this motion was adopted by the House of Representatives on 11 October 2022 (Veh, 2022a).

Some VvEs specific subsidies and policy measures do exist, which also address several of the issues. For example 'het national warmte fonds' (The National Heat Fund) has started financing over thirty energy-saving measures for VvEs in 2015 as regular market-based financing options are limited (Rijksoverheid, 2022a). However, only VvEs of eight households or more may apply and evaluation of the policy stated further expansion of the options is needed (Rijksoverheid, 2022a). And an investigation of the applicability other subsidies such as the Cooperative Energy Generation Subsidy Scheme (SCE) to VvEs is also promised in this approach (Rijksoverheid, 2022a).

Experts agree that without change, energy transitions will not happen for VvEs at the desired rate to meet targets as they are not enabled to participate (Albers, 2022; Nu.nl, 2022; van den Dungen, 2022; VEH, 2022b). However, the discussion as a consequence of the recent publishing of the VEH report illustrates a lack of a clear solution exist, only various solutions proposed by different stakeholders. Some experts argue for legislation to make it possible for homeowners to implement sustainability measures independently, when an agreement within the VvE cannot be reached (VEH, 2022b). This is contested by the prediction that bypassing the current system will only lead to chaos (Kret, 2022). Others argue the need to relax the constraints imposed by the VvE 'apartment right', to decrease the required majority vote to pass sustainability plans (Kret, 2022). However, any decision related to building improvement is generally preceded by several members' meetings, at which two-thirds of the members must be present and at least two-thirds must support the proposal. Although such relaxations could potentially simplify the process of renovation, it would also mean more coercion for residents who do not wish to partake in such measures for any reason. The shared ownership in a VvE therefore creates a possible tension between achieving sustainability goals and members self-determination. Figure 1.2 shows a view example of

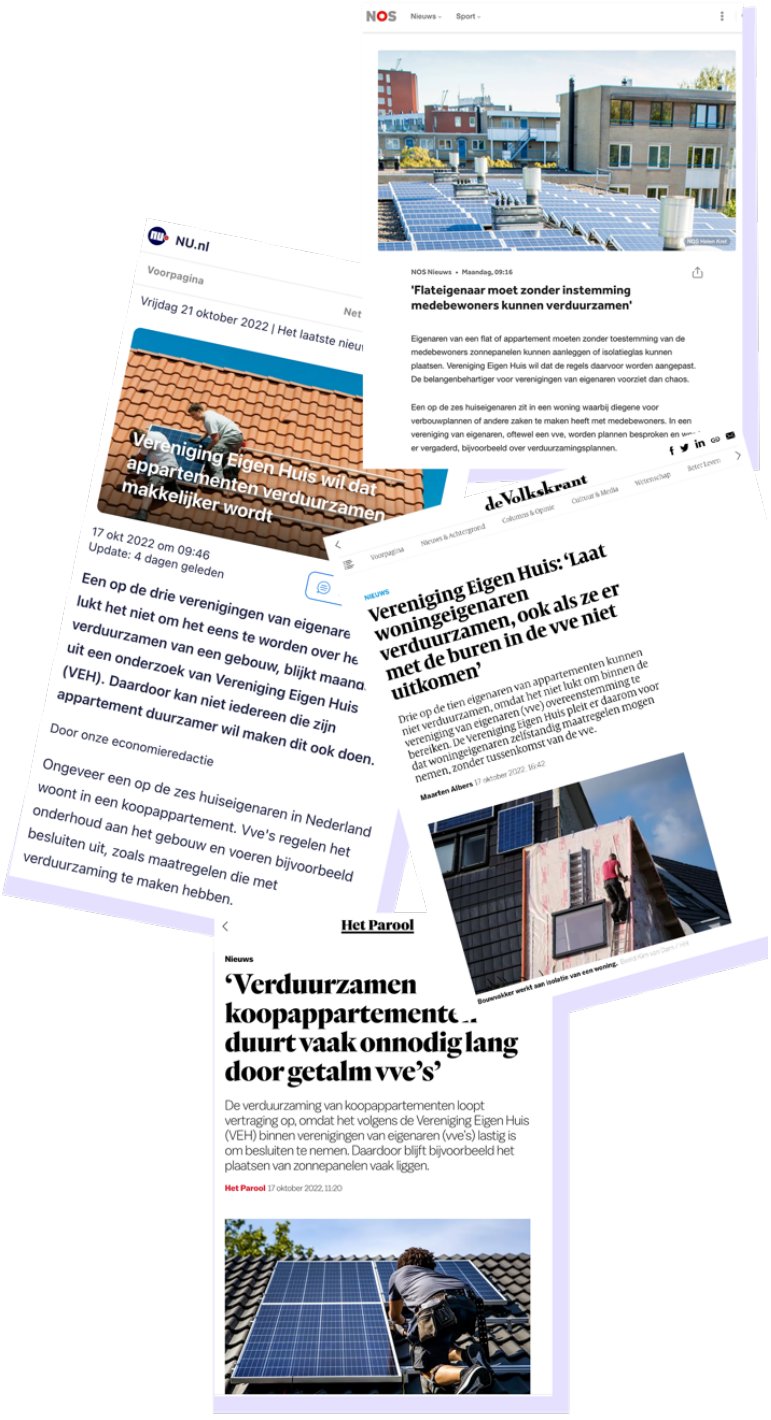

Figure 1.1 various headlines of news sources regarding the trouble of sustainable renovation for homeowners associations (Albers, 2022; Nu.nl, 2022; van den Dungen, 2022; VEH, 2022b).

1.2 | LITERATURE REVIEW

The goal of this review is to provide context and find clarity on how the concepts associated with the sustainable renovation in VvEs, can help to shape the investigation into their processes of collective decision-making. To address the social issues described in the introduction, a closer look is taken into Energy Justice Theory. The aim is to apply this theory as a lens which may reveal the underlying justice issues of the problem.

Secondly, to understand the background of sustainable renovations in VvE structures a comprehensive literature review is conducted. Through the literature review, the characteristics that define the VvE not only as a legal entity but as an actor in energy transitions are found by framing them as a local energy initiative. The theoretical framework behind this research shaped by this review of the current state of affairs regarding the energetic composition of the Dutch housing stock. This is followed by a section on an actor which is deemed especially relevant in literature, intermediaries (Matschoss & Heiskanen, 2017; Moss, 2009; Parag & Janda, 2014; Sovacool et al., 2020; Stewart & Hyysalo, 2011; Teunissen et al., 2020; Warbroek et al., 2018). This actor is introduced as a key ingredient into overcoming VvE's problems.

1.2.1 | Sustainable Renovation in the Energy Transition

In the context of this research the definition of sustainable renovation as cited by Killip and Owen (2020) is used: *'any work that alters the physical fabric of a building or the energy services within it, with the explicit goal of improving efficiency, reducing energy demand or reducing associated CO2 emissions'* (Killip and Owen, 2020)

The European Commission describes sustainable renovation, energy renovation or retrofitting, as a part of their energy transition strategies to combat climate change in the 'Renovation Wave' (European Commission, 2020). Aimed at the reduction of household energy bills by renovating energy-inefficient buildings while simultaneously creating 'green' jobs in the construction sector (European Commission, 2020). However, so far the estimated numbers of energy consumption of the Dutch housing sector are higher than they were predicted in 2017, with barely any change in the numbers of households' natural gas consumption between 2015 and 2017 (PBL, 2019). The Netherlands's built environment is in need of a renovation, as the Dutch government has stated that in order to meet their targets the overall housing stock is required to meet the demands regarding energy efficiency of labels A and B, in 2021 over 60% of buildings in the Netherlands C or lower (Rijksoverheid Voor Ondernemend Nederland, 2021). A jump from energy label C to B requires the significant reduction of total energy use of 90 kWh/m2, thus the improvement of these dwellings most likely require considerable renovations and investments. The Netherlands Environmental Assessment Agency (PBL) estimates that the average private home with energy label D, will require an investment of approximately €35,000 to achieve energy neutrality (Planbureau voor de Leefomgeving, 2021).

Scholars indicate that renovation management is especially difficult in the owner-occupant sector, as the full responsibility falls to individual homeowners. Whereas, for example in the social housing sector they benefit from the presence of a central organisation to manage the renovation process (Ebrahimigharehbaghi et al., 2020).

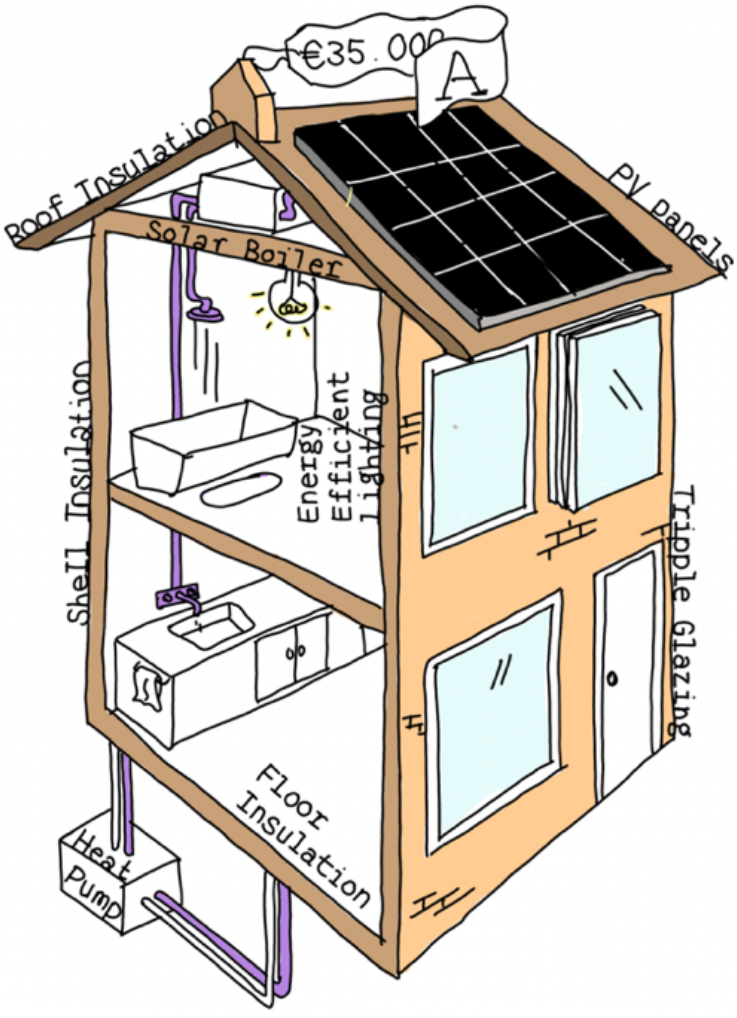

Figure 1.2: Visualization of sustainable renovation measures to achieve energy label A, author's own image.

Policies in the Netherlands focus on neighbourhood-level approaches, in which a large role is reserved for local authorities by offering various forms of financial support for specific buildings and household structures (Paradies et al., 2021). Local municipalities face many challenges with the provisioning and implementing their renovation programs, as adoption rates remain low.

Against this backdrop, the topic of sustainable renovation towards (near) zero energy dwellings has attracted the attention of scientific researchers. For example, Boess (2022) states how processes of sustainable renovation are both technological and social.
Furthermore she argues the need for both these aspects to be taken into account in involving residents as a contribution to success (Boess, 2022).

Along that same line, Pellegrino et al. (2022) plea for policymakers to pay more attention to residents' behavior in renovation projects. Their research, a comparison of energy renovation projects in the Netherlands and France, illustrates a similar tension as mentioned in section 1.1.3 between sustainability goals and citizens' interests. They found a lack of attention to residents' interests in policies was caused by the urgency of the goal of achieving a massive reduction in energy consumption (Pellegrino et al., 2022). Scholars criticize government' renovation programs in the way they fail to address social issues, such as energy poverty by neglecting vulnerable groups such as low-income households and disabled persons (Gillard et al., 2017; Willand & Home, 2018; Seebauer et al., 2019). As a response, scholars call not only for the involved participation of citizens but also for the consideration of justice in EU renovation policy (Mangold et al., 2016; Lithmaa et al., 2018; Seebauer et al., 2019).

A significant number of tools and assessment systems have been researched that address sustainable renovations measures and strategies. For example, Kapedani et al. (2022) do so with a user-centered approach which focuses on comfort as a factor that makes residents accept sustainable housing (Kapedani et al., 2022). Other works prioritize resident values with the development of a framework to match contractors and residents and aid decision-making regarding measures of sustainable renovation (Oostra & Nelis, 2022). A significant amount of research is based on case-studies indicating the challenge of providing generalizable advice which is applicable in different situations, due to the system of renovation being context-bound (Boess, 2022).

The recurring message throughout the majority of these recent publications is that of the misconceptions existing between involved actors (Van der Schoor & Sanders, 2022). Actors in the building sector such as contractors appear to be far removed from the overall energy transition process, which limits citizens' access to practical and understandable information on energy renovation to support them in financial and technical decision-making. The deficit of information is named as one of the crucial factors determining the pace and progress of the energy transition in the built environment (Van der Schoor & Sanders, 2022).

1.2.2 | Ethical Energy Conundrums

"If there is a comprehensive energy problem, it is a problem of choice and value in a world of finite capabilities. It is therefore also a moral and political problem, and for this reason will not yield to a purely technical solution"
- political scientist Lynton K. Caldwell, more than 40 years ago

The problem context in chapter 1.1 describes a tension between achieving sustainability goals and the democratic decision-making within the Dutch VvE structure. A tension that is not unique to sustainable renovation nor to the VvE structure. As the the European energy landscape aims to implement system-wide changes in towards a low-carbon energy system, more of these hurdles will surely be encountered (van Bommel & Höffken, 2021).

The existence of this tension shows that the goals of energy transition are not fully encompassed by reaching a carbon neutral society. But in achieving those goals it should be ensured that all groups in society are able to benefit from this transition equally. Moreover, it should be ensured that transitioning efforts do not come at the expense of certain societal groups. This is not always ensured by current policies aimed towards low-carbon energy systems. For instance, subsidies for electric vehicles, are mainly used by the rich (Correljé, 2021). Or, on a more global scale this includes, for example, paying attention to the local consequences of phasing out coal for the communities living in the mining areas (Jenkins et al., 2018).

Such examples represent pressing ethical conundrums that lack an easy resolution (Hughes & Hoffmann, 2020). Scholars are making it increasingly clear that current popular energy analyses do not provide the answers to these questions. Not only do these question require a more social focus, they also involve aspects of equity and morality that are seldom explicit in the current way planning or analysis of our energy systems (Sovacool & Dworkin, 2015). Thus, these system-wide changes present an opportunity to look beyond decarbonization goals and address social matters such as energy justice in policies (van Bommel & Höffken, 2021).

Energy justice originates with the concepts of social justice and environmental justice. As a discipline in scholarship, which has been growing rapidly, researchers of energy justice strive towards understanding what is (un)just in energy systems. A discipline which is driven to making energy systems more just, especially in light of changes towards renewable energy sources (van Uffelen, 2022).

The concept of energy justice refers to the goal of achieving equity (figure 1.3) in both
the social and economic participation in the energy system (McCauley et al., 2019). In literature energy justice is most often discussed within the context of fairness regarding the distribution of the costs and benefits in the global energy system as well as a fair and representative decision-making process regarding changes in the energy system (Droubi et al., 2022; Heffron, 2022; Jenkins et al., 2016; Sovacool et al., 2016). Scholars often frame energy justice as a part of a broader "just transition" towards achieving a low-carbon energysystem that will remedy the injustices of the fossil-fuel energy system across multiple sectors (Mundaca et al., 2018; Olivadese et al., 2021; Vitéz & Lavrijssen, 2020; Williams & Doyon, 2019)

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1.2.3 | Sustainable Renovation

In the context of this research, sustainable renovations of dwellings can be defined as a socio-technical system change. As the aim of sustainable renovation is to increase the building's energy efficiency and provision (Boess, 2022) as well as user-oriented goals in regards to comfort of living to the satisfaction of residents. Therefore it can be concluded that energy transitions are not solely technical. A successful outcome of the 'Renovation Wave' is therefore not limited to a carbon neutral society, if that society is not to the satisfaction of its citizens. Rather, an inclusive (see figure 1.4) energy transition also ensures equal benefits across the full range of diverse groups in society and especially safeguards the most vulnerable groups (Heffron, 2022; Knox et al., 2022; Lacey-Barnacle, 2022; Sovacool et al., 2022).

As the current energy crisis reveals obstacles and underlying issues towards achieving climate goals, policymakers are reassessing and adjusting the energy policy framework to accommodate the volatile market behaviors. This re-evaluation of the current state, raises questions regarding the decision-making processes. This includes aspects of recognition, participation and power of the actors involved in those decisions. Questions such as 'which parties should be involved?' and 'how are decisions made?' or 'how fair is the institutional involvement in the decision-making process?' are brought forward by an awareness of the relationship between structures of the energy system and social justice (Jenkins et. al., 2014). In the current system, investments necessary for sustainable renovations often call for resources that are less or even unobtainable to lower-income groups (Middlemiss et al., 2019). While simultaneously, the benefits of government subsidized incentive schemes of various types, from acquiring renewable energy sources to insulation programs for homeowners to high-end

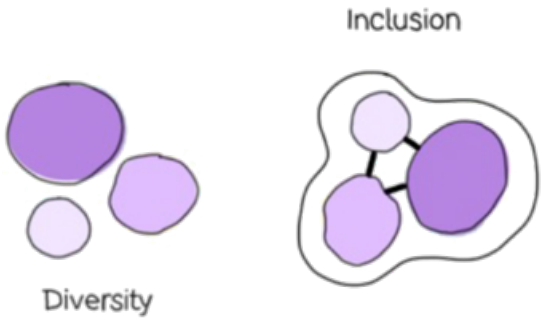


Figure 1.4 Illustration of the concepts of diversity and inclusion, author's own image

electric vehicles are reaped by higher-income citizen groups (Middlemiss et al., 2019). Such are examples of justice issues related to the transitioning of energy systems. Scholars stress need for such concerns to be taking seriously and energy justice is increasingly becoming a more important issue for policymakers across the globe (Huijts et al., 2022).

1.2.4 | Approaching Energy Justice

Energy justice in literature is often presented in the context of energy poverty, for example by Sovacool (Sovacool & Dworkin, 2015; Sovacool et al., 2016) in their study of injustices regarding sustainable renovation measures such as solar PV. Closer to home, Breukers et al. (2017) studied a Dutch social housing neighbourhood and found that without ensuring the quality of the participation, institutional lock-ins can occur. Which can cause the initiative to fail in achieving both its energy-efficiency goals while the intended beneficiaries equally lose out (Breukers et al., 2017). Moreover they also propose the application of an energy justice approach, to examine the conditions for local self-governance and how to address these in the design of the participatory process.

Energy justice theory can provide a guide towards a just energy transition and acts as a tool to shape transition strategies. One way of facilitating energy justice is through participatory processes which involve citizens in the decision-making, policy and planning processes (Coy et al., 2022; Germes et al., 2021; Pandey & Sharma, 2021). For example through so-called 'material-participation' where citizens own resources in the energy system such as solar PV panels or participate in community energy initiatives (Pandey & Sharma, 2021). However, although participation is often regarded to increase legitimacy, this is not always the case (Hanke & Lowitzsch, 2020). Participatory processes can be selective and exclusive, where there is typically an overrepresentation of highly educated, middle-aged, white male participants with high income levels in participation processes (Yildiz et al., 2015). Therefore it is important for energy justice implications to be taken into account when designing participatory processes for energy transitions. Participatory processes such as those to support collective decision-making in citizen-driven initiatives towards a low-carbon energy system.

Furthermore, the concept of energy justice can be utilized as an assessment-tool of underlying reasons behind controversies. To this end energy justice can be deployed to investigate tensions between stakeholders in relation to energy infrastructure development (Pesch et al., 2017). Scholars note that the public acceptance of energy transition measures is not the same as ethical acceptability (Pesch et al., 2017). In their research of controversial energy transition projects, Pesch et al. (2017) found a relation between the limited attention and understanding of the moral implications of a project and the controversies surrounding it. Therefore, it is recommended to incorporate objectives of ethical and social acceptability in the development of new infrastructure projects or policies (Jenkins

1.2.6 | Community Energy (Justice)

No specific literature was found on participatory processes or energy justice in the specific context of homeowners associations in the Netherlands, or the EU. However, by following the definition of van der Schoor & Scholtens (2019) who define "place–based energy communities" as communities shaped by citizen involvement in the energy market, where members come together based on the closeness of their spatial locations and shared common objectives and cohabitation rules. The organizing of collective energy efficiency measures in the sustainable renovation processes for a VvE qualifies as an energy community (CE), on which the body of literature in the context of energy justice is abundant and can be used for the purpose of this research (van der Schoor & Scholtens, 2019).

Research on the topic of community energy covers a range of citizen driven initiatives related to energy transition. And from the perspective of energy justice and equity, community energy is increasingly discussed as taking a central role in overcoming energy-related injustices with a democratic, equity enhancing approach (Hanke & Lowitzsch, 2020). In theory, these community driven initiatives can better address energy poverty for example by providing lower tariffs and increased energy efficiency. As they are citizen driven, self-organizing entities, they are expected to have easier access to and better ways to engage with these vulnerable citizen groups (Hanke et al., 2021a; Koirala et al., 2018).

EU policymakers have high expectations for these community energy initiatives in their ability to provide benefits for energy consumers that also increase energy justice (Koirala et al., 2018).

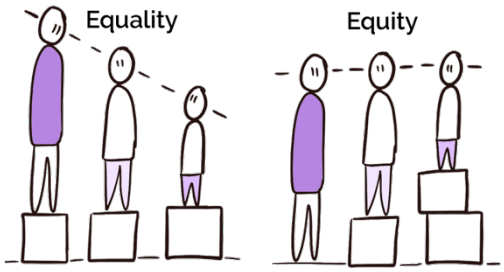


Figure 1.5 Illustration of difference between equality and equity, author's own

1.2.7 | Characteristics of Homeowners Associations

The following part of the literature review consists of an analysis of homeowners associations in the Netherlands. This section aims to create an understanding of the dynamics, underlying the problem described. As this research aims to make recommendations for the sustainable renovation of this specific type of dwelling, a more in depth look is taken into their workings.

Vegter (2012) describes an association of owners as "a juridical entity consisting of dwelling owners that are situated in a complex or building". In the Netherlands membership to a VvE is obligatory, mandated by a deed of property division. This deed is a legal document in which the juridical framework of a VvE is established and describes which parts of the property are private or communal.

The property of fraction as defined in this document also determines the height of the periodic service costs as well as the weight of individual voting rights. Voting rights are exclusive to owners therefor not all residents can be a member of the VvE. VvEs are typically organized as displayed in figure 1.6 (Nederland VvE, 2017).
The figure shows the 'general meeting of owners' (GM) as the highest body within the organization. The meeting of owners are held a minimum of once a year and cover topics such as maintenance issues and budgetary accounts. Tenants require power of attorney from their landlord to participate in the GM.

The chairman of the executive board (EB) leads the GM. The EB carries the administrative responsibilities of the association on behalf of all members. These responsibilities included the execution of the plans, which are formed during the GM. The GM also allows for the transference of accountability from the EB to all owners by executive discharge.

The property fraction is conditional to the value of the properties or their square footage, due to which not all households have an equal vote in the GM. When multiple dwellings within a VvE are owned by a single owner an even greater disparity of votes may occur. Especially in cases where a single owner, for example corporations or private landlords, holds a majority of the votes and therefore has a veto in the GM.

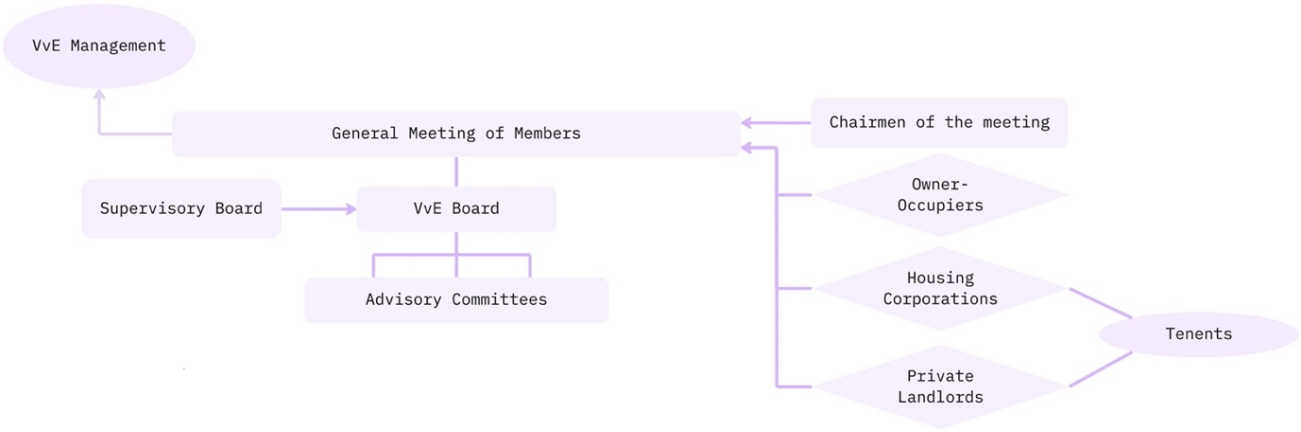


Figure 1.7: Visualization of homeowners association in the Netherlands, author's own

The tasks of EB members can be supported by specialized committees. Unlike the obligatory financial committee, other topics such as sustainability improvements are not required by law. VvE Belang, an interest group for owners associations, describes on their website that within the juridical framework of a VvE, 'home owners' within an apartment building for example, technically do not own their dwelling. In actuality what they legally own is a share of the building and the right to use their apartment and the common property in addition to voting rights in the GM. Upon the acquisition of a dwelling, membership of VvEs is obligatory as is compliance with the rules and regulations set by the VvE and the periodic service costs.

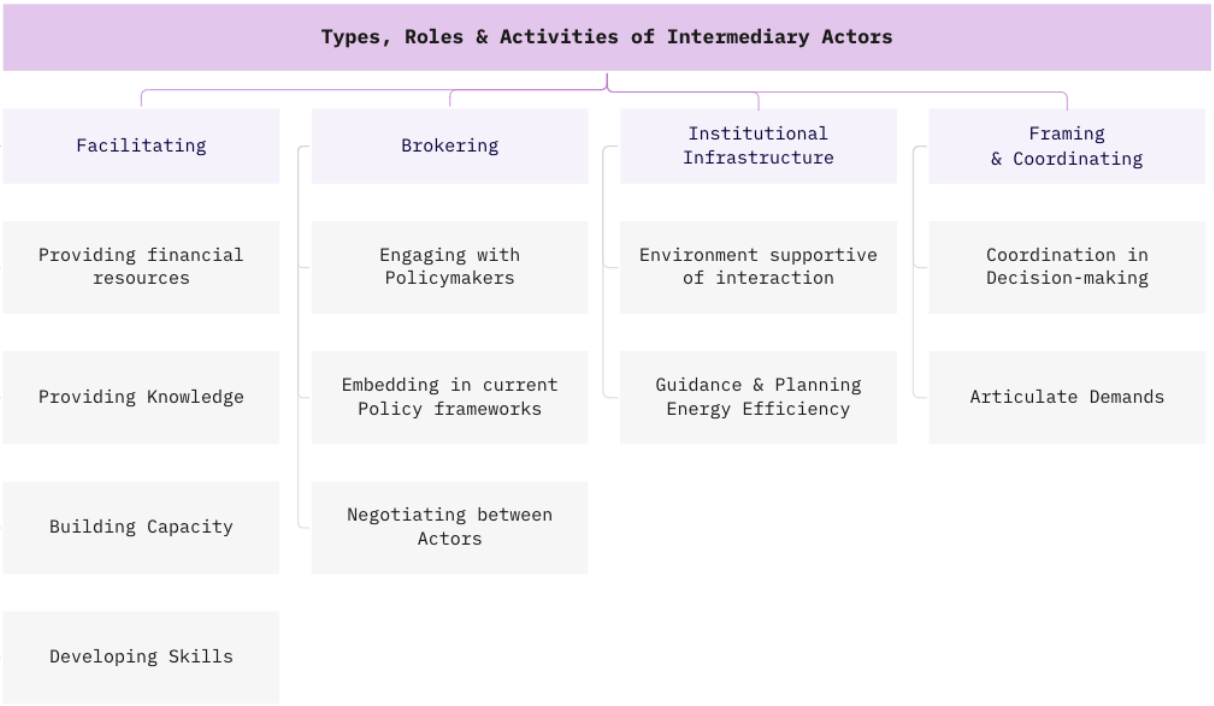
A mandatory component of VvE planning is the multiyear maintenance plan (MYMP). This plan includes a detailed record of building parts to determine expected maintenance costs and scheduling. Maintenance costs are covered by the periodic service fees paid by members as well as other regular expenses like insurance or cleaning services. Since 2018 VvE are obligated to set up an additional fund for irregular maintenance that is at least 0.5% of the reconstruction value of the building and is not always part of the periodic service fees ("Rollen binnen de VvE - VvE Belang," 2020). Sustainability upgrades to the property can also be integrated into the multiyear maintenance plan when approved in a GM.

Figure 1.6: Organizational chart of a homeowners association adapted from (Nederland VvE, 2017).

Composition

As previously stated, over 15% of the Dutch housing stock is part of a VvE (Duffhues, 2019). With over 125,000 residential VvEs recorded in 2015 (CBS, 2016) comes a wide variety in VvEs and VvE members. Thus an exploration into the physical and social composition of VvEs was found to be of importance. As illustrated in figure 1.7, VvEs are often mixes of owner-occupants and rental dwellings (CBS, 2016). CBS further provides information of the average residents of VvE-managed dwellings. Such as age, as they found that one in four VvEs consists for the most part of residents aged 65 and up, although in the three largest cities this share is much smaller. Here residents between thirty and fifty years old are particularly well represented. Furthermore, the homes in VvEs are mainly occupied by people with middle incomes: incomes in the second and third income quartile. And almost half of all VvE dwellings are occupied by single-person households The majority (78%) shares a background of native Dutch or a western immigrant descend.

Table 1.1: Roles and activities of Intermediary Actors adapted from (Warbroek et al., 2018)



1.2.8 | Transition Intermediaries

Progress in the energy transition is dependent on the actions of various actors and citizens, therefore collaboration between these actors is crucial for its success (Dragomir et al., 2020; Hamann & April, 2013; Stieß & Dunkelberg, 2013). The realization of local energy transitions has many challenges and actors on both the demand-side as well as the supply-side resulting in a fragmented market, which makes decision-making a complex process on all levels (Seyfang & Haxeltine, 2012). Research points out these complex decisions are often not made by homeowners alone, but influenced by the collaboration between various intermediaries and the homeowner (Killip and Owen, 2020).

These intermediary actors are defined as organizations or institutions that act as an agent or broker in any phase of the innovation process between two or more stakeholders (Howells, 2006). Simply put, an intermediary works in between other actors (Moss, 2009), makes connections and enables relationships between other involved parties with various activities as can be found in table 1.1. Quite a significant body of research can be found, highlighting the significance of the linchpin role played by intermediary actors in the success of energy transitions on all levels (Ehnert et al., 2021; Kivimaa et al., 2019). Van der Schoor (2020) for example, suggests successful collaboration between actors on the supply-side can be increased through intermediary involvement in the form of 'one-stop-shops' to simplify the overall renovation process for homeowners (van der Schoor & Schrijft, 2020).

Often individual homeowners lack the specific knowledge or expertise to decide upon and install sustainable measures themselves and thus rely on actors such as contractors, installers or architects (Decuypere et al., 2022; Ehnert et al., 2021; Wolf et al., 2021; Barbara S Zaunbrecher et al., 2021; Barbara S. Zaunbrecher et al., 2021)

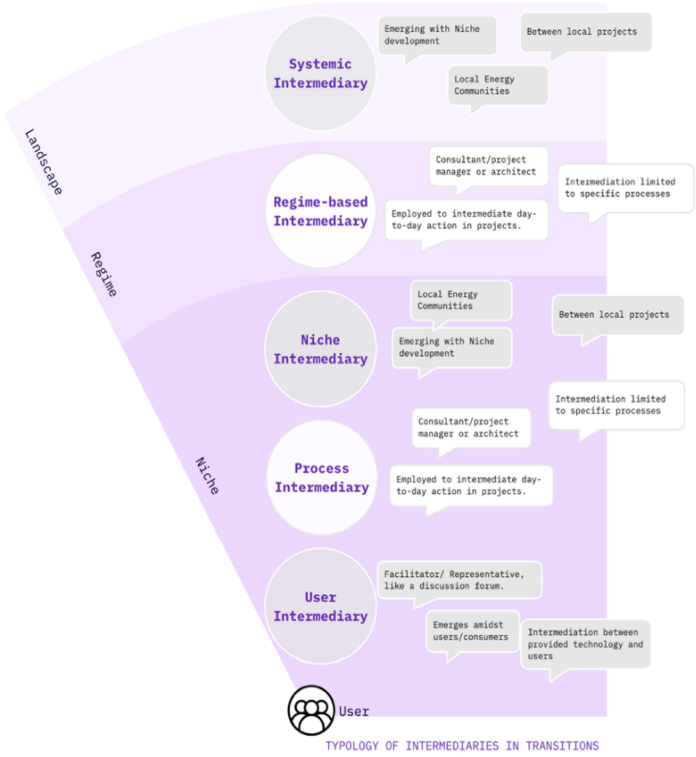


Figure 1.8: Typology of intermediary types in transitions, adapted from Kivimaa et al. (2019)

Researchers have only just recently begun to explore the role that intermediaries take in individual homeowners' sustainable renovation decision-making, but warn for the consequences of ignoring these important actors in policy interventions (Decuypere et al., 2022). Zaunbrecher et al (2021) found that intermediaries' renovation advice is followed the majority of times and thus can positively influence the diffusion of sustainability measures.
This was found to be true for intermediaries which were convinced of the usefulness of these measures themselves and those who have a relationship that is based on trust with their clients (Zaunbrecher et al., 2021). Conversely, intermediaries on the supply-side can also form a barrier rather than to act as an enabling mediator (Risholt & Berker, 2013). A lack of energy transition engagement of actors such as contractors, product manufacturers, architects, local municipalities and energy communities can make it even more difficult to navigate the fragmented energy landscape. Especially as new products frequently enter the market, and experts keep developing claims about innovative technologies constantly, these supply side actors might experience difficulty to keep up with homeowners demands (de Wilde & Spaargaren, 2019). Because of this great influence, it was found by de Feijter et al. (2019) that active involvement of households and intermediaries is essential to the realization of sustainable renovation targets in the Netherlands (de Feijter et al., 2019).

As a form of self-organization, VvEs require a user-intermediary. As described by Kivimaa et al. (2019), user-intermediaries are typically peers or support organizations. They characterize this actor by the connection they form between new technologies and the everyday lifes of citizens (Kivimaa et al., 2019). Furthermore, user intermediaries are able to operate between the niche and landscape domain by voicing the demands of their community in the adoption process (see figure 1.8).

Through their literature review Kivimaa et al.(2019) found that intermediaries at this level are likely to form knowledge-sharing networks which may grow into regime or landscape action once a niche becomes mainstream.
Which raises the question how an intermediary actor can facilitate sustainable renovation practices for homeowners? Therefore, this research analyzes the role of these intermediary actors in navigating the fragmented renovation landscape, but in the specific context of collective decision-making for VvEs. The characteristics of a VvE further complicate the decision-making process, as compared to individual homeowners. Thus, many VvEs consult the help of an external administrator in building maintenance. These administrators are also known to take on an intermediary role in sustainable renovation processes, thus emphasizing the importance of this actor within the scope of the research (Amsterdam, 2020; Energy.nl, 2020; Platform31, 2018).

1.2.9 | Summary of Literature Findings

A review of literature at the intersection of energy justice, energy efficient renovation, renovation policies with a focus on owners' associations can be found in the previous section 1.2. This literature shows the urgency to address the issues of sustainable renovations for homeowners associations and the potential impact to the Dutch energy transition goals. Furthermore sustainable renovations can be interpreted as a socio-technical system where tensions exist between sustainability goals and citizens' interests due to which the need to increase the involvement of residents is discussed, although homeowners association are rarely mentioned. The recurring message throughout recent publications is how the misconceptions between involved actors limit citizens' access to practical and understandable information which slows down the pace of sustainable renovations. Literature highlights the influence of intermediaries on household decision-making and the potential for this actor to facilitate sustainable renovation practices for homeowners, although literature lacks any specific frameworks towards this topic. Furthermore, energy justice theory is presented as a way to analyze the tensions between social and technical aspects of systems. As well as a guise by which to design participatory processes such as those to support collective decision-making in community energy initiatives. To apply this theory to the topic of the research, sustainable renovation within a VvE is defined as a place-based community energy initiative.

1.3 | KNOWLEDGE GAP

1.3.1 | Literature Knowledge Gap

A knowledge gap exists in literature due a general lack of information regarding practical application of energy justice within the domain of homeowners associations.
Home owners associations as actors in the energy transition are heavily overlooked in research and have even been named as a 'forgotten entity' in energy transition policy documents (Paradies & Beekman, 2017). The Paris Climate Agreement for example, refers only to a limited number of measures and options for Home Owners' Associations. Illustrating further that research into the barriers and motivations within VvE's for the adoption of sustainability measures and the participation in community energy is needed to better understand the subject. Some scholars have called for an explicit consideration of justice in the European energy efficiency renovation policies (Mangold et al., 2016; Lithmaa et al., 2018; Seebauer et al., 2019). Furthermore it is shown in literature review, that there is abundant interest in research towards the identification of barriers and opportunities for renovation decisions of house owners. In the majority of research the motivation for decision is attributed to technical and financial factors, or the demographic characteristics of the decision-maker. The majority of this research is catered towards home owners as sole actors in energy efficiency measures investments, while contrastingly research also indicates homeowners rarely make such a decision on their own. What this body of research neglects is influence of intermediaries such as consultants and contractors. This important stakeholder group is especially important in the context of collective deciscion making like in community energy projects and within VvE structures. Moreover, because many VvEs outsource (part of) their management and maintenance to VvE management corporations, this actor becomes an even more important stakeholder.

Energy justice theory is intended to be used to both, analyze the decision-making processes of sustainable renovation and the assessment of conflicts between stakeholders within these processes (Pesch et al., 2017). Sovacool & Dworkin (2015) state that this dimension of should be included in the decisions of a plethora of decision-makers, including policymakers, ordinary students, homeowners, investors, and consumers (Sovacool & Dworkin, 2015). However, a "narrative" literature review focused on the practical applications of the proposed framework reveals that most literature is limited to policy-makers and scholarship and lacks practical output beyond this target audience (Delina & Sovacool, 2018; Heffron et al., 2015; Hiteva & Sovacool, 2017; Jenkins et al., 2018; McCauley et al., 2019; Sovacool et al., 2016). And although the need to improve this is widely recognized in literature (Forsyth, 2014; Jenkins et al., 2014; Jamal and Hales, 2016), research that focusses on the practical implementation abstract and ideological components of energy injustice is needed. To this extend, this thesis offers an exploratory analysis of applying energy justice theory as a lens, in combination with a more practical and useable tool for understanding injustices associated with decision-making in sustainable renovation.

1.4 | RESEARCH QUESTIONS

This chapter introduces the questions that shape the research in a way that meets the objectives set by the researcher. To answer this RQ and provide structure to the research, five consecutive sub research questions are established. How these questions are answered is further explained in Chapter 2.

The aim of this research is to develop a practical tool that can be used to gain insights into the energy (in)justices that may occur in the collective decision-making processes towards sustainable renovation in homeowners association (VvEs). Additionally, the aim is to apply this conceptual tool to uncover strategies for intermediary actors to address the revealed (in)justices. Therefore the main research question addressed in this study is as following:

RQ | How can the process of decision-making, in regards to sustainable renovation within homeowners associations (VvEs), be facilitated by intermediaries to foster energy justice?

SRQ1 | What are relevant indicators of energy justice in the collective decision-making on sustainable renovation within VvEs?

SRQ2 | What are the various stages in the decision-making process of home owners associations in sustainably renovation measures and what are the influencing factors, barriers and actors at these stages?

SRQ3 | What junctures with energy justice can the application of the conceptual user journey framework to the case study reveal?

SRQ4 | What strategies for intermediary actors can be identified in the sustainable renovation decision-making process of VvEs, that facilitates a just renovation process?

SRQ5 | How can this strategy be implemented through user journey proposition for VvEs?

1.5 | THESIS OUTLINE

Figure 1.9 shows a visual representation of the outline of this thesis. Chapter 2, research design and methodology, discusses the overall research design and various methods deployed for data gathering as well as data analysis. In this chapter the research flow diagram gives a more detailed overview in which ways the various sub research questions are answered.
The outline of this thesis is comprised of three main elements, starting with the building the conceptual framework from theory in chapter 3 and 4. Chapter 3 aims to answer sub-research question 1 by operationalizing the energy justice framework through the development of indicators by which potential injustices could be recognized. To this end a literature study is performed on the nexus of sustainable renovation/community energy and energy justice. The second part of the conceptual framework is built in Chapter 4, this section presents the results of the process of user journey mapping. This method in which information of the system analysis is mapped out in a consecutive manner, reflecting the processes of decision-making within a VvE. The combined results of chapters 3 and 4, shape the conceptual framework which is then applied in the case study research.
Chapter 5 presents the results of this case study research as well as the results of expert interviews. In the discussion section, in chapter 6, the findings are presented and interpreted. This section aims to identify the solution spaces in which intermediary actors can act to facilitate energy justice in the decision-making processes of a VvE. Which ultimately leads to the answering of the third sub research question.
Combining the knowledge obtained through the theory building, the conceptual framework, case study research and expert insights allows for the fourth sub research question to be answered. Before finally concluding this report and answer the main research question in chapter 7 and addressing the limitations of the research in Chapter 8, as well as presenting further recommendations.

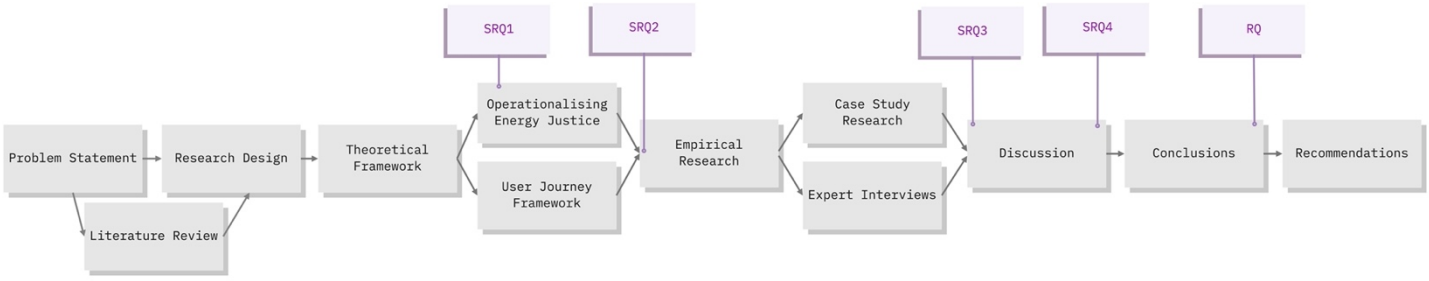


Figure 1.9: Visualization of thesis outline as it relates to the research questions, author's own

1.6 | RESEARCH RELEVANCE

The resulting outcome of answering the proposed research questions is twofold. This thesis research project aims to address both a scientific and a societal objective, which are addressed in the following section. Followed by a statement in which the research aims to contribute to the field of Industrial Ecology as it is part of the completion of a masters' degree within this field.

1.6.1 | Scientific Relevance

Through literature review it was revealed that a gap exists in knowledge regarding the role of homeowners' associations in the transition of the Dutch energy landscape while also making a call for attention to individual needs of citizens in renovation policies. As Haarbosch et al. (2021) uncovered, current Dutch policy documents have limited consideration of the social aspect of transitions. This is echoed by Klabbers (2020) who found that even though the active participation of homeowners is said to be a priority in renovation policies of Dutch Municipalities, there is a lack of practical application and little execution documented. This thesis research addresses this gap by providing insight into the decision-making processes in VvEs and developing energy justice indicators for that specific context as well as formulate recommendations for a strategy to alleviate the identified risks. Energy justice theory intended to be used to, both analyze the decision-making processes of sustainable renovation and the assessment of conflicts between stakeholders within these processes (Pesch et al., 2017). Sovacool & Dworkin (2015) state that this dimension of should be included in the decisions of a plethora of decision-makers, including policymakers, ordinary students, homeowners, investors, and consumers (Sovacool & Dworkin, 2015). However, a "narrative" literature review focused on the practical applications of the proposed framework reveals that most literature is limited to policy-makers and scholarship and lacks practical output beyond this target audience (Delina & Sovacool, 2018; Heffron et al., 2015; Hiteva & Sovacool, 2017; Jenkins et al., 2018; McCauley et al., 2019; Sovacool et al., 2016). And although the need to improve this is widely recognized in literature (Forsyth, 2014; Jenkins et al., 2014; Jamal and Hales, 2016), research that focusses on the practical implementation abstract and ideological components of energy injustice is needed. To this extend, this thesis offers an exploratory analysis of applying energy justice theory as a lens, in combination with a more practical and useable tool for understanding injustices associated with decision-making in sustainable renovation.
This thesis research adds to the field of Energy Justice by presenting a novel approach which integrates a framework of Energy Justice with the practical method of Journey Mapping. This approach yields practical insights, aimed to support intermediary actors facilitate VvE-residents in their journey of decision-making towards sustainable renovation.

1.6.2 | Societal Relevance

This thesis aims to contribute to the societal debate about trade-offs in the energy transition by researching specific social aspects of decision-making in sustainable renovation through the lens of energy justice. Experts in the area of energy justice, call for planners in the energy sector to use it as a decision-making tool (McCauley, 2017, Sovacool et al., 2017, Sovacool and Dworkin, 2015). Although limited research is available regarding this actor, homeowners' associations face urgent challenges in increasing the energy efficiency of residential buildings. Exacerbated by the current energy crisis and soaring gas prices, these challenges need to be addressed by policymakers so VvEs can be enabled to implement sustainable renovations. In the discussion on which way the pace of sustainable renovations among VvEs can be increased, trade-offs between energy efficiency and social aspects seem to be pushed towards the technical and financial side. Which involves risks of worsening existing inequalities in the energy system and conceiving new equity issues (Heffron, 2022; Knox et al., 2022). Within the research field many tools are developing to. These practical outputs could directly provide policy-makers and intermediary organizations with recommendations to support decision-making. Additionally, this thesis aims to provide insights into the potential consequences caused by budding shifts in decision-making processes due to the slow pace in renovation. These insights could make a call for a more socially responsible strategy to increase this pace.

1.6.3 | Relevance to the Field of Industrial Ecology

The studying of trade-offs concerning the implications of social- and sustainability related aspects of housing renovations is relevant for the field of Industrial Ecology in different ways: Firstly, the research takes on a social-technical perspective of sustainable renovation as it explores in what way citizens organize themselves, in a understudied entity of a homeowners' association, by taking on a new role within a socio-technical system; the transition of the Dutch energy system.
Secondly, the United Nations Sustainable Development Goal number seven states: "To ensure access to affordable, reliable, sustainable and modern energy for all" (UNDP, 2015). While in many ways this goal presents a desirable vision for the global energy system, it is absent of any explicit mention of justice issues. In this thesis the conceptualization of energy justice theory is explored with a novel systemic approach by integrating aspects of design thinking through the use of user journey mapping. The master's programme of Industrial Ecology of which this thesis is part, is inherently multi-disciplinary. In this thesis project had the personal goal of combining the obtained knowledge and skillset from both the fields of Industrial Design Engineering, in which I received a bachelor's degree, and Industrial Ecology. In de completion of this project I believe to have fully taken the opportunity to enhance my personal expertise and work on the grand challenge of achieving global prosperity within planetary boundaries.

2

2| RESEARCH DESIGN & METHODOLOGY

In the introduction chapter, the problem was defined and a preliminary literature review was conducted. After which, the objective of the research set up and research questions defined. This following chapter is dedicated to how these questions will be answered in this research. The research of this thesis project was aimed to combine the obtained knowledge and skillset from both the fields of Industrial Design Engineering and Industrial Ecology. As such an interdisciplinary approach was taken by integrating an engineering, environmental and social science perspective. As such, the an exploratory approach is taken to the research design. A visual overview of the research design can be seen in the research flow diagram in figures 2.1 and 2.2.

2.1 | RESEARCH DESIGN

This section first provides the research approach taken in this thesis before going into the different elements that comprise the design of the research aimed at answering the research questions as stated in section 1.4.

2.1.1 | Research Objective

This thesis explores a novel approach to enact energy justice. That takes on an approach that focusses on the experiences of the end-users in energy transition related processes. This methodology combines prevailing energy justice frameworks with user journey mapping, which will be explained in the following section. The objective of which is to produce a unique tool that can be used by both practitioners and researchers alike. This research aims to illustrate the utility of this conceptual framework by applying it to the case study of the Numansgors VvE, who are considering collective sustainable renovation. The application of the combined framework provides understanding of how the occurrence of (in)justices align with the lived-experiences of VvE members during sustainable renovation processes. With these insights the objective is to develop strategies through which intermediary actors can facilitate a VvE to overcome process barriers while increasing capacity to enact energy justice. This approach is driven by the hypothesis that tremendous value can found in combining the analysis tools used by service designers and energy justice scientists. After all, both fields aim to solve complex problems and improve the experiences of those affected.

2.1.2 | Design of the Research

The research in this thesis utilized a mixture of methods for the gathering and analysis of qualitative data to answer the research questions posed. Three core elements can be identified in the research approach (figure 2.1.):

(1) Development of a combined conceptual framework
(2) Application of the framework to a Case Study
(3) Strategy Finding

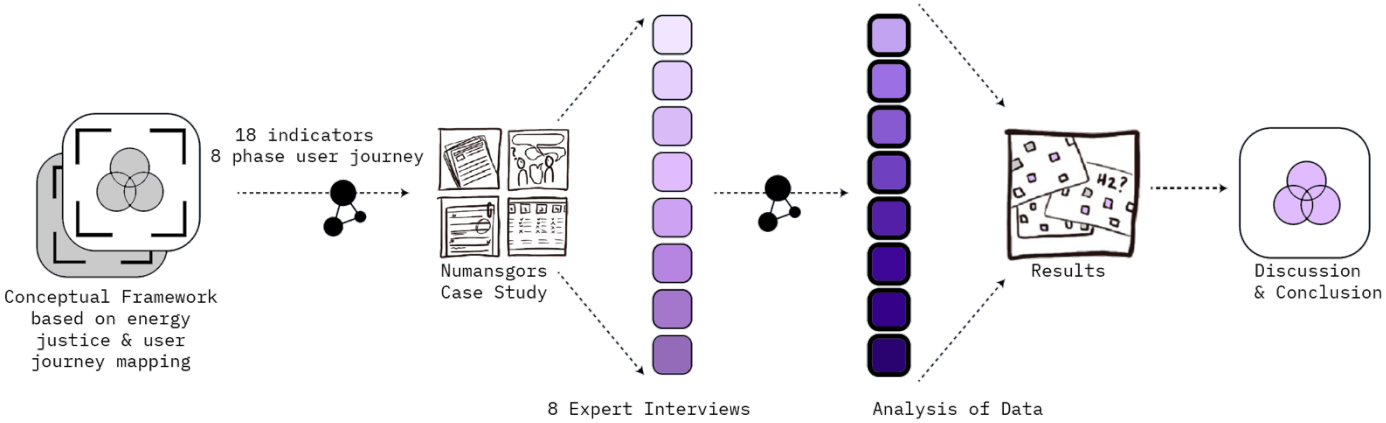


Figure 2.1: Simplified overview of research flow, author's own

Conceptual Framework

The development of the conceptual framework combines methodology from social science and service design. This combination fuses energy justice theory with user journey mapping in a conceptual framework to analyze the case study in a systematic way.
The first element of this conceptual framework is achieved through the operationalizing of energy justice theory by means of literature review. Literature on the nexus energy justice and community energy is analyzed to identify themes and indicators that point to (in)justices occurring. As such, energy justice can deployed as a lens to the case study. A lens through which potential justice issues can be revealed.

These indicators are combined and aligned with user journey mapping. This is a methodology from within the field of service-design, as a means to thoroughly understand of people's experiences around a specific topic over a period of time and place (van Boeien & Daalhuizen, 2010).

The user journey is an holistic method to depict the sum of experiences that customers go through when interacting with a system or service of interest. As such, this method is regularly used to illustrate sequential stages of decision-making in complex systems. A user journey is composed of a network of actors, actions and interactions. And integrates different elements that characterize a specific actor's experiences, from their vantage point (Berry et al., 2002). As such, the design of this conceptual framework responds to scholars' calls for a human-centred approach to the study of energy transitions (Rasch & Köhne, 2017). Within the scope of this research, the user journey describes the phases which a VvE would collectively pass before the final investment decision is taken.

To provide a better insight into factors influencing decision-making, barriers in the sustainable renovation process as well as opportunities for facilitation to aid the process by intermediary actors. By mapping and identifying the barriers that homeowners' associations encounter throughout the process, pain and gain points are identified.

Application of the Framework to the Case Study

The conceptual background of the emerging field of energy justice is thus combined with this practical, user-centered tool. through which justice issues can be revealed and solution spaces can be identified. In the final phase of this research, this framework will be brought into the technical sphere and a case-study approach is incorporated. The case study of Numansgors is designed to align both elements of the developed framework and test its assumptions in an empirical setting. In line with Rasch & Köhne (2017), who argue that energy justice is something statice which can be check-listed the combining of these elements allows for a dynamic and context dependent approach. They elaborate that social practices should be placed at the centre of social inquiry and energy justice should be analysed within its specific history, time and location (Rasch & Köhne, 2017).
Therefore, the case study approach was chosen to accommodate for the highly contextual nature of energy transitions (Knox et al., 2022). In case study research, the researcher is known to dive into a specifically selected system with the aim to uncover and identify the role played by actors (Baxter & Jack, 2008). Within the scope of this thesis, the case of Numansgors is used to study their specific situation considering the uniqueness of the VvE structure and the experiences of the stakeholders. The case is described through the phases identified through journey mapping and analysed through the lens of energy to provide practical insights into the decision-making process and intermediary solution spaces. Since the research is focussed on a single environment (Yin, 2009), a choice was made to conduct a single embedded case study methodology. As part of the research interviews with multiple experts in the field of VvE management and local (household) energy transitions were conducted as well as with case specific stakeholders and a survey data conducted among Numansgors residents. A more detailed account of the specific methodology used in this research is given in the following section.

Strategy Finding

The application of the framework will uncover junctures in the mapper user journey where (in)justices may occur. Finally, the insights gained from empirical research provide opportunity to formulate a strategy to address the (in)justices found.

2.1.3 | Research Flow Diagram

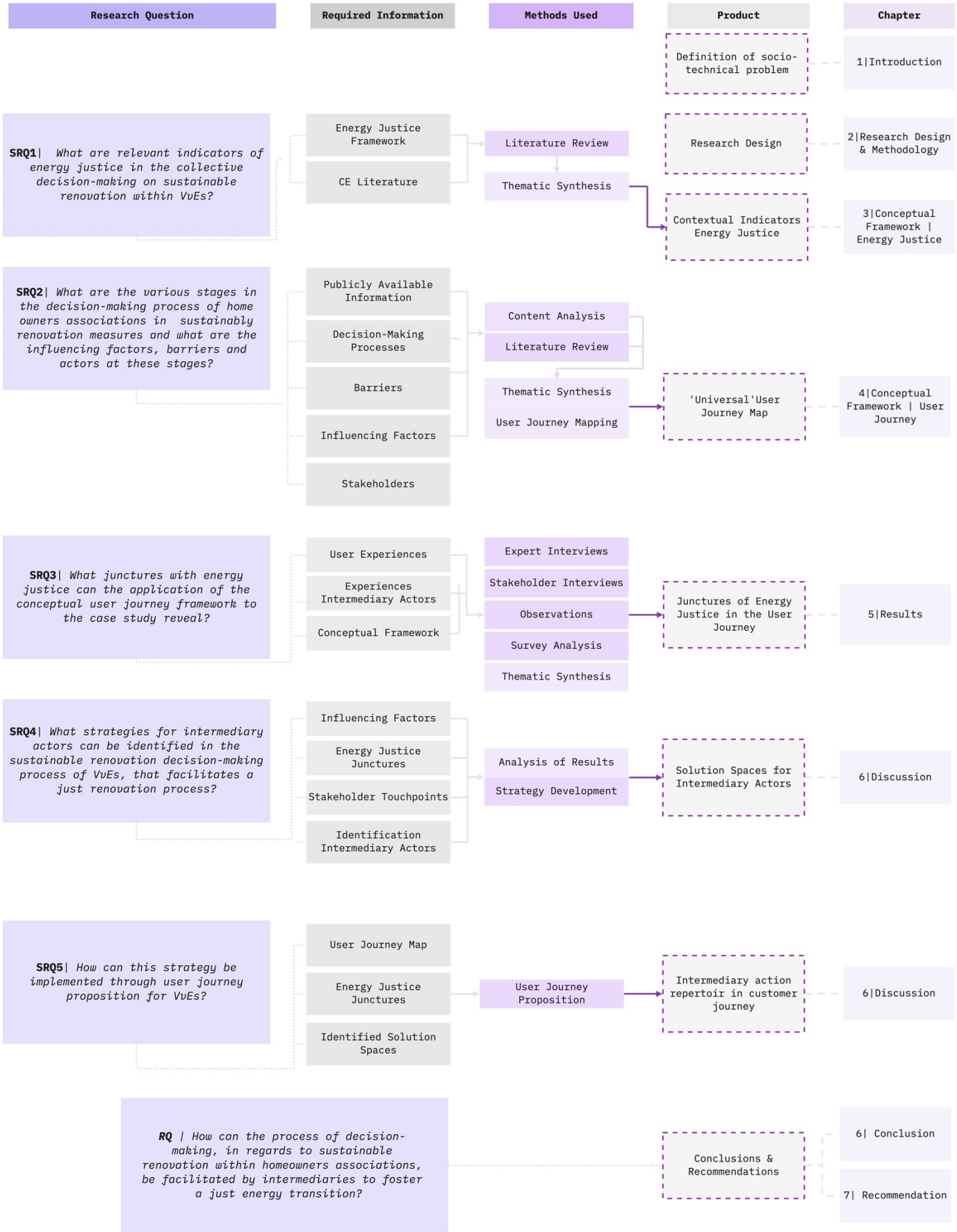


Figure 2.2: Complete overview of research flow (author's own)

2.1.4 | Case Study Description

In Numansgors, a neighborhood located on the water, an enthusiastic group of citizens have brought their query to on how to make their 'village' more sustainable in a way that is in line with the residents' wishes, without compromising the park's unique location and architecture to the Wageningen University & Research Science Shop. When several residents of the waterfront park expressed their desire to improve the energetic quality, they met residence from their neighbours as not everyone shared their vision. The residential park, comprised of 201 houses, built in the 1980s by the architectural bureau Van der Broek & Bakema as a luxury holiday destination now mostly used for permanent residency. With homes equipped with a waterfront view, a personal parking space and access to the marinas, a boat shed and a tennis court all available exclusively for the residents of Numansgors. The residents are not just neighbors but also share responsibility of the collective facilities, which are managed by the Association of Homeowners (VvE).

To meet contemporary energy requirements, the VvE has set up a committee, GORS2025, to explore what the contribution of the residents of Numansgors could be to the energy transition. Currently their focus lies with collective renewable energy generation and housing renovations such as insulation and fitting solar PV panels. GORS2025 came into contact with the WUR Science Shop to aid them in this process, as thus far talk of transitioning has been met with social resistance. Numansgors' residents differentiate in demographics, and opinions about the type and the speed in which measures should be taken are divided.

Previous attempts of individual residents have been opposed by neighbours for aesthetic reasons, causing conflict between residents. For these reasons, the initiators wish to present the residents with a coherent plan for sustainable development that will not meet additional resistance. The Wageningen University & Research Science Shop is in charge of organizing the required research that is commissioned by the residents, in compliance with their mission to aid non-profit civil society organisations with limited financial means. In this case, the research was presented as a graduation opportunity and commissioned to graduate students from various different disciplines. At current stage, the work in Numansgors is focused on housing renovations, such as installing solar panels, improving house insulations etc.

The case of Numansgors illustrates an interesting problem in the Dutch Energy Transition, where the social aspects of energy transitions are under shadowed by technical and economic considerations (Wittmayer et al., 2020). And like Numansgors many other VvE want to become more sustainable, but encounter numerous obstacles such as lack of knowledge, little involvement of fellow residents or insufficient financial resources (Vereniging Eigen, 2019). This is unfortunate as the energy transition of the Dutch housing stock cannot happen without the inclusion of VvEs.

Efforts in housing renovation has been progressing in recent years, however, the total rate of sustainable renovation in the EU remains low. According to (European Commission, 2020), only 1% of the houses in EU are renovated annually, and only 0.2% have implemented a renovation that reduces energy consumption by more than 60%. When considering the costs of household energy, we must realize that these are strongly determined by the nature and quality of housing: in that sense the entire built environment should be regarded as part of the energy transition infrastructure (M. P. C. Weijnen et al., n.d.).

Just as in Numansgors, approximately twenty percent of the Dutch housing stock and almost fifty percent of the housing stock in the larger cities (Drift, 2018) are part of an organizational structure of collective home owners. Which is why the Numansgors project is what sparked the start of this thesis research and is the illustrative case study that threads through the report.

2.2 | METHODOLOGY

It is common for case study research to contain various sources of data such as observations, public records, interview results, surveys and documents in order to enable a researcher to gain insights to the topic as a whole (Yin, 2009). Furthermore, the use of a variety of sources for data collection is said to increase the reliability of results (Baxter & Jack, 2008). With this reasoning it was that multiple sources of data were used for the purpose of this research. Content Analysis of documentation is a typical methods within case study design (Yin, 2009). Within the design of this research, content analysis was performed of publicly available information to provide an understanding of the current situation of housing renovation for home-owners in the Dutch landscape as well a focused analysis on the topic of VvEs as a legal entity. A key ingredient to this research are interviews, as an essential source about behavioral events. Stakeholder interviews were selected to provide important insights into the affairs and behaviors regarding the case study. Expert interviews were conducted to identify other relevant sources of evidence and information and verify findings. To make further inquiry into the specific justice related issues surrounding the case study survey data was drawn upon, conducted among residents in the case-study area. This mixed method approach was designed to address the complex research question by selecting a rich array of data sources. In table 2.3 the connection between research questions posed and method of answering can be found. This section further elaborates on each individual method.

2.2.1 | Literature Review

To create an understanding of the context and background of the Case study a literature review is conducted regarding the landscape of Dutch energy system and citizen initiatives. This phase of research is composed of consultating both peer-reviewed literature as well as grey literature. Grey literature was used to complement the limited availability of peer-reviewed literature on Home Owners' Associations particularly or housing renovation within the specific context of the Netherlands. However, the peer-reviewed literature forms the foundation of the theoretical underpinning of the energy justice framework to ensure a quality standard of the research. The peer-reviewed literature was gathered from scientific databases, primarily through Science Direct and Scopus or by snowballing. This literature review was deemed most relevant in this initial phase of the research as the results will provide information to focus in the subsequent phases of the research. Keywords "community energy", "local energy initiative", "energy renovation" were developed to associate with terms such as "energy justice"," just energy transition" to generate a variation of search queries related to the topic of interest. Primary materials such as journal articles, reviews and scientific papers were targeted through these queries. The results of the literature review was used as input for the empirical research as well as the framework by which the empirical research was analyzed.

2.2.2 | Content Analysis

Content analysis is a method for the systematic analysis of communication material with the objective of identifying specified characteristics (Mason et al., 2004). In this research a content analysis was performed on documentation regarding sustainable housing renovation for owner-occupants in the Dutch context and local energy initiatives, as well as publicly available tools and guides aimed at energy efficient homes and home owners associations. By means of thematic analysis, the dominant themes in the analysed texts are captured. This common approach of content analysis uses a coding scheme based on categories of interest to this research as a result of the literature study. Themes such as 'process steps' and 'decision making' were used to analyse the documentation in this research. Due to time as a limiting factor to the research, a decision was made to sample a subset of available sources and documents as sampling provides an efficient way to achieve research results on content analysis (Mason et al., 2004). Additionally, content analysis was used to develop codes to analyse the data gathered from interviews and survey.

2.2.3 Journey Mapping

There are many different forms of journey mapping, often used in service design. For this thesis research a method of user journey mapping is deployed, the outcome of which can be used as an iterative tool for stakeholder alignment (van Boeien & Daalhuizen, 2010). Typically, a user journey is visually represented and consists of phases, steps, stakeholder touchpoints on a vertical axis (van Boeien & Daalhuizen, 2010). The horizontal axis represents time. Through content analysis, an inventory was made of existing user journeys (klantenreis) of sustainable renovation for homeowners to identify their common information. This includes user journeys targeted at homeowners, user journeys for generic decision-making in VvEs not aimed at sustainable renovation as well as scientific publications. Through the analysis of these documents, insights were given into the overlapping and differentiating factors of theseuser journeys. And subsequently, a genericuser journey for homeowners' associations was made in regards to the decision-making processes involved with sustainable renovation.
By means of this generic journey, the relationship between barriers and opportunities of a just sustainable renovation can be examined. To this end an in-depth analysis was conducted.
Publicly available information was reviewed, most of which could be found through the websites of municipalities, government institutions and local energy initiatives. A focus was placed on documents which addresses the approaches of decision-making, potential pitfall and success factors. Apendix C provides and overview of the consulted sources. Based on the collected information, the decision-making processes of individual residents and the factors influencing this decision, the barriers and motivators can be integrated into the identified phases of the VvE's user journey. To gain insight into the user experience, typically data is based on qualitative research, such as interviews (van Boeien & Daalhuizen, 2010). The analysis of this qualitative data is conducted by means of coding. This is known as the linkage of passages of text in different documents based om common themes, the themes used in this case are the indicators of energy justice (Mason et al., 2004). Which brings the first two elements of the research design together by answering the third research question. This combination produces the solution space in which intermediary action can be defined.

2.2.4 | Interviews

As part of the case study, empirical data was collected through the method interviews. One-on-one interviews were conducted in an open-ended, semi-structed form with the aid of an interview guide. In accordance to (Mason et al., 2004) the interview questions are developed based on topics covered in the theory research. For this research that means; the key themes extracted through content analyses and literature reviews such as the three tenets of Energy Justice and the VvEuser journey. The questions and procedure were formulated along a timeline suggested in the Make Toolkits by (Sanders & Stappers, 2012). Beginning with the present experiences, via past memories, finalising with expectations of the future, this timeline allowed participants to gradually reveal and express their tacit and latent knowledge (Sanders & Stappers, 2012). As part of the semi-structured format, room was left in between the interview questions for natural conversation to flow as this may uncover unexpected topics for the research (Mason et al., 2004). The interviews are part of two elements of research, firstly experts were consulted to offer their expert analysis of the topic. Organisations were contacted based on their experience with the research topic such as organisations that facilitate management and maintenance commissioned by VvEs. For a broad view on the subject from various experiences and fields, interviewees each were asked for further recommendations on contacting additional organisations afterwards, For example through VvE Metea, contact was made with Ecostroom.nu and VvE Energie.

Secondly, case study stakeholders were approached by direct contact with the help of WUR science shop. Three members of GORS2025 were interviewed as well as a representative of the municipality Hoeksche Waard to discuss the topics in the specific context of Numansgors. A total of eight interviews were conducted over the course of this research through Zoom or Microsoft Teams. With permission of the respondents, the interview audio was recorded using the Iphone Dictaphone application. All interviews were transcribed for analysis, after which the transcriptions were deleted and only anonymized summaries were kept in fulfilment of the TPM Delft University of Technology data management and ethics policy. An overview of each interview can be found in table 4.3. The programme ATLAS.ti 9.1.0 Mac (by ATLAS.ti Scientific Software Development GmbH (ATLAS.ti, 2018)) was used for the analysis of the interview transcripts. This software was essential for the analysis of the empirical analysis as it can be used to create and analyse codes.

Table 4.3: Overview of interview respondents

Reference	Organisation	Field of Work	Role in organisation
G1	Gors2025	Sustainability committee of VvE Numansgors	Gors2025 member/ resident
G2	Gors2025	Sustainability committee of VvE Numansgors	Gors2025 member/ resident
G3	Gors2025	Sustainability committee of VvE Numansgors	Gors2025 member/ resident
G4	Municipality Hoeksche Waard	Municipal Government	Energy Coach
E1	VvE Metea	VvE management. Offering of services including how to establish a VvE, management support for board members , constructing a MYMP and problem solving within a VvE.	Sustainability advisor/Process Guide
E2	VvE Belang	Interest group for home owners associations	Management
E3	VvE Belang	Interest group for home owners associations	VvE Zonnecoach (Solar Coach)
E4	VvE Energie	Ongoing energy collective specifically for Owners' Associations (VvEs) and its managers.	Energy consultant
E5	VvE-balie gemeente Den Haag	Advice offering on sustainability for VvEs, municipal initiative	Consultant
E6	VvE Duurzaamheids Loket	Issuing energy advice and supervising the process at VvEs.	Consultant/Process Guide
E7	DVvE	Process guidance and independent consultancy	Process assistant
E8	VvE Duurzaamheidsloket	Process guidance and sustainability consultancy	Process guidance expert

2.2.5 | Analysis of Survey Data

To gather data providing a deeper understanding of the case study, a survey was conducted among Numansgors residents. The survey used is characterized by form of a questionnaire, which was because questionnaires present the questions equally to each person thus allowing for the construction of a structured data set for analyses (Mason et al., 2004). The questionnaire was designed to gain insight into residents' opinions towards sustainable renovation measures and the current (energetic) state of their homes as well as their perspective on the functioning of the VvE board and the GORS2025 committee. Additionally feedback was asked on the information meeting that was organized by GORS2025 on March 24th. As multiple research projects are conducted in Numansgors in the same time period, it was chosen for one survey to be administered, combining relevant questions from multiple to avoid unnecessarily disturbing residents. The administering of the survey was performed by (Chen, 2022) and was available both online and via hard copy versions distributed among homeowners.

The survey was constructed in eight sections;
A. Basic household information
B. Energy consumption
C. Improvement Need
D. Information Need
E. Values: Sustainability
F. Values: Collective versus Individual
G. Feedback: GORS2025 information meeting
H. Feedback: Suggestions for the VvE

Not all questions were relevant for this thesis research as some were catered specifically towards other students' research as well as the timeline of the survey was administered at a stage where only preliminary research was done and the research goal was yet to be formulated. An overview of the questions used in analyses can be found in appendix E. Of the 201 households in Numansgors which were all approached for the survey, data of 46 effective responses was collected. 24 Residents submitted their responses through paper questionnaires, including 1 duplicate response as well as 25 digital forms. A common function of survey analysis is to describe the characteristics of a specific case or subset of cases (Mason et al., 2004). In this research the survey data was analysed to provide qualitative insights into the values and perceptions of a group of actors. A quantitative analyses was not considered as the number of respondents was deemed insufficient to provide a statistically valid overview (Israel, 1992).

2.3| QUALITY OF RESEARCH DESIGN

The design of a research should represent a logical set of statements which can be tested on conformability, credibility, data dependability and trustworthiness of the research (Yin, 2009). The research design of this thesis research can be defined as an exploratory single case study approach, the results of which are likely to have a relatively high degree of validity as well as relatively low degrees of replicability and reliability.

The conformability requires that the data accurately represents the information that the participants provided and the interpretations of the data are not invented by the researcher (Polit & Beck, 2012). To mitigate potential biases in data collection resulting in low validity, multiple sources of evidence are drawn upon to answer the research questions in this thesis, combining survey data with interviews and content analysis. The data dependability concerns the generalizability of the research results, so-called external validity. To increase the external validity of the research, the use of multiple case studies would have led to improvement as this would serve a stronger basis for generalizing (Yin, 2009). The theoretical framework, constructed through literature study, is performed and built in advance of conducting empirical research. Therefore, the framework can also be used as a frame of reference of the case study results. The reflection of the tenet of the energy justice framework in the case study results are a form of analytic generalization and addresses this test element within the single case study approach (Yin, 2009). The objective of replicability of the research is aided by the development of a case study database to enable accurate documentation protocol, this however was not possible within the scope of the research and the terms agreed upon in fulfilment of the TPM Delft University of Technology data management and ethics policy.

CONCEPTUAL FRAMEWORK

The following phase of this report, comprised of chapters 3 and 4, introduces the twofold construction of the conceptual framework. This framework aims to enable human-centred research of collective sustainable renovation in VvEs, through the lens of energy justice. Firstly, chapter 3 shows how the energy justice framework is operationalized for this purpose. Secondly, chapter 4 builds on existing research with the construction of a 'universal' sustainable renovation user journey for VvEs. The conceptual framework combines these two approaches and determines how this thesis is embedded in existing literature. The framework defines key concepts and theories which form the scientific basis of this research. And provides the analytical basis of the empirical research for the next phase of research.

3

3 | ENERGY JUSTICE

As described in the literature review as well as the knowledge gap, the emerging theory of energy justice lacks in practical application and tools for an audience beyond scholars and policy-makers. This chapter addresses this gap by operationalizing energy justice theory in the context of community energy as well as sustainable renovations to infuse the mapped user journey with.

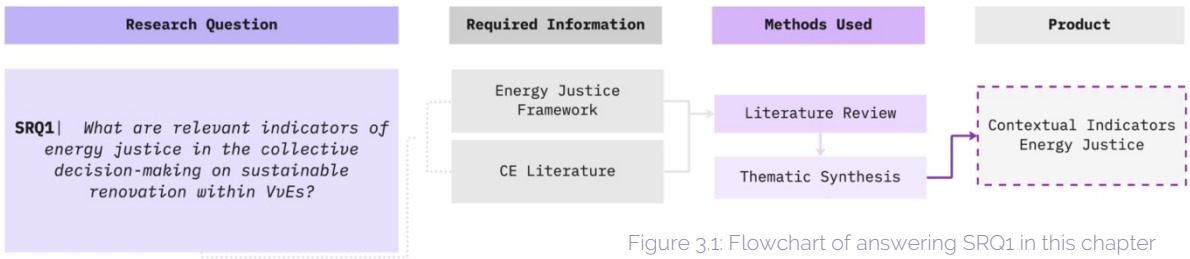


Figure 3.1: Flowchart of answering SRQ1 in this chapter

Starting with the commonly referred to three tenet model of energy justice, literature is selected that focusses on the context of community energy initiatives as can be found in Appendix A. Firstly, the theoretical embedding of energy justice is addressed through the perspective of the prevailing three tenet framework.
Scholars observe many occurrences of injustices and their related causes. From these observations themes can be extracted that categorize these justice issues, as well as indicators (codes) of topics which may lead to (in)justice issues. This chapter describes the synthesis of thesis themes, an overview of which can be found in figure 3.3. The following chapter 4 describes the second part of development, after a user journey is synthesized, that chapter will describe how energy justice is infused into the tool.

3.1 | Energy Justice as a Framework

As the first part of the conceptual framework development, this chapter explores how the concept of energy justice has inspired many researchers to provide frameworks for this abstract concept. This chapter considers multiple approaches brought forward in literature, to ultimately provide the most suitable framework to operationalize in the context of sustainable renovation.

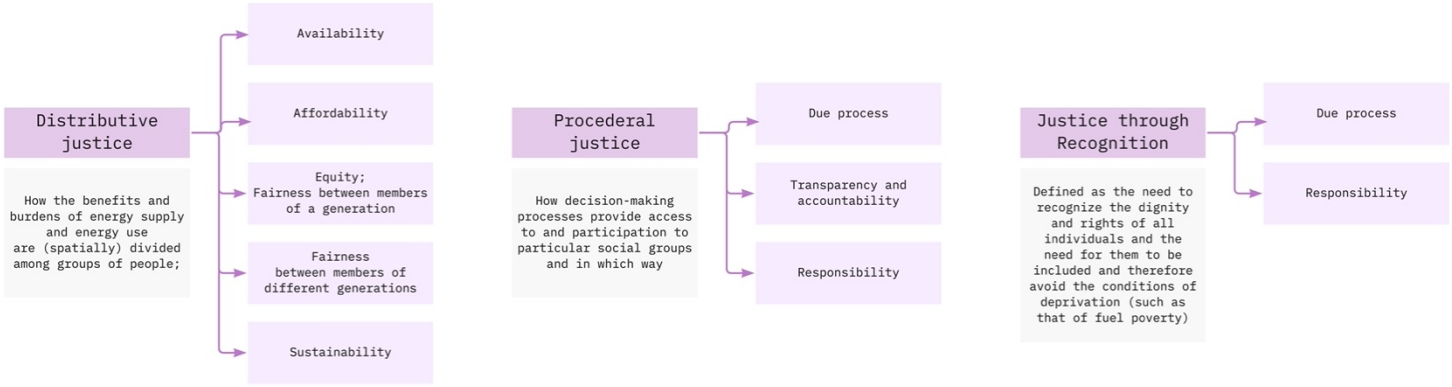


Figure 3.2: The three core tenets framework of energy justice as adapted from McCauley et al. (2013) and (Delina & Sovacool, 2018).

As was explained in the literature review in the previous chapter, the low carbon transition of household energy systems has the potential to bring opportunities to improve experiences of using energy as well as potentially increase the risk of exacerbating existing issues, or even create new energy related issues for households (Sovacool & Dworkin, 2015). The notion of "energy justice" is put forward by scholarship as a way of assessing whether energy related dilemmas are ethically justifiable, or not. As a research approach, the aim of energy is "to provide all individuals, across all areas, with safe, affordable and sustainable energy" (McCauley et al., 2013). Similarly, Sovacool and Dworkin (2015) define an 'energy-just world' as a place where any benefits and burdens of energy consumption and production are shared equitably and where energy decision-making is fair in its treatment of people and communities.

Three Tenets of Energy Justice

(1) Distributive justice

Inequalities in the distribution or sharing of benefits and burdens of an energy system between actors give cause to distributional injustices. Distributive justice therefor addresses the question of where are injustices occur (McCauley et al., 2013) as well as addressing the distribution of responsibility (Jenkins et al., 2016). For example Dutch citizens may all experience the benefits of gas winning in Groningen, while negative effects such as earthquakes are experienced solely by local communities. Distributive justice is not limited to the infrastructure of energy systems, but also requires equitable access to (renewable) energy services (Jenkins et al., 2016). Literature demonstrates an "uneven spread of burdens with regards to affordable access to energy services" (Jenkins, 2016).

(2) Recognition justice

Recognition justice applies to energy systems by acknowledging the energy needs of all. Non-recognition of the needs of specific groups in a society, as well as misrecognition of values and beliefs especially of marginalized groups, can lead to recognition-based injustices (Jenkins et al., 2016). For example, a UK policy addressing fuel poverty misrecognized the consumption patterns of certain social groups as inefficient use of energy due to a presumed lack of knowledge. However, by not recognizing some social groups, such elderly and chronically ill, dependency on fuel use the policy failed to address certain vulnerable citizen groups. Misrecognition and disrespect occurs with the unjust treatment of marginal groups, for example on the basis of as age, ethnicity, gender, religion or belief, education, income, sexual orientation, gender identity, health status or due to the geographical areas in which they reside (EIGE, 2022). In the study of demographics of energy communities in Europe van Bommel and Hoffken (2021) found an overrepresentation of wealthy, white males above middle-age among members.

(3) Procedural justice

Addressing the question "Is there fair process?", procedural justice relates to the decision-making processes in energy systems by all stakeholders. Concerning not only equitable procedures of decision-making, but also having equal levels access to the processes involved (Jenkins et al., 2016; Sovacool & Dworkin, 2015). Procedural justice is of importance on the topics of citizen engagement, participatory processes and community energy projects. For example, Lennon et al. (2019) found that the perceived agency of citizens in decision making regarding their energy consumption was a determining factor in their willingness to join community energy initiatives. Procedural justice requires transparency, mobilization of expertise, full disclosure of, and access to information for all stakeholders (Jenkins et al., 2016; Sovacool & Dworkin, 2015). Recognition is often named a precondition for trust, involvement and compensation provision (Correljé, 2021).

3.1.1 | From concept to framework

The concept of energy justice was inspired by the concepts of social justice and environmental justice and is defined and operationalized in the academic literature. McCauley et al. (2013) suggests three basic forms of energy justice, often referred to as the core tenets of justice as seen in figure 3.2.
This abstract framework has been given substance and elaboration over time, with an ever increasing interest in scholarship. Sovacool and Dworkin (2015) built on these three pillars with an analytical approach, and identify the values that influence our energy systems. Their approach utilizes the energy justice as a decision-making tool for policy makers to make more informed choices regarding energy provisioning.
Additionally, Sovacool et al. (2016) presented a complementary framework which adds to the three tenets with eight principles of energy justice to further operationalize the concept of energy justice. These principles correspond with the three tenets as can be seen in figure 3.2.

Scholarship also recognize two additional forms of energy justice: Restorative Justice which argues that the injustice caused by the energy sector should be rectified and Cosmopolitanism Justice stipulating the consideration of cross-border effects of energy related activities (Heffron, 2022). Although the importance of these forms of justice is recognized, the spatial and generational aspects of these two forms go beyond the scope of the research. For the purpose of this research, Jenkins (2018) is considered as the foundation from which energy justice is considered as a framework. In their research Jenkins presents a defined focus on the energy system, by making the framework more explicit and eliminating the broader considerations corresponding to environmental and climate justice. Without the intention to disregard the importance of restorative and cosmopolitan justice, their absence in this research is aimed to increase the analytical power of the framework and making it more applicable to bring into practice for case study research.

3.1.2 Multi-level Framework of Energy Justice

Finally to accommodate for the notion of space, this research considers the later approach Sovacool et al. (2019) have taken. Similar to Bouzarovski and Simcock (2017), they apply a multi-level perspective (MLP) to the energy justice framework. In the context of the multi-level perspective, energy (in)justice occur at three different levels: the niche, the socio-technical regime and the landscape level (Geels, 2002). The inclusion of this perspective allows the researcher to identify injustices at a community scale, such as a homeowners association of 200 homes. Background information on the MLP can be found in appendix B. The MLP considers transition initiatives at a local scale to be at the niche-level (Sovacool et al., 2019). In this context, niches are analytical spaces in which innovative activity takes place with the protection from dominant rules. Applying an energy justice perspective at this level enables the researcher to identify potential of (in)justices at an early stage of development (Sovacool et al., 2019).

3.2 | OPERATIONALIZATION

In the previous section the approach in which energy justice is considered was introduced, as well as the frameworks this research relies upon. Next, the concept of energy justice is defined in the context of community energy initiatives. To operationalize the said framework, a literature review was conducted (see appendix A). This section presents the results of this review, namely the identification of themes that indicate to the presence of potential injustices.

Distinguishing these different aspects of justice is not only descriptive, but also of normative intention. Energy justice has thus evolved as a conceptual, analytical and decision-making framework, the operationalizing of which is much discussed by justice scholars (Clark, 2015; Feenstra & Özerol, 2021; Heffron, 2022; Heleno et al., 2022; Jenkins et al., 2018). In its current form the framework not only provides structure to the evaluation of policies and decisions regarding our energy systems, but operationalizing it also provides the function of a tool for practical analysis in a specific context, such as case study research (Feenstra & Özerol, 2021). In the current research, operationalization refers to the extraction of context-specific elements of energy justice theory. The context being collective decision-making in Dutch VvEs regarding sustainable renovation. As the keywords aimed to capture this context delivered no results in combination with energy justice, a broader perspective had to be taken to the problem and its context. Thus applying the proposed definition of a place-based energy community to sustainable renovation within VvEs (van der Schoor & Scholtens, 2019).

3.2.1 | Community Energy & Energy Justice

CE projects are often mentioned in literature and policy documents as a significant contributor to shaping an inclusive energy transition (Weijnen et al.). The democratic, equity enhancing approach of CE is discussed as a way overcome the exclusion of vulnerable groups from energy transitions. However scholars do also criticize a 'romanticized narrative' of CE, such as Bommel et al. (2021) who show this that fostering CE will not automatically bring about energy justice. A substantial body of literature focusses on energy justice for members of CE projects (Forman, 2017; Hiteva & Sovacool, 2017; Hoicka et al., 2021; Mundaca et al., 2018; Simcock, 2016; Sovacool et al., 2022; van Bommel & Höffken, 2021). Scholars also discuss the justice issues that result from the relations and interactions with a range of actors that CE initiatives are entangled (Simcock, 2016). And a notable amount of attention in research is placed on the impact of intermediaries on these relations and the resulting justice implications (Cuppen et al., 2015; Lacey-Barnacle & Bird, 2018). From this vast body of literature common themes can be extracted, by which community energy initiatives can be analyzed to asses implications for energy justice.

3.2.2 | Distributive justice in Sustainable Renovation

The tenet of justice as distribution is especially important to address in the context of sustainable renovations, due to the potential energy renovations have in creating inequalities in distributing the costs and benefits of energy transition (Hanke et al., 2021b). Distributive justice demands energy services to be equally distributed among members of society, regardless of people's social status (García et al., 2016). In literature 'energy vulnerability' is often used to reflect distributive injustices as transitions in the energy system could prove increased risk for vulnerable members of society (Broers et al., 2022). Local community energy initiatives potentially increase to distributional justice by lowering the distance between citizens and the energy system. Hanke et al. (2021) formulates the following indicators to assess the contribution of an CE initiative to distributional justice within: member diversity, activities dedicated to vulnerable groups and the provision of lower tariffs or similar services.

Member diversity is often discussed in literature in the context of the inclusion of vulnerable households (Hanke & Lowitzsch, 2020; Williams & Doyon, 2019). Vulnerable households can experience even more inconvenience and difficulties during the renovation process and often have less capacity (time, knowledge) to participate in the decision-making process to express their needs. A closer look at who those vulnerable households are, in analysis of research institute TNO it was found that within the group of energy-poor households, over half are categorized as having a relatively low income and live in a house of low energetic quality (TNO, 2020). Additionally, within this vulnerable group women, households with migration backgrounds and young adults are overrepresented. However, literature also notes that these demographic factors do not automatically translate to vulnerability living experiences and socio-economic hardships (Hanke & Lowitzsch, 2020). In the same line it can be argued that having access to sustainable renovation measures such as renewable energy generation is a distribution issue. In the context of appartement buildings issues of distribution may occur for example, because roof-insulation measures do not benefit apartments on all levels of the building equally based on their physical location, spatial distribution of measures is therefore added as an indicator.

3.2.3 | Recognition justice in Sustainable Renovation

A focus on recognition-based justice is important to understand how asymmetric flows of agency may occur among association members during decision-making and setting priorities (Levenda et al., 2021). Cases of non-recognition, are found to lead to tensions in which instances of procedural and distributional injustice also arise (van Bommel & Höffken, 2021b). Recognition justice within community energy initiatives is defined by the extent to which community members are considered equal (van Bommel & Höffken, 2021). Recognition justice focuses on understanding differences and accommodating particular needs of members, and insures all members to be taken seriously as a partner in decision-making processes. Equity for members in CE initiatives isn't self-evident, to facilitate recognition justice, vulnerable individuals must be identified and different perspectives with regards to energy must be recognized that exist within different social, cultural, ethnic, and gender groups (Creamer et al., 2018).
Recognition of the specific energy needs of particular community members can influence decision-making as well as prioritization of measures. Misrecognition of needs can cause not only injustices but also limit the chances of success for the adoption of measures (Walker & Day, 2012).

Recognition is also mentioned in the context of respecting individual interpretations of energy-related issues, what their needs are and the strategies they propose to mitigate energy problems. This includes awareness of demographic inequities, such as a dependence on education, training or digital skills (Catney et al., 2013). For example, the above average energy use of the elderly and infirm could be framed as inefficiency caused by ignorance or lack of knowledge. On the other hand, recognizing this behavior as a need due to their reliance on above average room temperatures for comfort could influence decision-making in a way that suits the majority of members (Walker & Day, 2012). Recognition of needs therefore includes efforts to address individual motivations behind objections for participation in energy transition. Investments into communication with residents and the involvement of residents who may be less interested in the project is of great importance to embedding recognition justice into the process phases (Cuppen, 2018).

3.2.4 | Procedural Justice in Sustainable Renovation

At its heart, procedural justice aims concern inclusive decision making processes that are open to all relevant stakeholders (Knox et al., 2022). Insights into what is procedurally just is especially important as research shows that the perceived fairness of procedures increases the perceived legitimacy of the process outcomes (Mundaca et al., 2018). This tenet is directly applicable to decision-making processes, the effective participation of home-owners and collaboration between actors (Czischke, 2017; Y. Wang et al., 2022; Fruhmann & Knittel, 2016; Hauge et al., 2019; Wang et al., 2016). Within the scope of procedural justice it is often that issues arise with the prevail of pragmatism and the adoption of utilitarian approaches as this causes conflict with the essence of participation (van Bommel & Höffken, 2021). Inclusive stakeholder engagement at the level of sustainable renovation is to give all members equal opportunity to participate (McCauley et al., 2016). The reliance on resident involvement in the VvE's decision-making process ensures a certain level of procedural justice. However, a potential pitfall is that greater participation is often afforded to individuals with greater capacity (Knox et al., 2022). To ensure procedural justice, literature mentions ensuring of equal levels of access to decision-making processes (Jenkins et al., 2016)

Fair decision-making demands accommodation of any differences in the pace of decision-making between members in the overall timeframe of renovation processes (Bouzarovski & Simcock, 2017). Especially to safeguard the inclusion of underrepresented groups in the initial phases of decision-making and consultation (Simcock, 2016).
Furthermore. access to information and communication is found to be key for community participation (Simcock, 2016) which confirms the previous findings regarding the needs of initiative members, it is also essential for the information to be presented by a reliable and objective party (VNG, 2017).

3.3 | Indicators and Themes of Energy Justice

In the previous section the results of the conducted literature were presented. This section provides an overview of the identified indicators and themes in figure 3.3. Furthermore, the application and use of these indicators is presented in conclusion of this first part of the conceptual framework.

The Energy Justice framework presents a set of principles to aspire to. However real-world conditions make the conditions much more ambiguous. and imperfect. In the field of justice, it is argued that any notions of justice should allow responsiveness to context of political, institutional and societal realities (Sen, 2008). This research aims to illustrate how energy justice theory can be brought into practice. There are numerous ways how instances of energy justice can happen in practice. This research focuses on these occur through the system of sustainable renovation.

The indicators of energy justice presented in this chapter have been developed through a review of related scholarship. Based on searches of "energy justice" combined with the queries on "renovation", "community energy" "energy retrofit". The resulting literature was analysed, coded and categorized in accordance to the principles of energy justice in the three tenet framework. The goal of this development is the synthesis of an analytical tool, specifically adapted to the context on sustainable renovations.
In their research on the capacity of community energy initiatives to deliver energy justice, Hanke et al. (2021) developed themes and indicators used to assess energy justice (Hanke et al., 2021b). Although Hanke et al. (2021) provide very relevant and useful insights and indicators for the application of this thesis, the outcome of their research serves as the foundation of indicators, supplemented by insights as presented in section 3.3. A complete overview of the themes and codes used in the development of this framework can be seen in figure 3.3.

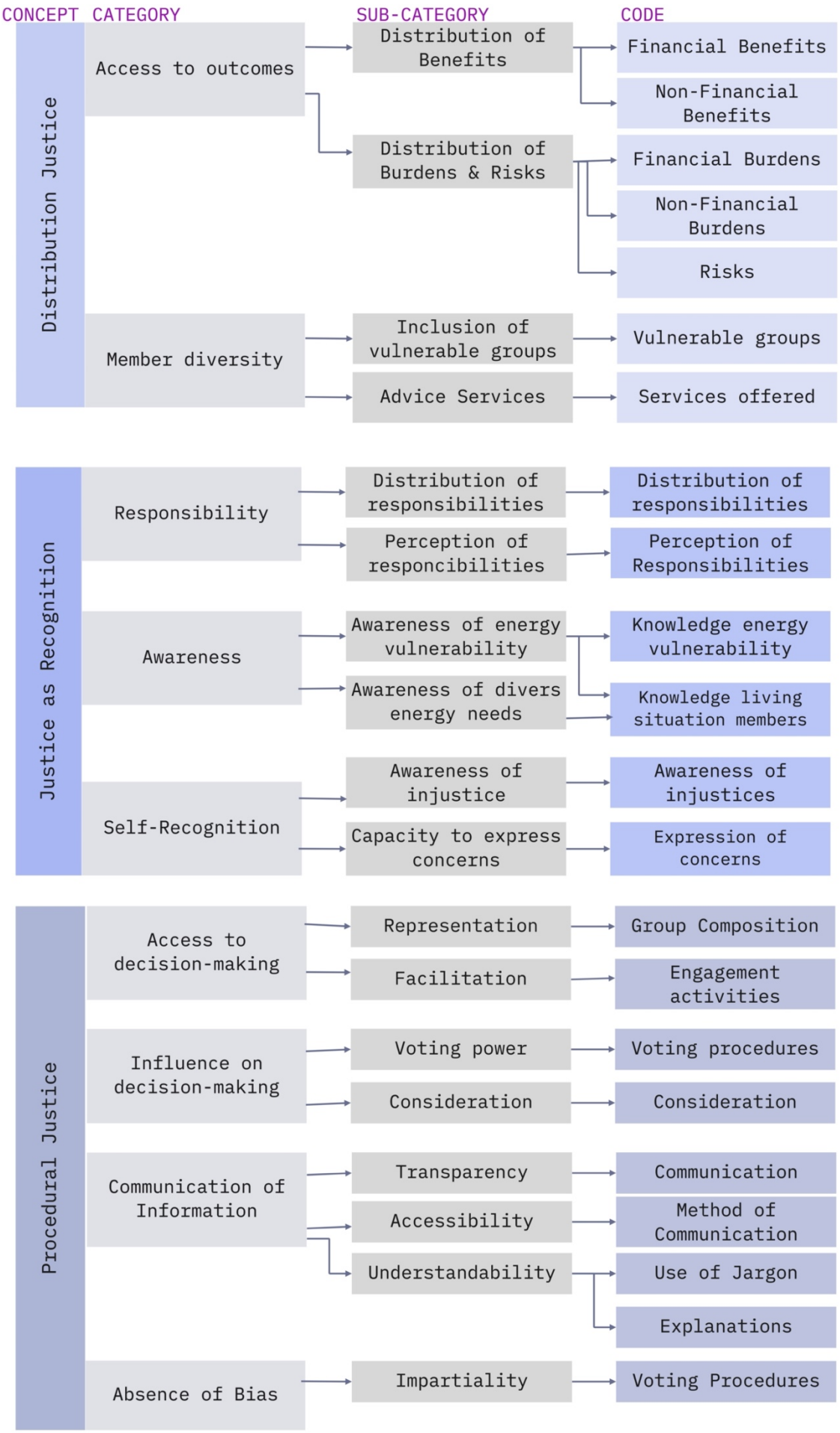


Figure 3.3: A complete overview of themes, categories and codes developed, structured according to the three tenet framework, own image .

3.3.1 | Contribution to the Conceptual Framework

Academic researcher have long been convinced of the opportunity provided by the energy justice framework to reveal and reduce injustices related to residential energy systems (Jenkins et al., 2020). However, as recognition is often named as the first step in actually achieving energy justice (Schlosberg, 2003), the development of practical responses to these identified injustices requires more than establishing parameters. In addition to identification, what is needed is the ability to define and describe the lived experiences of those affected by changes to the energy system (Hernández et al., 2022).
Thus, connecting this framework of evaluation that energy justice provides, to these lived experiences in a manner that is aligned with research evidence can play a crucial role in the delivery of justice.

This research addresses this challenge through the exploratory development of a framework that takes on the citizens' viewpoint to analyze the occurrence of injustices. The foundation of this framework is the user journey, which can be defined as 'a description of experiences where different touchpoints characterize the user's interaction with stakeholders and junctures characterize the user's interaction with a subject of interest' (Følstad & Kvale, 2018). The subject of interest in this case being energy (in)justices.
The literature review in the current chapter has defined the themes and key terms that indicate the occurrence of energy related (in)justices. The next step in conceptualization is therefore to develop the foundation to which the indicators can be attached, which can be found in chapter 4.

4

4| USER JOURNEY MAPPING

This chapter represents the second phase of the framework development and describes the user journey development as well as the synthesis of the combined 'justice-sensitive VvE journey'. First, the insights gained from analyzing existing journeys are presented as these shape the foundation of the journey map. Through this analysis generic elements in VvE processes as well as steps in sustainable renovation are identified, resulting in the identification of 6 consecutive phases in sustainable renovation as well as two moments of voting in which decisions are made collectively. Further analysis reveals factors which influence decision-making in the different phases as well as a preliminary set of barriers and motivators in the success of each phase. These barriers and motivators are verified and elaborated upon through interviews with several experts in homeowners' association management as well as experts in sustainable renovation. This yields a generic journey map of the stages which a VvE goes through in the process of sustainable renovation. Subsequently this chapter describes how this journey map is integrated with conceptual theory by deploying a lens of energy justice, as described in the previous chapter. The combination of this twofold framework development synthesizes a justice sensitive journey towards sustainable renovation of homeowners associations.

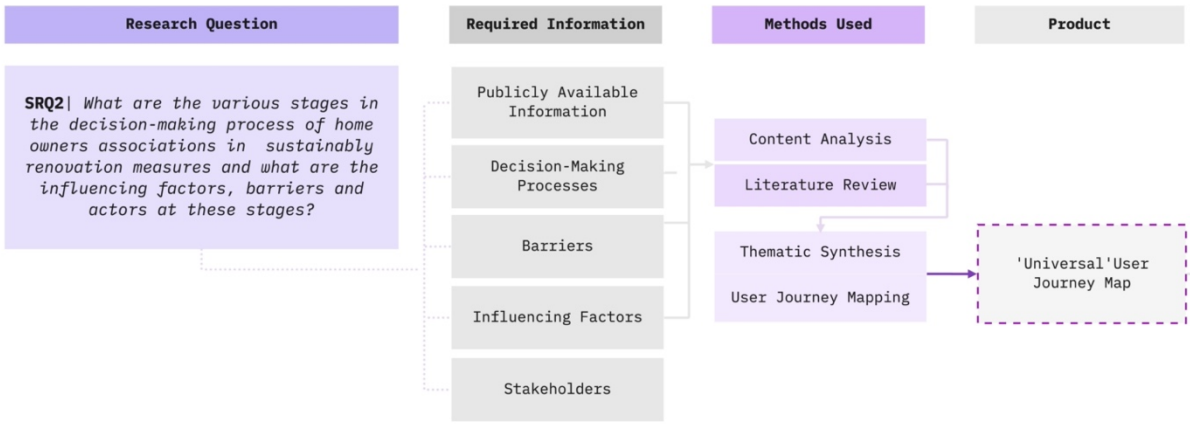
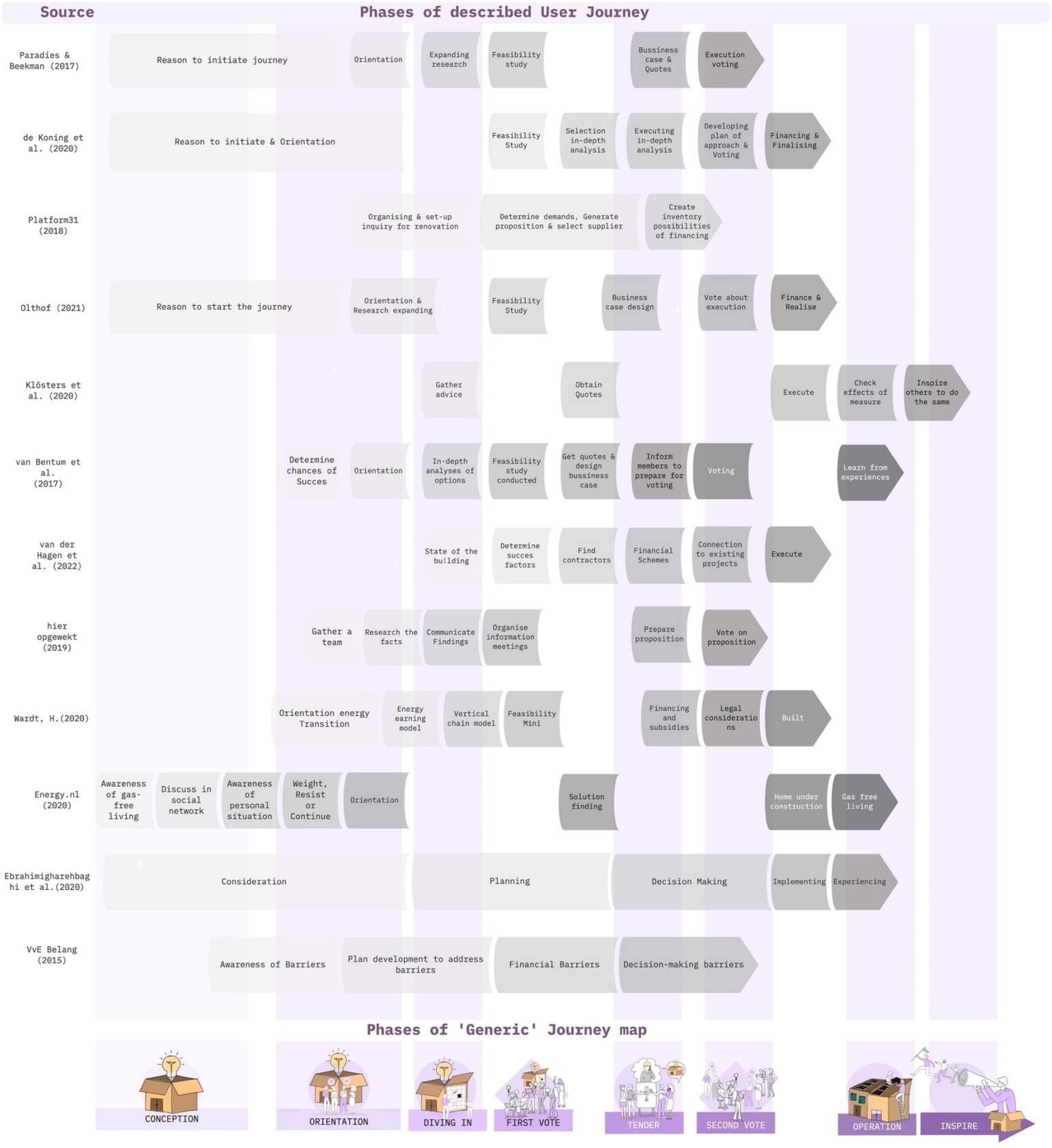


Figure 4.1: Research flowchart of SRQ2 (own image)

4.1 |Comparison of Journey Maps

This section provides the first insights at the barriers homeowners associations encounter in their sustainable renovation efforts by analysis of the decision-making process as described in a user journey. For this purpose twelve sources of documentation were deemed most relevant as can be found in table 4.1. All relevant sources described a different type of user journey, some targeting individual home owners decision-making processes (de Koning et al., 2020; Ebrahimigharehbaghi et al., 2020; Nieboer & Straub, 2018), others describe journeys for actors who aim to facilitate renovation processes (de Wilde & Spaargaren, 2019; Platform31, 2018; Uyterlinde et al., 2022) or specifically address VvEs (Lauteslager & van Gemen, 2018; Paradies & Beekman, 2017; Stroomversnelling, 2018; TNO, 2020; van Bentum et al., 2017). Through their respective research efforts a complete overview is found of the steps involved, the barriers in moving forward in the journey, the actors involved and the factors influence decision-making.

Table 4.1: Described phases of related user journeys from literature and how they lead to the generic user journey in this thesis



| Phases

The analysis of these different models starts with an in-depth look at the phases they describe as is shown in table 4.1. Although user journeys are typically depicted as linear processes, it is important to note this is not necessarily an accurate representation of the real-life experience as people could move forward and backwards as people go through their journey (Richardson, 2010). For a holistic view, different elements of these journeys are incorporate into a new universal user journey. Paradies & Beekman (2017) found that VvE most are likely to drop out of the trajectory of sustainable renovation within the first phases of the journey, when the transition into the next phase will involve making financial investments. This is confirmed in the research among VvE collaboratives (VEH, 2022b; Vereniging Eigen, 2019). For the purpose of this research project, it was therefore decided to focus on the phases that consequetively lead to the first moment of voting in a general meeting as shown in figure 4.2.

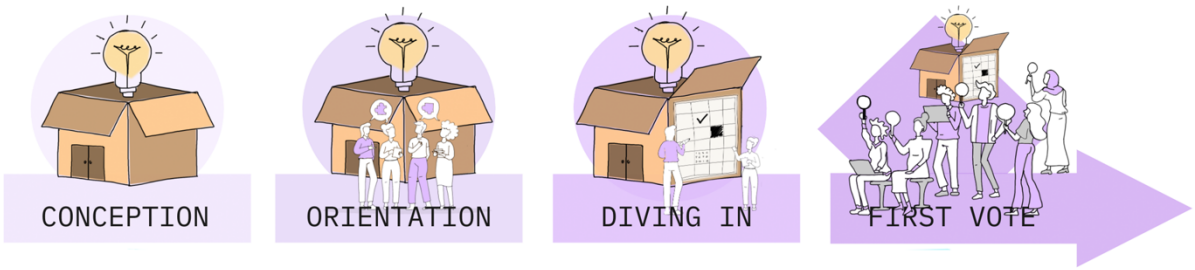


Figure 4.2: Visualization of the first three phases in the user journey, followed by the feasibility vote (own image)

This new journey begins with at the moment of awareness, the Conception Phase. Through comparison, a notable difference was found between individual or collective decision-making in regards to the onset of the journey. An individual homeowner usually initiates their journey with a phase in which they become aware of sustainable renovation possibilities, in this phase one of these possibilities is a collective solution. For some homeowners this could mean joining an existing energy community due to benefits such as reduction in complexity of the selection processes. Or in the case of a VvE, consideration of this possibility may be due to legal necessity (DRIFT, 2018). The decision-making of individual homeowners is depicted with much more consideration of how a homeowner becomes aware of sustainable renovation (Energy.nl, 2020). In comparison, processes for VvEs start from the moment of orientation, where the exploration of possible measures is instigated (Klösters et al., 2020; van Bentum et al., 2017); (van der Hagen et al., 2022). As research describes a barrier for individual homeowners in difficulties in making them interested in sustainable renovation (Ebrahimigharehbaghi et al., 2022), the Conception Phase includes these elements described in individual journeys, such as a reason to initiate, awareness creation, discussion in social groups and consideration (Energy.nl, 2020). The new user journey for VvEs is a combination of those of individual homeowners and those of energy communities and consist of aspects of both.

Following that argument, the conception phase is considered to be separate from the orientation phase. The conception phase mainly describes the consecutive decision-making of actors within the VvE, formulating the reason to embark of this collective journey (van der Schoor et al., 2021). In the second phase, the VvE has started their journey by investigating available measures and explore their specific possibilities. This step of the process is represented in all existing models, either through the specific activities or by the same name (Paradies & Beekman, 2017 ; van Bentum et al., 2017; (Energy.nl, 2020).
Where two phases are largely divergent, the Diving In Phase is one of convergence leading up to the first moment of voting in the general meeting. This is the vote in which a first proposal of a plan and potential measures are presented of which a feasibility is desired (Bakker, 2020). Therefore, this third phase consists of a deep-dive into possible scenarios of the project as it should become clear to members why this expenditure should be prioritized over other expenditures in the conclusion of this phase (VNG, 2017).
To create such a scenario, the driving member will need to acquire information on what available types of measures would be appropriate in their situation and find reliable contractors to compare. Therefore, this phase requires the project champion to interact with external parties in order to obtain reliable information.

Resulting in the first voting moment in a general meeting, the Feasibility Vote, where VvE members are presented with the outcome of the first three phases through the most promising scenarios (Energy.nl, 2020). Performing a feasibility study is an essential part of the majority of the analyzed journeys (Paradies & Beekman, 2017 ; van Bentum et al., 2017; Olthof, 2021; de Koning et al., 2020; Stroomversnelling, 2018). Because conducting such a study requires allocation of VvE funds which are not regullarly reserved for this matter, a vote is required (VNG, 2017). It is important in the presentation of the most promising scenarios to provide realistic insights into the actual costs, and the potential consequences in terms of benefits and burdens to enable objective and informed choices of the members (de Wilde & Spaargaren, 2018). Thus, the phases leading up to this vote are defined by this objective and will be elaborated upon in the following sections which describe the influences on decision-making as well as the specific steps of each phase.

4.1.2 | Actors in Decision-Making

A closer look at the stakeholders interacting with the homeowners' association are described from various points of view in the compared sources. As some are focused on A distinguishment can be made between actors already involved with VvE activities outside of sustainable renovation processes, actors in the public sector and actors in the private sector. The sustainable renovation decisions and initiation are driven by the homeowners, additionally larger roles are reserved for the VvE board and, where present, VvE managers (Mlecnik, 2021). Decisions can also be influenced by various intermediaries, for example financing institutions or contractors and architects. The influence of local municipalities and energy suppliers is also found the be considerable in terms of services offered, policies, subsidies and infrastructure (Platform31, 2018).

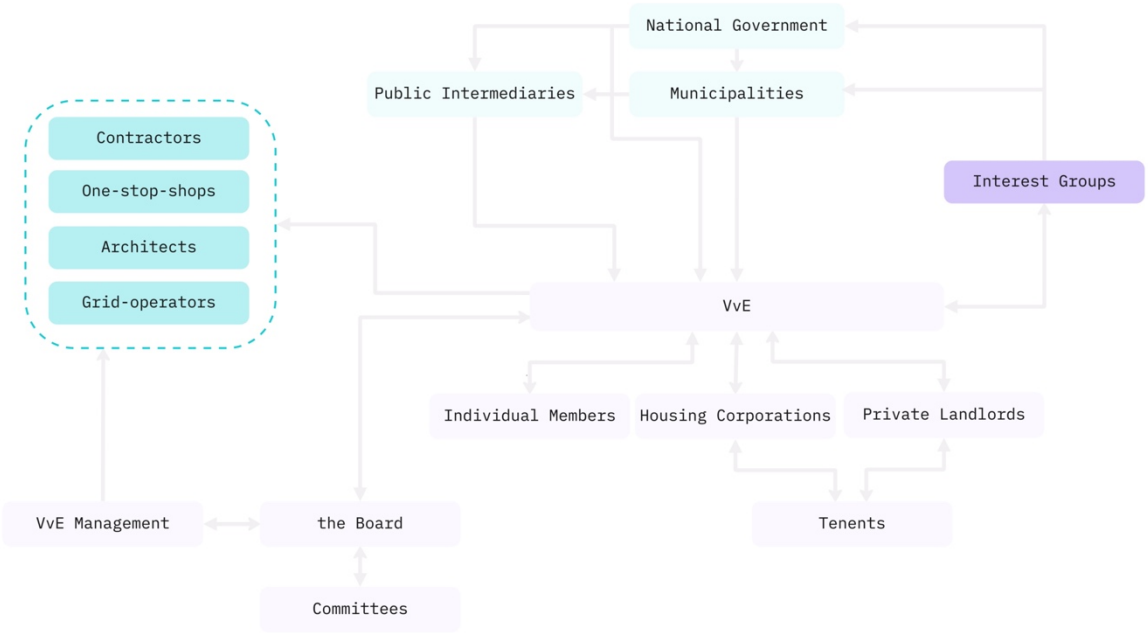


Figure 4.3: Simplified version of network of relevant actors in VvE decision-making (own image)
The connections between actors surmise various interactions such as policies, regulations subsidies, voting power, services etc.

Actors within the VvE (depicted in pink in figure 4.3)
As stated in literature review of section 1.2, VvEs typically consist two organizational bodies, the board and the general meeting (GM) as well as several committees with individual responsibilities of which the specifics can vary widely per VvE (Energy.nl, 2020; Vereniging Eigen, 2019). The GM is considered the highest organizational body as here all important decisions are made and a board is chosen. The implementation of these decisions falls under the responsibilities of the board, such as maintenance. Many VvEs outsource the management and maintenance tasks to private companies, listed as 'VvE Management' in figure 4.3. Although these are private-sector actors, for many VvEs they are an integrated part of their internal organization and thus fall in this category (VvE Belang, 2009). As not all VvEs consists of individual households as members, housing corporations and landlords are also listed here.

Public Actors (depicted in light blue in figure 4.3)
Actors in the public sector play a significant role in the general design of energy transition in the Netherlands. Although most influence is indirect, national government targets set the course of policies which partly shape the transitioning landscape. Through the local municipalities, more direct government influence is administered as they are tasked with the execution of policy measures on the neighborhood level. Government roll-out of programs such as 'Energiesprong' and 'WarmteFonds' birth the actor of public intermediaries (Platform31, 2018).

Private Actors (depicted in dark turquoise in figure 4.3)
VvEs often lack the capacity to fulfill all parts of a user journey without expert assistance (Paradies & Beekman, 2017) and gaps in knowledge and skills are often filled by the services of supply side actors, who often take on the role of intermediaries. Several studies reveal that not all consultancy of these actors is perceived as trustworthy by homeowners as they are not independent actors (Stroomversnelling, 2018; VEH, 2022b; Vereniging Eigen, 2019).

4.1.3 | Factors Influencing Decision-Making

In the decision-making processes specifically literature also describes several barriers to consider. For example, decision-making is sometimes obstructed due to a lack of information and knowledge (Ebrahimigharehbaghi et al., 2019), a lack of processes guidance throughout the user journey (Brown et al., 2019; Brown et al., 2018; de Wilde & Spaargaren, 2018), a lack in offering of complete 'unburdening' services (Ebrahimigharehbaghi et al.,2019; Mlecnik et al., 2019) or even due pre-existing conditions of lack of VvE management and coordination of the involved processes (Weijnen et al., 2018). Moreover, decision-making is found to be influenced by the perceived inconvenience of the renovations and its impact on residents comfort of living and the duration they expect to inhabit the building (van Middelkoop et al., 2017; Vringer et al., 2016). Other factors include the residents' age, Schilder (2019) found that elderly Dutch citizens have a considerable amount of power as they typically are homeowners with an above average level of income, yet they are much less likely to make renovation investments (Schilder, 2019). Furthermore, the level of trust in the provided measures and the associated supplier influence the decisions, where the experience of homeowners' who have previously renovated their home is considered to be highly trust worthy (Steenbekkers et al., 2021). Steenbekkers (2021) proposes motivating, informing consulting and supporting interventions in the decision-making process could potentially overcome some of the barriers addressed. Additionally, their research shows potential of utilizing homeowners' social environment to influence the decision (Steenbekkers et al., 2021). Examples of this can be found in the ambassadors' function of pioneering homeowners or VvEs, who have already implemented sustainable renovation measures and can share their positive experiences to inspire others (Wolske et al., 2020). In the context of collective decision-making such as in the VvE structure, group dynamics are a large influence which could pressure less motivated residents to take action (Cattaneo, 2019). Especially face-to-face interactions with people within a homeowners direct network are found to effectively influence people's decisions (Mlecnik, 2021). Especially as it is shown that VvE members account for the (known) preferences of others in their personal decision (Tiellemans et al., 2021). As the perceived preferences of fellow members increases the utility assigned to the proposed scenario, a more divided opinion among the VvE will lead to decision-making from a more individual point of view (Tiellemans et al., 2021).

4.2 | Barriers in the journey

Besides phases, actors and factors a user journey typically includes a descriptions of the barriers that a user is likely to encounter throughout the various phases of their journey (Følstad & Kvale, 2018). Thus, a barrier in a user journey can be seen as an obstacle that prevents a user from continuing their journey by moving on to the next phase (Nieboer & Straub, 2018). In the VvE user journeys there both general process related barriers as well as collective decision-making barriers to be recognized (Ebrahimigharehbaghi et al., 2019). Both of which will be discussed in this section. These barriers are later incorporated into the universal user journey at their associated phases in section 4.3.

4.2.1 | Transaction Cost Barriers

Ebrahimigharehbaghi et al. (2019) describe so-called transaction costs as barriers associated with different phases of renovation decision-making. The main barriers were found to occur in the (their defined) consideration, decision, and execution phases among a survey of 3,776 homeowners in the Netherlands (Ebrahimigharehbaghi et al., 2019). Specifically in sustainability driven decision-making, difficulty of finding energy efficient measures was found to be the main barrier. The survey respondents typically consulted maintenance and installation companies for information. The complexities of finding the right information comes at a costs of time, effort and general 'hassle factors' (Ebrahimigharehbaghi et al., 2019). This barrier is most influenced by the level of knowledge of the homeowner regarding the following topics (Ebrahimigharehbaghi et al., 2019) :

- sustainable measures;
- the state of the building;
- building a business case;
- requesting quotes;
- where acquire information;
- how to judge information;
- negotiating with market actors.

4.2.2 | Barriers in Collective Decision-Making

The collective decision-making in VvE structures comes with advantages as well as disadvantages over individual decision-making. The collective user journey is found to be not as linear and unambiguous as those of individual residents (Klösters et al., 2020; van der Schoor et al., 2021). This is attributed to the observation that collectives have to deal with many more stakeholders and associated dependencies than individual residents do (Klösters et al., 2020). As many stakeholder must be united and aligned, the presence of a leader is found to be an especially influential factor to the initiative's success (Paradies et al., 2017). Paradies et al. (2017) ads to this that it is important for residents to be in equal phases of their individual decision-making journey to make an informed, collective decision. Therefore a leader should be aware of residents individual pace of decision-making (Paradies et al., 2017). To accommodate individual VvE members, attention should be placed on enhancing communication within the VvE by involving members in the processes especially to account for diverse living situations of members and diverse needs (Klösters et al., 2020). Therefore the following barriers will be considered during the empirical part of the research, in the context of collective decision-making:

- Number of members present at GM to vote
- Communication within the VvE
- Resident involvement
- Leadership presence
- Individual pace of decision-making

4.3| Universal User Journey

The previous section describes the various elements that influence the user journey, the actors involved and the barriers that must be overcome to move onto the next phase. In this section the universal user journey is presented as a result of integrating the information provided by literature. Additionally, the energy justice lens provides a first conceptual insight of touchpoints between the user journey steps and capacity for energy justice. The corresponding justice indicators are incorporated in the user journey overview as they indicate the presence of a touchpoint where the capacity of energy justice could be increased or challenged. The synthesis of the 'universal' VvE user journey towards sustainable renovation provides the conclusion of this chapter.

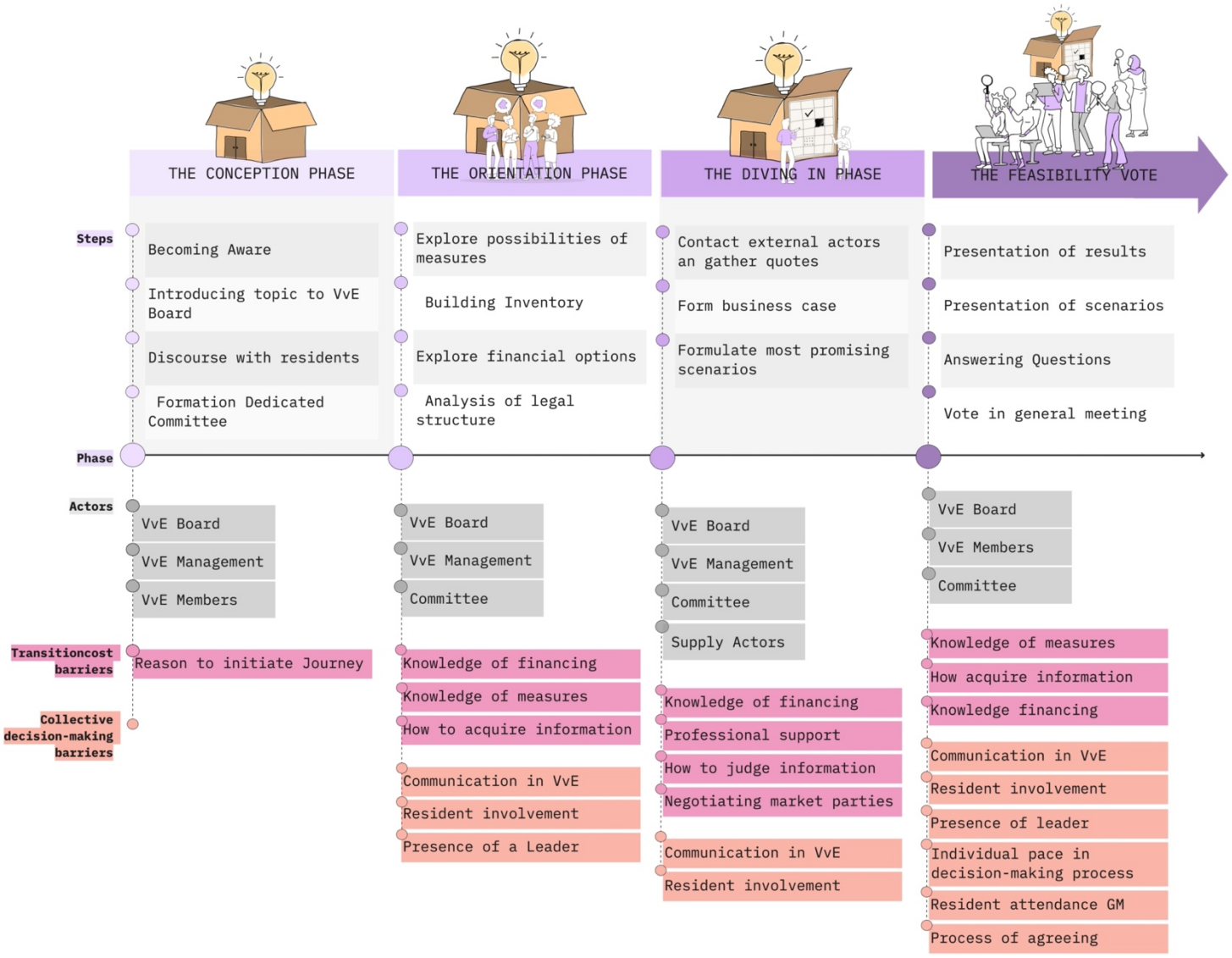
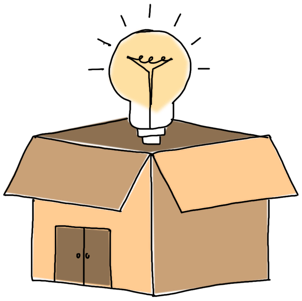
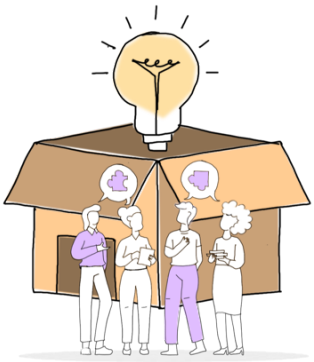


Figure 4.4 overview of universal VvE sustainable renovation user journey (own image)



4.3.1 | The Conception Phase

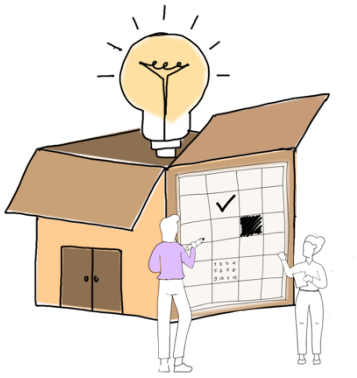
The phase of conception starts from the moment a VvE resident is motivated to initiate the collective process of sustainable renovation. This could be internally motivated to decrease living costs or cause by environmental concern, or externally motivated by subsidy schemes or municipal programs. As sustainability improvements is not a standard element element in VvE maintenance, the topic must be presented to the VvE Board by the initiator. Thus, the steps taken in the conception stage can be defined as becoming aware, introduction of topic to VvE Board, initiate discourse with residents and formation of a dedicated committee. This initial phase is notably absent of explicit barriers, besides the incurrence of a reason to start the journey. Notable factor of influence in are the presence of a leader, this could be a VvE member, board member or external party.



4.3.2 | The Orientation Phase

After the project is initiated, the Orientation Phase is dedicated to the exploration of the possibilities of sustainable renovation for the VvE. This exploration falls typically under the responsibility of the board, which the board could delegate to the dedicated committee or when applicable the VvE management. It is also during this phase that part of the orientation is to acquire the assistance of an intermediary. The orientation phase is associated with several of the mentioned transition cost barriers. As information is gathered, the level of knowledge of the project champion(s) and the board could form a barrier. Not only needs the relevant information be found, but trade-offs also have to be made. Although the collective decision-making only truly takes place in the GM during the first vote on the feasibility study, related barriers can arise at earlier stages. Presence of a leader is relevant at the associated tasks are expected to be performed. Resident involvement and internal communications are relevant at this stage as all voting members are expected to be at equal stages in the decision-making process in the feasibility voting, thus the lagging members must be taken along in the journey.

4.3.3 | The Diving-In Phase



To this end preliminary quotations are requested, as the feasibility of a sound business case is found to be a particularly influential factor in this phase (Paradies & Beekman, 2017). Although the business case will have a limited amount of detail in this stage, the outlines of the feasibility of the potential measures are explored. In the case these preliminary estimates do not match the desires of the members, the board may choose not to present the scenario but continue explorations into a different direction (Roelofs et al., 2021). In this phase many of the transaction cost barriers associated with the previous phase stay relevant, but are joined by those barriers which arise in engagements with private actors. These actors are mainly suppliers who's advice and quotes have to be analyzed in order to present the VvE members with the most promising scenario, as such negotiation, information judgment and professional advice shape potential barriers.

4.3.4 | The Feasibility Vote

A general meeting is the first official moment of discourse between the project leader(s) and the VvE members. This moment will reveal how well the previous phases have been executed and how successful the project champions have been in communication with the residents. Foremost by the numbers in which the meeting is attended, which is crucial due to the minimum required attendees for a valid vote. At this moment it is also important that, in spite of the individual decision-making pace of members, they all arrive at equal stages of their process. This can only be achieved through resident involvement and engagement activities at earlier stages in the process and various degrees of knowledge sharing.

4.3.5 | Key Findings | Conclusions

Even at first glance, the overview of the user journey in figure 4.4 shows the distribution of barriers and associated energy justice touchpoints leans heavily towards the voting moment. This observation is interesting as many of the barriers arise after completing steps in the previous phase moments in the journey that directly lead to the barrier arising. For example, the step of 'Discourse with residents' in the conception phase, directly affects the barriers of 'communication in VvE' and 'resident involvement' in the orientation phase. This suggests that the journey should be undertaken with an holistic mindset that considers the upcoming steps.

4.4| Intermediaries place in the User Journey

Literature showed 'professional support' as a transaction cost barrier in only the third phase of the user journey (Figure 4.4). The reviewed existing user journeys typically address involving intermediaries at a stage where quotes need to be obtained and compared, describing their role as connecting homeowners to supply-side actors (de Wilde & Spaargaren, 2018). However, literature specifically focused on intermediaries describe a larger role for this actor.

Kivimaa & Martiskainen found intermediaries to be most contributing to sustainable renovations through their facilitation of individual projects (Kivimaa & Martiskainen, 2018). Specifically for homeowners associations it was found that customized guidance is needed to steer their maintenance decisions towards the inclusion of sustainability improvements (Mlecnik, 2021). Process guidance is mentioned as an essential solution for VvEs to arrive at the point in the user journey where measures are taken. Companen (2015) finds this process guidance is best provided by external expert or by VvE management. Therefore consideration of intermediary action is important in the discussion of the results, to aid the VvE in overcoming the barriers.
This addressed by Wilde & Spaargaren (2018), who have designed a journey from the perspective of an intermediary in sustainable renovations as depicted in figure 4.5. They describe six main touchpoints in which intermediaries can aid the VvE in their process.

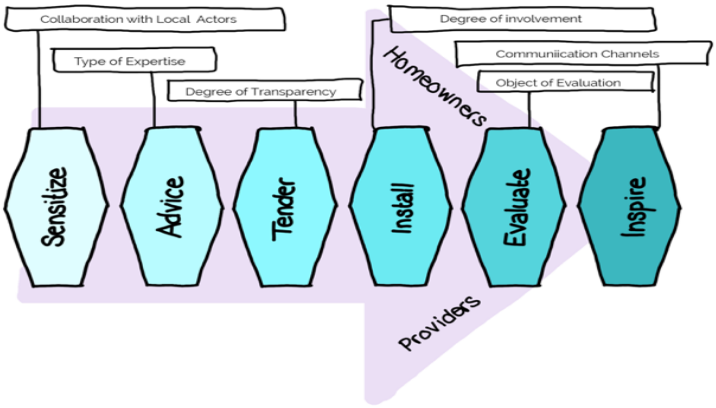


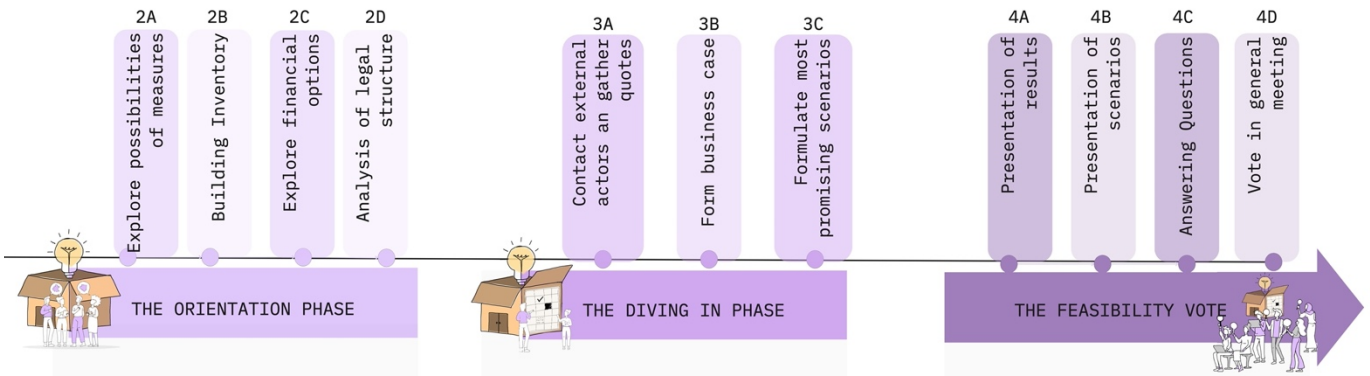
Figure 4.5 Intermediary customer-journey design with six basic touch points (de Wilde & Spaargaren, 2018). Adapted by author.

For the selected user journey phases in this thesis, the associated intermediary stages of "sensitizing", "advising" and "tendering" are considered. In the conception phase, the intermediary is advised to sensitize the homeowners to the concept of sustainable renovations. During the orientation phase, the modelled intermediary's actions are to advice individual homeowners in the measures and contractors to consider. In the equivalent of a diving-in phase, the intermediary actions are to create transparency during the tendering of offers from supply side actors (de Wilde & Spaargaren, 2018). This journey is modelled after intermediary interactions with individual homeowners and does not directly provide barrier mitigating conclusions for a VvE journey. However, this model will be used in the analyses of the empirical results to provide similar points of intervention in the VvE user journey. Adapted from these insights is figure 4.5 which shows where in the user journey the VvE is best aided by intermediary actions.

4.5| CONCLUSION OF CONCEPTUAL PART

This chapter concludes the theoretical underpinning of this research. The theorical conceptualization of the described universal VvE user journey shows several key barriers in the decision-making processes of VvEs regarding sustainable renovation investments.
With the conclusion of the two-fold development of the conceptual framework, the next step is to move beyond theory to empirical research. The aim of putting the conceptual framework to practice is to assess the relation between the energy justice indicators and the established user journey.
The next portion of this thesis describes the empirical elements of the research, the case study results and expert interviews. The gathered data on user experiences are examined through each corresponding, identified phase. Furthermore, the data was coded thematically with the theme developed in chapter 3. With the objective to evaluate the relation between the user interactions in each phase and the identified justice components.

The application of the energy justice framework to the Numansgors' user journey map as a lens, reveals where in the user journey junctures exist with aspects of energy justice. These junctures represent risks and opportunities at which the capacity for (in)justices is affected. Based on the resulting findings, opportunities are then proposed to advance the user's journey while reducing its capacity for injustices.
In the following part of this thesis, the case study in Numansgors, the factors, actors and barriers as mentioned in the user journey provide the variables for the empirical research. The combined conceptual framework aims to provide a tool of analysis through which intermediary strategies to overcome process barriers while increasing the capacity for energy justice can be found.



VvE Board	VvE Board	VvE Board
VvE Management	VvE Management	VvE Members
Dedicated Commitee	Dedicated Commitee	Dedicated Commitee
	Supply-Side Actors	
Knowledge of financing	Knowledge of financing	Knowledge of measures
Knowledge of measures	Professional support	How acquire information
How to acquire information	How to judge information	Knowledge financing
Communication in VvE	Negotiating market parties	Communication in VvE
Resident involvement	Communication in VvE	Resident involvement
Presence of a Leader	Resident involvement	Presence of leader
		Individual pace in decision-making process
		Resident attendance GM
		Process of agreeing

Figure 4.6 | visual representation of the conceptual framework as a canvas

EMPIRICAL RESEARCH

In this portion of the thesis report the results of the empirical research is presented. By means of the research questions discussed in chapter 1 and the framework developed in chapters 3 and 4, the empirical part of this research entails a case study that is conducted to test the framework by bringing it into practice in order to gain insight into what extend this practical tool can be applied to reveal the areas where potential injustices may occur. With the goal of finding a strategy for intermediary actors to address these issues within the user journey. Through this case study approach SRQ3 is answered in this chapter. In the discussion, the remaining SRQ4 and SRQ5 are answered before finally answering the main research question in the conclusion (figure 5.1).

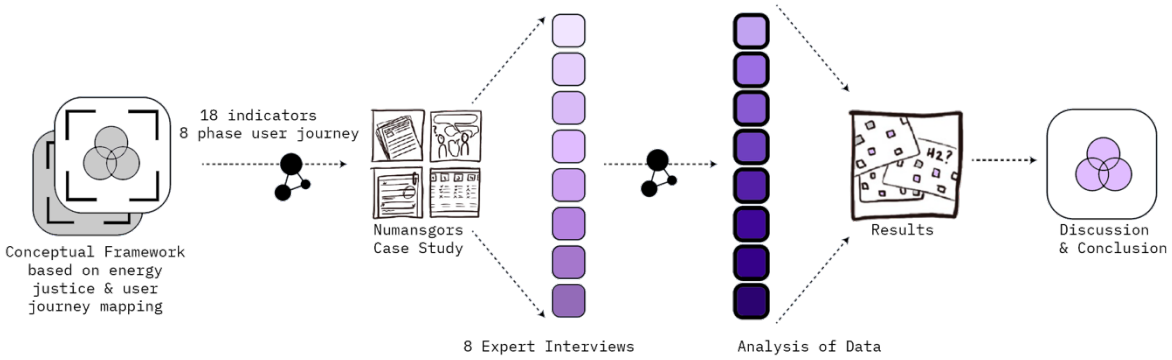


Figure 5.1: Visualization of research flow of this empirical part of this thesis

The results of the empirical research are presented in two sections; The case study results and the results of intermediary interviews.

First is the section on the Numansgors case study, the results of which are presented through their user journey. The collection of data regarding the energy transition in Numansgors took place between March and November of 2022. Over this period semi-structured interviews were conducted with various stakeholders, including members of Gors2025, representatives of municipality of Hoeksche Waard. Additionally several information meetings were attended, observations of which were used to strengthen the interview data. Furthermore, an analysis was performed of the data obtained from a survey conducted in April 2022 among Numansgors residents and material related to the organization of the project was analyzed; this included online information, the PV panel

masterplan, the deed of division, presentation materials of stakeholders as well as demographical data. The interviews provided valuable insights into community perceptions that are difficult to capture from the diagnostic documentation. The survey and interview data were deepened by observations made during two information meetings that were held in Numansgors in March and November of 2022. As described in section 2.2.5, a combined survey was administered among the 201 households in Numansgors. The resulting raw data, gathered by (Chen, 2022) were repurposed in analysis for this thesis research. The anonymized raw data was then analyzed with the main objective of gaining insight to resident needs through thematic analysis of the factors influencing decision-making.

This section describes the findings as a result of this analysis. The survey, "Wat zijn de woon- & duurzaamheidswensen van de bewoners van Numansgors" (What are the living and sustainability desires of Numansgors Residents) was administered in Dutch, taking respondents approximately 30 minutes to complete. The topics of the survey questions and number of questions are shown in Appendices E1 and E2.

The journey of collective sustainable renovation for the VvE Numansgors is mapped 'as-is' meaning the map provides insight into the processes, barriers and actors as they have occurred in the case study project. These insights are then analyzed through the energy justice lens to contextualize the barriers and identify opportunities to address process related barriers in a way that increases the journey's capacity for energy justice.

Secondly, the analysis of the expert interviews provide insights into the current state of intermediary aid, in what way energy justice is addressed as well as directions of potential strategies for intermediary actors to mitigate the revealed challenges and injustices. These experts were chosen based on their experience with sustainable renovation in VvEs or their experience with process guidance of VvEs. Thirdly, the results are presented of the energy justice analysis as they reveal the junctures in the user journey that could potentially influence the energy justice capacity of the user journey.

5

5 | CASE STUDY RESULTS

This chapter provides the interview results from the case study. The results that were retrieved through the analysis of interviews with stakeholders. The stakeholders that were interviewed are members of the dedicated committee GORS2025, who were contacted through researchers of Wageningen University and a representative of the municipality of Hoeksche Waard. The aim of these interviews is to create insight into the processes towards sustainable renovation in Numansgors from the first phase of the user journey, conception. Apendix C provides a description of the interview guide that was used to maintain a line of questioning. From these interviews the universal user journey framework was applied to reveal the barriers encountered and steps taken to capture the range of perspectives of the case study. This is followed by a stakeholder analysis in section 5.4 before the results of an analysis of the user journey's energy justice implications are presented in section 5.5 Then conclusions are drawn on the challenges and opportunities revealed by the proposed framework in the final section of this chapter.

5.1.1 | Interview Set-up

To create an understanding of the decision making processes, the challenges encountered, the influencing factors and involved actors in each phase as well as to account for the uniqueness of individual VvEs, knowledge is gathered from the experiences of the responsible committee GORS2025. In their role of project champion, the analysis of their experiences contributes to the understanding of the project processes leading up to collective decision-making. The analysis of the resulting data through the framework, thus allowing for insights on; where the potential challenges lie for limited capacity for energy justice in the journey towards sustainable renovation.

Then, interview with a municipality representative provided insight into their role in the processes and vision on further engagement. The semi-structured interviews allowed for conversation to flow naturally on the relevant topics, thus enabled finding unexpected results. However, a standardized list of questions was written for each stakeholder type and can be found in Appendix E. Interviewees were invited to the interviews per e-mail and received a consent form to sign in advance which can be found in Appendix E. This form was signed in advance of the meeting to ensure informed consent of the participant. The stakeholder interviews were constructed following a technique of Sanders & Stapper (2012) in which participations are first asked questions regarding present state of the project, followed by past experiences and leading to finally future expectations (Sanders & Stappers, 2012). Table 5.3 shows an overview of the interviewees and their respective referencing in the further presentation of the interview results.

Table 5.1: Interviewee references Numansgors

Reference	Organization	Field of Work	Role in organization
G1	Gors2025	Sustainability committee of VvE Numansgors	Gors2025 member/ resident
G2	Gors2025	Sustainability committee of VvE Numansgors	Gors2025 member/ resident
G3	Gors2025	Sustainability committee of VvE Numansgors	Gors2025 member/ resident
G4	Municipality Hoeksche Waard	Municipal Government	Energy Coach

5.1.2 Analysis of Survey Data

As described in section 2.2.5, a combined survey was administered among the 201 households in Numansgors. The resulting raw data, gathered by (Chen, 2022) were repurposed in analysis for this thesis research. The anonymized raw data was then analyzed with the main objective of gaining insight to resident needs through thematic analysis of the factors influencing decision-making as presented in section 4.1.1. This section describes the findings as a result of this analysis. The survey, "Wat zijn de woon- & duurzaamheidswensen van de bewoners van Numansgors" (What are the living and sustainability desires of Numansgors Residents) was administered in Dutch, taking respondents approximately 30 minutes to complete. The survey questions and summary or responses van be found in Apendix C. The survey data provides insight into the experience of the respondents of the processes regarding sustainable renovation. These experiences are analyzed to which they influence decision-making in V1, the first voting moment in the user journey.

The survey collected a total of 47 responses, of which 1 duplicate response. Of these total effective responses, 24 were administered and digitally and 23 respondents submitted a paper questionnaire. The survey included several open-ended questions and written comments as well as multiple choice questions. The number of respondents, 46 responses out of 201 households, was deemed insufficient to provide a statistically valid overview thus quantitative analyses of the data was not considered (Israel, 1992). Therefore qualitative analysis of the data was performed through the categorization by the present categories of factors influencing decision-making as described in table 5.2

Table 5.2: Thematic analysis of survey data

Factor Influencing decision-making		Related Barriers
I	Information Needs & Knowledge Base	TC: Knowledge of financing TC: Knowledge of measures TC: How to acquire information
II	Individual energy needs	TC: How to acquire information TC: Knowledge of measures
III	Perceived impact of renovations	TC: How to judge information
IV	Comfort of living	
V	Expected duration of habitation	DM: Resident attendance GM DM: Resident attendance Information meeting
VI	Demographic Factors	DM: Individual pace in process DM: Communication in VvE DM: Resident Involvement
VII	Social Environment	DM: Communication in VvE DM: Resident Involvement
VIII	Pioneering Residents	DM: Communication in VvE DM: Resident Involvement DM: Presence of Leader
IX	Diversity of opinions	DM: Communication in VvE DM: Resident Involvement DM: Presence of Leader DM: Individual pace in process

5.1.3 | Observations

In additional to the interview and survey data, observations made by the author during two of the information meetings held at Numansgors were used to strengthen the data. These observations were made in the information meetings organized by Gors2025 on march 24th and November 24th. These observations have provided insights into the attendance of the meetings, the engagement of the residents, the questions that were asked as well as the substantive information provided by the speakers of these meetings, After the meeting, the presentation slides and minutes were provided by the organizing party for further reading.

Photo taken in the common building in Numansgors during the information meeting in November (source: Gors2025)

5.2 | The Numansgors' User Journey Map

From combined data the universal user journey can be used as a canvas to map out the Numansgors' experiences. This journey is mapped to provide insight into where the intersections lie between strategies towards sustainability, the experiences of the residents and the associated energy justice implications. These strategies aimed to overcome process barriers provide opportunity as they can intertwine successfully with strategies to increase the journey's capacity for energy justice. This section presents the results of the performed case-study research through the description and analyses of their user journey towards collective sustainable renovation. .

5.2.1 | Numansgors: The initial Picture

In the 1980s the architects Van den Broek en Bakema in Rotterdam were commissioned to design a widely varying plan of 200 luxury recreational apartments on open water, in which the emphasis had to be placed on the individual character, on the outside as well as the inside of the apartments. Individuality and exclusivity are therefore the characteristic features of the homes. All houses in the park are built in the same style and shape. There are three variations of details among the homes, though they remain almost identical in terms of main mass. Sketches of the three types can be found in figure 5.1.

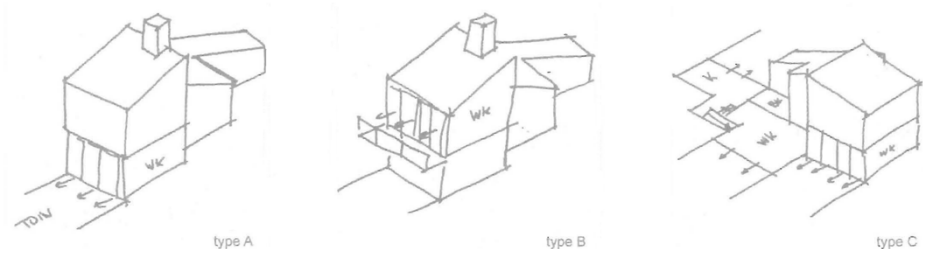


Figure 5.1: Sketches of the typology of the Numansgors houses (van den Broek, 2005)

Since the built of the residential park, the shift from a luxury holiday destination to most permanent residents has brought with it a tumultuous history of management.
Although all properties on the terrain are contractually subject to the VvE, it has proved difficult to maintain the demanded quality of the architect's original aesthetic intact. With the arrival of new residents often come with renovations that may test the homogeneous appearance in which the recreational homes were designed. One resident recalls haphazard renovations that affect the rhythm out of the facades in a 2012 magazine article (gebiedsontwikkeling.nu, 2012). Although the VvE has set up a supervisory committee to oversee and approve renovations, disagreements between residents still exist regarding the aesthetic fragmentation.
The VvE board in Numansgors is comprised of one resident who is compensated for their work and several VvE boards have resigned over the years due to social and administrative complications. In recent history a VvE board resigned due to a conflict regarding sustainable renovations. In 2016, when seven residents took it upon themselves to equip their home with solar PV panels which wasn't appreciated by fellow residents who felt that the addition to the roof cause aesthetic fragmentation of the park. A lawsuit followed, won by the residents, resulting in the judge's approval of the solar panels and a change in management and the previously selected appointed advisors. Finally, the 'Zonnepaneelplan' was brought into effect through a general meeting which stipulates dimensions of pv panels allowed on the roofs. This plan was adopted with an 80% majority vote and currently over 33 houses are equipped with solar panels.

This situation was able to worsen as, in contrast to the average VvE, the apartment rights in Numansgors stipulate that the houses are all private property. This includes the roofs, outer walls, floors, and windows. Interestingly, the current situation in Numansgors resembles much of what was suggested by VEH because of their research where they argue for VvE members to be enabled to independently implement sustainable measures (VEH, 2022b). Yet the conflict instigated by this independent action also resembles the predicted chaos (Kret, 2022). Therefore, it can be argued that, although Numansgors may not be a broadly representative VvE, they do provide an especially interesting case study in context of the current problem definition. The situation in Numansgors is party representative of both scenarios, that of individual action as well as that of collective action. As the dedicated sustainability committee explores both options, their investigations provide insight into the possible consequences or either situation.

Figure 5.2: Layout of the Numansgors Park (van den Broek, 2005)

5.2.2 | The Conception Phase

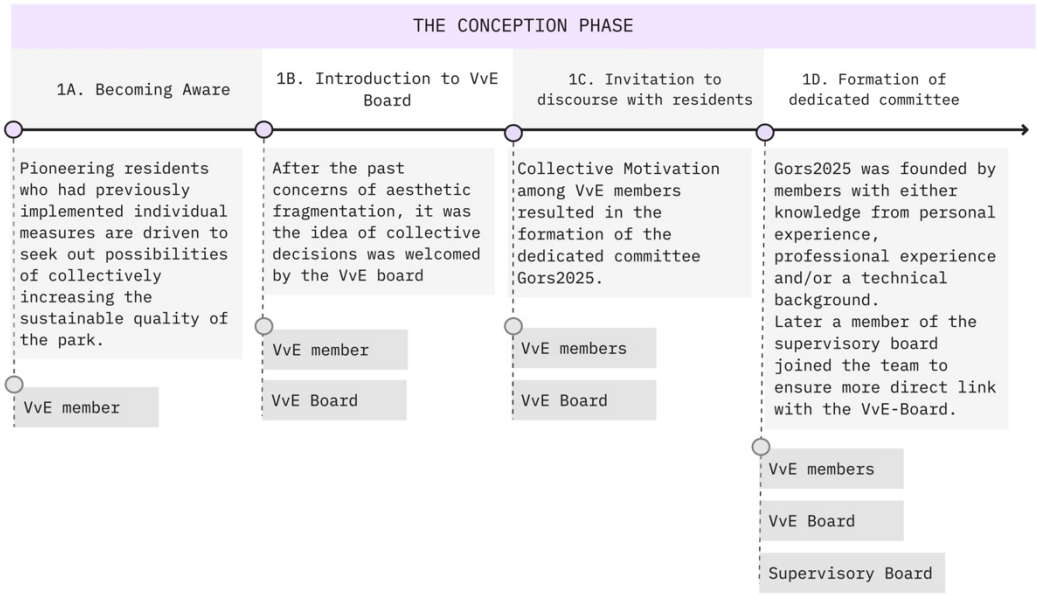


Table 5.3: Summary of the conception phase in Numansgors

As shown in table 5.3 the VvE user journey starts with the awareness of a member, who the initiates the project and sets off the conception phase of the user journey.

In Numansgors the conception phase was initiated by the need for a collective decision regarding individual housing renovations. Due to the differences in value between residents regarding the aesthetic fragmentation of the park's appearance after pioneering residents had equipped their homes with solar PV panels, the need to address sustainable renovation collectively was introduced to the VvE Board. This was initially only to prevent any further disagreements among residents but grew into the conception of collective journey towards sustainability for the park. To this end the Gors2025 committee was installed to investigate ways 'Gors' can move into a gas-free future and can actively contribute to reduce energy consumption. The new VvE Board was more receiving of sustainability efforts and approved the instalment of the dedicated committee. The Long-Term Maintenance Plan (MJOP) also plays a part in the motivation as planned maintenance of collective plumbing is taken into consideration.

"there was a disagreement, with the […] the VvE Board in the past regarding the PV panels. Because of this, we tried with our project Gors2025 to try to create a more common understanding within our community that we can all contribute to using less fossil fuels and electricity. So there is now a broader perspective, beyond the PV panels, where we aim to get everyone in the same direction." (G1)

Resident Discourse

In terms of inviting discourse with residents, survey respondent noted a preference and likelihood to inquire with neighbors and friends regarding their experiences with sustainable renovations and that they place high value on the [informal] information exchange within their community. The residents experienced Numansgors as a social

environment, both in interviews and survey responses this is highlighted to be made aware of options for home sustainability through inspiring examples within their social environment.

" [...] as long as we can start creating some awareness and make people make think about, what can they do themselves to cut down on the consumption of gas and electricity. Then automatically, things will start changing." (G3)

"Most people now only considering renovation for more comfort. What we want them to know and do is that even when they renovate for comfort, they can take energy use and sustainability into consideration, that's it. And they will benefit from that in the end." (G2)

Awareness

Motivations and awareness of sustainable renovation measures varied among residents, such as a desire for independence from the volatile energy-market and to increase the value of their home for selling. One interviewee argues most renovations that are performed within the community are motivated by comfort.

"No, I think, I think everybody here is very aware of the realities of environmental issues, they hear about it, it is hard to avoid. But comfort of living is still very important and people think they would have to compromise that." (G2)

"Newcomers usually renovate their new homes, new kitchens and bathroom etc. [...] so I asked them how they had planned insulation, but they had never even thought about it! That seems like a big missed opportunity and I wish we could have talked about it before." (G3)

5.2.3 | The Orientation Phase

With the founding of Gors2025, the responsibilities associated with the investigation into renovation measures was allocated to the committee members. Gors2025 then carried these responsibilities into the orientation phase. This phase is comprised of activities to create insights for decision-making. Financial insights, insights into energy consumption, awareness of benefits of a more sustainable home, both in terms of comfort as financial and environmental. As it is not pre-determined what measures would be most suitable in Numansgors, information is sought out by the committee members through the internet, local energy information points (energie loket) or through personal experiences as the Gors2025 members are equipped with technical knowledge of measures, renovations and financing due to their professional expertise, as such they were able to perform relatively in-depth analysis of possible measures without the involvement of intermediaries.

"We came together because of our collective knowledge base. You see, [Gors2025 member] has great knowledge about insulation, because they have renovated their house very sustainably, very innovative. [Gors2025 member] is very familiar with Aqua thermal energy generation, getting electricity from water." (G1)

Building Inventory

The majority of survey respondents did not have any information on the energetic quality of their homes. The respondents that did know, inhabit homes that were labeled A or B after either recent renovations or they were responses by residents who had more recently moved in. Among respondents that had been living in the park for over 10 years, less information was available regarding the energetic quality of their homes, but had experienced thermal discomfort as well as annoyance towards their energy bills. Interviewees suggested this could be related to the relatively high age demographic in Numansgors, with the majority of residents being over the age of 50 and a lack of young families in the park.

"Yes uhm, I think the most of the people are about our age around 50 plus and live in couples. There are hardly any young families on the grounds, as the houses are relatively small [..] The younger generation is much more aware of the need for sustainability, the older people seem to prioritize comfort and don't want to invest too much in the far far future." (G1)

"[..] there's a majority of older residents. They are older, and I think, uh, they don't realize their houses could be better. […] last year, many houses changed owners, and those new owners, [..] they immediately make changes to the house, they bring in more insulation and new heating systems. So I think, that these renovations are going to happen at some point anyway." (G2)

Professional Support

Options are explored for collective purchasing (of PV Panels for example) as well as collective energy generation. Despite their relative expertise, the committee forged a partnership with the local municipality Hoeksche Waard, who became actively involved in the project. The municipality HW has a focus on energy saving measures, such as insulating and ventilating houses. The intention of HW to undertake municipality-wide in-depth research into aqua thermal energy aligned with the interests of NG, thus the two forged a partnership. The municipality financed a feasibility study in NG to further develop aqua thermal energy, which was completed in April.

"the [name of municipality representative] provides us with a lot of support and is really encouraging throughout the project." (G2)

"The municipality of HW has very limited renewable energy sources currently and we wish to change that. A project such as this could have a lot of potential beyond the residents [in Numansgors] and help achieve the goal of energy neutrality by 2040." (G4)

Additionally the Wageningen University Science shop was reached out to and asked the how the homes can be made more sustainable, considering energy conservation, sustainable energy generation and storage at the forefront. To answer the central question, the WUR researchers are assisted by students from various universities and colleges.

"As I have a lot of experience with students, I appreciated the effort students can bring by doing their thesis here, that's how you come up with new ideas. So that's why we approached the WUR, to be sure we have explored all our options." (G3)

Through this collective effort, help was found to address the residents' need for reliable and accessible information.

"I think collectively it can be better long term. We want to make it easier to prevent VvE members having to make hard decisions alone. Together you can be stronger, because we are working together we could get the attention of the municipality and the Wageningen team, I don't' think it would be interesting if we were all alone." (G3)

Information Meetings

The first information meeting for residents was held in march 2022, this meeting was aimed at how NG residents can make an active contribution in reducing energy consumption. Among the speakers were a representative from HW, a pioneering resident who had previously renovated their home gas-free. Information on individual and collective measures and the approach of the WUR research-team.

"so it [the information meeting] is partly about creating awareness of what you can do by yourself, and also what the community can do." (G3)

The received feedback on the information meeting shows the information presented was received differently among attendees. Although the majority of respondents who attended this meeting found it to be at least satisfactory, respondents stated they found the information provision too rudimentary, others noted to appreciate covering all facets of the topic.

"Too much basic information, such as explaining what an electric heater is. The substantive explanation of the project was poor"

"Requires a lot of time for things that are already known"

"I found the meeting very informative. All facets of sustainability were discussed and there was plenty of room to ask questions."

"I would have liked to hear more about the associated costs" (All survey responses)

The second information meeting was held in June 2022, which was presented as an opportunity to share knowledge between members and ask questions to research team, the Municipality and the committee members. Many of the questions raised concerned issues specific to individual houses or situations.

"I am concerned about the associated costs of sustainable renovations. Will the measures earn back the money?" (Survey response)

5.2.4 | The Diving-in Phase

In this third phase, NG dove deeper into specific possibilities and as such has chosen aqua thermal energy as a measure to invest more time and energy into. Based on its suitability for the NG area, a feasibility study was commissioned on the measure. However, no decisions have been made regarding individual or collective approaches nor regarding what collective measures fit the preferences of the VvE members. Residents have expressed an interest in collective measures beyond aqua thermal energy generation.

"We want to offer all residents options to enable collective action such as collective purchasing of heating, solar panels or insulation. We are still investigating how we can best bring residents together to tackle these kinds of issues together." (G2)

In addition to collective heating measures, individual measures were explored such as (hybrid) heat pumps. Both scenarios benefit from insulation of the individual houses, thus the Gors2025 have presented an insulation-plan catered specifically to the houses in Numansgors.

"We will inform people on how they can insulate their house better and without gas. We have explored anything from heat pumps, wood stoves, hydrogen boilers." (G2)

Phase in decision making

The survey shows that a majority of respondents did not have a strong preference for an collective or individual approach to sustainable renovation. Of those that do, more than double prefer an individual approach over a collective one. The concept of collective sustainable renovation was expected by respondents to decrease the overall investment costs and possibly increase the choice of innovative measures. Respondents also saw the expected decrease in the amount of work they would need to do

themselves as potentially beneficial as well as the larger collective knowledgebase. However, others do not expect any benefits from a collective approach and mention delays and unacceptable compromises. But, these 'no-benefit' responses were limited to those respondents that answered to have already renovated their homes. Respondents answered not to know what measures would best be taken individually or collectively.

"No benefits from collectivity, everything has already been renovated" (survey response)

"Only enormous delays and unacceptable compromises." (survey response)

The majority of respondents thought they required no additional information to make an informed decision regarding sustainable renovation. Correspondingly, two thirds of respondents found their knowledge of the technological possibilities to be either up-to-date or sufficient to meet their personal needs. However, in a later question the majority of respondents did not show a preference for any specific measures to be implemented nor a preference regarding an individual or collective approach.

Most remaining questions were in regards to regarding the economic feasibility of a collective sustainable renovation, including mentions of pay-back time, subsidies and quotes of contractors.

Information Meeting

A third information meeting was held in November 2022 in which the results of the feasibility study were presented. This meeting was attended by approximately 20 VvE members. A representative from an engineering company who conducted the feasibility study presented the results and answered questions. The representative from the municipality also had a notable role in simplifying and explaining the complicated subject matter.

"I see our role as an enabler, as an energy coach we also spend a lot of time in people's homes and see their personal situations therefore we really just want to help to make an informed decision" (G4)

"You never really know what the intentions are of the parties you are dealing with, as a government entity we are more neutral and people find that easier to trust for objective advice" (G4)

5.2.5 | The Feasibility Vote

The VvE members in Numansgors had not yet needed to vote regarding the allocation of funds towards a feasibility study. However, a feasibility study was conducted regarding the collective heating facilities using aqua thermal energy generation. The study was commissioned by the municipality of Hoekse Waard and therefore did not require a vote.

5.3| Stakeholders

A stakeholder analysis was carried out, resulting in the overview provided in this section. An emphasis was placed on the roles played by the intermediary actors within the case study.

5.3.1 | Stakeholders in Numansgors

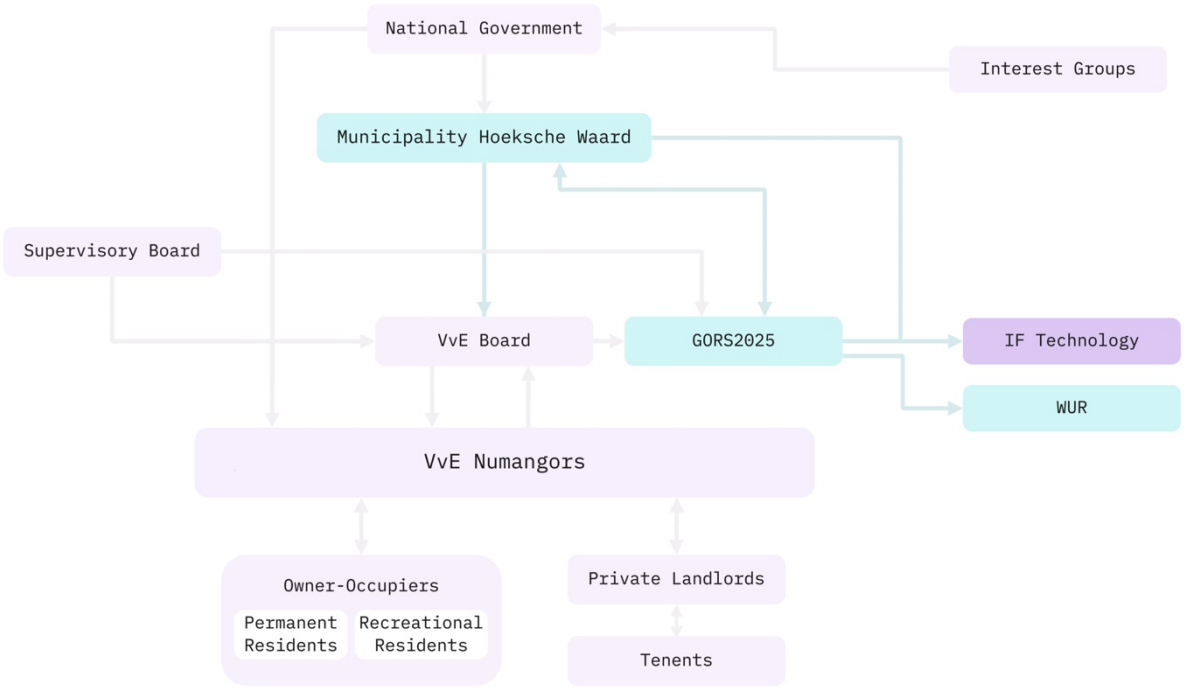


Figure 5.3: Map of stakeholders in the sustainable renovation of Numansgors (own image).

Figure 5.3 provides a visual overview of the stakeholders in the Numansgors project. The VvE is comprised of the owners of the 200 apartment rights as stipulated in the deed of division. Within the Numansgors VvE, the board consists of a single resident who receives a stipend for taking on these responsibilities. The board is overseen by a supervisory board who operate to check if the board member does their job correctly. The board interacts with the residents in two main ways, through means of a newsletter and a general meeting. In Numansgors all maintenance and management is insourced and they have not acquired the services of VvE management. The board forms dedicated committees to aid their tasks, as such the task of exploring the options of sustainable renovation is delegated to a committee GORS2025. This committee was conceived by an enthusiastic resident with approval of the board. Committee members are approved by the VvE in a general meeting. The GORS2025 team consist of residents with personal affinity to the topic and who have technical experience and knowledge from their professional background or from previous renovation. In their exploration, the GORS2025 members have enlisted the help of a representative from the local municipality of Hoeksche Waard.

5.3.2 | Intermediary Roles

In the case-study of Numansgors, several intermediary actors are recognized. Analysis of the interview data outlines the facilitating function of intermediaries, similar to that found in literature. In practice, intermediary actors aim to empower VvE members to engage in energy transition activities and ultimately to either vote in favor of collective sustainable renovation measures or to participate in individual measures.

GORS2025 have established themselves in as a user intermediary, emerged among the residents they intermediate between the available technology and measures and the users (residents). They have taken on facilitating activities like sharing their aggregated knowledge and providing fellow residents with information regarding energy use and insulation possibilities for their homes as well as providing a comprehensive overview of government subsidies and financing resources. Through their platforms of information meetings, websites and the VvE newsletter they aim to impart important knowledge and offer advice to the VvE members. Gors2025 further fulfills their intermediary role through ensuring peer support within the VvE and establishing connections with supply-side actors as well as policy initiatives. Their role is also to investigate whether there is support among members for the proposed solutions.

The municipality of Hoeksche Waard (HW) has gotten involved in the project and has taken on various facilitating activities. HW has deployed their energy coach to support the project development. For example HW and Gors2025 have embarked on a joint research effort to investigate aqua thermal energy generation as a feasible measure as a collective measure. HW has commissioned and paid for a feasibility study into this technology with IF Technology for the Numansgors VvE.

"The role of the municipality, is to provide resources and offer advice to Numansgors in order to help give them do it themselves. We are very involved with this project because of its wider potential, but do not aim to tell them what to do" ***(G4)***

The committee Gors2025 has commissioned the science shop of Wageningen University & Research (WUR) to address the larger question of energy transition within their VvE. In response, a project plan has been drawn up by WUR in collaboration with students from WUR, Rotterdam University of Applied Sciences and TU Delft, who have investigated the case from different viewpoints. Through these actions the WUR research team also fulfills several intermediary actions. As the costs for these studies will be fully borne by WUR on the condition that the knowledge gained is made publicly available (anonymously) so that it can serve a greater social interest and the municipality of HW will also participate and support this project as a partner.

5.4 | RESULTS | EXPERT INTERVIEWS

This chapter presents the results of the interviews conducted with professional actors a VvE could engage with on their sustainable renovation journey. These interviews were conducted with the aim to provide a broader perspective of the topic as many of the interviewees have gone through the renovation journey numerous times with multiple VvEs. Through these interviews a deeper understanding is created of the influence intermediary actors have in the VvE journey, what barriers they encounter and the solution space they reside in to overcome these barriers.
By means of an interview guide, presented in appendix F, based on the theoretical framework, the research questions and the case study results, insights into potential intermediary strategies are obtained and described in this chapter. This chapter only contains the empirical results of the expert interviews.

5.4.1 | Interview Set-up

Over the course of the duration of the research contact was made with eight intermediary actors that work in the domain of home owners associations at varying capacities. The majority of the interviewees are operative in the capacity of process guidance and are therefore directly involved in the processes of a VvE in their renovation journey.
The interview data provides insight into the requirements to overcome the limitations of collective decision making, the capacity of intermediaries to meet those requirements and in which way the identified opportunities for increasing the capacity towards energy justice can be enabled. The semi-structured interviews allowed for conversation to flow naturally on the relevant topics, thus enabled finding unexpected results. However, a standardized list of questions was written for each stakeholder type and can be found in Appendix F Interviewees were invited to the interviews per e-mail and received a consent form to sign in advance which can be found in Appendix E. This form was signed in advance of the meeting to ensure informed consent of the participant. The stakeholder interviews were constructed following a technique of Sanders & Stappers (2012) in which participations are first asked questions regarding present state of the project, followed by past experiences and leading to finally future expectations (Sanders & Stappers, 2012). Tabel 5.4 provides an overview of the interviewed experts and their corresponding references.

Table 5.4: Interviewee references experts

Reference	Organization	Field of Work	Role in organization
E1	VvE Metea	VvE management. Offering of services including how to establish a VvE, management support for board members , constructing a MYMP and problem solving within a VvE.	Sustainability advisor/Process Guide
E2	VvE Belang	Interest group for home owners associations	Management
E3	VvE Belang	Interest group for home owners associations	VvE Zonnecoach (Solar Coach)
E4	VvE Energie	Ongoing energy collective specifically for Owners' Associations (VvEs) and its managers.	Energy consultant
E5	VvE-balie gemeente Den Haag	Advice offering on sustainability for VvEs, municipal initiative	Consultant
E6	VvE Duurzaamheids Loket	Issuing energy advice and supervising the process at VvEs.	Consultant/Process Guide
E7	DVvE	Process guidance and independent consultancy	Process assistant
E8	VvE Duurzaamheidsloket	Process guidance and sustainability consultancy	Process guidance expert

| INTERVIEW RESULTS

The following section presents the results of the expert interviews. The results were obtained through the thematic analysis of the transcribed interviews. The subsections in this chapter present key the themes in which the analysis was performed.

5.4.2 | Work area interviewees

Interviewee E1 has been employed in VvE management for a long period of time, and has experienced an increasing amount of question related to sustainable renovation among their clients. This had ultimately led to their expertise in 'verduurzamen' (increasing sustainability) and overtime became their full focus within the VvE management company.

"If you intend to take yourself seriously as a VVE board, you must answer this [question of sustainability]. So I finally got my boss to develop a product to help VVEs with the sustainability drive. He did have ideas on how he would do that, as he had done some training in this area He has devised energy labels for buildings instead of the individual homes. For each apartment you would put a magnifying glass on the difference between the apartments, inside versus outside of homes, differences in energy consumption." (E1)

E7 describes their organization as a social enterprise with the aim to support the municipalies and the national government in achieving sustainability objectives. Although they are a social enterprise they operate on large scale projects (renovation volume) for a better return on investment for builders and contractors.

"VvEs can employ our help and guidance in various phases. Currently we have ongoing projects that are in the intake, Quickscan and Deepscan phases. Also in the coming year, we hope to take the step towards the quotation and implementation process with a number of VvEs." (E7)

"Our team has previously been involved in sustainability projects with VvEs. Because we work with a large team of consultants, we are able to provide tailor-made solutions and organize appropriate expertise." (E7)

Like E1, E2 and E3 directly have VvEs as their clients, however VvE Belang operates at a completely different level as an interest party which represents VvE interests in the political sector. As such representatives of VvE Belang have been very actively in the news concerning the price ceiling as mentioned in the problem statement. In their capacity they do research without being commissioned by their associated VvEs, on their website and newsletters you can find various toolkits for taking sustainability actions. Moreover they offer the services of E3 as a solar coach who guides VvEs in the process of collectively purchasing PV panels.

"Policy-makers don't always realize how the VvE structure effects the appropriateness of a policy, but as so many Dutch people are part of a VvE it is our job to make sure they do not fall short" (E2)

"[...]I think, as so many VvEs would reach out after a successful PV-panel story was posted in the newsletter that we saw an opportunity to share the lessons learned from that, which is why we now offer process guidance when VvEs want to buy Solar together " (E3)

Interviewees were all mostly familiar with VvE related processes, some with an added focus in sustainability, solar energy or energy efficiency in general. However non expressed familiarity with community energy initiatives other than the collective ownership of solar panels or collective purchasing or renewable energy.

5.4.3 | Intermediary Roles

Among the interviewees different intermediary roles can be identified. Several of the interviewees had taken on their role in energy transitions from personal interest rather than professional motivations. E1 introduced their current role to their employer after they found an interest among clients and E6 has gained their expertise from championing a successful project in their own VvE. Among the interviewees two main roles are identified, knowledge sharing and facilitating. The first is performed foremost through imparting key knowledge regarding measures, legal and financial structures and providing access to networks agents, policy initiatives and subsidies to support sustainable renovation efforts.

"*Most VvEs aren't able to navigate such a project without external help unless they are lucky and have expertise among residents […] If you don't have a professional like us translating technical information to simple terms it would be more difficult for the average VvE member to understand what's happening […] especially the consequences of what's happening*" (E8)

Whilst the transfer of knowledge is recognized by several interviewees as a core activity of their intermediary role, Interviewees more directly involved with the VvEs in their capacity of process guidance identified more social and community related barriers as the biggest hurdles (E1, E3, E6, E8). As the following quotation illustrates, interviewees suggested that good project management is the key ingredient to a successful project.

"The success of a project is not the result of detailed knowledge about sustainability, etc., but much more about good project management, the art of binding people together and the will to offer each other encouragement and stability over a long period of time." (E6)

"T*he technical* investigations… that *is the easiest par*t. Once we know the building you can just calculate what measures would have the biggest impact. The difficult job is to get *community* support and build *confidence* in decision-making for the group. *Without that,* the project will not get up and running" (E5)

It was found that residents commonly had high expectations of what the tasks of the VvE board should encompass, E1 found that in many of their experiences, members of initiatives assume that a VvE board would be able to function as a a processes guide and fulfill numerous roles simultaneously. E5 had similar observations that conflicts can arise between the board and members when expectations in the process aren't met. E6 argued that if VvEs come to them to ask for help when they have been trying to implement measure for some time already, a lot of their work is related to mending social bonds and trust.

"Emotions can run high when people feel decisions in their own house are being made for them[…] sometimes I spend many ours going door-to-door to ask people to join in the information meetings and convince them their voice will be heard" (E7)

"Generally speaking: the larger and more diverse the composition the VvE, the more important having a strong support base becomes […] in that case it is even more important that everyone feels involved from the initiation, to pull together and decide together." (E8)

Developing this theme further, another key role that is identified is that of coordinating the project and the members' involvement with the project. Interviewees suggest that their role encompasses many activities that support to frame the project and the proposed measures as well as coordinate information meetings and follow-up steps. As the following quotes suggest, this role requires the intermediary party to be very involved with the project champions (often VvE Board).

"A lot of the job is really hands-on, I sit with the VvE board and we make every presentation together [..] I feel responsible for all information they provide to the other members because if it is well done it will make my job a lot easier later on in the process" (E1)

"I find it best to stay in the background and let the VvE board present the plans, to do that we offer courses to prepare them for these meetings [...] I only step in, in the meetings when I experience they (the VvE board) aren't able to fully answer the questions they are being asked." (E3)

Litigation support through independent consultancy are named by multiple actors as their benefit to the clients. E7 for example offers direct market this mediation as they can mediate more attractive prices through EU subsidies than a VvE could do themselves.

"We want to bring together the supply and demand sides faster, to make options more accessible and more effective. [..] we want to accelerate the sustainability of VvEs" (E7)

The analysis shows that the interviewed intermediaries can also have the role sensitizing and sometimes even initiating the project, when they incorporate sustainable renovation measures into the planned maintenance. This is especially true for VvE management and maintenance intermediaries, who can motivate VvE boards to allocate funds towards sustainable renovation as a means to save costs in the future.

"Sustainability is often not a goal by itself [...] In many cases it's most interesting to combine sustainable measures with other planned maintenance. We often remind VvEs that the use of sustainable materials could mean you're saving on maintenance costs in the future." (E1)

"We try to inform all the VvEs that are members of our organization that failing to take action now will be very expensive in the near future, the current energy crisis only shows the first problems they will encounter" (E3)

5.4.4 | Intermediary's perspective on the User Journey

Whilst experts share a recognition of the similar processes and process steps VvEs go through and certain VvE characteristics among successful projects, the expert-interviewees highlight the influence of the local contexts in which projects exist.
Several of the interviewees mention how challenging it is to persevere in the project processes as many hurdles must be overcome (E1,E2, E3).
Within the expert interviews it was found that the variation between VvEs makes it is impossible to 'copy-paste' the successful approach of one project to another (E7). Varying buildings, VvE sizes, owners and residents requires customization of the approach taken to such a degree that a sustainable renovation 'package' becomes too expensive to offer as a standardized consultancy option (E1).

Interviewees found that projects are most commonly ended due to financial reasons (E1, E4 and E6) due to which measures are voted against in general meetings. However, E2 argues that financing shouldn't have to be a barrier. In their point of view, with all available subsidies an financing schemes, the financial aspects aren't the real barrier but getting to access to those subsidies is. E6 relates to that statement and argues that filing for subsidies is found to be difficult by many of their clients. Municipal actors G4 and E5 and E6 all describe that programs and subsidies are often not found by targeted citizens. Actors working for or closely with government entities share the notion that financing should not be a limiting factor as there is an abundance of options available (G4, E5, E8, E2, E3). As such this barrier is easily mitigated by deploying intermediaries in the process who can help overcome the knowledge barriers.

"With loans such as the heat fund, mortgages and subsidies, money can no longer be called a real obstacle, the problem then really lies more with the willingness to put effort into the project" (E2)

The majority of the interviewees recognize the importance of intermediaries in the success of a VvE renovation project. They also note the importance of recognizing each other and connecting multiple intermediary actors. This is specifically mentioned in making a connection with the targeted VvEs, especially E6, E8 and E5 express difficulty in reaching the people they aim to support.
Several interviewees were currently engaged with VvEs in various stages of the user journey, some of which they were connected to through local municipalities. Others were employed after a VvE member was approached by a commercial party, a supplier, with an offer they found interesting. In the case of the VvE managers, they are most likely to have instigated the VvE's embarkment on this journey. Furthermore, interviewees experience that in most cases VvE members have widely varying paces of decision-making as well as levels of engagement.

"Participants can be miles apart in how much they actually participate and want to participate. Quite often I find that

people only join when they know they might have to pay for something, and by then it's a lot of information to take in at one time so they just give up and let the group decide. […] That might not sound that bad, but those are the resident that will complain later on." (E8)

The intermediary role is further described as facilitating trust in the process. As VvE members explore the options in decision-making, the intermediary serves as a 'neutral' party. In case of the VvE maintenance, their objective is clear as they are tasked with maintaining and preserving the quality of the building. It is therefore assumed that they are without anterior motive as they are just doing their job.

'The less enthusiastic people can be extremely reluctant to agree to any renovations that goes beyond maintenance. Especially at the early stages of the project. […] they cannot seem to look beyond the significant price tag. […] It can take quite some time explaining the options and discussing the benefits. How much they could save on energy costs, and gain in level of comfort that helps people to agree. However, you can't take away how big of a financial step it can be, thus the whole process requires a lot of trust'. (E7)
'I'm not trying to sell anything, nor am I anyone's neighbor. So it's easy to understand that I just care about the state of the building and want to make that future-proof.' (E1)

5.4.6 | Success Factors and Barriers

With the custom nature of the renovation process, interviewees found it difficult to name general success factors and barriers. Many anecdotes were shared of hyper specific barriers that delayed projects for years at a time, often related to construction or administrational issues. Social barriers were found to lead most often to termination of the project, as the residents simply had the power to vote against any further continuation with enough votes. Financing wasn't directly named as a defining barrier, yet the financial circumstances of the VvE members was named as a contributing factor to success sevral times. The interviewees directly employed by VvEs as process guides found their successful projects to be in VvEs with homes of relatively high value. In such cases the homeowners were easily able to pay for investments required for large scale renovations.
"My biggest success stories are all in relatively affluent buildings, as people understand how much the renovations will increase the value of their homes they do not mind making the initial investments" (E6)

And examples were provided where lack of financial resources of an individual resident presented an obstacle in the user journey. The following quote also shows how there are no alternative ways of distributing the costs other than equally among the VvE members.
"Especially success in projects where many people had money to spend. Example of a project where 1 resident stopped the process due to financial considerations. This could only be solved because she herself (only) sought an alternative way of financing. The costs of renovation are simply divided proportionally among the VvE members."

Interviewees expressed mixed views regarding whether projects should focus on providing added benefits, of comfort and potential increase of the estimate value of the home.
"Landlords are easily motivated by the increase in value, because for them the return on investment is immediately seen in the increase of rent. Especially housing corporations with multiple apartments in a flat are usually the biggest advocates for these types of renovations." (E1)

5.4.7 | Participation

Multiple interviewees expressed a lack of interest of VvE members to participate in the sustainable renovation process. Although most encounter a few enthusiastic VvE members, most often the initiators of the project, they have a difficult time to engage residents beyond this group.

'A lot of times VvE boards are just glad to find a few residents who are willing to make some time to express interest in what is going on with building maintenance or maybe join a committee'. (E2)

This was attributed by E1 to different sense of ownership among residents. Especially in larger mixed VvEs, tenets and landlords are said to have very different perspectives on ownership of the shared property.

'It's easy to assume that everyone has a similar sense of ownership, but not everyone always uses the common property in the same way. So if you never use an area, people feel distant from it and it can be harder to convince them to allocate funds to upgrade or replace it. (E1)

This is especially unfortunate as interviewees also experienced that the active participation of residents benefits the process in terms of process-efficiency and successful outcomes.

'In the projects where we start off with a very active VvE, where people know each other or succeed in actively involving VvE members at an early stage, things actually go a lot smoother.' (E5)

' If we have the time for it does little longer, to engage everyone, it so much easier to get an okay to move on to the next phase or to get everyone's information. There's a bigger chance at success because there's a bigger chance at customer satisfaction.' (E3)

And it was also found to be very de-motivating for the responsible VvE-board.

'For me, it's just my job. But if no-one shows up to a meeting it can be so frustrating for a VvE board, because they put in a lot of work.' (E1)

5.4.8 | Diversity

VvEs are found to be relatively homogenic in terms of the demographic factors of the residents. This is attributed by the interviewees to the shared price-range of the homes. This was found mostly true for smaller VvEs, the fewer homes they encompass the more homogenic they were found to be.

"VvEs are homogeneous in type of people, especially small VvEs, then you will see all the same types of people. In larger buildings where you have a mix of rental, purchase and social, it can be more of a mix of people. I think it is comparable to the people that all live in a street or a neighborhood, like attracts like." (E8)

Additionally, interviewees note to experience the diversity between the VvEs who employ their services to be limited.

'I would say that, to a degree, we always seem to reach the same kind of people. The people who look for us, or look for some type of consultancy are that are interested in increasing the value of their homes or interested in sustainability. […] We talk about it in the team, reaching other types of people. I think that's the big challenge really.' (E6)

Furthermore, majority of interviewees expressed not to have thought about this in advance of being asked the question in the interview. The aspects of diversity mentioned most often upon answering this question were related to either perceived income, gender and age.

'Well I hadn't really thought about it before [diversity among the VvEs they had encountered] I mostly just talk to VvE board and I think those happen to be men. But of course not the whole VvE are just men.' (E2)

Some interviewees (E5, E1) had noticed a lack of diversity among the participating residents they encountered and offered this information without being asked.

'Tackling a sustainable renovation project like this is also sort of a hobby for retired old men I think. Most of the time that's actually very helpful as they don't mind going door to door or to hold some extra meetings. Makes my job a little easier because they know the other residents better than I could.' (E5)

Lastly, one interviewee recognized a connection between participation of residents and vulnerable groups from their professional experience in larger VvE complexes as well as social housing.

'Not everyone wants to be involved, of course. But people also often just have other priorities, like jobs and kids.' (E)

'When you go door to door and into people's homes it's easier to understand why they didn't show. For example a single parent who didn't have the time to come or elderly people who were overwhelmed by the information and do not want to ask stupid questions in front of everyone'

5.5 | RESULTS | INDICATION OF ENERGY JUSTICE

This section presents the results of the thematic analysis of the gathered data by means of the energy justice indicators, as developed in chapter 3. With the aim to reveal places in the user journey, where junctures between process and energy justice exist. The gathered data was coded with a set of 18 themes that point towards an interface with principles of energy justice. As the data was also organized in the use journey framework, as presented in the previous sections, the result of the combined analysis is a series of junctures that can be found in figure 5.4. The junctures are placed at a specific step of the in the decision-making process which corresponds to the organized data which was coded with specific energy justice indicators. The following subsections go into detail for each individual phase of the user journey.

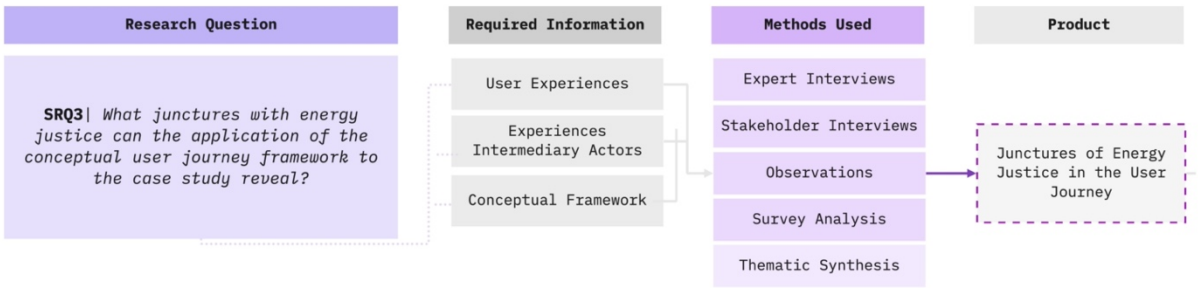


Figure 5.4: Research Flow

5.5.1 | Junctures in the Conception Phase

The analyses of energy justice indicators ascribed to the data organized in the conception phase of the user journey brough the attention to the touchpoints with energy justice as shown in table 5.5;

Table 5.5: results of the Energy justice analyses of the conception phase

	Indicator Recognition Justice	Indicator Procedural Justice	Indicator distributional Justice
THE CONCEPTION PHASE	Responsibilities	Group Composition	Engagement Activities
	Expression of concerns	Communication	Awareness of energy needs
			Services Offered

The expression of concerns corresponds to the expression of interest in sustainable renovation to the VvE board, which is required for to initiate the journey. From the onset of the user journey, communication with residents, the chosen methods of information provision correspond directly to several indicators of *Procedural Justice.*

"[…] ideally all [VvE members] would be participating from the beginning of the project, get them involved from the beginning because that's when we can still shape a lot of the project. As soon as the wheels have really started turning and money is getting spend, it becomes harder to change course as that will cost more money." (E4)

The methods of communication determines, to a degree the accessibility of that information to the members. This applies to all phases of the user journey, but especially during the introduction of the idea, as interviewees found that people can drop out of the user journey when they think they will not be able to understand the topic. Abbreviations and complicated technical language where mentioned as barriers in members' capacity to obtain and judge information.

"I saw the email that was send before the information meeting, but I didn't read the attached information. When I glanced it I only saw a list of abbreviations I could not decipher so I closed it again." (Attendee during Numansgors information meeting)

"The woman stopped attending the meetings, which was odd as she was so enthusiastic before.[…] When it came to a vote and I saw she opposed the plan, I asked her what had changed her mind and she said she couldn't say yes to spending money if she didn't know if it was actually a good option and she wasn't able to open the excel sheet we had send everyone" (E5)

In the conception phase, Indicators of distribution of responsibilities as well as group composition, awareness of energy vulnerability, and awareness of divers energy needs correspond to the formation of a dedicated committee. Interviewees agree that members often expect the VvE board to take on all responsibilities, regardless of their capacity. The dedicated committee is found most likely to determine the direction of the possibilities explored, the is exemplified by the wide variation of explored measures by the Gors2025 committee which are motivated by personal interest and expertise of the members. Interviewed experts were also more likely to mention the capacity or skillset of a VvE board or committee in response to questions related to diversity in group composition (in relation to representation of vulnerable groups). However, experts did find that the average leaders and active residents were often middle-aged males with some affinity to sustainability or technology.

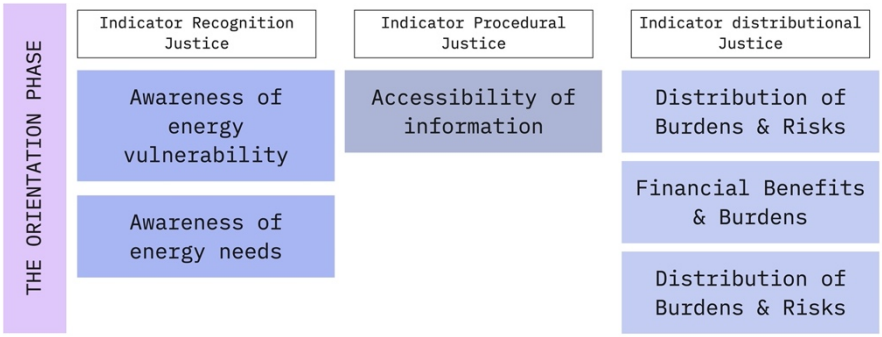
"We came together because of our collective knowledge base. You see, [Gors2025 member] has great knowledge about insulation, because they have renovated their house very sustainably, very innovative. [Gors2025 member] is very familiar with Aqua thermal energy generation, getting electricity from water." (G1)

"The real enthusiasts are often old techies, who have time on their hands for an extra hobby, so they take on this project yes. Haha, they might all be middle aged TU-Delft Alumni." (E2)

5.5.2 | Junctures in the Orientation Phase

The analyses of energy justice indicators ascribed to the data organized in the orientation phase of the user journey brough the attention to the touchpoints with energy justice as shown in table 5.6.

Table 5.6: results of the Energy justice analyses of the orientation phase



Indicators of recognition justice during the orientation phase, relate to the awareness of energy vulnerability and the awareness of divers energy needs of members. The responsibilities in this phase are distributed between the VvE Board and dedicated committee, therefore awareness among the responsibility carrying actors indicates to be influential of recognition justice. Among the Numansgors stakeholders, there were several mentions by gors members where they acknowledge that not every member may be able to afford to join in a collective energy transition due to financial constraints. However, there was no mention of reaching out to specific members or member groups to ensure their engagement and inclusion.

"In some homes, the windows are quite literally plastered with newspapers as a type of insulation. […] For some of the residents that is all they can afford, but think it will prove to be a mistake when they get their energy bill this winter" (G3)

The HW municipality spoke of policies to combat energy poverty in the current energy crises. They are aware of vulnerabilities to energy poverty, yet expressed they are experiencing difficulty in reaching the targeted citizens groups. A diverging perspective on energy vulnerability and divers energy needs was found among the interviewed experts. However, non-had participated in any engagement activities to include vulnerable parties. The interviewed intermediaries either working for or with, government entities were much more aware of the social consequences of sustainable renovation and the vulnerability of some citizen groups.

"We are trying to hand out free money, but we don't have any takers." (G4)

"In mixed situation maybe, when some homes are social housing that could be an issue. But the VvEs we usually work with people want to invest in their house, that's why the project was started. So I can assume they are not in poverty " (E7)

"We go door to door, to deliver the energy saving packages, so I feel like I have seen it all.[…] I remember coming in to explain how to apply the insulation foils, which turned into a lesson in the necessity of bleeding the heaters before you turn them on." (E8)

Indicators of distributional justice show during this phase as measures are being considered and the legal structure is analyzed To a degree the deed of division determines the distribution of burdens and risks among residents. The orientation of financing options forms a juncture with distributional justice through its influence on the distribution of the financial burdens and benefits among residents. None of the interviewees were familiar with any alternative distribution of costs in the VvEs they had worked with, other than equal distribution. One exception was found due to the presence of a large corporation who was found willing to fund a project as they would largely benefit from the result.

"Look, VvEs are now able to take out a favorable mortgage as a VvE, without individual requirements of a high salary or anything like that. You could say that makes it a bit more equal. […] Yes, everyone must make an equal monthly contribution." (E2)

"It happens sometimes that a large party, for example a housing corporation with many houses within the VvE, prefers a different heating network. I have had an experience where they then pay for the total renovation […] laying the pipe etc. and that the homeowners then only had to pay for their own connection to their home. But you don't see that often!" (E7)

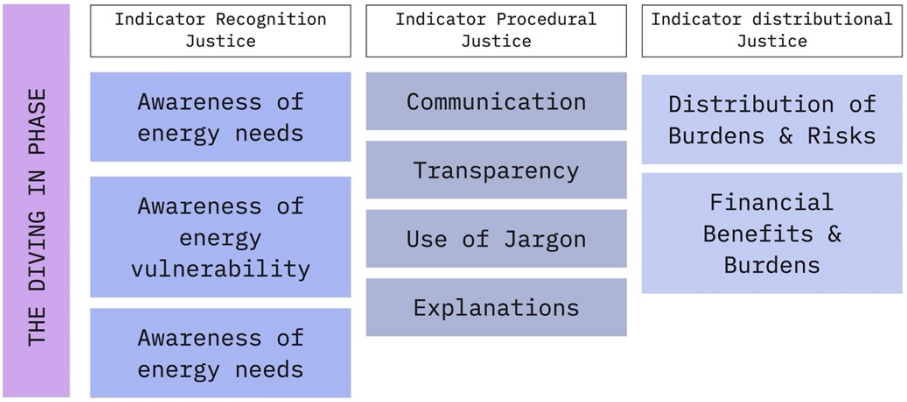
A juncture with procedural justice is found in the exploration of financing options. The importance of accessibility of financial information to all members is exemplified in the responses to the Numansgors resident survey, where it was found that only one third of respondents stated they found their knowledge of related policies and financing possibilities to at least be sufficient to meet their personal needs. In the survey as well as during the information a large portion of questions concerned the economic feasibility of a measure, which included mentions of pay-back time and subsidies.

"Especially in large apartment complexes it's a bit of a mix of people and you see a lot of people come and go.[…]People considering to move out, people who want to continue living in the house for years to come have different enthusiasm for investing in their homes. You only want to be investing energy and money if you can reap the rewards." (E5).

5.5.3 | Junctures in the diving in phase

The analyses of energy justice indicators ascribed to the data organized in the diving-in phase of the user journey brough the attention to the touchpoints with energy justice as shown in table 5.7

Table 5.7: results of the energy justice analyses of the diving in phase



Junctures with recognition justice are indicated during the formulation of the most promising scenarios. Similarly to the junctures in the orientation phase, the awareness among decision-makers could influence a just outcome. What was defined as most promising was determined by techno-economical factors, as was confirmed by the majority of Interviewees.

"We formulate the most promising scenario […] based on a technical inventory of the building, available subsidies, and prioritize measures that could be incorporated with planned maintenance such as roof insulation if the roof needs replacement anyway" (E1)

"We optimize energy efficiency, to the most promising solutions are the ones that save the most [money] when you get your energy bill" (E4)

However, during the November information meeting in Numansgors one attendee expressed a hesitance in the purchasing of solar panels due to ethical concerns. Their comment was positively received by the committee members. And the discussion continued into the topic of costs and benefits of sustainable renovation measures beyond financial ones.

In the formulation of the business case resides a juncture with distributional justice. Even though it was recognized by the interviews experts that a sustainable measure was unlikely to benefit all homeowners equally by all interviewees, none offered any alternative distributions of costs. Most often a solution was presented in the formulation of a more holistic and complete approach to the sustainable renovation, to ensure each home benefitted from the project. Moreover, interviewees provided examples of cases where lack of financial resources of one individual resident presented an obstacle in the user journey. Which was resolved by pressuring that resident into finding individual financing options to pay for their share of the collective measure. The following quote also shows how there are no alternative ways of distributing the costs other than equally among the VvE members.

"Roof insulation will always benefit the top floor apartments most, but if you include the walls, the basement and install solar, there's something for everyone. [..] Maybe it won't be possible [financially] to implement that all at once, but if it's n the plan, everyone knows that they will also benefit at some point." (E3)

"Especially success in projects where many people had money to spend. Example of a project where 1 resident stopped the process due to financial considerations. This could only be solved because she herself (only) sought an alternative way of financing. The costs of renovation are simply divided proportionally among the VvE members."

All stakeholders express concerns related to communication and obtaining of quotes from external actors such as contractors. The resident survey shows uncertainty among residents in finding a trustworthy party. Intermediaries as well as Numansgors stakeholders expressed mistrust of supply side actors. Other intermediaries noted the advantage they perceived in their role as they have a network of trusted actors at their disposal.

"When there too busy to perform the planned measure they just tell you it can't be done in your home. Well that is hard to believe when your neighbors in the exact same type of house successfully implemented [the measure]. " (G3)

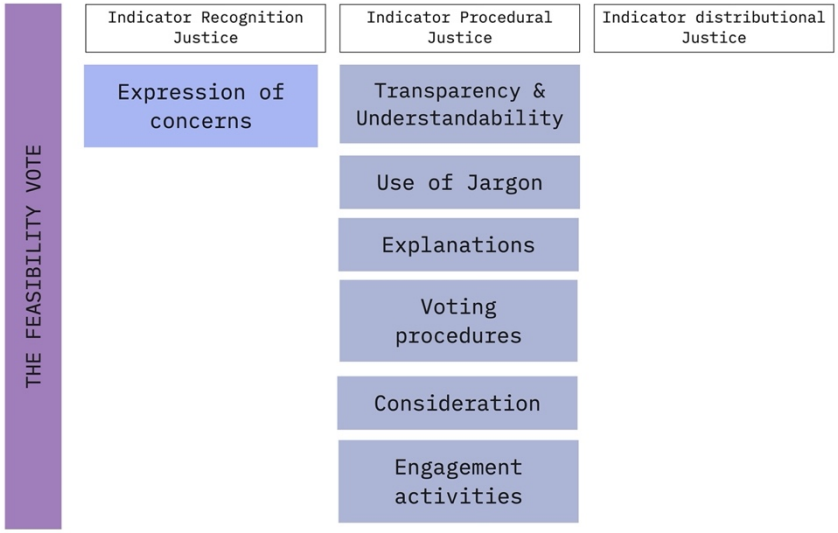
"It's always the lesser of two evils, you're going to be dependent of some company or institution." (G4)

"All the time, we hear stories of crazy quotes and strange proposals. Many contractors only offer one measure so they can't compare what they do to other measures and their advice may not be the best solution. We have a great relationship with contractors who do maintenance and renovation measures, so we make a plan together and tackle lots of things at once." (E1)

5.5.4 | Junctures in the Feasibility Vote

The analyses of energy justice indicators ascribed to the data organized in the feasibility vote of the user journey brough the attention to the touchpoints with energy justice as shown in table 5.8;

Table 5.8: results of the energy justice analyses of the feasibility vote



The feasibility vote junctures with multiple elements of procedural justice. Interviewed experts note that they experience a conflict in leadership where they prefer to assist the project champions to present the results and scenarios to the VvE members, as they are more relatable, However they found that, when confronted with questions the project champions are more often than not, not the best party to provide further explanations. Contradictory information and can harm the perceived transparency of information. During the information meetings in Numansgors, presentations were held by the relevant experts and when a 'translation' step was required the municipal energy coach provided the residents with understandable explanations.

"I mainly work together with the board. We write everything together, but during the meetings I take a position in the background. I let them present everything, because they know much better who they are talking to. Unfortunately, they often get exposed quickly when people ask difficult questions. Then I have to jump in." (E1)

Engagement activities relate to the attendance of member at a GM which is named by several experts as a known hurdle in this process. Expression of concerns, adheres to the expressed concerns of VvE members are addressed in the proposed business case. Some intermediaries find it is difficult to meet everyone's needs in these projects and prioritizations of needs heavily depends on the case.

"You can never satisfy everyone, some needs better align with other benefits so they might be prioritized. But that really depends on the situation." (E7)

5.5.5 | CONCLUSIONS

- The energy justice indicators have revealed junctures with different aspects of energy justice in the case study data as well as expert interview data, throughout the user journey phases.
- These results show that intermediaries interact with VvEs at phases in the user journey where these junctures can be found.
- There is an increase in junctures with procedural justice aspects as the user continues in their journey.
- There is limited awareness of the concept of energy justice among stakeholders.

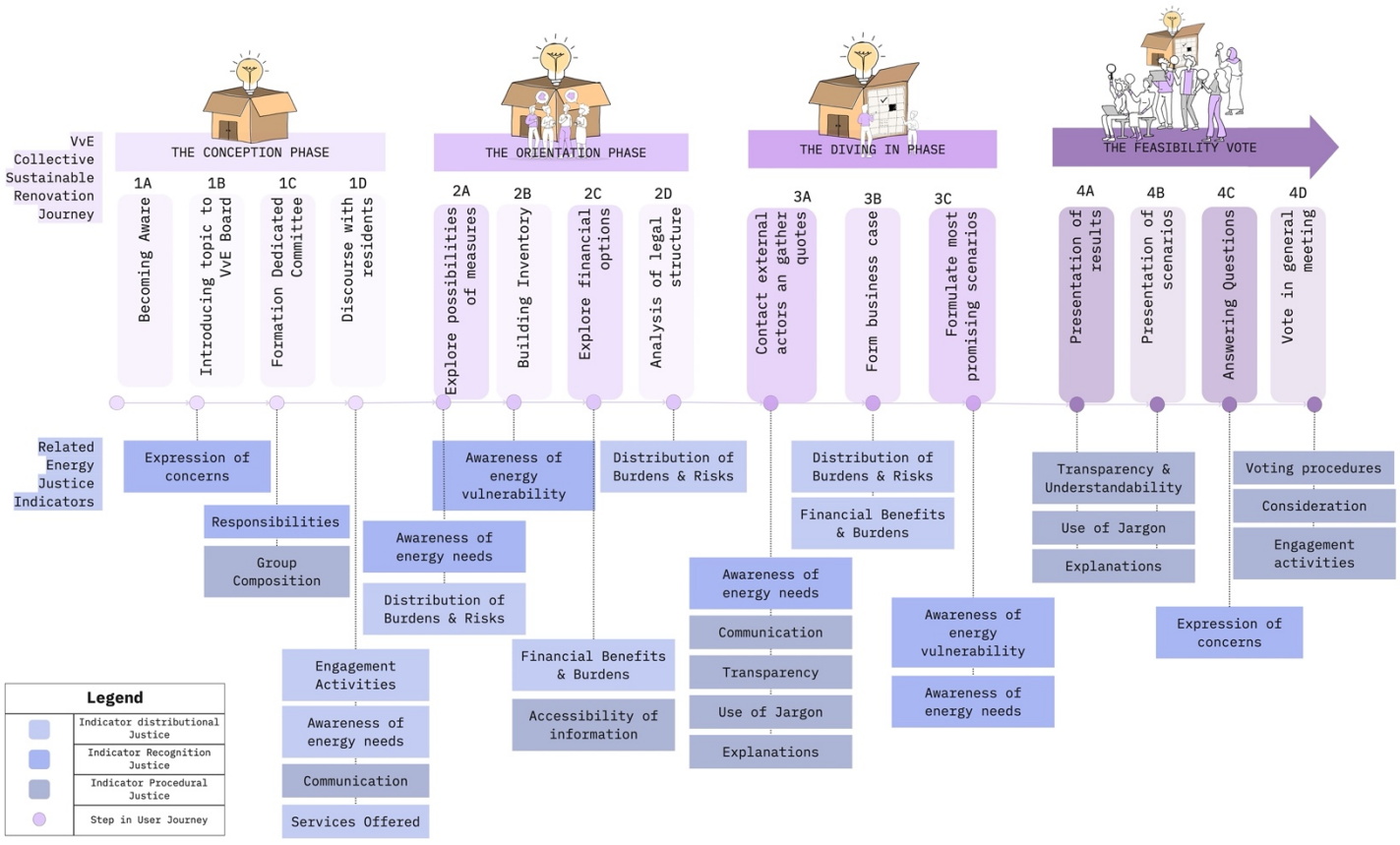


Figure 5.5: Visualization of result of indicated junctures of energy justice in the user journey (own image).

6

6 | DISCUSSION & CONCLUSION

In light of the lack of the disconnect of academic research on energy justice and the practical application of the theory, this study aimed to integrate energy justice theory with the practical design tool of user journey mapping to investigate what such a map would reveal. This framework was put into practice in the real-world setting through a case-study in Numansgors, researching the relationship between the collective decision-making process, people's experiences and energy justice. The case study was comprised of observations, survey data analysis and stakeholder interviews through which the homeowners associations' user journey was mapped. With the intention of uncovering how to overcome barriers towards sustainable renovation in a just way, interviews were held with eight intermediary actors who work in the field of homeowners' associations.

This chapter discusses the research findings in several major steps. First, a summary of the key findings are presented, including the main takeaways of the results. Secondly, a comparison is drawn between the findings from the expert interviews and those from the Numansgors case study to uncover any further opportunities. Through this comparison between empirical data and theory and the associated implications for energy justice, adjustments are made in the universal user journey to accommodate for the insights created. Thus, the potential implications of these findings are discussed in the context of energy justice. This results in the next iteration of this journey mapping, the justice sensitive user journey. With this justice sensitive user journey, interventions can be synthesized that enable both the overcoming of barriers in the user journey and the increasing journey's capacity for energy justice.

6.1 | KEY FINDINGS

This section discusses the key findings of the empirical research in sections 6.1.1 to 6.1.6. This begins with a discussion of what was found in the application of the conceptual framework, and how does the empirical research compares to the theory.

6.1.1 | Barriers and Junctures

The application of the energy justice lens on the user journey map has revealed junctures throughout the phases of the user journey. An increase in junctures with procedural justice aspects as the user continues in their journey can be found throughout the consecutive phases of the user journey. This is a similar line in which the associated barriers related to collective decision-making increase towards the feasibility vote. As all previously phases lead up to the feasibility vote, this is consistent with expectations as it will show in the feasibility vote whether earlier decision-making (DM) barriers, such as communication within the VvE have been addressed effectively. The Numansgors (NG) user journey exhibits that the transition cost (TC) or DM barriers that do not require voting in the general meeting or allocation of collective funds do not present any 'hard' barriers. As overcoming or addressing the associated barriers does not form a strict prerequisite to continue in the user journey.

Along that line, the increase in procedural junctures can be attributed to the 'hard', procedural barrier of the voting moment. The junctures found in the earlier phases of the journey show a larger emphasis on elements of recognition justice. In the phases which the business case is formulated, steps indicate more towards distribution justice as these concerns the outcomes of the considered measures. This follows the same line of reasoning presented in literature, which argue that recognition is the basis for effective procedural initiatives to overcome distributional energy injustices (Hanke et al., 2021b). This indicates that mitigation strategies for intermediary actors would best be suited to follow accordingly and should be set in a foundation of procedural justice.
Furthermore, as shown in table 6.1, opportunities can be found where action to overcome specific barriers, simultaneously addresses several indicators of energy justice. Which is the aim of the main research questions strategy development.

Table 6.1 | The relation between decision-making barriers with the energy justice junctures in Numansgors and the opportunities they present to increase the process' capacity for energy justice while overcoming set barrier.

Desicion-Making Barrier	Identified Barrier(s)	Current Approach	Energy Justice Touchpoints	Opportunity
Individual pace in decision-making process	Misalignment in implementation of individual sustainable renovation measures Disparity in information need and capacity to judge information.	Gors2025 have created a website through which all information and presentations were shared so residents are able to re-read information.	Transparency & Understandability Accessibility of information Engagement activities Awareness of individual needs	Create insight into the individual pace of decision-making from the project onset. Engagement activities for those lagging in the decision-making could provide opportunity to level the playing field
Resident involvement	In the two observed information meetings. Attending residents were engaged and involved. However only <10% of residents were present.	Three information meetings have been held on the grounds. Residents have been surveyed by students in the WUR research.	Knowledge living situation members Capacity to express concerns	Knowledge of individual living situation could provide more targeted or completely new ways to involve residents. Early involvement of residents increases they capacity to express their concerns throughout the process.
Communication within VvE	Residents have a need for more effective formal communication Limited communication of underlying values or motivations	Residents are invited for meetings through the VvE newsletter	Self-Recognition Awareness of divers energy needs Consideration Capacity to express concerns Accessibility of information Engagement activities	NG residents value the social aspects of their environment greatly. Here lies an opportunity to extrapolate this value to enable residents to freely express their concerns. This does require capacity for self-recognition among residents, which can be increased through

6.1.2 | Parallel User Journeys

Another essential finding of the case study results, concerns the individual and collective approaches the residents could choose to take to renovate their homes. It was found through mapping of the case study that the VvE's user journey is better represented as a combination of individual homeowners' decision-making journeys as well as a collective one. This is illustrated in Figure 6.1, how the individual and collective approaches to decision-making have influenced each-other and the overall user journey in Numansgors. The results of the mapping indicated that barriers found in taking an individual approach lead to the desire to take a collective decision-making approach concerning the installation of PV-Panels on residents private homes. Collectively, a plan and protocol were made to avoid similar barriers in the future. The collective approach was then changed (from stage 2 to stage 3) beyond the pv-panel plan with the establishment of gors2025. Here, the collective approach also instigated a change in the individual approach (from stage 3 to stage 4) as the dedicated committee set out to spread awareness and offer advice in the residents individual decision-making journeys.

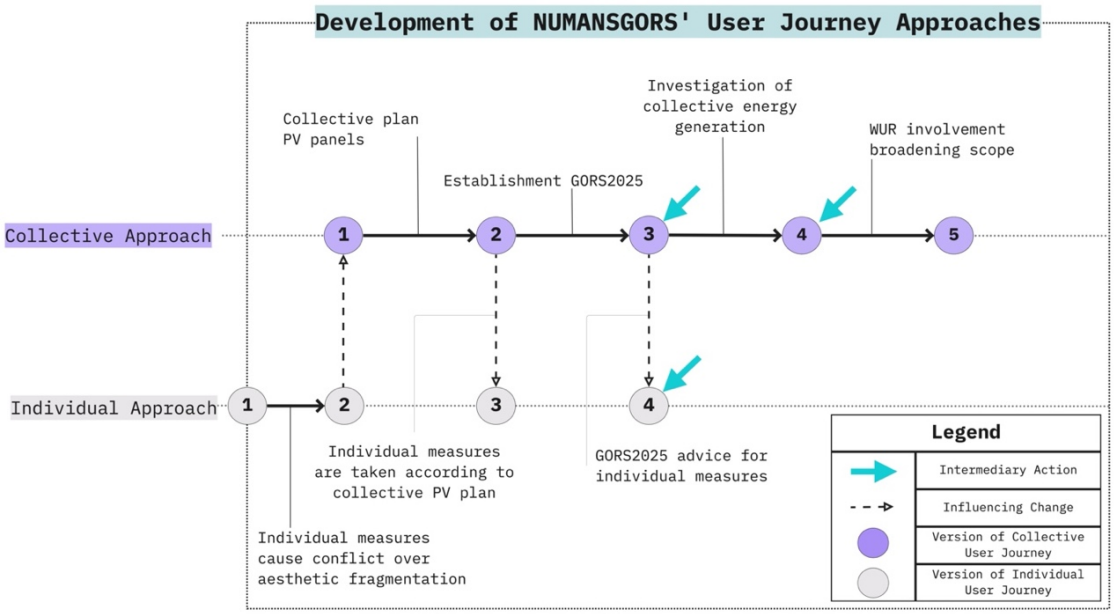


Figure 6.1: Interaction and influence of individual and collective approaches to decision-making in the Numansgors User Journey

The expert interviews confirm a similar experience amongst other VvEs. In NG, individual residents have full ownership of their homes. Therefore, as long as renovation measures do not conflict with the rules and regulations of the association, residents can individually implement desired measures. Although this may not be the case for all Dutch VvEs, parallel user journeys can still be recognized if only a collective approach is considered. For instance, considering a scenario where a majority vote would opt for the implementation of the collective aqua thermal heating system, this is only effective if all participating homes are insulated to energy label levels A or B. As insulation measures, in the case of Numansgors, only concern private property this decision would have to be made individually. What this scenario illustrates it that to achieve collective success, the decision-making user journey of the individual resident must be taken into account.

6.1.3 | Misaligned Pace of Individual Decision-Making

The formulation of the parallel user journeys highlights the significance of the collective decision-making barrier of 'individual pace of decision-making process'. As any individual resident must have completed their personal decision-making journey before arriving at the feasibility vote stage in the collective user journey to make an informed decision regarding collective measures. It is also confirmed in previous research, for example by Paradies et al. (2017) who noted the importance of individual residents being at equal phases of their individual decision-making process. This is not only to the benefit of a majority vote regarding a feasibility study, but to enable all residents to make an informed decision. This follows Bouzarovski & Simcock's (2017) interpretation of fair decision-making. Who state a fair decision-making process demands accommodation of any differences in the pace between members.

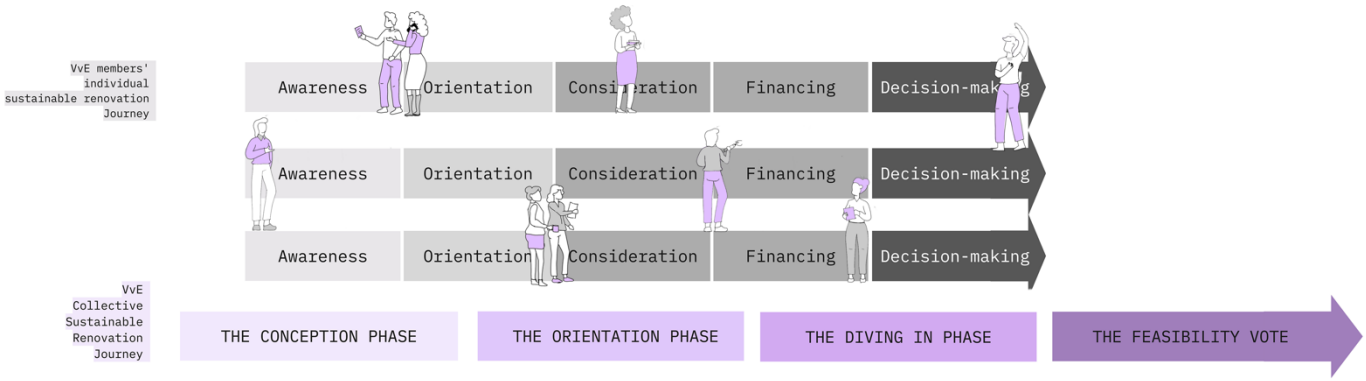


Figure 6.2: Misalignment of individual VvE members' decision-making phases, author's own

A misalignment between residents and their individual decision-making process is recognized in the Numansgors case study. This is first indicated by the diverging energy labels of the individual homes and the differences in attitude towards Solar PV panels, Additionally, respondents of the resident survey showed to have scattered views on a decision of a collective or individual approach to sustainable renovation. These diverging views were partly caused by the level of sustainable renovation previously implemented by the respondent. Respondents without a strong preference, also answered not to have made a choice or have a preference for any specific measures. Contrastingly, respondents with a clearly stated opinion and preference for an individual approach also said to have "*already renovated everything*". This shows that the residents who have already made individual decisions on the sustainable renovation of their home (and are further along in their individual user journey) are able to make an informed decision regarding the benefits of a collective approach. Whereas the residents who are not yet able to make a decision on a collective an individual approach, indicate not to be as far along in their individual journey.

6.1.4 | Foundation in Recognition

This misalignment in pace, as an element of procedural justice is rooted in the objective to ensure inclusion of underrepresented or vulnerable groups (Simcock, 2016). This identified procedural injustice ties in with recognition injustices. As barriers in the individual decision-making process may hinder a VvE member from moving on to the following step, the journey is interrupted and no decision will have been made upon collective voting.
This presents an issue of recognitional justice as this is an issue of understanding the differences between individual VvE members. As well as accommodating for the particular needs of members. Doing so insures all members that they are taken seriously as a partner in the decision-making processes. Failing to do so, could create further injustices through diminishing a VvE members capacity to express their concerns and limiting their influence in decision-making.

Although there is notable potential in collective sustainable renovation, to enhance equity for VvE members this is not self-evident. To facilitate these considerations of recognition justice, considerable effort has to be made in the identification of the diversity of needs and different perspectives of members with regards to sustainable renovation. Mis- or non-recognition of individual needs and living situations could present to tensions throughout the user journey. Not only recognition injustices, but instances of procedural and distributional injustice can also arise (van Bommel & Höffken, 2021b).
Currently, even the very involved Gors2025 members repeatedly discuss the 'invisible nature' of energy vulnerability in the context of neighbors who may not be able to afford sustainable renovation measures. It remains difficult to identify these residents or their specific vulnerability or needs, even though the results show that residents experience Numansgors as a very social environment. This is underlined by their stated preference to first inquire with neighbors regarding their experiences with home renovations and the high value they bestowed upon the [informal] information exchange within their community. This shows a lot of potential to apply a targeted strategy to obtain the required knowledge on members' individual user journeys and its barriers to avoid issues of recognition.

Individual Needs

Results indicate the more prominent individual barriers in sustainable renovation are financing and a lack of trust in the supply-side actor or in the process itself. This lack of trust concerns, for example, a lack of confidence in the durability of offered technology or whether current subsidy schemes will continue to exist. But also a lack of confidence in the quality of the research performed or measures implemented as it results show that VvE members experienced difficulty to calculate the potential effects of an implemented measure. These individual needs and barriers in participation of the collective user journey, are part of VvE members individual user journey. Literature provides ample examples of customer/user journeys for individual homeowners designed by companies which offer energy saving measures (Mlecnik, 2021; Nieboer & Straub, 2018). A widely-used example originates from the 'SLIM' project which will be used as the model for the individual VvE member's user journey in this research, as can be seen in figure 6.2.

In the current situation no specific efforts were found aimed to address individual motivations behind objections for participation in energy transition. Recognizing all members should include knowing and respecting, the various ways in which individual members interpret sustainable renovation, what their needs are and the strategies they would propose to increase the sustainability of their homes. A lack of this awareness carries the risk of limiting the agency of VvE members who may have alternative information needs. Thus, in communication with members it is important to clearly convey the intentions of the shared information to avoid conflict which may cause individual members to drop out of the user journey. For example in the survey administered among residents some residents expressed they experienced an infringement of their autonomy as they believed the GORS2025 committee wants to make decisions for them. Respondents expressed a strong determination to be independent. However GORS2025 expresses they do not have that intention but as they were focused on the sharing of knowledge through the information meeting, limited time was allotted for input from residents. Due to the lack of communication regarding the values and needs of the residents, both actors misrecognized each other's intentions.

6.2| LEVELS OF INTERMEDIATION

The activities of intermediary actors showcased in the results section can be divided into three different categories. Therefore, out of the results three intermediary roles are identified that interact with the user journey at three levels of interaction. The three levels that are recognized in this thesis, built upon the typology of transition intermediaries of Kivimaa et al. (2019). As previously introduced in section 1.2.6, this typology regards intermediaries in the context of the multi-level perspective (MLP) a core approach of transition studies.

The analysis performed in this thesis show that different types of actors can perform intermediation throughout the VvE user journey. This ads to the body of literature on transition intermediaries and MLP by illustrating how intermediation interactions manifest in the user journey. Specifically how the respective action repertoire of the identified intermediaries has the potential to advance energy justice. This is discussed in greater detail in the sections below.

6.2.1 | User Level

The first level is presented with the establishment of the dedicated committee Gors2025, which led to their taking on the role of intermediary. Firstly, the aim of the Gors2025 committee is to create awareness about the possibilities of sustainable renovation measures among the VvE members. They provide VvE members with information in several different ways. In doing so, they frame the concept of sustainable renovation from the perspective of their shared living environment and lifestyles. This informal information provision makes the introduced concepts more understandable and appealing to the other VvE members.

Secondly, the committee has the objective to enable residents to make an individual choice in approaching sustainable renovation. This is done by providing knowledge that is contextually specific to the Numansgors residences. For instance, the exemplary function of the frontrunning residents creates an action perspective for other members. The renovated homes of the frontrunning residents showcases the measures other residents can do themselves. The organized information meetings were also beneficial to this end. Although the meetings were only attended by a limited portion of the VvE members, those that were in attendance showed a high degree of engagement. However, it is challenging for the committee to answer the residents need for tailor-made plans of individual.
Thirdly, the committee provide a channel of communication between the municipality of HW and the residents. As such they have invited the municipal representative into the project. Additionally, they collect knowledge regarding the VvE which could help the municipality achieve their targets. Especially as the municipal interviewee expressed the difficulty they experience with reaching the citizens they aim to help in their struggle with energy poverty. Although this research did not specifically address energy poverty in Numansgors, the position of the committee between the municipality and residents has the potential to aid their efforts.

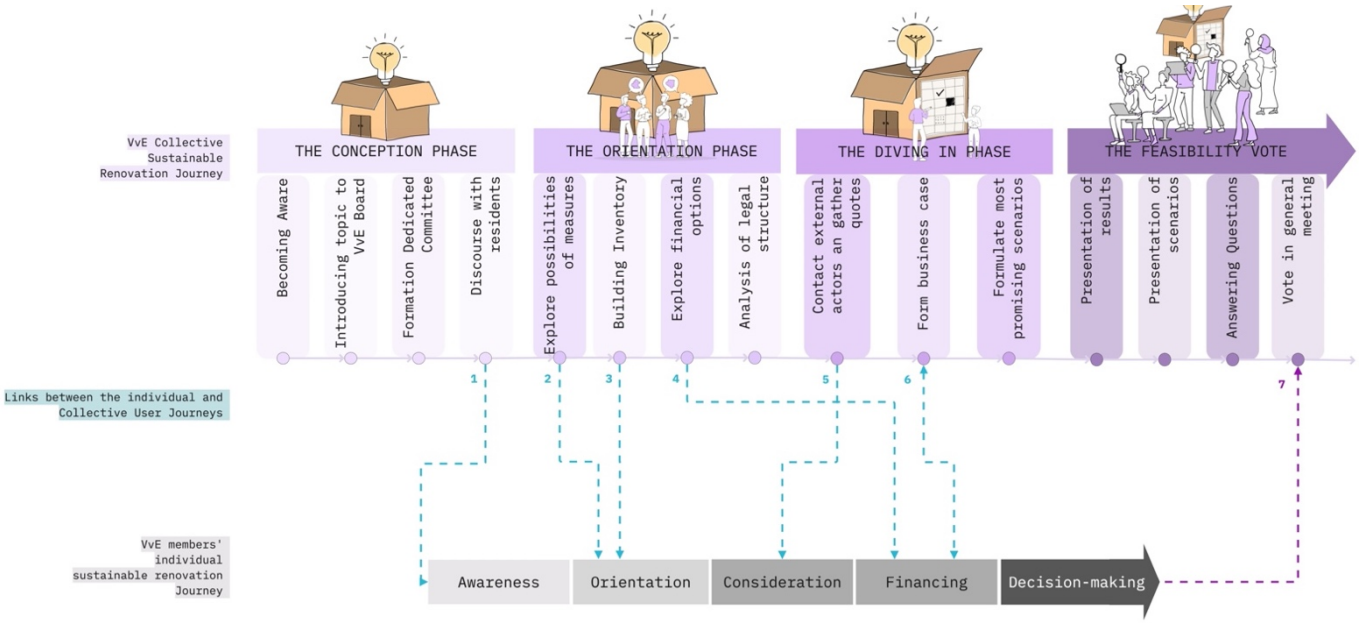


Figure 6.3: The VvEs collective user journey, parallel to the individual user journey of a VvE member. Linked through the ways the individual could be influenced by the collective.

Lastly, the committee is exploring the possibilities of collective business models for decentralized renewable energy generation, like option of aqua thermal energy generation. As such they offer the individual VvE members to change their role in the energy system. The individual VvE members could together have more power and take on a more active role, beyond being a consumer, which they may not have individually.

The aforementioned actions and context of this actor, correspond to those attributed to a 'user intermediary' by Kivimaa et al. (2019). Having emerged from among residents, they act as a facilitator between individual residents (users) and measures (technology) (Kivimaa et al., 2019). Furthermore they broker between residents and supply side actors or other intermediaries, such as the WUR research team and the municipality of HW. Moreover, the committee provides a knowledge-sharing network between residents through the Q&A meetings and the forum on their website. It seems likely this would form the initial knowledge base addressed by the VvE-members as the results indicate their preference of inquiring with neighbors and friends for information. As such, the user-intermediary role of the dedicated committee essentially forms the link between the parallel decision-making journeys of the individual residents, and the collective user journey of the VvE. As the case study in Numansgors shows, this provides opportunity for the project champion to take on this role of user intermediary to ensure the collective user journey of the VvE aligns with individual user journeys.

6.2.2 | Process Level

Second, the expert interviews revealed a need for *good project management and to build* confidence *in decision-making within the community.* From experience, interviewees had learned that the long-term nature of the projects often presents a challenge for project champions to carry the full responsibility, which is why they regard process guidance as a determining success factor of a project. The activities presented in the results that shaped the identification of this second intermediary role, who performs a facilitating role at the process level, corresponding to the typology by Kivimaa et al. (2019).

Where the user-level intermediary, intermediates between the individual and collective user journeys. This level of intermediation is concerned with advancing the processes of the collective user journey and facilitates the renovation process without individual agenda. What defines intermediation at a process level is the coordination and visioning of the project. An initial vision for the project could very well be created by a non-intermediating actor or user-level intermediary. A process intermediary can offer inspiration and guidance for visioning by sharing experiences from previously completed projects. That same experience, gives an advantage in managing the implementation of that vision. can be an important intermediation activity undertaken by an architect or a developer, for instance.

These activities go beyond the knowledge sharing associated with the user-intermediary through the linchpin role in which they preside between the various actors, which is exemplified by the experiences of several expert interviewees who recognize the value of the independent nature of their consultancy and litigation support. In the case study, fulfillment of this role was missing. Although several of the activities associated with this role had been fulfilled by the municipality HW or the Gors2025 committee. Especially in the role the municipal representative took on during the information meetings, their actions of explaining and coordinating are exemplary of this function. The partnership of Gors2025 and the municipality HW has been every beneficiary to the continuation of the NG user journey. This is in contradiction with Parag and Janda (2014) who underline this intermediary role as being without independent agency or capacity.

A more promising actor to fulfill the role of process intermediary can be found in the VvE management companies. Due to their long term experience in maintaining and managing the VvE buildings, they are likely to have access to valuable information their existing client base as well as the expertise and network to accelerate the renovation journey. Their role revolves around the development of connections and advancing the activities of the project champignon, like a committee or VvE Board. A big advantage of allocating this responsibility to the VvE management actors is their existing task of designing the multiyear maintenance plan, as interviewees note the benefit of incorporating sustainable renovation with planned maintenance. Moreover, the interviewed VvE management representatives indicate they have access to a network of actors with more technical expertise which could provide insight into the distribution of benefits of certain measures and aid in planning for an equitable distribution.

6.2.3 | Niche Level

The third level of interactions between the intermediary and the user is at the niche level. At this level the actions of the intermediary actor are less directly involves with the user, but are more facilitating and ensuring. As the more projects develop within the HW municipality, they have the potential to fulfill this role. The position of the energy department of the municipality allows them to intermediate between multiple projects, connect VvEs with process intermediaries and share lessons learned. The HW representative (G4) has expressed the municipalities aim to aggregate knowledge and help guide local developments. As such a niche intermediary interacts both with the user intermediary and process intermediary. As the municipality was the only actor identified to be aware of and engaged in activities related to energy vulnerability, they present the most promising actor to spread this awareness. Additionally, the municipality already plays a significant role in the renovation environment due to its connection with various other stakeholders. Currently, the relationship between the municipality and the VvE is not clearly defined and their relationship is solely based on mutual interest. Although this may not hinder the Numansgors project, this may be difficult to extrapolate to other VvEs with less opportunities of implementing renewable energy generation.
As the municipality may not be able to provide all the support a VvE requires at the same time. Therefore, the municipality is better suited for intermediating between different VvEs and community energy initiatives. Providing this connection between various experimental project in the community energy sector enables initiatives to learn from each other. Meanwhile this mutual relationship can aid municipalities to better understand the (energy) vulnerability of the households within a VvE.

6.2.4 | Conclusion

Opportunities for intermediary actors to advance the VvE in their journey were found on three levels of interaction with the user journey. The user level intermediary, the process level intermediary and the niche level intermediary.

- The user level intermediary intermediates between the individual VvE members' user journey and the collective user journey. This level of intermediation advances the user journey by translating technologies and financing schemes to individual members. Additionally user-level intermediation communicates the lived experiences and preferences to other stakeholders.

- The process level intermediaries are specifically established or tasked to intermediate the collective sustainable renovation process. For example, this actor can be a sustainability consultant or VvE maintenance expert. Process intermediaries facilitates the renovation process without individual agenda, in support of the goals or vision set by the VvE.

- The niche level intermediary, the municipality, supports the sustainable renovation process through the provision of a supportive environment. This actor intermediaries within the niche of collective sustainable renovation, by connecting different initiatives on municipal or national scale.

6.3 | STRATEGIES

The junctures do not necessarily show where injustices occur, but rather do they reveal opportunities within the related phase to enact energy justice. Correspondingly, the results convey interaction between intermediaries and VvEs at phases in the user journey where these junctures can be found. Hence, it can be reasoned that promising strategies can be discovered in which intermediary actors can enact energy justice within their existing function.

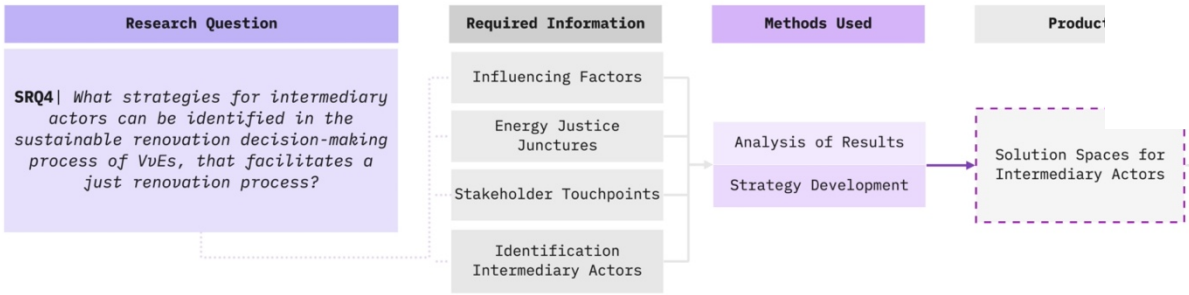


Figure 6.4 | Research Flow Diagram of answering SRQ4

The following sections present the strategies that were found for three levels over intermediary actors to enact energy justice and accelerate the decision-making process. Figure 6.5 illustrates how intermediaries fulfill their facilitating role and enact energy justice principles at the revealed junctures. This results in the VvE overcoming the described barriers and move forward in their journey, with an increased capacity for energy justice. The strategies in this section are precisely that, an action repertoire for each identified level of intermediary which aims to enact energy justice principles through the interactions of facilitation at the identified junctures.

6.3.1 | Strategies for Niche Level Intermediaries

The niche level intermediary's action repertoire is aims to create an environment that stimulates VvEs to initiate the user journey towards sustainable renovation. A key ingredient is to support interaction. As the expert interviews showed, as well as the representative of municipality HW, it can be challenging to find your intended audience. Moreover, the fragmented information and untrustworthy supply side point to the desire for an environment supportive of the interaction between these actors. Collaboration with local actors is facilitated by the niche level intermediary, bringing VvEs and process intermediaries together. Moreover, the municipality is placed in this position because of their awareness of energy justice related issues, such as energy poverty and vulnerability. Not only are they aware of the issues and the causes of these issues, they have some means at their disposal to target vulnerable citizen groups and engage them in a collective journey or connect them to intermediary actors who can.

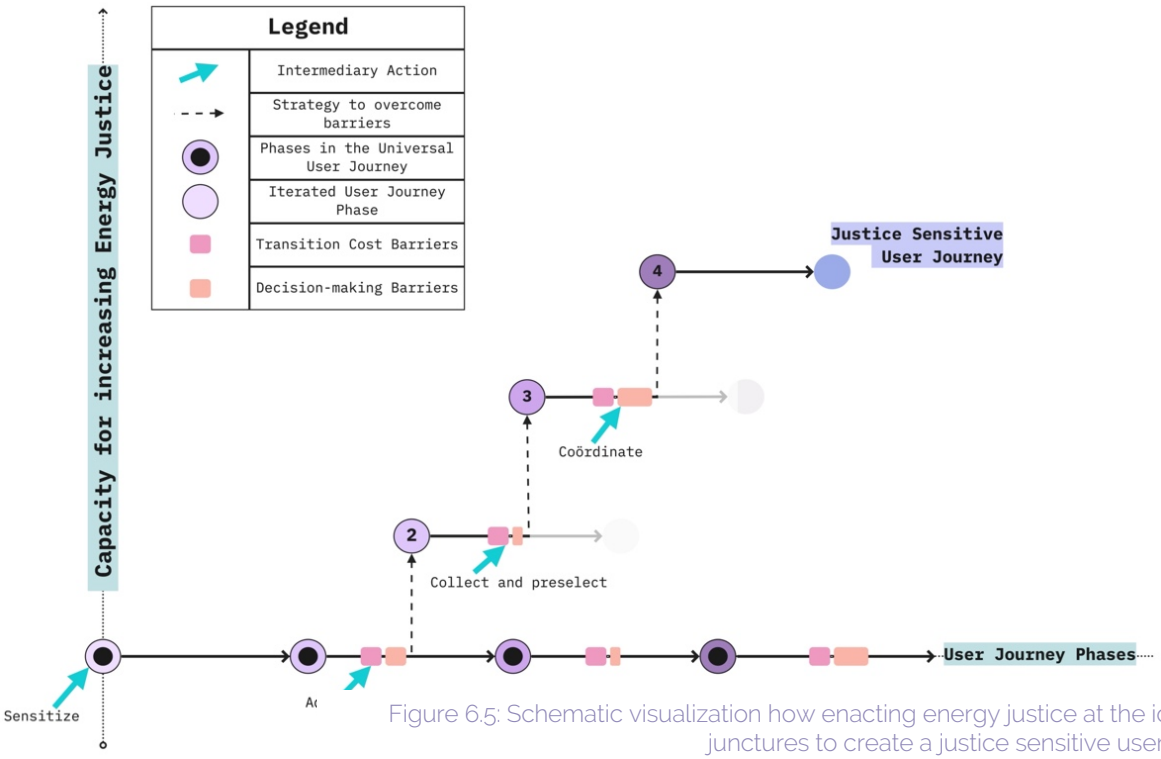


Figure 6.5: Schematic visualization how enacting energy justice at the identified junctures to create a justice sensitive user journey

6.3.2 Strategies for User-Level Intermediaries

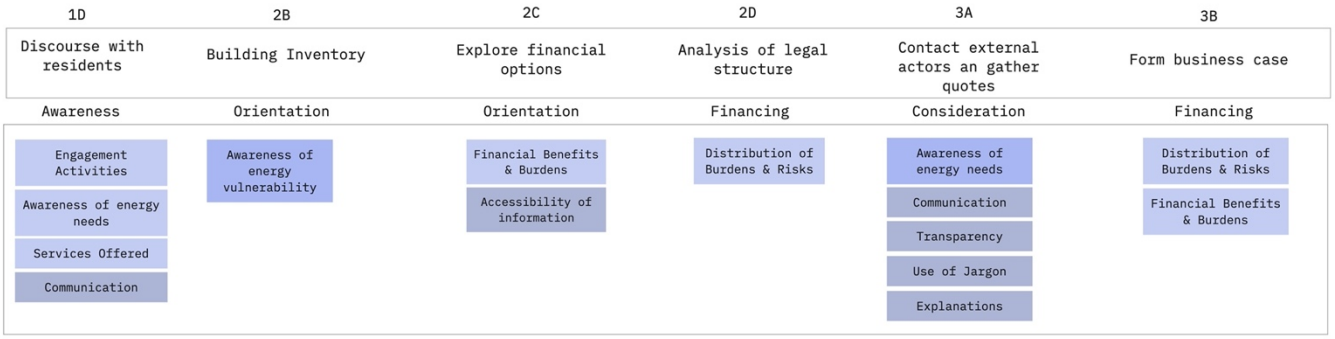


Figure 6.6 | Overview of junctures and corresponding steps in the user journey

The user-level intermediary has been defined in this research as intermediating between the individual user journey and the collective user journey, as was shown in figure 6.3. As such this actors encounters junctures of recognitional nature. The NG User Journey map, shows how internal community dynamics around the energy decision-making are steered by the dedicated committee. Intermediaries at the user level directly address resident as individual homeowners, as opposed to a member of a VvE, which research has shown to be preferred (W&I Group BV, 2016). Which coincides with aspects of recognition justice that require this actor to have a degree of awareness, of the diversity of members as well as their divers energy needs. The user-level intermediary is tasked with the question, 'who is ignored in decision-making?' as well as the responsibility to acknowledge those actors.

Figure 6.3, shows six touchpoints between the individual and collective user journeys through which this intermediary can facilitate the individual homeowners. The first is in step 1D of the collective user journey, where the discourse with residents sparks awareness in the individual. There lies an opportunity to address potential injustices during this phase, for example by deploying engagement activities dedicated to making an inventory of the needs, desires and values of the VvE residents. Thus this first link, through which the collective journey sparks awareness in the individual resident, should be designed to reciprocate a spark of awareness in the user-intermediary.
The second and third touchpoints at steps 2B and 2C can of the collective user journey, can be addressed similarly. Step 2B, building inventory, aims to aid the individual homeowner by providing them information that is specified to the energy consumption of their home. At this juncture, lies an opportunity to enact principles of energy justice by providing vulnerable residents with information specified, not just to their home but to their individual energy needs.
This is aimed at facilitating individual homeowners with sufficient knowledge of measures, while taking away the barrier of how to acquire information and enact justice. Moreover, the proposed action of step 1D, enables addressing recognition based junctures better through the increased awareness of residents individual needs as well as potential energy vulnerability.

In Step 3A, many procedural junctures are found. The mitigation can be found through the example of the Gors2025 committee. Their role of collecting quotes and applying them to the context of Gors, designing of calculators specific to their homes exemplifies the key characteristics of this intermediary role.
The opportunities described in the section above, ultimately lead to the arrival of the individual homeowners in at the feasibility vote phase of the collective user journey at equal stages of their individual jour

6.3.3 | Strategies for Process Level Intermediaries

The action repertoire of the process level intermediaries is aimed at alleviating barriers of the collective user journey. The barriers that need to be addressed by this actor are those that initiate the user journey as well as motivate the user-level intermediary to enact justice principles at the aforementioned junctures. For instance, inquiring knowledge regarding the personal situation of residents does not automatically lead to the increase of energy justice. Rather, the knowledge of how to address these needs and accommodate for more vulnerable groups is needed for justice to be enacted. This illustrates the significance of the process-level intermediary, through the provision of support the user-journey's capacity to increase justice is enabled.

The touchpoints of sensitizing, advising, collecting & preselecting and coördinating (de Wilde & Spaargaren, 2018) should be approached carefully and patiently as dictated by the notion of procedural justice (Simcock, 2016), which is how this actor is presented with an opportunity to enact energy justice. In contrast to the facilitating role of the user-intermediary, the process-intermediary corresponds better to the activities of framing & coordinating as defined by (Warbroek et al., 2018).

The scenarios of sustainable renovation, presented at the feasibility vote, reflect to what extend energy justice principles have been enacted through the journey. The proposed business-case has the capacity to increase energy justice to the degree it is able to address the barriers related to all previous steps. For example, this should be reflected in the preliminary business case. In the way the presented measures address the divers energy needs within the VvE and, the way it distributes the burdens across residents. As not all measures will benefit residents equally, the business case should reflect the disparities of burdens and benefits in the access to outcomes. To design the business case is such a way might be challenging for VvEs, thus this task fall under the responsibility of the process-intermediary.

By aligning expectations of participants and systematically guiding the VvE through the user journey as a collective. In their coordinating role, a key task is planning, which shapes the timeline in which the individual journeys and the collective journey must align. This also adheres to a degree of expectation management, as residents are usually unfamiliar with the technical aspects of measures. Resulting in difficulty to gauge the timeline of the overall project and thus the pay-back-time, a point to which many questions were raised. As these actors are without independent agency, these actors can ensure the project's objectives reflect the objectives of the individual residents. As interviewed experts found that the championing residents can be much further along in the decision-making process than the other residents. A process intermediary can mitigate the resulting tension, where lagging residents feel like they are unable to catch up and pragmatism is prioritized over contemplation.

Figure 6.7 presents a visual overview of the findings and strategies in relation to the VvE user journey, which can be seen as a visual summary of this research.

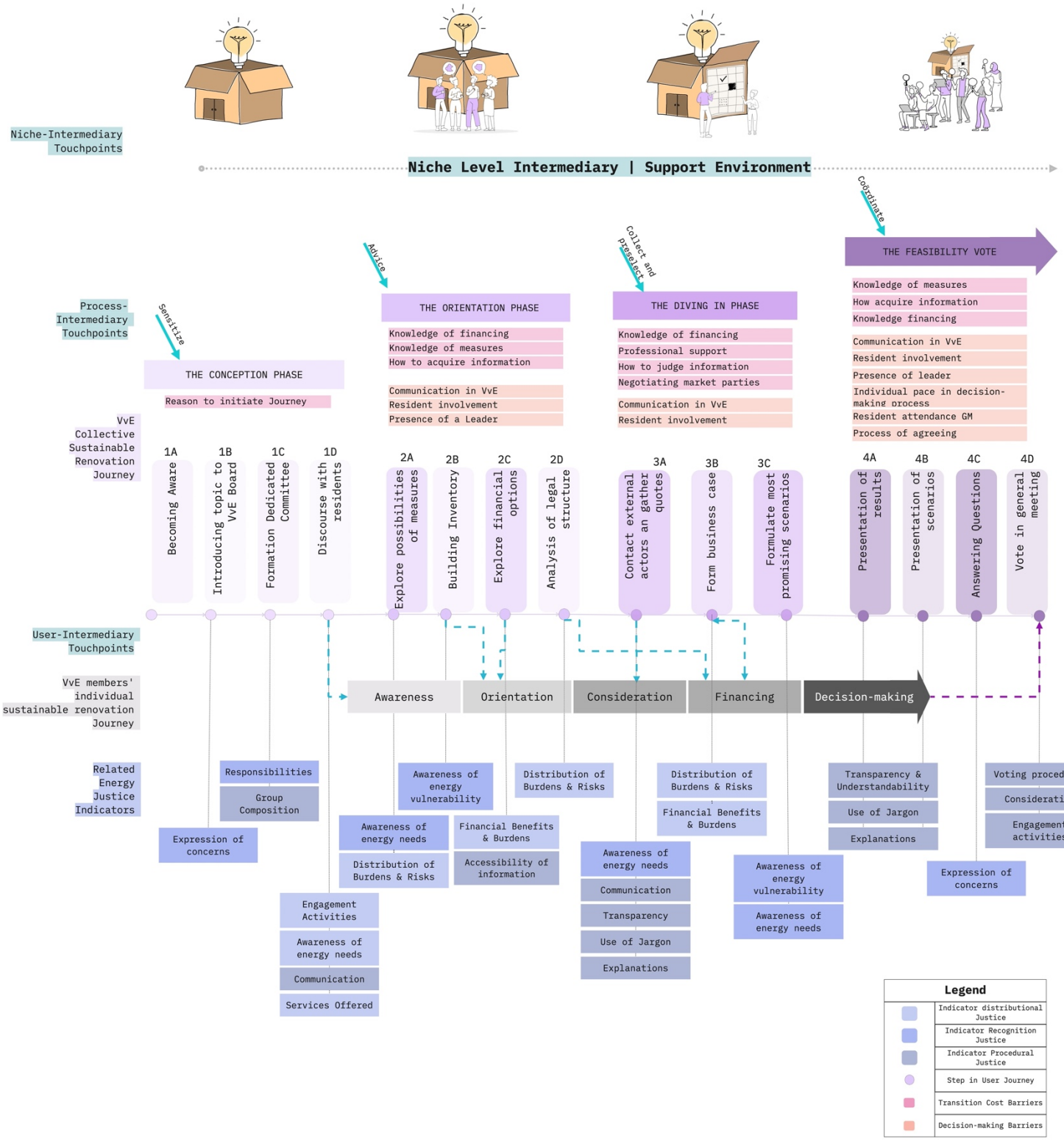


Figure 6.7: Visual overview of findings, integrated in the user journey framework.

6.4| BEYOND FEASIBILITY

This section explores the potential for energy justice junctures in the VvE user journey beyond the feasibility vote. As stated before, a complete a user journey spans over several years. The case study in Numansgors was limited up until the feasibility vote due to temporal constraints of the research. However, this section aims to extrapolate the findings to the following user journey phases to briefly touch upon what junctures with energy justice to expect in the oncoming phases.

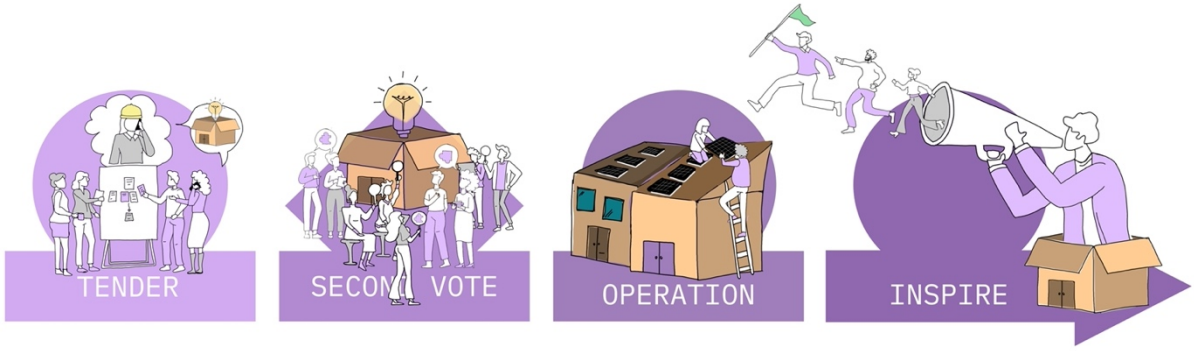


Figure 6.8 | Visualization of user journey phases outside the research scope

6.4.1 | Tender Phase

The performed content analysis on sustainable renovation within VvEs (chapter 4) identified three additional phases as well as an additional moment of voting in a GM as can be seen in figure 6.8. After the feasibility study is approved by the VvE members in the general meeting, the VvE can move into the tendering phase. This phase is defined by the requesting and comparison of quotes of supply-side actors. In that sense, the tender phase can be seen as an extension of the 'Diving-In' phase. However, a perquisite for entering this phase is the feasibility study. As selecting a supply side actor for measures must be done specifically. Thus, this requires a choice of or selection of measures that have been deemed feasible.

Results have indicated a lack of trust in supply-side actors among various stakeholders. Municipality, residents and intermediary actors experienced communication with supply-side actors, such as contractors and architects, as difficult. These actors are experienced as being partisan, as they sell the proposed measures. Residents and intermediaries spoke of these actors in the context of discontent with being dependent on a single supplier, who they did not fully trust. That implies a presumed difficulty in properly assessing the received offers as well as building the business case.

During this phase a need that is likely to arise for residents is to have a clear insight into the benefits of the measure in the short and long term. This could also been seen in Numansgors, where this need was expressed in the questions raised regarding the aqua thermal energy generation. Questions that dominated the debate largely concerned payback time of the measure as well as the relative benefit of the change in monthly energy costs. The different quotes, as well as the varying business cases, require thorough screening for suitability not only for the VvE as a whole, but also for the individual VvE members. As the quotes are obtained to design a more detailed business case, which will be voted on in the 'execution vote'.

Potential Junctures

Table 6.2 Potential Junctures associated with the tender phase

	Indicator Recognition Justice	Indicator Procedural Justice	Indicator distributional Justice
THE TENDER PHASE	Knowledge energy vulnerability	Representation	Financial Benefits
	Awareness of divers energy needs	Communication of Information	Non-Financial Benefits
			Financial Burdens
			Non-Financial Burdens
			Risks
			Inclusion of vulnerable groups
			Advice Services

The activities foreseen in this phase, would likely presented junctures with various energy justice indicators. This phase encompasses the final formation of the business case. This business case establishes the individual members' access to the outcomes of the implemented measures. The capacity of members to understand the implications of the chosen measure is dependent on the communication of information obtained from supply side actors. The way both the procedural and distributional junctures presented in this phase, are addressed is likely to depend on recognitional aspects such as awareness of the divers needs among VvE members and knowledge of energy vulnerability.

Potential Intermediation Strategies

Following the findings of the first four phases, it can be foreseen that VvE members could easily feel overwhelmed by the many options and numerous variables up for consideration in finding a suitable tender to match their plans. Therefore, this phase seems one where a process-intermediary could really lean into their role of guiding the VvE members to the process. Specifically in collecting and pre-selecting information obtained from supply-side actors. This intermediary actors' characteristic independence may be able to create a feeling of and trust. Through offering transparency in information provision and guiding the VvE members through the bureaucratic landscape towards possible financial benefits.
Furthermore an advantage can be offered by the user-intermediary to turn to one, relatable contact person with their questions. Especially for the VvE members with less capacity to obtain and judge information, this could have great influence on their capacity for self-recognition and capacity to express concerns.

6.4.2 | The Execution Vote

In the previous phase quotes have been assessed and feasible options have been found to build a business case. This business case most likely encompasses a combination of the most suitable measures for the VvE, the expected costs of purchasing, implementation, maintenance, financing and yield (in case of energy generation measure). To proceed to the execution of this plan, another voting round in a general meeting should be held and the plans approved. During the presentation in the general meeting, the attractiveness of the business case of a measure is assessed by the members. The proposition will previously have been submitted to the members for review, as is determined by the rules and regulations of the VvE.
Member attendance is again an important influencing factor, as a minimum percentage is required to approve the business. Controversial or impactful business plan proposals are said to generate an above average turnout, according to the interviewed experts. However, this does not necessarily positively affect the outcome of the vote.
As in the previously described general meeting, the feasibility vote, the presence of leadership in the project and the meeting itself are likely to play a significant role. As is a sense of trustworthiness of the actor conveying the information regarding the financial and technical aspects.
Likewise, this phase requires recognition of the different paces of assessment members perform their decision making. If members are still unsure of the benefits or have reservations regarding the specific quotes, this may lead to a negative decision.

Table 6.3 Potential Junctures associated with the execution phase

	Indicator Recognition Justice	Indicator Procedural Justice	Indicator distributional Justice
THE EXECUTION VOTE	Expression of concerns	Voting power	
	Self-Recognition	Voting procedures	
		Consideration	
		Voting Procedures	
		Influence on decision-making	
		Access to decision-making	

Potential Junctures

As in the feasibility vote, procedural justice concerns are prevalent in this phase. As in this general meeting the members vote to approve the business case, this moment reflects the last place in the user journey map where influence on decision-making is guaranteed. The voting procedures of the VvE determine distribution of voting power among VvE members. Thus, equity of power is pre-determined by a VvE's deed of division. A members influence on decision-making is further dependent on consideration. For example in how a VvE deals with disagreeing members.

Potential Intermediation Strategies

The role of the intermediaries during a general meeting is one of coordination and information. As most voting procedures are pre-determined, this role is limited to facilitating the predetermined procedures. However, again the importance of the pace of decision-making is brought to attention in this phase. In the position of intermediary, there is potential in providing engagement activities for residents to both inform as well as gauge their place in the individual user-journey.

6.4.3 | The Operation Phase

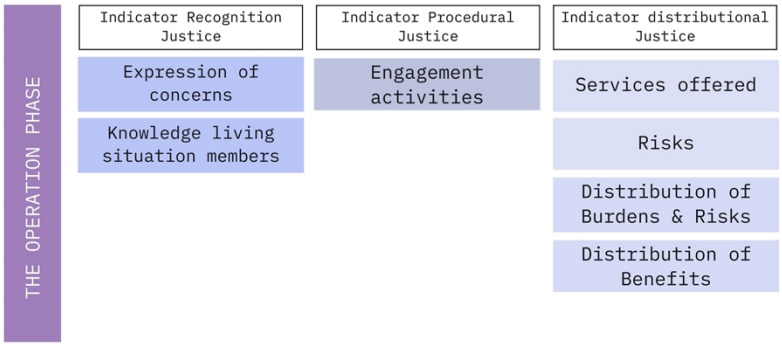
After the business is approved in the general meeting the VvE can move into the operation phase. This phase is comprised of implementation and operation of the proposed measures. After a decision has been made, installation, delivery and payment all have a major impact on the way homeowners experience the entire energy process. Therefore, needs arising in the operation phase are practical ones, such as being able to choose a suitable installation moment. Emphasis is placed on communication, with an awareness of parties of the wishes and requirements of the residents.

The implementation will most likely involve construction to shared as well as individual property. During this phase, it is likely that communication with residents is important. This is not just to keep them informed of the status of the process, but also to coordinate the project. Implementation of measures and installation insulation can potentially be a cause of nuisance (such as noise, the temporary un-availability of space, the need for residents to be present at specific times. Communication provides opportunity to make sure residents are heard and aid them in overcoming the nuisance.

Table 6.4 Potential Junctures associated with the operation phase

Potential Junctures

The implementation of the measures concerns the distribution of non-financial burdens. Which in turn consider recognition aspects of awareness. As plans could be coordinated to suit vulnerable residents is there is knowledge regarding the living situation of member.



Potential Intermediation Strategies

Implementation of the selected measures is most likely to be undertaken by contractors or other supply-side actors. Thus the focus of the intermediaries should shift from the business case and measures towards the social aspects of the process like communication with residents. After installation of renovation measures or energy generation technology, it can be important to check if everything has been been implemented to the satisfaction of residents. And if the residents are all able to use the measures as some measures may require specific technological knowledge. Intermediaries can offer advice and services to those who need extra help with the new measures.

6.4.4 | The Inspiration Phase

The inspiration phase is less a phase in the implementation of measures, but one where the renovated VvE can serve as inspiration and example for other interested parties. The processes undertaken and experiences lived can be shares with other VvEs to learn from eachother. Because this phase mostly involves communication between VvEs, a larger role is apparent for the niche-intermediary who can make the connections between interested actors.

Internally, within the VvE, this phase could also be a moment to record the experience of undertaking the project. As well as gaining insight into the financial effect of the measures. Both are important for making improvements to the process in the future. Thus, the process itself can be evaluated with the residents. After evaluation, sharing these insights and experiences with interested peers, could inspire others to implement sustainable renovation measures.

6.4.5 | Conclusion

Based on the research of the previous phases in the user journey, several junctures with energy justice can be expected to arise in the following phases;

- More junctures with distributional justice arise as the formulation of business case establishes the access to the outcomes of the proposed renovations.
- The second vote presents the last official opportunity in which residents can express their voting power. At this phase more junctures will likely arise with procedural justice.
- The operation phase will likely find junctures in relation to distribution of risks and non-financial burdens during construction. To address these concerns, solutions can be found in recognition aspects of awareness and knowledge of individual living situations of residents to accommodate the more vulnerable residents.

In this section the research is concluded, which is started with the re-iteration of the purpose of this thesis before concisely providing the answers to the research questions in section 6.4.5. And finally the main research question will be answered.

6.5| CONCLUSIONS

In its core, energy justice demands a balance of costs and benefits distributed over society, recognition and fair treatment of individuals as well as inclusive and accessible decision-making processes to all stakeholders. We do not fully understand the energy justice impacts of many of our transition efforts, such as those of sustainable renovation stimulants. Whilst government entities advocate sustainable renovation for homeowners as a means to reach their decarbonization goals, much remains uncertain about the concrete actions required to ensure these projects support energy justice. Furthermore, whilst the research on energy justice theory is ever expanding, there is a gap between between theory and practice. Navigating this complex theory could be aided by practical tools and as such to help fill this gap, this thesis research asks the following question;

How can the process of decision-making, in regards to sustainable renovation within homeowners associations, be facilitated by intermediaries to foster a just energy transition?

This research question demands insights in two ways, firstly insights into the main barriers that could make collective decision-making in sustainable renovation journey (un)just. Secondly, insights into how intermediaryy actors could mitigate the (in)justices in collective decision-making in sustainable renovations? The answers to these questions offer insights to academics in field of energy transition as well as policy makers and practitioners in the field of sustainable renovations in VvEs, about their role in delivering a just energy transition. More specifically, in answering these insight are brought forward on how these intermediaries can support these projects best, not only to promote justice but to deliver a successful outcome of the project overall.

The research conducted fort his thesis project answers that question by it's investigation into the influence of intermediaries in sustainable renovation of homeowners associations. To this end, a theoretical framework was developed by combining user journey mapping (a practical design tool) with theorical concepts of energy justice to create insight towards what would constitute a fair process of sustainable renovation within VvEs.
A case study was conducted in Numansgors, a homeowners association on a journey of sustainable renovations. The case study data was analysed through means of the developed framework to investigate what opportunities would be revealed. Furthermore, interviews were conducted with professionals in the field of homeowners associations to find strategies befitting of the revealed opportunities.

The following sections comprise how the conducted research answers the research questions and discuss how each Sub Research Question (SRQ) contributes to answering the main RQ:

6.5.1 | SRQ1 |

The research was initiated with a literature review to operationalize the energy justice framework in aim of answering the first sub research question;

What are relevant indicators of energy justice in the collective decision-making on sustainable renovation within VvEs?

Based on the interpretation of the three tenets of energy justice by Jenkins et al. (2016), this research ascribed the set of principles to aspire to within the processes of collective decision-making on sustainable renovation within VvEs. As this research sided with the argument of Sen (2008) that any notions of justice should allow responsiveness to its context, these principles were therefore abstracted to a set of 18 themes that point towards an interface with principles of energy justice. Building on research by Hanke et al. (2021) who reported indicators to determine the capacity of local energy communities to deliver energy justice, these themes were ascribed with corresponding indicators, developed through review of literature on community energy initiatives.

The resulting indicators contribute to answering the main research question as they are used to contextualize the empirical data and reveal opportunities to enact energy justice. Throughout the analysis of the case study data was coded using the developed indicators. For example the indicators 'methods of communication, 'use of jargon' and 'explanations' were associated with numerous quotes in the stakeholder interviews, survey data, observations as well as expert interviews. This indicates how crucial the transparency and understandability of information is in communicating within the community through the process. Whilst achieving due-process is not a clear goal, the aim of developing these indicators is to reveal opportunities within the related system to enact energy justice.

6.5.2 | SRQ2 |

To that end, this thesis described the transitional and collective decision-making processes of members of homeowners associations by answering the following sub research question;

What are the various stages in the decision-making process of home owners associations in sustainably renovation measures and what are the influencing factors, barriers and actors at these stages?

This research draws on the conceptual insights from previous research through the analysis of publicly available content in which the experiences of sustainable renovation of homeowners is described. An inventory was made of the stages of decision-making and related factors and illustrated through the 'user journey map'. The term 'customer journey or user journey' is a practical tool from the field of Industrial Design, regularly used to illustrate the sequential stages of decision-making. From this inventory a universal representation was developed of the processes, which VvEs go through towards increasing sustainability of their homes, and defined in eight consecutive phases, including two required voting moments.

The resulting framework contributes to answering the main research question as it addresses the theoretical underpinning of the process steps and prerequisites for the continuation into the following phase of the user journey. To fit the scope of this research,

a focus is placed on the phases leading to the first vote. The user journey starts with the conception phase, when a VvE member becomes aware of the possibilities of sustainable renovation and initiates the process by informing the VvE Board. This resulting universal journey presents a user-centred perspective of the related processes of planning and organizing and the interactions between the users and other actors. The case study data is analysed through this framework to reveal the touchpoints with intermediary actors and the barriers encountered alongside the user's experiences. Looking at the results, the findings related to this SRQ thus contributed by producing the blueprint of the framework, used to organise the empirical data and to iterate towards a justice sensitive user journey, aimed to improve the capacity to enact energy justice within the user journey. Through conceptualizing the answers of the first two sub research questions, a theoretical framework was constructed that shaped the foundation in answering the third, fourth and main research question.

6.5.3 | SRQ 3 |

The empirical part of the research is initiated with the aim of answering the third sub-research question:

What junctures with energy justice can the application of the conceptual user journey framework to the case study reveal?

To answer this question case study research is conducted in Numansgors, in which survey, interview, content and observation data is analysed by means of the indicators developed in answering the first research question. Furthermore, the data was organized in the framework of the universal user journey map, developed in answering the second sub-research question. The result of which is a series of junctures in the decision-making process (user journey) that indicate potential consequences to the journey's capacity to enact energy justice. As can be seen in figure 6.9.

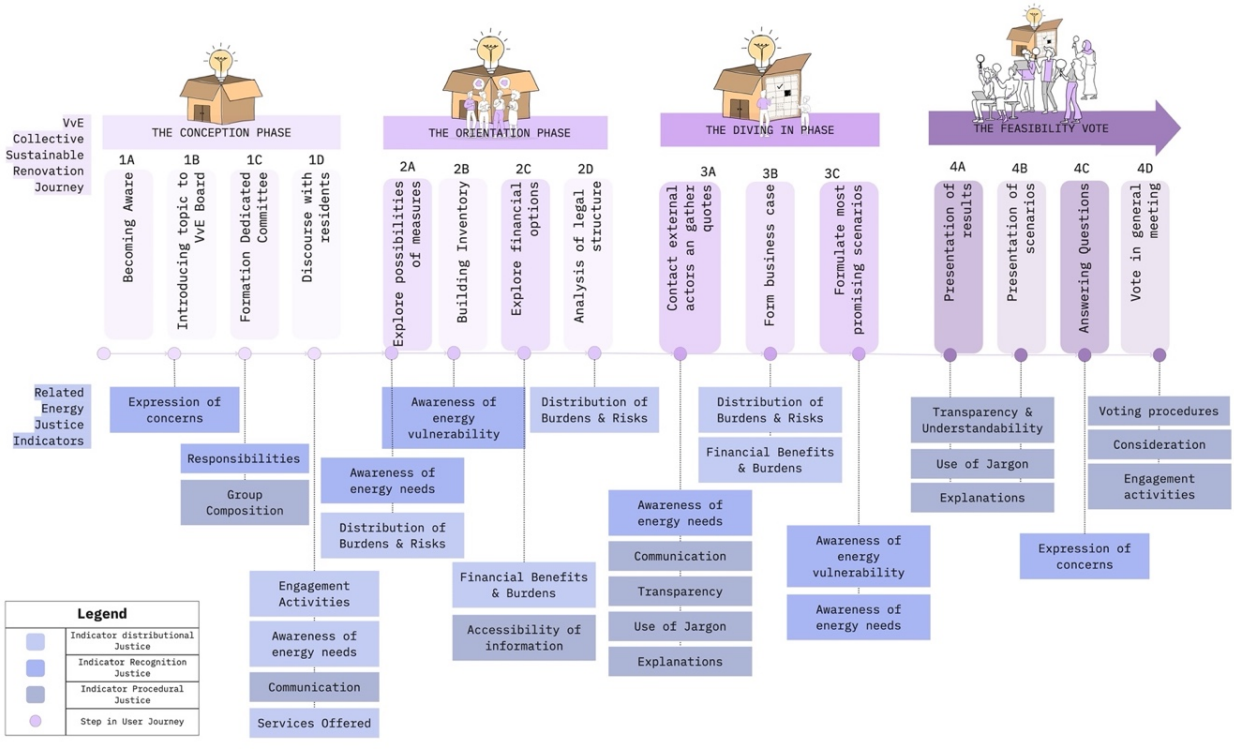


Figure 6.9 | Overview of energy justice junctures found in the user journey.

6.5.4 | SRQ 4 |

With the answering of SRQ3, the results section is completed. The following research question is answered in the discussion section:

What strategies for intermediary actors can be identified in the sustainable renovation decision-making process of VvEs, that both facilitates a just renovation process?

In answering this question appropriate intermediaries and strategies were found to take advantage of the opportunities presented by the identified junctures. The case study research identified three levels of intermediaries that touch upon the user journey. User-level intermediaries, process-level intermediaries and niche-level intermediaries, whom all play a different role in advancing the user journey of a VvE through overcoming specific barriers. Through analysis of the expert interview data, an action repertoire was synthesized for each level of intermediary at the identified junctures to enact different aspects of energy justice. The results allow for the conclusion to be drawn that this research has identified three strategies in which intermediaries can facilitate a just decision-making process for sustainable renovation in VvEs.

6.5.5 | SRQ 5 |

In answering the fifth sub research question:

How can this strategy be implemented in a VvEs user journey?

The identified junctures and strategies were incorporated into the universal user journey, which together formed the final iteration of this user journey within the scope of this research: a justice sensitive user journey of sustainable renovation in VvEs. Figure 7.4 presents this final iteration of the user journey map, as derived from the synthesis of empirical analysis. It is intended as a blueprint for VvEs, intermediaries and policymakers when embarking upon a journey of sustainable renovation to include considerations of the various aspects that contribute to the (in)justices of the resulting energy system and the processes of getting there. The components of the first iteration of the user journey offers a detailed perspective on the factors associated with the (in)justices of collective decision-making in sustainable renovation. Which are designed to provide a lens through which the factors responsible for shaping the (in)justices associated with a project can be determined, specifically against the three pillars of distributive, recognition and procedural justice. The final iteration as presented in figure 6.7, offers the incorporation of targeted interventions in the user journey aimed to mitigate potential injustices.

6.5.6 | MAIN RQ |

To conclude, cumulative the answers to the sub research question form the answer of the main research question;
How can the process of decision-making, in regards to sustainable renovation within homeowners associations, be facilitated by intermediaries to foster a just energy transition?

The results of this research show three ways in which intermediary actors can interact with the VvE in their user journey to facilitate them in decision-making for a just energy transition. Through the use of an illustrative case study, and the developed framework, that combines energy justice theory with user journey mapping. Through this case strategies were described in which intermediary actors can facilitate the VvEs in their user journey while enacting energy justice. These strategies, as proposed in this study consist of three levels in which the user (VvEs) interact with intermediaries in their user journey to facilitate their decision-making.

- On a **niche-level**, intermediaries (such as municipality HW) can deploy a strategy of facilitating collaboration between actors and creating an environment that fosters interaction between process-intermediaries and VvEs.
- On a **process-level,** a coordinating strategy can be deployed to alleviated the barriers in a collective decision-making journey and facilitate the intermediaries at the user-level to enact justice principles at the aforementioned junctures.
- On a **user level**, the project champion resides in the role of intermediary in between the collective user journey of the VvE and individual user journeys of each homeowner. As such a strategy is proposed to utilize the six touchpoints through which this intermediary can facilitate the individual homeowners. By deploying engagement activities dedicated to making an inventory of the needs, desires and values of the VvE residents and providing vulnerable residents with information specified, not just to their home but to their individual energy needs.

7

7 | LIMITATIONS & RECOMMENDATIONS

This chapter final chapter of this thesis, looks beyond the results of the study and its interpretations. A broader perspective is taken as the general contribution of the research is placed in the landscape of energy justice literature and the Dutch energy landscape.
The outline of this chapter is as follows; The chapter starts off with a reflection on the contribution this research aims to present to both energy justice scholarship as well as society, in section 7.1. Afterwards the limitations to the research are discussed, before addressing the recommendations for future research.

7.1 | CONTRIBUTION

This section reflects on how the findings in this research contribute to theory and society.

7.1.1 | Scientific Contribution

The academic field of energy justice is said to be at a critical juncture (Jenkins et al., 2021). With the growing interest in scholarship, the importance of the social dimensions of transitioning our energy systems is becoming more salient. Yet a gap remains between theory and practice. This is presented in one of the core challenges and opportunities for energy justice scholarship, which is to achieve outcomes and forge partnership between academic and non-academic communities (Knox et al., 2022). The contribution of this study is to explore pathways on how to move energy justice theory beyond the written page. As it is believed that bringing justice into practice is next wave of development for this research field (Jenkins et al., 2020).

The contribution of this study to scholarship is twofold, the first is through the presentation of the justice sensitive user journey itself. This second iteration of the conceptual framework is presented as a tool for future research, as explained in section 7.3. The second contribution that was attempted to made in this research is to shape communication of energy justice beyond rhetoric. As a practitioner of energy justice, the author's role can be viewed as a translator between scholars and actors. With the development of the practical tool to enact energy justice, an attempt was made to frame justice related trade-offs more explicitly in a specific context. With the aim to enable actors to recognize these junctures in a process that may cause injustices.

That they may act upon this recognition to take on the principles of justice to voice their concerns or intervene.

Following a critique on energy justice scholarship, that limited attention is paid to how citizens and communities pave way to a more energy-just future, this research centers the user, the people. In this human-centered approach, their experiences shape the strategies

7.1.2 | Social Contribution

As we are beginning to see more and more, how our efforts to achieve sustainability related goals have caused issues of inequity throughout society (Clark, 2015). This is problematic, because the climate targets set by the Dutch government are currently not being met (Rvo, 2022). Therefore, it seems likely the near future will include the introduction of many more policies that aim to advance to Dutch Energy Transition. Without special consideration these effort may cause a rise of inequality as a result of technological development.

Although scholars in the field of energy justice provide ample insight and research into various aspects of the problem and conceptual solutions, there is a lack of practical tools for implementation on the scale of a project. This thesis explores one way in which practical application of the energy justice can be facilitated for practitioners. That objective involves practitioners using this conceptual framework to design or redesign their participation processes.

7.2 | LIMITATIONS

This academic research is subject to limitation. This subsection discusses the limitations of this research of varying aspects.

7.2.1 | Limitations of the Research design

The research design of this thesis can be categorized as exploratory research. As such, the exploratory nature of the research allows for ample flexibility, appropriate for the experimental integration of two different fields of research. And convenient while research a subject that of which continuous change is expected. However, this flexibility and active context provide a recipe for continuously changing research in which lies a danger for the research to lose its intended relevance.
From the offset, this research was designed with a solution-oriented approach that was found to be less fitting of the research than initially thought. Over the course of the project it was found that the problem itself needed further researching, before a relevant solution could be found. This relayed the focus of the research on the position of the junctures in the user journey where opportunities to enact energy justice reside.

As a single case study approach is taken, this effects the generalizability of the findings. This focus of investigation on a singular VvE, Numansgors, increases the likeliness that the findings are only applicable to this specific context. This restraint is inherent to case study research and was therefore taken into account in the overall research design. To extrapolate the identified energy justice junctures beyond the studied area, the results of the interviewed intermediaries was incorporated. As their knowledge comes from the cumulative experiences of working with various VvEs in the context of sustainable renovation. As was stated in the discussion, data obtained from these interviews often supported what was found in the case study research.

To make more definitive statements this should be addressed in future research, as can be found in section 7.3.

The research had to follow restrictions with respect to time constrains the case study design, as the Numansgors case was the motivation behind the choice of subject and scope of this research. The findings of this study are addressed to the context specific to Numansgors. Therefore, the results will not likely be generalizable to other contexts, A first recommendation for further research is therefore to test the framework in different contexts.

7.2.2 | Limitations of the Conceptual Framework

Due to the time constraint of this project, a very narrow view of both energy justice as well as the processes within the VvE was researched. As the renovation process can take years, limited phases of the journey were observed during the research. The aim was to mitigated this in part, with the expert interviews who had walked through several similar processes with various VvEs. Although their experiences were valuable data to fill in the framework, the appropriateness of this data is debatable as user journeys are designed to be a user-centred framework.

Limitations Energy Justice Framework

As briefly addressed in chapter 3, the chosen framework of energy justice is one of the possible ways to regard energy justice (McCauley, 2013). The three-tenet framework is currently prevailing in energy justice scholarship, and has shaped the current discourse (Heffron et al., 2015). The framework and the distinguished tenets was designed to be descriptive as well as normative. It was deemed appropriate due to its functionality as a toolkit by which to analyse literature and develop indicators. However, there are limitations to the framework itself as well as the way it was used in this research. As the research field itself is growing, so is the quantity of research that critiques the framework (Jenkins et al., 2014; Jamal and Hales, 2016). The three tenet framework mainly focuses on processes and social conditions and less on underlying structures such as the economic and political landscape (McHarg, 2020; Sovacool & Dworkin, 2015). As such it provides a concise way to analyze ethical aspects and trade-offs in the energy systems. Or, like it was used in this research, as the backbone to identifying where in a process injustice could occur. The critiques on the framework note that its application tends to be limited to revealing 'tailpipe' problems (Lee & Byrne, 2019). This current research supports this critique, as the strategies developed mainly address affordability and accessibility principles of energy justice but do not address any underlying, systemic forces that may drive the occurrence of injustices. Moreover, the scope in which the three-tenet framework is applied in this research does not approach any 'embodied' energy injustices which occur along the supply-chain of energy resources. The analytical boundary this limitation provides should be noted, although it was not deemed inappropriate for the purpose, and within the scope of this particular research.

Limitations of User Journey Mapping.

The application of the (customer) user journey mapping is not new in the context of renovations for homeowners (de Wilde & Spaargaren, 2019; Nieboer & Straub, 2018; Pardalis et al., 2022). Because this tool is aimed to produce a user-centric view to the process it maps, a limitation is presented in the singular view it is able to reflect. This research was thus unable to address any differentiation between different types of VvE members and their individual user journeys. Another point of limitation of the user journey format is found in its inability to reflect the non-linearity in which a VvE experiences their journey. In the field of service design differentiation of users is often depicted through so-called personas. These personas embody characteristics of user segmentations. Following this methodology, future research could address this limitation through the development of individual user journeys for different persona types within a VvE.

Which touches upon another limitation of the current research, the survey data. Due to the time at which the survey was administered, the questions asked were not all relevant to the final direction of this research. A more relevant survey in combination with interviews with residents beyond the dedicated committee could lead to the identification of personas.

7.2.3 | Methodological choices

The research in this thesis utilized a mixture of methods for the gathering and analysis of qualitative data. Both the methods of data gathering, semi-structured interviews, observations and content analysis and the thematic analysis of this data are subject to interpretation by the researcher.
The semi-structured interviews were recorded and transcribed for analysis. However, the data from observations were gathered from the fieldnotes therefore it is possible information has been lost. The accounts recorded in the field notes are also subject to bias as they are dependent on the researchers values and interpretations.

The case study consists of four interviews with involved stakeholders, this low number is likely to influence the representativeness of the results. Moreover, all interviewed stakeholders were operational on an organizational level of the project which could make their perspective one-sided. To mitigate these influences, the interview data is strengthened by survey data, content analyses and observations. Additionally, the case study itself was a single case study of a single energy project within a VvE which in turn could hold implications towards the representativeness of the results.

The content analysis through which the universal user journey was synthesized, made use predominantly of non-peer-reviewed sources which makes them subject to bias.
Additionally these documents are based on secondary sources, which in some cases date back to 2015 or 2013. This may make the sources less accurate and reliable as changes may have occurred in policy or legal matters that these sources do not consider.

The thematic analysis of data is also subject to the researcher's interpretation of the data. Therefore the results may differ if the research was repeated by a different researcher. This limitation is mitigated, to a degree as the themes used in the analysis were identified through the development of the conceptual framework in chapters 3 and 4. This given set of themes and indicators makes the likelihood of similar results greater. Especially considering the selection of indicators is built upon review of previous research, thus limiting bias due to the interpretations of the researcher. Moreover, the data analysis is fragmented further due to the combination of energy justice indicators and the user journey framework. This may put the findings at risk of losing their context and therefore misinterpretation.

7.3 | RECOMMENDATIONS FOR FUTURE RESEARCH

The limitation of the current research have been discussed in the previous section. This chapter continuous that line by proposing ways these limitations could be addressed in future expansion of the current research. Secondly, recommendations are proposed for future research to further contribute to energy justice scholarship. Lastly, recommendations are presented for practitioner in the context of the case study.

7.3.1 | Expansion of Current Research

The project studied in the case study of this research is not yet completed. Thus, a first recommendation would be continuing the research through the further phases of the user journey. This would also allow for to draw a comparison between the two captured moments and determine whether the user journey's capacity for energy justice has changed. Which will enable the adequacy of the developed framework to be tested. The next step would be to repeat the research with multiple VvEs of varying types and sizes to compare the results, as the current study only regards a single VvE. A comparison of result between varying VvEs could provide insights needed to give body to the identified strategies. In addition, it would prove interesting to design a more active research in which these strategies are put into practice by a participating VvE. Furthermore it would be recommended for any future research to be conducted on case studies in VvEs of varying socio-economic compositions. Such a research design could most likely provide more representative insights into the extent the developed framework is generalizable beyond the current case study. A more generalizable framework would is preferable as it could lead to the inclusion of more junctures and provide a wider perspective on the topic.

7.3.2 | Future Research

The present study has shown the potential of the user journey map understand the actual experiences that surround injustices from the user perspective. Yet in its exploratory condition, much is left to question. Thus a call to future researchers is made, in which this conceptual framework is offered in the hope that it will be challenged, expanded, and strengthened through the collective efforts of scholars and practitioners.
With the objective to add to an engaged research agenda that may contribute to both achieving 'just' energy and addressing the established climate targets (Planbureau voor de Leefomgeving, 2021). Future research could aim to investigate the dynamics between the three justice tenets. As Schlosberg put it 'one cannot simply talk of one aspect of justice without it leading to another' (Schlosberg, 2003). The current research wasn't able to sufficiently address the interplay between the different aspects of energy justice. The three core tenets are notably co-existent as well as mutually reinforcing (Gillard et al., 2017). This could be addressed more in future research by investigating how these different energy justice tenets are interlinked. The consecutive nature in which a user journey map could provide an interesting pathway into framing this analysis.

The identified junctures have revealed that both collective and individual approaches to energy decision-making could cause injustices. Due to the limitations of the current research, is not able to further elaborate on the causes or consequences of decisions made at these junctures. Future research could address this by repeating the application of the composed framework and find causality between the decisions made in the journey and the outcome of the project . Furthermore, it is the intention of this research to encourage the examination of the touchstone concepts that influence the generalizability of the user

journey; location, stakeholders, temporality. As well as concepts that weren't touched upon in the current research, for example gender (Feenstra & Özerol, 2021).

Personas

With the introduction of service design tools, such as user journey mapping, to the academic field of energy justice this opens up the possibility of incorporating more related tools. As stated in the limitations section, a promising tool which is often combined with user journeys are personas. Future research could take an even more interdisciplinary approach by combining social science with design research and create customized user journey propositions for various identified VvE-member categories. Examples of persona-based approaches can already be found in research concerning residential sustainable renovation (Cherry et al., 2022; Haines & Mitchell, 2014). However, this is yet to be incorporated with energy justice research. Based on the findings of this current research, potential is seen in this approach to further explore how the individual behaviours, attitudes and motivations of residents interact with the found junctures. Persona development enables to tailor the strategies to suit different archetypes of VvE members. Tailor-made strategies could considerably enhance the diffusion of sustainable renovation measures and help intermediary actors to target an appropriate user.

Finally, future research could investigate how policy experiments could be formulated, with regard to different proposed sustainable renovation measures, different types of VvEs, process guidance and governance.

7.4 | RECOMMENDATIONS FOR PRACTISIONERS

Initially the Gors2025 committee commissioned the WUR research team with the question of how they could contribute to the energy transition with their VvE. The original question specifically mentioned the issue of diverging values regarding aesthetic fragmentation due to sustainable renovation measures. From this question, the research has diverted quite a bit. The aim remains to provide them with recommendations in this objective, nonetheless. Even though this current research did not specifically address aesthetic fragmentation, recommendations can be made regarding diverging values.

Accommodating for value differences of VvE members is another way to enact recognition justice. This is addressed in the user journey proposition with the suggestion to gather information among VvE members. Through surveys and narrative analysis, a more representative overview of what is important for the VvE members could be found. This presents a great opportunity to incorporate the research of Chen (2022), who has also completed their thesis research on Numansgors. Chen (2022) has developed a toolkit through which residents can gain insight into their collective values.

It is important to note that the Gors2025 committee's actions impressed many of the interviewed experts. They have displayed a lot of responsibility throughout the process, and more importantly a great willingness to learn.

The recommendation for practitioners further involves using the developed framework as a tool to achieve more inclusive decision-making. And as a guideline to enact to the principles of energy justice throughout various steps in the user journey. Upon arrival at a certain phase, the framework can be utilized to reflect whether considerations of social elements must be made in the according step to avoid negative consequences at a later stage.

To enable the strategies deployed in threefold by the different level intermediaries, a recommendation for policymakers would involve the development of policies that stimulate the connection between process intermediaries and VvEs. The perspective on the role of the municipality as a niche-level intermediary asks of the municipality should clarify their role in their continued support of the project. With confidence and trust being prevalent barriers in the individual user journey, this clarification would make it easier for residents to know what extend they can expect municipal support. And to what extent and how the promises made can be fulfilled.

To this end this recommendation involves the user intermediary to accommodate a justice sensitive user journey for the interested VvEs. As described by the interviewed VvE management companies, the level of customization currently makes the process guidance too expensive to be an attractive product. Therefore this recommendation includes to subsidize VvEs to employ a VvE management in the capacity of a process-intermediary. Through the chain of responsibility, illustrated in figure 7.6, the municipality is tasked with educating the VvE management on the topic of energy justice. Both VvE management and interest groups are deployed to contact their associated VvEs to initiate their journeys and apply for the subsidy. Furthermore, this research could be used by policy-makers to provide insights into the perspectives of different stakeholders throughout the described user journey. As for anyone involved in similar project it is important to be sensitive to potential injustices.

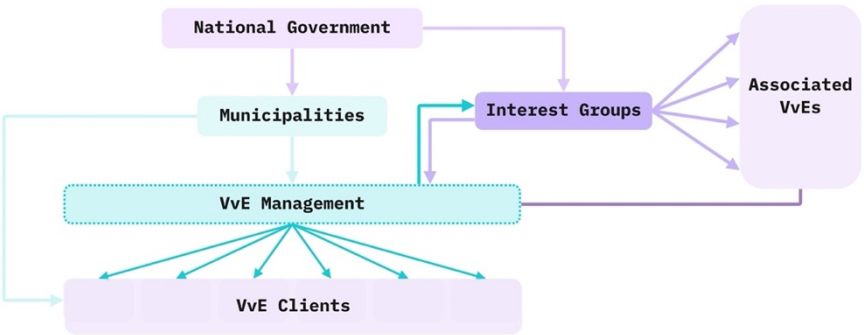


Figure 7.1 Future Chain of responsibilities within the stakeholders.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APENDICE

B| Overview Literature Review

Table 1: Literature review of energy justice scholarship

Category	Journal	Keywords
Energy Justice Framework	*Planning, Theory & Practice / International Energy Law Review / Energy Policy / Energy Research & Social Science / Applied Energy*	Energy Justice / Energy Democracy / Climate Justice / Inclusive Energy Transition / Energy Justice Applications/ Energy Citizenship / Energy Equity / Renewable energy transition
Energy Justice and Community Energy	*Energy Policy / Energy Research & Social Science / Applied Energy / People Place & Policy / Sustainability*	Energy Justice and… Community Energy / Local Energy Initiative / Community-based energy initiatives / Renewable Energy Initiatives /
Energy Justice and Sustainable Renovation	*Energies / Energy Research & Social Science / Environmental Research Letters / Energy for Sustainable Development*	Energy Justice and.. Sustainable Renovation / Just renovation / just retro-fit / Energy Efficient retro-fit / Low-carbon housing / Carbon neutral renovations /

C | Background information on the Multi-Level Perspective

An alternative approach in applying the notion of energy justice is suggested by Jenkins et al. (2018), with the multi-level perspective approach (MLP) of the socio-technical system serving as a framework (Cherp et al., 2018; Geels, 2002). Bouzarovski and Simcock (2017) and Sovacool et al. (2019) take a similar approach to which they add the notion of space; identifying injustices at the scale of the community, the nation or region, or the global scale. In the MLP context, occurrences of energy (in)justice are linked to three different levels: the niche, the socio-technical regime and the landscape. It is the interaction between developments at the level of the niches and the socio-technical system (and within that), and in the context of the landscape, that transitions are given shape.

At the level of the niche(s) we find concrete, more or less innovative, applications of technologies or systems under development, such as electric cars, individual or neighborhood batteries, or biogas installations. Developments in niches are dynamic and their embedding in technical and institutional frameworks has often not crystallized yet. A justice perspective applied at this level should make it possible to identify

potential sources and forms of injustice at an early stage. Technological adjustments can be proposed and assessed with these insights. Aspects of an appropriate institutional embedding, in terms of rules of conduct, norms and standards, can be explored, with which social acceptance can be strengthened. We see here a possible application of concepts such as socially responsible innovation (MVI) (Taebi et al., 2014). Nevertheless, we stress that at the niche level it is impossible to make a full evaluation of the institutional embedding of such new technologies. This only comes to light at the level of the socio-technical regime and larger scale implementation, when issues of economic, market, technical, social and system coordination become important and have to be addressed.

At the level of the socio-technical regime, the established technological systems, their institutional embedding, the resulting routines and practices and their social effects are examined. The regime creates stability and gives direction to further technological developments and to the behavior of public and private actors. Changes in the regime take place under the influence of the dynamics within the regime and as a result of developments in the niches, also influenced by landscape shifts. At the regime level, as argued by Jenkins et al. (2018), energy justice can play a role in mapping and evaluating the social, economic and ecological effects of the functioning of (parts of) technical systems, such as the electricity or gas supply infrastructures, district heating networks, wind parks, electric vehicle loading systems, etc. The establishment of normative criteria and assessment frameworks can help policy makers and companies to assess the functioning of those systems, as well as the possible changes therein. Here it can be checked to what extent such systems meet the social requirements in terms of distributive and procedural justice, and of justice through recognition regarding the impact on those involved.

The third level of the MLP concerns the macro landscape (Jenkins et al., 2018: 70). Here we find the embedding of actors and institutions in a relatively stable social and global context of political, social and cultural values, including knowledge and scientific insights. The landscape level in the MLP literature is usually considered static and inhibitory or facilitating. However, here we also see elements that sometimes change relatively quickly and thus influence the notion of energy justice and its application. Examples are the way in which the behavior of multinational companies and the role of the state in the economy is evaluated. It also may concern international relations, developments in the oil and gas market and, for example, the consequences of the nuclear disaster in Fukushima. Other shift parameters include the development of new knowledge and insights into the effects of energy use on climate change and the consequences thereof. Such phenomena influence the identification and societal and political assessment of aspects of energy justice. These, in turn, influence how the argumentation and evaluation is conducted at the lower two levels, giving rise to shifts within the regimes and to innovation in (new) niches. It can be argued that the positioning of energy justice in relation to the goals of affordability, reliability and sustainability partly takes shape at the level of the landscape. Examples are the expectation of higher oil prices in the future due to depletion and the power of OPEC, the risks of EU gas dependence on Russia, the hazards of nuclear energy, the expected consequences of global warming and the deterioration of the Arctic by oil and gas extraction, and so on.

D | Content Analysis Sources

Table 2: Overview of sources that were consulted to build generic user journey

	Tool	Type	Description	Key Take-Aways	*Reference*
1	"Bestaande bouw energieneutraal: Reisgids voor een gebiedsgerichte aanpak"	Integrated approach	The "travel guide" describes the journey of energy transition on a local scale. It is a practical guide, mostly focused on engaging with the right industry partners during the journey as well as obstacle management.	Qualitative applications for aligning stakeholders and making trade-offs between measures. Not specifically for VvE's but can be applied.	*René Idema and Nicole de Koning, Bestaande bouw energieneutraal: Reisgids voor een gebiedsgerichte aanpak, Gebieden Energie Neutraal, 2014.34*
2	Information Choice Questionnaire (ICQ)	Method of Stakeholder Mapping	This tool is mainly for policy problems to create insights into the opinions of the public regarding policy proposals.	Very specific tool that requires expert knowledge that can be used to engage citizens in participatory policy making.	*De Best-Waldhober, M., Daamen, D., Faaij. A., 2009. Informed and uninformed public opinions on CO2 capture and storage technologies in the Netherlands. International Journal of Greenhouse Gas Control 3(3): 322-332.*
3	Orchestrating Energy Transitions/ Orchestration Innovation Model	Social Model + Stakeholder Mapping	This is a multi-step approach with tools aimed at decision-making for municipalities. This tool is characterized by the 4 perspectives it considers; business, technical, social and governance.	It is used as a support tool for decision-making of neighborhood level as well as on a larger scale such as provinces.	*Guus Mulder, Nicole de Koning, Alexander Woestenburg and Anita Lieverdink, Orchestrating Energy Transitions, 2016 (presentation).*
4	Quick Guide The Sustainable Home Owner Association	Dedicated model	This is a very practical guide which describes the different steps in decision-making for VvEs and also a set of tools.	Very specifically targeted towards home owners associations and is therefore very relevant for this research. It focused on sustainable home improvements, not community energy but is relevant nonetheless.	*De Duurzame VvE: quick guide43 - https://www.tno.nl/nl/overtno/nieuws/2017/10/stimulans-vve-s-voorverduurzamen-woningen/*
5	Routeplanner Energieneutraal	General Energy System Models	This guide describes all the steps that should be taken to design a carbon neutral energy system. As well as a business model with the goal to be affordable for all.	It is focused on a larger scale of districts with one-five thousand dwellings. Its targeted more towards the business model aspects more than decision-making but it does have justice considerations by taking into account the lowest levels of income.	*Gebieden Energie Neutraal, Routeplanner Nieuwbouw; Toelichting, 2018.44*
6	Stakeholder Engagement for Energy (SEE)	Social Model + Stakeholder Mapping	Focused on collaboration of municipality with other stakeholders during local energy transition processes.	Many practical tools that can be applied on neighborhood level. It has been developed for municipalities but can also be used by other organizations.	*Nicole de Koning and Pepijn Vos, "Lokale energietransitie: samen aan de slag - een systematische aanpak voor 'Stakeholder engagement for energy' (SEE)", TNO, 2017 (presentation).*
8	Value-based Experience Framework	Social Models & Stakeholder Approaches	This is an holistic approach for vision making with all stakeholders. This system level approach is targeted towards developing a participatory design process that is considerate of the capacity, willingness and affordances of all stakeholders.	It can be applied on neighborhood up to regional level. Should be applied to shed a light on conflicting values between and within stakeholders to smoothen the transition process. Can be very relevant for this research.	*Joke Kort, Nicole de Koning and Charlie Gullström Hughes, Creating successful transitions in energy, By respecting stakeholder values and securing trust and cohesion, Energy-Open, 201747*
9	KLANTREIS ENERGIE BESPAREN WONINGEIGENAREN	Report for Industry partners involved with energy	This report answers the question of what priorities knowledge partners set in the field of energy saving, to solve the biggest bottlenecks for homeowners.	Most identified 'pain points' are in the first 4 phases of theuser journey. Most of these pain points are regarding information availability.	*https://vng.nl/files/vng/20172106-vng-rapport-klantreis-energiemaatregelen-woningeigenaren.pdf*

		renovations		A Key Positive experience in this part of the journey is opportunity to join a collective approach to energy efficiency.	
10	KLANTREIS ENERGIE BESPAREN HIEROPGEWEKT	HierOpgewekt in collaboration with Wageningen Universiteit	The research focuses on the effectiveness of local energy approaches. Aimed at intermediary organisations that bridge between energy service providers and Users.	It's all about trust. Trust is often more important to a resident than other core values such as independence. In the context of energy saving, homeowners' trust has 3 dimensions according to this report: a) trust in people and institutions (organizational); b) confidence in their level of knowledge, experience and competences (expertise);	*https://www.hieropgewekt.nl/uploads/inline/Infographic-Klantreis-Energiebesparing.pdf*
11	ONTZORGING VAN PARTICULIERE WONINGEIGENAREN	Research Report containing user journey for single homeowners by Squarewise commissioned by Bouwagenda	This report is focused on the support needs of owner-occupiers on their way to a sustainable home. They further outline the landscape of Dutch "unburdening initiatives" in the various phases of the residents' journey. Finally they indicate to what extent these initiatives actually unburden the resident.	Owner-occupiers are currently not be optimally enabled to participate in the energy transition in the built environment surroundings.	*https://www.squarewise.com/wp-content/uploads/2020/11/Ontzorging-van-particuliere-woningeigenaren-Squarewise-3-11-2020.pdf*
12	EINDRAPPORTAGE DE DUURZAME VvE	STEM project 'The Sustainable Owners Association produces user journey and accompaniying report	This report defines a number of steps,Owners' associations go through to reach the moment of decision-making. Then VvEs go through five steps; the so-called "User journey".	The presence of a leader has a major impact on the decision-making process. A leader refers to someone who is continuously committed to decision to be made. The information available to Owners' Associations is fragmented. The available resources mainly focus on the beginning and end of the journey; the middle of theuser journey is underexposed. The decision-making process of Home Owners' Associations has a long lead time. Keeping the subsidy schemes often do not take this long lead time into account and are often already completed before a VvE has made the decision.	*https://projecten.topsectorenergie.nl/storage/app/uploads/public/5cc/c3c/806/5ccc3c806e15560483442o.pdf*
13	Collectieve Aanpak Versnelling Aardgasvrije VvE's	Public summary of project and practical tool by topsector energy	Through interviews, further insight is gained into drivers and barriers of owners and the collective decision-making process. The result of the project is a practical online toolkit "Natural gas-free VvEs".	The target group of the toolkit are intermediaries who want to stimulate and facilitate VvEs in the collective decision-making process (VvEuser journey) towards making their VvE radically sustainable (Zero op de Meter). Energy renovations are often an emotional process.	*https://projecten.topsectorenergie.nl/projecten/collectieve-aanpak-versnelling-aardgasvrije-vves-31476*
14	Designing trust: how strategic intermediaries choreograph homeowners' low-	Report	This paper investigates the potential role of strategic intermediaries as agents of change located between	This paper distinguishes between three User-journey designs in which, depending on the role envisioned for homeowners, a different trust	*(de Wilde & Spaargaren, 2019)*

carbon retrofit experience	supply-side actors and homeowners.	relation is foregrounded: a private design envisions homeowners as passive consumers who trust in the expertise offered by the intermediary; a civic design envisions homeowners as engaged consumer-citizens who trust their neighbours as reliable service representatives; and a public design envisions homeowners as critical Users who trust in the retrofit technologies and products offered.

E1 | Case Study Interview Questions

All interviews were held in Dutch the questions have been translated for the purpose of readability of the report. The semi-structured interviews left a lot of room for natural conversation to flow, so the interviewees could speak more freely.

Table 3: Interview Questions Case Study Stakeholders

Topic	Main interview questions
Introduction	How long have you lived in Numansgors? How did you get involved with Gors2025? What was your motivation to contribute to Gors2025? In what way are you involved? (which focus area, what have you been working on?)
Present	What is Gors2025 currently working on? How did you come to this current repertoire for the committee? Do you experience much feedback from the other resident? How do you see the role of Gors2025? What are the objectives of the committee? Do they align between committee members? What is the role of the VvE-board, are they involved? Does the rest of Gors share your enthusiasm for sustainability? Is there a large engagement of residents in the sustainable renovation efforts? Do you have insight into why residents may not be involved in the project? In your experience, does this involvement reflect willingness to implement measures?
Past	How did you experience the information meeting held at march 25th? What were your expectations from this meeting? What was unexpected in this meeting? Do you think the general interest of the residents was reflected during this meeting? How so? What methods do you use to involve tenants in the sustainable renovation process? How has the engagement with residents been organized thus far? What has the response been like, to your engagement activities? How was Gors2025 initiated? Did the committee then have all its current members? What has changed since the initiation? How do you reflect upon the topic of solar panels in Numansgors? What do you think were the issues that caused this tension?
Future	Do you foresee any similar issues arising in the future? Why? What has changed since then? Do you think this will change more in the future? How so?
Measures	What is your opinion about the plans to take collective approach?

	What is your opinion of aqua-thermal energy for Numansgors? How would you describe your personal approach to sustainable renovation?
Stakeholders	How do you view the role of the Municipality? How transparent do you view their information provision? What is your experience with commercial parties (contractors/energy suppliers/ solar pv sellers)? How transparent do you view their information provision? Do you think all relevant stakeholders are currently involved? How do you experience the interactions and collaboration with other stakeholders? (IF Technology, WUR, Students, municipality HW)
Participation	Who is responsible for guiding the process? What are this actors responsibilities? What is your opinion on the facilitators of the process? Do you feel everyone has the opportunity / capacity to express their concerns? What are your concerns and are they being taken seriously?
Information	How well explained is the process? Is the information provided by the municipality understandable for all the residents? Is the information provided by the Gors2025 members understandable for all the residents? Is the information provided by the commercial actors understandable for all the residents? Is the information easily accessible? (if applicable) How did you consider the capacity of residents to understand the information you provide in a meeting? How are residents who may not understand all the information accommodated for?

E2 | Expert Interview Questions

All interviews were held in Dutch the questions have been translated for the purpose of readability of the report.

Table 4: Interview Questions Expert Interviews

Topic	Questions
Introduction / Context	Who are you, what is your function, what is your responsibility / area of expertise / research direction? Could you provide some background information about the company you work for and your role? Did you have specific training in this area? What type of outreach do you currently perform? Which channels/events? Who is responsible for the management of the participation process? What is your responsibility?
Roles / Responsibility	Which responsibilities does the VvE have in the sustainable renovation process? Which responsibilities does the VvE-management have in the sustainable renovation process? Which responsibilities do residents have in the energy renovation process? Are residents helped in order to be able to take responsibility? What is your perspective on responsibility in the sustainable renovation process?
Sustainable Renovation / Energy	How have you gotten involved with Sustainable Renovation/ Energy Projects? What are motivations of your company to engage in energy transition? How do you view the role of your organization in the overall energy transition?
VvEs / Clients	Is there a lot of interest / demand from your clients in sustainability? Has that changed over time? What are the main interests / motivations of your clients to engage in sustainability / energy transition? Are there distinctive characteristics of your clients who are interested in sustainable renovation? What are requirements for a VvE to undertake sustainable renovation?
Procedures	Could you walk me through the average process of sustainable renovation? Do you use any tools to guide / explain / manage this process? Who is in charge of the decision-making process? What are your objectives during the decision-making process? What are the objectives of the VvE-board during the decision-making process?
Succes Factor / Barriers	What do you view as barriers for VvE's to engage in community energy? How could those barriers could be improved in your expertise? What do you view as barriers for individuals in VvE's to engage in the initiative? How could those barriers could be improved in your expertise? What do you view as influencing success factors in the process? Do you have any examples of these successes?
Recognition	How are extra vulnerable households taken into account in the energy renovation process? How is diversity addressed in the decision-making process? How is dealt with the diversity of needs of residents during the renovation process? What is your perspective on how to deal with the heterogeneity of the residents?

Distribution	How are inequitable measures dealt with? How are the individual wishes and needs incorporated in the renovation plan? How is the financial distribution of costs and benefits organized? How is dealt with the differences in energy consumption prior and after the renovation? Which arrangements are made about the distribution of costs and benefits? What is your perspective on how this distribution has to be organized in future?
Participation	Which participation methods do you use to involve tenants in the energy renovation process? How is a participation method chosen? Who is responsible for the participation process? Does the tenant have influence on the type of participation method what is chosen? What is your perspective on how participation must be organized in the energy renovation process?
Stakeholders	Who are the most important stakeholders? How do you select and approach these stakeholders? Are all relevant stakeholders involved? (also the less vocal ones) What is the best way for stakeholders to participate in your opinion? Can feedback from stakeholders be easily incorporated and used in the decision-making process? Do you have contact with the most important stakeholders and do they support the participatory methods? Do you experience any involvement of municipalities?

E3 | Resident Survey Questions per section

1.1.1 Survey Questions Section A: Basic Household information

	1.1.1.1 Question (Dutch)	1.1.1.2 Translation	1.1.1.3 Answer options 1.1.1.4 (Multiple Choice)	1.1.1.5 Translation
1	Bent u eigenaar of huurder?	*Are you a homeowner or tenant?*	- Ik ben de eigenaar - Ik ben een huurder	*-I am owner* *-I am a tenant*
2	Hoeveel personen woonden er in dit huis in het afgelopen jaar?	*How many people were living in your house the past year?*	OPEN	
3	Bewoont u één of meerdere woningen?	*Do you inhabit 1 or more homes?*	- Een huis - Twee of meerdere huizen	*- one home* *- two homes or more*
4	Sinds wanneer woont u in dit huis?	*Since when have you been living in this house?*	OPEN	
5	Woont u permanent of af en toe in het huis?	*Are you living permanently or partially in this house?*	-Permanent/(bijna) elke dag -Af en toe, ongeveer/minder dan de helft van de tijd -Meeste tijd vacant	*-Permamently* *- Partilly, less than half of the time* *- House is mostly vacant*
6	Hoe lang denkt u nog in dit huis te blijven wonen?	*How long do you intent to live in your house?*	-Minder dan 1 jaar -1-3 jaar -3-10 jaar -10 jaar of langer	*- Less than a year* *-1-3 years* *-3-10 years* *-10 years or longer*
7	(Alleen voor eigenaren) Bent u van plan dit huis te verkopen/verhuren?	*(only for owners) Are you considering to sell or rent out your house?*	-Nee -Ja -Waarschijnlijk	*- No* *- Yes* *- Probably*
8	Zo ja, wanneer bent u van plan te verkopen/verhuren?	*If so, when do you intent to sell/rent out?*	-Minder dan 1 jaar -1-3 jaar -3-10 jaar -10 jaar of langer	*- Less than a year* *-1-3 years* *-3-10 years* *-10 years or longer*

1.1.2 Survey Questions Section B: Energy Consumption

	1.1.2.1 Question (Dutch)	1.1.2.2 Translation	1.1.2.3 Answer options 1.1.2.4 (Multiple Choice)	1.1.2.5 Translation
1	Wat is het energielabel van uw huis?	*What energie label does your house have?*	A/B/C/D/E/F/G Ik weet het niet	*A/B/C/D/E/F/G* *I do not know*
2	Gasverbruik: hoeveel gas heeft u in het afgelopen jaar verbruikt (m^3)?	*How much gas did you use in the past year?*	OPEN	
3	Elektriciteitsverbruik: hoeveel stroom hebt u in het afgelopen jaar verbruikt (MWh)?	*How much electricity did you use in the past year?*	OPEN	
4	Hoeveel heeft u in het afgelopen jaar betaald voor elektriciteit (euro)?	*What was the cost of your electricity use in the past year?*	OPEN	

5	Over welke van deze faciliteiten beschikt u?	*Which facilities do you have?*	-Bad of douche -Gasfornuis (een kooktoestel op gas, gashaard of gaskachel) -Open haard (een open haard, houtkachel of pelletkachel) - Elektrisch fornuis - Vloerverwarming - Air conditioner - Elektrische auto - Extra gevelisolatie - Extra dakisolatie - Extra vloerisolatie - HR++ of driedubbel glas - Zonnepanelen - Zonneboiler - Warmtepomp/ hybride warmtepomp	*- Bath or shower* *-Gastop stove* -
6	Welke bent u van plan te nemen?	*Which of the following facilities do you intent do acquire?*	- Bad of douche - Gasfornuis (een kooktoestel op gas, gashaard of gaskachel) - Open haard (een open haard, houtkachel of pelletkachel) - Elektrisch fornuis - Vloerverwarming - Air conditioner - Elektrische auto - Extra gevelisolatie - Extra dakisolatie - Extra vloerisolatie - HR++ of driedubbel glas - Zonnepanelen - Zonneboiler - Warmtepomp/ hybride warmtepomp	
7	Hoeveel maakt u gebruik van de haven?	*How much do you regularly use the harbor facilities?*	- Heel vaak - Soms - Helemaal niet	
8	Hoeveel maakt u gebruik van de tennisbanen?	*How much do you regularly use the tennis facilities?*	- Heel vaak - Soms - Helemaal niet	
9	Hoeveel gebruik maakt u van de gemeenschappelijke parkeerplaatsen?	*How much do you regularly use the collective parking facilities?*	- Heel vaak - Soms - Helemaal niet	
10	Heeft u een eigen parkeerterrein dat voldoet aan uw wensen?	*Do you have a parking spot that satisfies your needs?*	-Ja -Nee maar ik ben het wel van plan - Nee, heb ik niet nodig	

1.1.3 Survey Questions Section C: Improvement needs

	1.1.3.1 Question (Dutch)	*1.1.3.2 Elaboration*	*1.1.3.3 Answer options* *1.1.3.4 (Multiple Choice)*	*1.1.3.5*
1	Wat vindt u leuk/ niet leuk aan de buurt?	Wat waardeert u het meest aan het woonpark? B.v. ligging, landschap, rust, veiligheid, contact met buren, …	Long answer text	

2	Wat vindt u leuk/ niet leuk aan uw huis?	B.v. faciliteiten, lucht, geluid, ventilatie, temperatuur, watergebruik, …	OPEN	
3	Als u iets aan uw leefomgeving zou kunnen veranderen, wat zou dat dan zijn en waarom?		OPEN	
4	Ergert u zich aan één van deze?		-Thermisch ongemak -Vochtgehalte, vochtigheid of tocht - Luchtkwaliteit -Ruis -Energiekosten -Niet veel	
5	Hoopt u uw huis te verbeteren, om welke reden dan ook?	-Interieure esthetiek -Modernisering van de sanitaire voorzieningen -Modernisering van de keukenfaciliteiten -Facade-isolatie -Vloerisolatie -Dakisolatie -Verwarmingssysteem -Lagere energiekosten - voor een energielabel certificaat	-Nee -Dit jaar -In 1-3 jaar -In 3-10 jaar -In 10+ jaar	

1.1.4 Survey Questions Section D: Information Needs

	1.1.4.1 Question (Dutch)	*1.1.4.2 Translation*	*1.1.4.3 Answer options* *1.1.4.4 (Multiple Choice)*	*1.1.4.5 Translation*
1	Hoe goed kent u de technologische mogelijkheden voor energie neutrale verbeteringen?	*How familiar are you with the technological possibilities for zero carbon improvements?*	-Ik zoek veel gerelateerde informatie. -Ik weet genoeg om aan mijn wensen te voldoen. -Ik ken er een paar, maar ik zou er meer willen weten. -Ik weet hier niet veel over.	*- I actively search for relevant information.* *- I am knowledgeable enough to satisfy my own needs.* *- I know some, but would like to know more.* *-I do not known much.*
2	Hoe goed kent u het beleid/subsidies van de overheid voor energie neutrale verbeteringen?	*How familiar are you with policies and subsidies for zero carbon improvements?*	-Ik volg elke update over gerelateerde informatie. -Ik weet genoeg voor mijn eigen plan. -Ik weet dat er subsidies zijn, maar niet in detail. -Ik weet hier niet veel over.	*-I am up to date with relevant information* *-I am knowledgable enough to make/excucute my own plans.* *-I know subsidies exist, but not in detail.* *- I do not know much.*
3	Welke soorten financiële voordelen verwacht u van de renovatie?	*What types of financial benefits do you expect to gain from renovation?*	-Overheidssubsidies -Lagere prijzen wanneer meer bewoners zich bij een collectieve aankoop aansluiten -De initiële investering kan in de verwachte jaren worden terugverdiend -Lager energietarief na renovatie -Verhoogde woningwaarde voor verhuur/ verkoop	*-government subsidies* *-lower investment costs through collective action.* *-return on investment* *- lower energy costs after renovation* *-increased value of home for sale/rental*

4	Hoe lang denkt u dat de terugverdientijd zal zijn?	*What do you expect of the timeline for your return on investment?*		
5	Welke andere informatie heeft u nodig om tot een renovatiebesluit te komen?	*What information do you need to come to a decision regarding renovation measures?*		
6	Welke informatiebronnen gebruikt u gewoonlijk?	*What sources do you usually consult to obtain information?*	-Sociale media -Kranten -Televisie nieuws -Website/overheids website -Nieuwsbrief -Gesprekken met medebewoners	*-social media* *-newspapers* *-television news* *-website/government websites* *-newsletters* *-interactions with neighbors*

1.1.5 Survey Questions Section E: Values regarding sustainability

	1.1.5.1 Question (Dutch)	1.1.5.2 Translation	1.1.5.3 Answer options 1.1.5.4 (Multiple Choice)	1.1.5.5 Translation
1	Wat komt er op als je aan verduurzaming (van je huis) denkt?	*What comes to mind when you think about sustainability measures?*	-Meer hernieuwbare/ recycleerbare hulpbronnen gebruiken -Onafhankelijk worden van energieleveranciers -Lage ecologische voetafdruk -Voldoen aan onze wensen zonder toekomstige generaties op te offeren -Lager levensonderhoud -Waardestijging van het huis -Kan langer leven -Verhoogt het wooncomfort -Een duurzaam park	*- Increased use of renewables/recycled sources* *- Becoming independent of energy companies/institutions.* *- Lowering ones carbon footprint.* *- Fulfilling societies needs without compromising those of future generations.* *- Lowering the cost of living.* *- Increasing the value of your home.* *- Increasing lifespan.* *- Increasing comfort of living.* *- A sustainable living environment.*
2	Met welke van de volgende uitspraken bent u het eens?	*Which of the following statements do you agree with?*	-Ik zou graag meer contact hebben met medebewoners. -Ik vind het belangrijk dat mijn huis onafhankelijk wordt van de energieschommelingen. -Ik denk dat het belangrijk is dat de buurt onafhankelijk wordt van de energiefluctuaties. -Ik ben bereid om iets meer te betalen voor meer wooncomfort. -Ik ben alleen bereid te investeren in renovatie als mijn investering tijdens mijn leven kan worden terugbetaald. -Ik ben bereid te investeren als dat mijn kosten van levensonderhoud verlaagt. -Ik wil investeren om de waarde van mijn huis te verhogen voor toekomstige verhuur/ verkoop. -Het is belangrijk dat duurzame materialen worden gebruikt.	*- I would like to have more contact with my neighbors.* *-it is important to me that my home is independent of fluctuating gas/electricity prices.* *- it is important to me that the neighborhood is independent of fluctuating gas/electricity prices.* *- I am willing to pay a little extra for increased living comfort.* *- I am only willing to make investments of which the returns I will receive.* *- I am willing to invest if it will lower my cost of living.* *- I am willing to invest if it will increase the value of my house.* *-The use of sustainable materials in renovations is important to me.*

			-Ik waardeer de uitwisseling van informatie en kennis. -Ik zou me graag aansluiten bij andere bewoners/ huiseigenaren voor een lagere renovatieprijs. -Ik werk liever alleen aan de energieneutraliteit van mijn eigen huis.	*-I value the exchange of knowledge and information between residents.* *- I would join collective action with fellow residents if it will lower the investment costs.* *- I prefer individual approaches to increase the energy efficiency of my house.*

1.1.6 Survey Questions Section F: Values, collective or individual action

	1.1.6.1 Question (Dutch)	*1.1.6.2 Translation*	*1.1.6.3 Answer options 1.1.6.4 (Multiple Choice)*	*1.1.6.5 Translation*
1	Welke voordelen verwacht u van een collectieve renovatie?	*What benefits do you expect from collective renovation measures?*	-Lage prijs -Mogelijkheid van de nieuwste technologie -Minder besluitvorming door mijzelf	*- Lower personal costs.* *- Having access to innovative energy technologies* *- I do not need to make decisions myself.*
2	Welke voordelen verwacht u van zelf renoveren?	*What benefits do you expect from individual renovation measures?*	-Sneller proces -Onafhankelijk zijn -Lagere Kosten	*- shorter timeline of process* *- Being independent* *- Lower costs*
3	Aan welke renovatiebenadering geeft u de voorkeur?	*Which approach to sustainable renovation do you prefer?*	-Beide Okay -Collectieve Aanpak -Individuele aanpak -Geen van beide	*- Either* *- collective action* *- individual action* *- Neither*
4	Als u deelneemt aan collectieve renovatie, wat verwacht u dan te doen?	*If you decide to participate in collective renovation measures, what expectations do you have regarding your personal role?*	-Ik zou graag op de hoogte worden gehouden van de ontwikkelingen -Ik zou graag aan de werkgroep deelnemen -Ik ben geïnteresseerd om een energieambassadeur te worden en anderen te helpen energie te besparen -Ik ben geïnteresseerd in persoonlijk energieadvies voor mijn huis -Ik ben niet geïnteresseerd	*- I would like to be kept up-to-date* *- I would like to participate in the committee workshops* *- I am interested in becoming an energy ambassador and inspire others* *- I am interested in personalized energy advice for my home* *- I am not interested*
5	Welke renovaties moeten volgens u afzonderlijk worden gedaan?	*Which renovationsdo you think should be approached individually?*		
6	Welke renovaties moeten volgens u collectief worden gedaan?	*Which renovationsdo you think should be approached collectively?*		
7	Welke aanpak heeft uw voorkeur?	*Which appraoch do you prefer?*	-Collectieve inkoopfaciliteiten -Delen van kennis/ persoonlijke ervaringen	*-Collective purchasing* *-Knowledge sharing*
8	Was u op de vergadering van 24 maart?	*Did you attend the information meeting on march 24th?*	-Ja, ik ben er persoonlijk bij geweest. -Ja, ik ben er online bij geweest. -Nee	*-Yes in person* *-Yes online* *-No*

1.1.7 Survey Questions Section G: Feedback regarding the Information meeting 24.03.2022

	1.1.7.1 Question (Dutch)	1.1.7.2 Translation	1.1.7.3 Answer options 1.1.7.4 (Multiple Choice)	1.1.7.5 Translation
1	Hoe tevreden was u over de bijeenkomst?	*How would you rate your level of satisfaction with the meeting?*	1- Zeer telerugesteld 5-Zeer tevreden	*1 – very disappointed* *5- very happy*
2	Kunt u aangeven waarom?	*Could you elaborate on why you gave the answer in the previous question?*		
3	Waarom kwam u naar deze bijeenkomst?	*What was the reason you decided to attend this meeting?*		
4	Welke maatregelen die tijdens deze bijeenkomst zijn genoemd, zijn voor u interessant/ kunt u overwegen te nemen?	*Which of the measures discussed in the meeting are you interested in or would you consider installing?*	- U waarde glas - Vloerverwarming - Isolatieplaat dak - HR++ of driedubbel glas - Gecertificeerde houtkagel - Infrarood verwarming - Aquathermie - Warmtepomp	
5	Welke andere informatie hoopt u te krijgen?	*What would you like to receive additional information on?*		
6	Welke andere vormen van communicatie verwacht u?	*What other forms of communication do you expect to receive?*		
7	Welke andere opmerkingen heeft u over de bijeenkomst?	*Do you have any other remarks, concerning the information meeting?*		

1.1.8 Survey Questions Section H: Feedback & Recommendations for the VvE

	1.1.8.1 Question (Dutch)	1.1.8.2 Translation	1.1.8.3	1.1.8.4
1	Heeft u nog verdere suggesties voor de VvE?	*Do you have any additional recommendations for the VvE?*		
2	Wenst u een persoonlijk interview om uw mening/ verwarring /ervaring met duurzame renovaties te delen, vul dan de contactgegevens in, en u wordt spoedig gecontacteerd door de onderzoeker.	*Do you wish to engage in further interaction for this research please provide your contact information and you will be contacted by one of the researchers soon.*		

E4 | Resident Survey Results

As described in section 2.2.5, a combined survey was administered among the 201 households in Numansgors. The resulting raw data, gathered by (Chen, 2022) were repurposed in analysis for this thesis research. The anonymized raw data was then analyzed with the main objective of gaining insight to resident needs through thematic analysis of the factors influencing decision-making as presented in section 4.1.1. This section describes the findings as a result of this analysis. The survey, "Wat zijn de woon- & duurzaamheidswensen van de bewoners van Numansgors" (What are the living and sustainability desires of Numansgors Residents) was administered in Dutch, taking respondents approximately 30 minutes to complete. The topics of the survey questions and number of questions are shown below.

Table E2.1: Number of survey questions per section

Survey Section	Topic	Number of Questions
A	Basic household information	8
B	Energy consumption	10
C	Improvement Need	5
D	Information Need	6
E	Values: Sustainability	2
F	Values: Collective versus Individual	7
G	Feedback: GORS2025 information meeting	7
H	Feedback: Suggestions for the VvE	2

The survey data provides insight into the experience of the respondents of the processes regarding sustainable renovation. These experiences are analyzed to which they influence decision-making in V1, the first voting moment in the user journey.

1.1.9 | Analysis of Survey Data

The survey collected a total of 47 responses, of which 1 duplicate response. Of these total effective responses, 24 were administered and digitally and 23 respondents submitted a paper questionnaire. The survey included several open-ended questions and written comments as well as multiple choice questions. The number of respondents, 46 responses out of 201 households, was deemed insufficient to provide a statistically valid overview thus quantitative analyses of the data was not considered (Israel, 1992). Therefore qualitative analysis of the data was performed through the categorization by the present categories of factors influencing decision-making as described in section 4.1.1

Table 5.2: Thematic analysis of survey data

	Factor Influencing decision-making	Related Questions
I	Information Needs & Knowledge Base	
II	Individual energy needs	
III	Perceived impact of renovations	
IV	Comfort of living	

V	Expected duration of habitation
VI	Demographic Factors
VII	Social Environment
VIII	Pioneering Residents
IX	Diversity of opinions

1.1.10 | Demographics of VvE members

All respondents are owners of the dwelling and thus are members of the VvE. Most respondents (71%) live permanently in Numansgors. Ninety percent of which inhabit a single house on the property and ten percent of respondents inhabit a duplex dwelling. Notably, all respondents' households are comprised of 2 people or less.

1.1.11 | Expected duration of habitation

Over 85% of respondents scan see themselves occupying their current residence for ten or more years. The remaining 15% of respondents expect to either sell or let their home in three to ten years. Over half of permanent residents have lived in Numansgors for over ten years already.

1.1.12 | Comfort of Living

In response to open ended questions regarding what residents did or did not enjoy about their neighborhood and their home, answers were overwhelmingly positive with only ten percent of answers mention anything they dislike of their neighborhood at all. The location of the park, the natural environment and peace and quiet are mentioned most often when asked what residents enjoy most about Numansgors. The homes themselves warrant a much more divided response where the mention of positives and negatives are 50/50 and all unique answers. Negative aspects of the home mostly relate to building specific issues such as a lack of insulation, drafts, high energy demand, maintenance and humidity. Half of the respondents who express the desire to renovate their home are motivated by expected decrease of energy costs. Almost half of respondents said to associate the term 'sustainability' with an increase in comfort of living, and a third of respondents are willing to make investments to increase their comfort of living.

1.1.13 | Social Environment

In response to that same open-ended question regarding what residents especially enjoy about their neighborhood and their home, several respondents highlight the social environment in Numansgors. The people, togetherness and organized activities are submitted as advantages to living in the so-called community. The mention of organized activities is combined with mentions of 'waterfront living' as most enjoyable. Furthermore, none of the negative responses to this questioning have mention of the social environment. Answers to open-ended questions reference the 'open character' of the Numansgors park and one respondent expressed the desire of a basketball court to teach young and old community members. Figure 5.3 shows that respondents are likely to consult their neighbors regarding sustainable renovation measures.

"Het gevoel van saamhorigheid/buren" "The feeling of togetherness/neighbors"
"Afrastering van de diverse tuinen liggend aan gemeenschappelijk terrein weghalen. Hoort niet in het open karakter van het park."

"To remove the fencing from the communal-area-adjacent gardens. Fencing does not suit the open character of the park."
"Ik zou wel graag een basketballpleintje (1 basket) bij/in botenloods zien. Dan kan ik daar (3x3) trainingen geven aan jong en oud" "I would like to see a basketball court (1 basket) near/in boat shed. Then I can give training to young and old there "

1.1.14 | Information Needs & Knowledge base

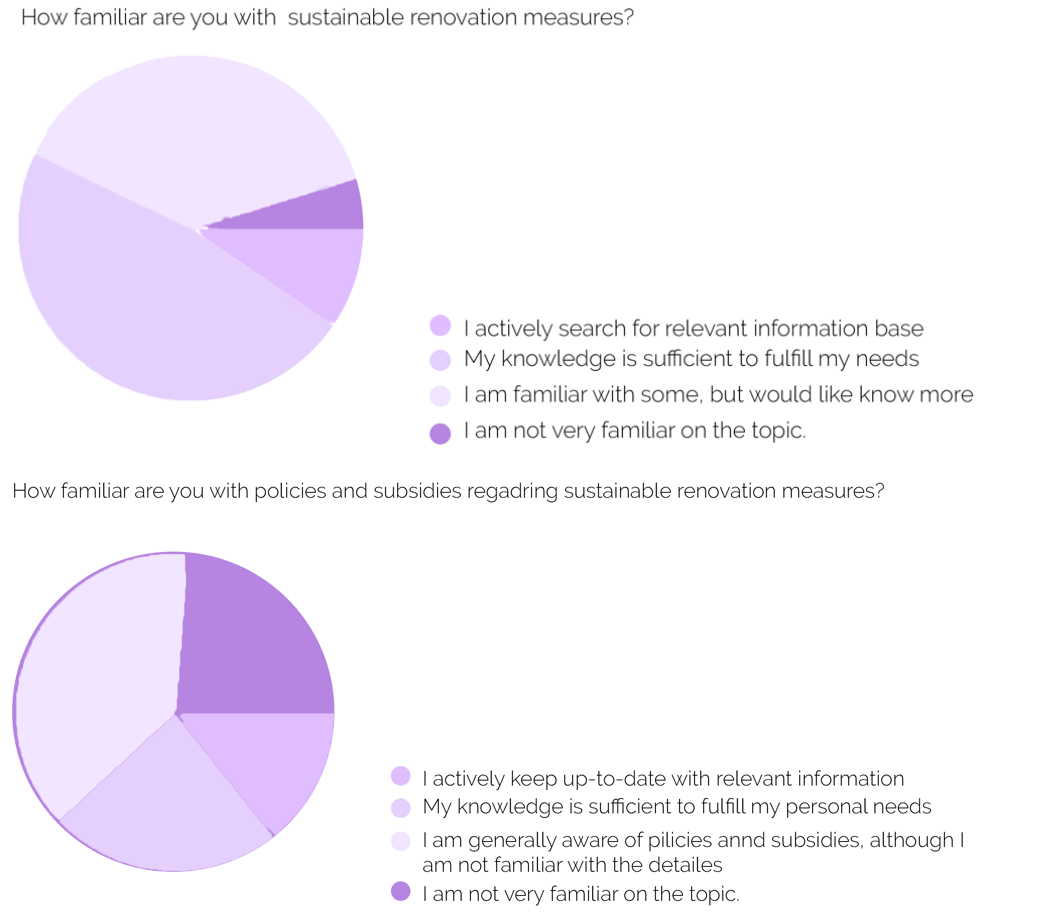

Figure E2.1: visualizations of survey responses (own image)

In response to the open-ended question of what additional information respondents thought they required to make an informed decision regarding sustainable renovation, almost forty percent of the responses stated no additional information was needed. Correspondingly, two thirds of respondents find that their knowledge of the technological possibilities regarding sustainable renovations to be either up-to-date or sufficient to meet their personal needs, as can be seen in figure 5.2. However, only one third of respondents stated they found their knowledge of related policies and financing possibilities to at least be sufficient to meet their personal needs. Most remaining questions are regarding the economic feasibility of a collective sustainable renovation, including mentions of pay-back time, subsidies and quotes of contractors. Besides financial information, specific technological knowledge about the building needs and applicability of certain measures is found to be of relevance to the respondents. Respondents were found to most likely consult government sources such as websites to update their knowledge base, as seen in figure 5.3. There was also a likelihood inquire with neighbors and friends, which is confirmed in a later question where 85 percent of respondents note that they value the information exchange within their community. Intermediaries were found to be least likely to be consulted by the respondents, of which several examples were provided (such as Energieloket, Milieu Centraal or commercial experts).

The questions related to feedback of the information meeting held by GORS2025, the dedicated committee show that the majority of respondents who attended this meeting found it to be at least satisfactory. However, responses are divided on the satisfaction regarding information provision as some found the presented information too rudimentary, while others note to appreciate covering all facets of the topic.

"Te veel basale informatie, zoals bijv. dat uitgelegd wordt wat een elektrische verwarming is. De inhoudelijke uitleg over het project was mager" "Too much basic information, such as explaining what an electric heater is. The substantive explanation of the project was poor"
"Veel tijd nodig voor zaken die al bekend zijn" "Requires a lot of time for things that are already known"
"Ik vond de bijeenkomst heel informatief. Alle facetten van verduurzaming kwamen aan de orde en er was veel ruimte om vragen te stellen." "I found the meeting very informative. All facets of sustainability were discussed and there was plenty of room to ask questions."
"Ik had graag meer willen horen over de bijhorende kosten" "I would have liked to hear more about the associated costs"

1.1.15 | Individual Energy Needs

The majority of respondents do not have information of the energetic quality of their homes, as 67% say not to know the energy-label of their home. Of the respondents that do know, the majority inhabit homes labeled A (10 percent) or B (20 percent) and the remaining 5 percent D. On the topic of their past recorded energy use, the (permanent-resident) respondents' average use of gas varies from 0 to 2200 cub between respondents. Two respondents note their homes have previously been renovated and are free of gas, corresponding to the '0'. However, the majority of the other respondents' reported use of gas exceeds the 1200 cub limit of the proposed energy price-ceiling.

Respondents of whom the previously reported energy use exceeds this limit, have not implemented any sustainability renovation measures in their home but do say they are interested in measure such as extra insulation and solar pv panels. These same respondents say they experience thermal discomfort as well as annoyance towards their energy bills. However, a notable amount of sustainable renovation measures have previously been implemented by other respondents (roof insulation 60%, triple glazing 60%, floor insulation 40%, and adoption of solar PV panels 20%) and these residents do not experience any of the discomforts listed in the survey questions.

1.1.16 | Perceived Impact of Sustainable Renovation

The majority of respondents expect financial benefits from sustainable renovations. On top of the list, a decrease in their energy bills and value-increase of their home are expected as a result of implementing sustainable renovation measures. The only respondents who said they did not expect to benefit financially from sustainable renovation measures were those that stated to have previously renovated their homes in a 'zero on the meter' way.
The concept of collective sustainable renovation was expected by respondents to decrease the overall investment costs and possibly increase the choice of innovative measures. Respondents also saw the expected decrease in the amount of work they would need to do themselves as potentially beneficial as well as the larger collective knowledgebase. However, others do not expect any benefits from a collective approach and mention delays and unacceptable compromises. But, these 'no-benefit' responses were limited to those respondents that answered to have already renovated their homes.

"Alleen enorme vertraging en onaanvaardbare compromissen." "Only enormous delays and unacceptable compromises."
"Geen voordelen vanuit collectiviteit, zelf alles al gerenoveerd" "No benefits from collectivity, everything has already been renovated"

1.1.17 | Diversity of Opinions

The survey shows that a majority of respondents did not have a strong preference for an collective or individual approach to sustainable renovation. Of those that do, more than double prefer an individual approach over a collective one.

1.1.18 | Additional Findings

- Several motivations for sustainable renovations were found such as independence from the volatile energy-market and to increase the value of their home for selling.
- None of the respondents could answer what specific measures were best suited for an individual approach. However, several measures are thought to be more suited for collective renovations.

1.1.19 | Conclusions

From the analysis of the survey data several conclusions can be drawn regarding the experiences of the Numansgors residents in their journey towards sustainable renovation and factors influencing their decision-making regarding a collective or individual approach. A summary of those can be found in the following bullet-points:

- There was found to be a general interest in sustainable renovation measures among respondents.
- Although respondent were largely undecided regarding collectivity, the majority of respondents would prefer a collective approach if that leads to lower investment costs.
- Over threequarters of the respondents expect lowered investment costs as a result of a collective approach.
- Respondents agree with a willingness to make investments when these lead to a decrease in energy costs and at a 'reasonable' pack-back-time.
- Government websites and neighbors were found to be the most inquired sources of information.
- Information provision of the information meeting was experienced as both too complicated and too rudimentary by attendees.
- Most respondents indicated to have found their own level of knowledge on technological measures as well as policies of sustainable renovation to be sufficient and did not require additional information to make an informed decision.
- Yet, the majority of respondent did not show a preference regarding which measures were to be implemented nor a preference regarding an individual or collective approach.
- Pioneering residents, those that have previously made (individual) sustainable renovations did illustrate a strong preference for an individual approach.

F | Interview Consent Form

Delft University of Technology
HUMAN RESEARCH ETHICS
INFORMED CONSENT TEMPLATES AND GUIDE
(English Version: January 2022)

You are being invited to participate in a research study titled 'Towards a Sustainable Numansgors'. This study is being done by Nienke Zweers from the TU Delft and the Wageningen University Science Shop.

The purpose of this research study is to investigate justice related issues with collective energy efficiency renovation of VvEs, and will take you approximately *45-60* minutes to complete. The data will be used for research purposes as part of a Master's thesis whose goal it is to explore how the lens of energy justice can eliviate barriers for collective energy transition. We will be asking you regarding certain information such as your understanding of decision-making within VvE's, barriers and opportunities.

As with any online activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by deleting audio recordings and the transcript after it has been used for the research purposes and by only publishing the anonymized summary of the interview's transcript. No personal information or individual survey responses will be published or made publicly available.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions.

You can also reach out to the researchers asking for data to be removed up to a month after the interview has been completed. You can rcontact the research team through the following contact details:

- Nienke Zweers (corresponding researcher) n.t.zweers@student.tudelft.nl
- Aksel Ersoy (responsible researcher) A.Ersoy@tudelft.nl

By checking yes to the questions below and signing the form, you are agreeing to this Opening Statement and providing informed consent to participate in this study.

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
1. I have read and understood the study information dated [28/06/2022], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☒	☐
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☒	☐
3. I understand that taking part in the study involves participating in an audio-recorded interview, from which written notes and a transcript will be generated. The audio file and transcription will be deleted after the study, and only an anonymized summary of the transcript contents will be made available.	☒	☐
4. I understand that I will not be compensated for my participation in the study.	☒	☐
5. I understand that the study will expect to be published in December 2022.		
PLEASE TICK THE APPROPRIATE BOXES:		
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
6. I understand that taking part in the study involves the following risk of emotional or mental discomfort. I understand that these will be mitigated by my ability to ask for the interview to stop at any point and ask for the data or information thus far to be deleted.	☒	☐
7. I understand that taking part in the study also involves collecting specific personally identifiable information (PII) such as name and job title as well as associated personally identifiable research data (PIRD) such as my insight on challenges and opportunities regarding collective energy measures to deliver energy justice. I understand that in case of a data breach there is a potential risk of potential re-identification and reputational risks.	☒	☐
8. I understand that the following steps will be taken to minimise the threat of a data breach, and protect my identity in the event of such a breach: * bare minimum collection of personal data (collected only in this consent form) * Deletion of recording from local device and move it to secure data storage with limited access. * Only making anonymized summary of findings available, excluding the interviewee's name and contact information. * Deletion of audio recording and transcript after use.	☒	☐

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
9. I understand that personal information collected about me that can identify me, such as my name and place of work will not be shared beyond the study team.	☒	☐
10. I understand that the (identifiable) personal data I provide will be destroyed after use, when the study is completed and the findings are deemed sufficient for publishing. (expected December 2022)	☒	☐
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
11. I understand that after the research study the de-identified information I provide will be used for a master's thesis and could feed policy and/or research recommendations within that publication.	☒	☐
12. I agree that my responses, views or other input can be quoted anonymously in research outputs	☒	☐
13. I agree that my real name can be used for quotes in research outputs (optional).	☒	☐
D: (LONGTERM) DATA STORAGE, ACCESS AND REUSE		
14. I give permission for the de-identified anonymized summary of the interviews transcript that I provide to be archived in the 4TU.ResearchData repository so it can be used for future research and learning.	☒	☐
15. *If* I understand that access to this repository is open.	☒	☐

Signatures

[redacted] _____ 6-10-2022_____

Name of participant | Signature | Date

I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____ _____ _____

Nienke Zweers. | Signature | Date

Study contact details for further information:
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