THE SOCIOECONOMIC HEAT TRANSITION

The role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition

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Colophon

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Abstract

In order to battle climate change, the Dutch climate act contains the compliance to make the transition from a residential heat system based on natural gas towards a system based on sustainable sources of heat. To do this, the Dutch government designed a participatory approach on the level of neighbourhoods (Dutch: Programma Aardgasvrije Wijken). In this programme, municipalities are given the authority to design and steer the participation processes.

As literature stresses the importance to understand the neighbourhood factors underlying successful and unsuccessful participation, this research aims to study the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the heat transition process. To do this, a comparative case study is conducted on four neighbourhoods with varying socioeconomic contexts. These are Ramplaankwartier (Haarlem), van der Pekbuurt (Amsterdam), Bospolder-Tussendijken (Rotterdam), and Overvecht-Noord (Utrecht). Data on these cases is collected by means of semi-structured interviews with key actors involved in the participation processes. Through a literature study on socioeconomic context factors and participation, a framework is developed to analyse the data. This includes several socioeconomic context factors that can have a role in explaining the participation of citizens divided into four branches: their willingness to participate, ability to participate, opportunity to participate, and actual participation.

The results show that the role of the socioeconomic context in explaining the participation of citizens in the heat transition can be kept limited when a well-designed and inclusive participation process is implemented. However, in neighbourhoods with a better socioeconomic context, citizens activate themselves more quickly to participate due to motivations like environmental awareness. Finally, the results show that the socioeconomic context of a neighbourhood can function as a catalysator for participation in the heat transition independent of the authorities, facilitating a bottom-up and citizen-led process.

Keywords: heat transition, participation, heat networks, socioeconomic context, energy governance

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CBS	Centraal Bureau Statistiek
IAPP	International Association for Public Participation
IPCC	International Panel on Climate Change
PAW	Programma Aardgasvrije Wijken
RES	Regionale Energiestrategie
SES	Socioeconomic Status
Solar PVT	Solar Photovoltaic-Thermal
TVW	Transitievisie Warmte
VVE	Vereniging Van Eigenaren

1. Background and scientific relevance

1.1 Background

Climate change is happening, and the human influence on it cannot be denied any longer. The most cautious models of the International Panel on Climate Change (IPCC) predict that global warming is likely to reach 1.5 °C between 2030 and 2052 if it continues to increase at the current rate (IPCC, 2018). This phenomenon is to a large extent the result of the burning of fossil fuels, which has become a prerequisite for the functioning of our daily modern lives (Burgler, 2022 p.4). One of these fossil fuels is natural gas, which functions as one of the most important sources of residential heating and domestic energy production (Teladia & van der Windt, 2021 p.2). Next to contributing to climate change, natural gas is a finite resource that won't be able to respond to our rising demand anymore (Zuidema & de Boer, 2013). Therefore, in the quest for a sustainable future, one of the crucial elements is the transition from a heat system based on natural gas towards a system based on sustainable sources of heating, better known as the heat transition (Burgler, 2022). This may involve the use of collective heat networks or individual heat pumps based on geothermal or aquathermal energy, industrial residual heat, or sustainable gases.

The heat transition is part of the Paris agreement. This legally binding accord was signed in 2015 by 196 countries which collectively agreed to limit the rise in temperature by a maximum of 2 degrees Celsius as compared to pre-industrial levels (United Nations, 2015). The Netherlands is one of the countries that signed the Paris agreement and translated it into their climate act which was presented in 2019 (Rijksoverheid, 2019). The climate act contains more than 600 agreements to counteract the Dutch greenhouse gas emissions, eventually aiming at a reduction of 49% by 2030 and 95% by 2050 (Burgler, 2022 p.4). This includes the compliance that 1.5 million buildings must become natural gas free by the year 2030 and the entire building stock must be natural gas free by the year 2050 (Rijksoverheid, 2019).

This is a complex challenge as the Netherlands has a long history of natural gas use and extraction (Teladia & van der Windt, 2021). The country is for example home to the biggest gas field in Europe near the city of Groningen. As a result, the Dutch energy system has an exceptionally high share of natural gas with almost 90% of all households being connected to the natural gas grid. Residential buildings cause approximately 9% of the country's CO2 emissions, with two-thirds of the energy consumption being spent on heating. A transition towards sustainable heat can thus have a substantial impact on CO2 emissions (Jansma et al., 2021 p.1). The urgency to move to such renewable sources gained attention recently when the prices of natural gas significantly increased, nearly doubling energy bills (NOS, 2022; Burgler, 2022 p.4). Furthermore, due to the local earthquakes caused by the gas extraction in Groningen, the Dutch government decided to close the gas field by the year 2024 (Mulder & Perey, 2018). Despite this, figure 1 below shows that the majority of the buildings in the Netherlands are still heated by systems based on natural gas.

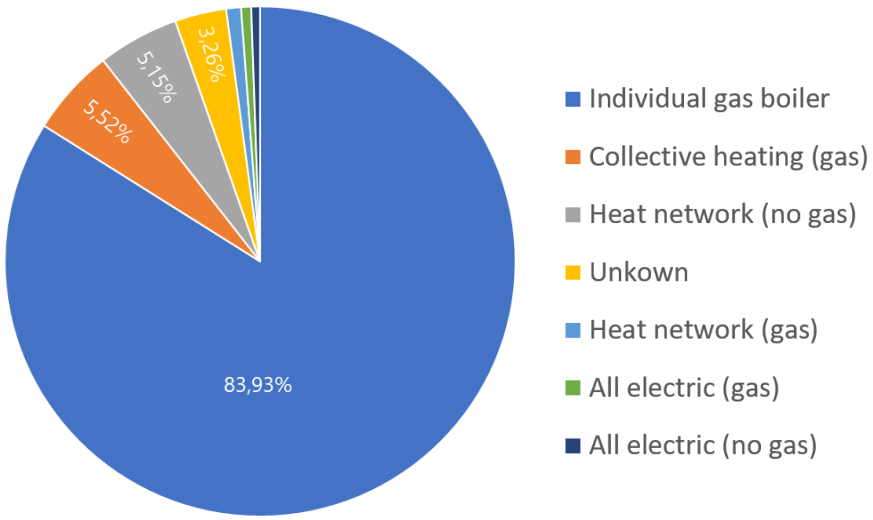

Figure 1. Dominant heat systems of Dutch households (CBS, 2021)

In order to make the transition from natural gas to other sources of heating and meet the targets of the climate act, the Dutch government chooses to implement a decentralized approach where municipalities are given the authority to steer the process on the level of neighbourhoods (PAW, 2021a). Before the end of 2021, each municipality had to develop a policy vision on the heat transition in its built environment. This includes a stepwise timeline indicating which neighbourhoods will make the transition when and a first study to what possible alternative sources for heat are feasible. This functions as a first outline towards making the definitive decisions for the neighbourhoods that are elaborated in implementation plans (PAW, 2021b). Such a plan concretizes the policy vision and describes the steps in which a neighbourhood will eventually make the transition towards one or more sustainable heat sources (PAW, 2021c).

1.2 Problem statement

The heat transition affects people's residences and has more financial consequences than other developments in the spatial domain. Citizens are confronted with the technical and financial consequences of measures in the form of home renovations and the replacement of appliances and equipment (Bouw et al., 2022). Therefore, the climate act states that it is crucial that citizens contribute to and participate in the transition process to achieve natural gas-free districts (Teladia & van der Windt, 2021). Accordingly, the Dutch government chose to implement a neighbourhood participatory approach to make the transition towards sustainable sources of heat (Rijksoverheid, 2019). Here, citizens should be involved as active participants in the energy system rather than passive stakeholders. This should lead to increased public trust in decision-making, higher transparency and accountability, and better accepted and adapted technologies to serve local needs (Teladia & van der Windt, 2021).

Literature shows us that implementing participatory processes is not an easy endeavour due to, for example, conflicting interests between citizens and authorities. Furthermore, because of varying circumstances, there is no one-size-fits-all approach to designing participation processes (Arnstein, 1969; Fung & Wright, 2016; Bouw et al. 2022). In the case of the heat transition, every neighbourhood is unique and has its own social context, needs, and preferences when it comes to participating. Where in some neighbourhoods the transition process has difficulties taking off, in others citizens take matters into their own hands and are already making significant progress towards implementing sustainable sources of heat. Considering this, Bouw et al. (2022) state that it is necessary to understand

the neighbourhood factors underlying successful and unsuccessful participation to improve the planning and implementation process substantially. One of these factors is the socioeconomic context of a neighbourhood. Ziersch et al. (2011) found evidence that community group participation is associated with indicators of socioeconomic advantage. For example, individuals with higher socioeconomic status (SES) have higher rates of public participation (Baum et al., 2000). Furthermore, Kalkbrenner (2016) states that determinants such as higher levels of educational background tend to increase the willingness of individuals to volunteer. While these are indicators at the individual level, this research focuses on the total effect of these at the neighbourhood level since harvesting the potential for renewable energy measures depends on its ability for collective action and consensus building (Kunze & Busch, 2011).

While several academics suggest that socioeconomic factors are important in explaining successful participation (e.g. Wilson & Musick, 1997; Hall, 1999; Marshall, 2005), little research has been done on this topic at the neighbourhood level (Ziersch et al., 2013), especially in the case of the Dutch heat transition. Bouw et al. (2022) analyzed a broad set of pre-existing neighbourhood characteristics as potential predictors of participation success in community energy projects. Doing so, they identified that socioeconomic factors such as income and education are relevant for constructing a social profile of a neighbourhood as a starting point for an approach to community participation. The research from Bouw et al. (2022) does however have an explorative nature with a focus on identifying a broad range of determinants that play a role in successful participation. The individual factors have thus not been investigated in depth (Bouw et al., 2022). This research will tap into this gap by focusing on the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition. Furthermore, whereas existing research on the Dutch heat transition mainly studied rural areas (Bouw et al., 2022; Teladia & van der Windt, 2021; Jansma et al., 2020), this research will be focused on neighbourhoods within an urban context. In these understudied neighbourhoods, other dynamics are at play due to different values, norms and beliefs n (de Haan et al. 2019).

1.3 Research framework and outline

Participation in this research is the extent to which citizens and communities participate in the heat transition process within their neighbourhood. This is divided into four branches: citizen's willingness to participate (e.g. motivations, attitudes), citizen's ability to participate (e.g. financial means, available knowledge), citizen's opportunity to participate (e.g. being involved, invitations), and finally their actual participation (e.g. attendance in neighbourhood meetings, applying energy saving measures). More on the operationalization of participation in this research can be found in section 2.1.

Following the problem statement, this research aims to investigate the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition. The socioeconomic context used for this study consists of the context factors income, wealth and poverty (1); homeownership and tenure (2); and educational levels and knowledge (3). Furthermore, the role of community effects (4) in explaining participation will also be addressed. More on the socioeconomic context can be found in section 2.2.

To investigate this, the following research question is formulated:

- *What is the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition?*

To answer this question, the following sub-questions need to be studied:

- *What are the advantages of a participatory approach in the heat transition?*
- *What socioeconomic context factors are relevant in explaining the participation of citizens in the heat transition?*
- *Do neighbourhoods with a lower socioeconomic profile perform worse in terms of participation? (less willing, less able, and fewer* opportunities*?)*
- *What socioeconomic context factors are most important when explaining the participation of citizens in the heat transition?*

In order to accomplish this and answer the main research question and the associated sub-questions, a literature study is performed first to establish a theoretical framework. After this, the actual research is conducted by means of an empirical study.

1.3.1 Literature study

Within the literature study, academic articles on participation are studied first in relation to the heat transition. Through discussing prominent academic theories like Arnstein's ladder of participation and the civic voluntarism model, different forms, levels, and determinants of participation processes are operationalized from both a public and citizen's point of view. After this, the socioeconomic context of neighbourhoods is elaborated by discussing several socioeconomic context factors and their relation to participation processes in the heat transition. This also involves the possible community effects that are at play in neighbourhoods. The socioeconomic context factors that are defined in this section will be used in the empirical study.

1.3.2 Empirical study

To investigate how the identified socioeconomic context factors of neighbourhoods play a role when it comes to the participation of citizens in the heat transition, a comparative case study is conducted on four neighbourhoods that are appointed as experimental learning areas in the context of the Dutch programme of gas-free neighbourhoods (PAW). These include two neighbourhoods with a rather poor socioeconomic context, one neighbourhood with a good socioeconomic context, and one neighbourhood that can be placed in between. Furthermore, all neighbourhoods are making the transition towards a collective heat network as alternative to natural gas. Finally, the neighbourhoods are all located within an urban environment in the Randstad agglomeration in the west of the Netherlands. More on the selection of the neighbourhoods can be found in section 3.2.

Since other academic work (e.g. Bouw et al., 2022; Ziersch et al., 2013; Kalkbrenner, 2016) solely explored socioeconomic context factors that are relevant in explaining participation, this research aims to study this relationship in-depth. Furthermore, whereas the focus in previous work was on individual households, this research will focus on the neighbourhood level as a whole. In order to investigate this, the empirical study is executed by means of a qualitative approach. This consists of semi-structured interviews held with heat transition professionals involved in the neighbourhood participation processes (e.g. project leaders, process supervisors). More on the methods can be found in Chapter 3.

1.4 Academic and societal relevance

From an academic point of view, this research will provide in-depth insights into the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the heat

transition, something which is only been slightly touched upon in existing literature so far (Bouw et al., 2022; Teladia & van der Windt, 2021). Furthermore, it will apply existing concepts and models (e.g. Arnstein's ladder of citizen participation) to the Dutch heat transition, a relatively new topic within the energy transition.

From a social perspective, this research aims to contribute to the acceleration of the heat transition. By identifying how the socioeconomic context of neighbourhoods relates to participation, neighbourhood planners can adapt tailor-made strategies and approaches to enhance the participation process. Furthermore, policymakers can rethink subsidies or other (non)monetary incentives for increasing participation in neighbourhoods according to these findings.

1.5 Reading guide

This research is structured as follows. First, Chapter 2 will provide a theoretical framework, exploring and discussing literature and concepts related to participation and the socioeconomic context of neighbourhoods in relation to the heat transition. From this, a conceptual model is developed (figure 3) that forms the basis for the empirical research. After this, Chapter 3 will explain the strategy and methods used for the empirical study. The results of the empirical study are presented and interpreted in Chapter 4. Finally, chapter 5 will provide the conclusions of the research, discuss their meaning, and provide some recommendations for further research (Burgler, 2022).

2. Theoretical framework

2.1 Participation

This section will discuss literature on participation. First, the concept of participation is defined for this research after which the importance and the advantages of participation in the heat transition are stressed. Second, the levels of participation are discussed, using Arnstein's ladder of participation (Arnstein, 1969) as a starting point. Finally, whereas the section on levels of participation mainly uses the point of view of public authorities, the last section will discuss participation from a citizen's perspective.

2.1.1 Defining participation

In the literature, a wide range of definitions and meanings have developed around the concept of participation. The most prominent theories about participation emerged from the 1960s onwards, defining participation as a means to allow citizens to have an influence on decision-making processes that were otherwise political (Fung & Wright, 2016). Furthermore, the concept of participation developed in response to the idea that it was needed as a response to complex, so-called 'wicked' problems that were hard to solve due to incomplete information, complicated interdependencies, and shifting environments (Rittel & Webber, 1973). This line of thought is still relevant today in the context of the heat transition, a societal problem that is characterized by complex societal interactions, highly uncertain physical processes, and management dilemmas (van der Brugge et al., 2005). Over the last decennia, the concept of participation gained increasing attention due to the rejection of top-down planning processes, shifting towards a bottom-up approach with more room for input from citizens (Healey, 2007). In contrast to the old stream of literature, more recent additions on participation (e.g. Reddick, 2010; Langer et al., 2016) underline the importance of seeing it as a dynamic process in which citizens are given a voice in public decision-making.

The concept of participation comes in various forms, of which citizen participation, public participation, and community participation are the most common. These variations have important differences that need to be operationalised for this research. First, whereas citizen participation solely focuses on the participation of citizens in public decision-making processes, public participation also involves other actors like the media, non-governmental organisations, and other possible stakeholders within the participation process (Haus et al., 2005). In this research, the focus will explicitly be on the participation of citizens in the heat transition in their neighbourhood. The concept of public participation will therefore be left out. Second, community participation differs from citizen participation in the sense that it is more focused on groups of citizens (Haus et al., 2005). As stated in section 1.2 of this research, collective action and consensus building are important elements within renewable energy projects (Kunze & Busch, 2011). Bouw et al. (2022 p.4) for example state that social cohesion within a neighbourhood makes it easier to reach different social groups, facilitate discussions among neighbours, and develop joint visions related to the heat transition. Considering this importance, the focus on community groups as adapted by community participation will be included in this research.

To conclude, when the concept of participation is used in this research it refers to citizen participation as well as aspects of community participation. The essence is that participation is a process in which citizens are involved in public decision-making processes regarding the heat transition.

2.1.2 The importance and the advantages of participation

According to the Dutch programme of gas-free neighbourhoods (PAW, 2021d), the challenge of making the built environment natural gas free depends to a great extent on involving citizens within a participatory process. Following their line of thought, the citizens themselves need to take measures behind their own front door and the chance that they are willing to cooperate increases with a process in which their voice is being heard and plans that fit their wishes, needs, and ideas (PAW, 2021d). But why is this the case? Following Edelenbos (2001), citizens are more willing to support and accept policies when they see their interests represented. Generally, they are more likely to support initiatives that they have a hand in creating, reducing opposition towards it at the same time. Next to these arguments, Teladia & van der Windt (2021 p.2) made a list of the most prominent advantages of participation that are stressed in the literature, which are summarized in the table below.

Table 1. Advantages of participation (Teladia & van der Windt, 2021 p.2)

Advantage	Author(s)
Increased public trust in decision-making.	Beierle (1998); Cornwall (2008); Reed (2008) Richards et al. (2004); Stringer et al. (2006).
Empowerment of local citizens through co-generated knowledge.	Greenwood et al. (1993); Macnaghten & Jacobs (1997); Okali et al. (1994); Reed (2008).
Heightened perception of fairness and legitimacy.	Cornwall (2008); Martin & Sherington (1997); Reed (2008); Richards et al. (2004); Wallerstein (1999).
Higher transparency and accountability.	Cornwall (2008); Hurlbert & Gupta (2015).
Enhancing equitable policy-making and implementation.	Martin & Sherington (1997); Reed (2008).
More informed project design, technological adaption, and decision-making which better serve local needs.	Beierle (2002); Blackstock et al. (2007); Fischer (2000); Fritsch & Newig (2012).
Greater adoption and diffusion rates of technologies, and acceptance of decisions.	Junker et al. (2007); Martin & Sherington (1997); Reed (2008).
Better adapted technologies and projects to serve local needs.	Dougill et al. (2006); Martin & Sherington (1997); Reed (2008).

However, including citizens within a participatory process does not only come with advantages. Participation requires time and resources, forming a challenge for governments that are already facing budget or time constraints. Furthermore, only a small portion of the population may participate, leaving out many voices and perspectives. Besides, if done poorly, public participation processes can result in a loss of faith in the government (Wouters et al., 2011).

Finally, an important note is that participation does not necessarily mean influence. Although citizens and communities are involved in public decision-making, their views, meanings, and other inputs can be ignored (Arnstein, 1969). In the literature, this is reflected by classifying participation into different levels, of which Arnstein's ladder of participation is the most well-known. This will be discussed in the next section.

2.1.3 Levels of participation

Today Arnstein's ladder of participation still forms the conceptual basis for a great level of academic research focused on participation. The levels of participation in the ladder show that there is a critical difference between going through the empty ritual of participation and having the real power needed to affect the outcome of the process (Arnstein, 1969). In total, Arnstein distinguishes eight levels of participation (see Figure 2).

The bottom two levels of the ladder, *Manipulation* (1) and *therapy* (2) are categorized as forms of non-participation. Here, individuals have no involvement in decision-making and are merely passive recipients of decisions made by others. With *manipulation*, citizens are given the feeling that they are being involved in decision-making, while in reality, it are the powerholders who educate, persuade, and advise the citizens, not the reverse. *Therapy* is defined by pseudo-participatory programmes that attempt to convince citizens that they are the problem when in fact it's established institutions and policies that are creating the problems for citizens (Arnstein, 1969).

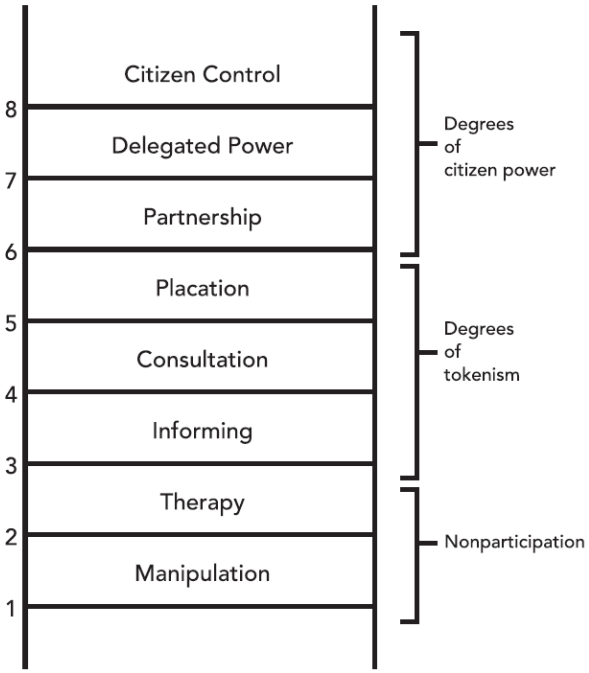

Figure 2. Eight rungs on a ladder of citizen participation (Arnstein, 1969)

At the middle of the ladder, *Informing* (3), *consultation* (4), and *placation* (5) are indicated as levels of tokenism. Here input from citizens may actually be heard. However, they still lack the power to ensure that their views will affect the decision-making process. The *informing* level refers to the situation where citizens are provided with information (e.g. brochures, public meetings) about a decision or policy, but have no opportunity to influence or shape the decision. *Consultation* is best described as inviting citizens to share their opinions, and therefore 'consult' the citizen in the process. This can however still foster a sense of powerlessness and cynicism among citizens if they feel their input is not taken into account. *Placation* is a somewhat higher form of tokenism as citizens start to have some degree of influence. As an example, Arnstein discusses situations in which some citizens are placed on boards of community agencies or planning commissions. These allow citizens to advise or plan while the powerholders retain the right to judge the legitimacy or feasibility of the advice (Arnstein, 1969).

Finally, further up the ladder, we find *partnership* (6), *delegated power* (7), and *citizen control* (8) as levels of citizen power. Here citizens have greater influence over the decisions and may play a central role in shaping policies and practices. This is seen as a more democratic and inclusive approach to decision-making. At the *partnership* level citizens and powerholders agree to share planning and decision-making responsibilities through such structures as joint policy boards, planning committees, and mechanisms for resolving impasses (Teladia & van der Windt, 2021). *Delegated power* is an advanced level of citizen participation where citizens have the authority to make decisions and implement policies, often acting on behalf of the government or another decision-making body. Here citizens hold the significant cards to assure accountability of the programme to them. To conclude, *citizen control* represents the highest level of citizen participation with citizens governing a whole programme or institution, being fully in charge of policy and managerial aspects. They act independently of the government or other decision-making bodies (Arnstein, 1969).

Throughout the years, numerous variants of the ladder have developed (e.g. Connor, 1998; Davidson, 1988), all making changes and/or additions to the original categorization from Arnstein. To make the ladder more applicable for policymakers in practice, the International Association for Public Participation (IAPP) developed a spectrum consisting of five levels of participation (IAPP, 2018). Because of the more theoretical nature of Arnstein's ladder and the applicability of the IAP2 spectrum to the heat transition, the last mentioned will be referred to for the remainder of this research. The spectrum leaves the forms of non-participation (*manipulation* and *therapy*) from Arnstein's ladder out, making *informing* and *consulting* the lowest levels of participation. *Involve* is most comparable to the *placation* level from Arnstein's ladder although the placation of citizens into boards of community agencies or planning commissions is not explicitly mentioned. Finally, *collaborate* is identical to the *partnership* level and the two highest levels of citizen power from Arnstein's ladder, *delegated power* and *citizen control*, are converted into *empower*. The spectrum and its contents can be found in Table 2 below.

Table 2. Spectrum of participation (IAPP, 2018)

Increasing impact on the decision

	Inform	**Consult**	**Involve**	**Collaborate**	**Empower**
Public participation goal	To provide the public with balanced and more objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
Promise to the public	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns, and provide feedback on how public input will influence the decision. We will seek your feedback on drafts and proposals.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will work together with you to formulate solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

2.1.4 Levels of participation in the heat transition

The heat transition resembles a special case of participation since measures need to be taken behind people's front doors, affecting the place where they live (Platform31, 2021). Considering that municipalities are in charge, it could be stated that the participation process at least starts at the level of involvement as working directly with citizens seems almost inevitable. Lower levels of participation (*informing* and *consulting*) may therefore in itself be insufficient in getting citizens and communities to action and can solely be used as means within the process. Within the climate act, the Dutch government leaves the preferred level of participation open by stating that every neighbourhood is unique with different situations, decisions and people involved. Therefore, authorities and other initiators are free to design participation processes that fit within the specific context (Rijksoverheid, 2019). Furthermore, since municipalities will be at the steering wheel, they will in the end choose how and when neighbourhoods will get removed from the natural gas. This implies that the *empower* level in which citizens make final decisions will not be a realistic scenario. The climate act does however

frequently mention that advanced collaborations between citizens and authorities (as described by the level of collaboration*)* are aspired, they name this co-creation (Rijksoverheid, 2019).

2.1.5 Participation from a citizen perspective

The theories mentioned so far mainly assume that participation processes are initiatives that are designed by public authorities. They do not tell much about the citizen's perspective. Therefore, Verba et al. (1995) created the civic voluntarism model, highlighting the importance of considering the motivations and factors that drive citizens to become involved in policy processes. The model distinguishes three variables, influencing participation processes from a citizen's point of view: citizen's willingness to participate, citizen's ability to participate and citizen's opportunities to participate.

Before explaining the variables, it is important to say that these will be used as sub-variables of participation in the empirical study. This means that the empirical study will address the role of the socioeconomic context of neighbourhoods in explaining whether citizens are willing to participate, are able to participate, and have the opportunities to participate. By doing so, this research mainly approaches participation from a citizen's point of view. This does however not mean that Arnstein's ladder and the IAPP model get less important as the public authorities create the frameworks in which these citizens need to participate. Finally, next to using the variables of the civic voluntarism model, an extra sub-variable will be added named actual participation. This variable allows us to investigate the role of the socioeconomic context on the observed levels of participation in a neighbourhood. All four variables and their evaluation criteria are explained below.

Willingness

Verba et al. (1995) state that participation is to a large extent dependent on the degree to which citizens are motivated. They can have different motives to participate related to values, attitudes and personal norms (Steg et al. 2015). Frequently mentioned motives include:

- *Economic motives***:** citizens may for example participate because of their high monthly energy bills and the perspective that the heat transition will reduce their energy costs (Germes et al., 2021).
- *Environmental awareness*: citizens may participate as a way to reduce their carbon footprint and contribute to a more sustainable future (Germes et al., 2021).
- *Social motives*: citizens feel part of a community and want to contribute to the transition in their neighbourhood (Tonkens & Verhoeven, 2011).

Table 3. Evaluation criteria for willingness

Criteria	Checks
General willingness	- Are citizens in the neighbourhood willing to participate in the heat transition process?
Economic motives	- Are citizens in the neighbourhood mainly willing to participate because of concerns about their high energy bills?
Environmental concern	- Are citizens in the neighbourhood mainly willing to participate because of environmental awareness?
Social motives	- Are citizens in the neighbourhood mainly willing to participate because they feel part of a community?

Ability

Next to being motivated, participation also depends on the means that citizens have. In the case of the heat transition, the most important resources for participation are time, knowledge and money. For example, people need to invest in renovations and the replacement of appliances and equipment in their houses. Furthermore, people themselves may think that they don't have the right educational or

knowledge level to participate (Bouw et al., 2022). Section 2.2 will go further into the role that such resources can have in the participation process.

Table 4. Evaluation criteria for ability

Criteria	Checks
General ability	- Are citizens in the neighbourhood able to participate in the heat transition?
Financial ability	- Do citizens in the neighbourhood have the financial ability to invest in physical measures at their houses?
Time available	- Do citizens in the neighbourhood have time to participate in the heat transition process? - Are citizens in the neighbourhood willing to spend time participating in the heat transition process?
Knowledge level	- Do citizens in the neighbourhood have some knowledge about the heat transition? - Do citizens in the neighbourhood believe that they need certain knowledge to participate in the heat transition process?

Opportunity

Third, it is important for citizens to be invited and involved to participate in the heat transition process. Following Verba et al. (1995), this is twofold. First, citizens need to be reached and involved by the authorities to participate in the process. Second, this also includes being involved in the community. The degree of social cohesion in a neighbourhood plays a role here. Kearns & Forrest (2000) for example emphasize the importance of communities for the participation of citizens. They state that citizens with more high-quality social ties are more likely to participate. More on these community effects can be found in section 2.2.5.

Table 5. Evaluation criteria for opportunity

Criteria	Checks
Invitations	- Do citizens in the neighbourhood receive invitations from the authorities about participation in activities? - What means are used by the authorities to invite citizens to participate in activities in the neighbourhood?
Opportunities	- Do citizens in the neighbourhood feel that they get the opportunity to participate in the heat transition process? - Is it difficult to reach certain groups in the neighbourhood?

Actual participation

Finally, within the heat transition, citizens can participate in numerous forms and ways. To simplify these they are divided into two categories. The first one includes participating in the activities, processes and programmes as designed by the government or other authorities. This may include attending public consultations and information meetings, participating in working groups and co-creation sessions, or being part of a neighbourhood council (PAW, 2021e).

Secondly, citizens may also take matters into their own hands and participate in the heat transition independent from the organized participation process. This includes activities like implementing energy efficiency improvements at their houses (e.g. insulation), starting or participating in citizen energy cooperatives, or investing in sustainable heat technologies. Furthermore, they could also

voluntarily raise awareness about the heat transition in their neighbourhood and promote sustainable practices or even act as an advisor themselves (PAW, 2021e).

Table 6. Evaluation criteria for actual participation

Criteria	Checks
Attendance in activities	- How large is the share of citizens in the neighbourhood that shows up at project meetings? - Are some groups underrepresented at the project meetings?
Resistance	- Is there resistance from citizens in the neighbourhood against the heat transition process? E.g. action groups, protests, and formal complaints.
Social participation	- Do citizens in the neighbourhood organise themselves in energy cooperatives or other related community groups? - Do citizens try to raise awareness about the heat transition in their neighbourhood?
Physical measures	- How large is the share of citizens in the neighbourhood that invest in energy efficiency measures (e.g. insulation) at their houses? - How large is the share of citizens in the neighbourhood that invest in sustainable heat measures (e.g. heat pumps) at their houses?

2.2 Socioeconomic context and participation

Now that the concept of participation is operationalized, this section will discuss literature on the relationship between the socioeconomic context of neighbourhoods and the participation of citizens in the heat transition process. It does this by describing socioeconomic context factors of neighbourhoods that hypothetically have an influence on the heat transition participation process. These were identified by reviewing academic articles and selected afterwards by assessing their relevance for this study. The socioeconomic context of a neighbourhood in this study refers to the economic and social conditions that shape the community and the lives of the people who live there (Boardman & Robert, 2000).

2.2.1 Income, wealth and poverty

The first socioeconomic context factor that is frequently discussed in the literature is the average or median income level of a neighbourhood. Following Stern (2000), the level of income determines the available means that citizens have to, for example, invest in insulation or energy-efficient systems at their houses. While this might directly influence citizens' participation in the heat transition independent from the authorities, participation in the organized process may also be influenced when people believe that the heat transition is not financially feasible for them. Bouw et al. (2020) state that although citizens might be willing to behave sustainably, they won't do so if they cannot afford it. The other way around, Kalkbrenner (2016) reports that higher levels of income tend to increase the willingness of citizens to volunteer in participation processes. Similarly, Forest and Kearns (2001) found that income has a positive effect on community action, stating that the capacity to act collectively is rated higher in wealthy areas due to a combination of material and social resources.

Something that is important to note is that income within a neighbourhood (e.g. average or median) does not necessarily reflect the financial situation of all the citizens. Neighbourhoods can for example be characterized by levels of income inequality. Therefore, additional measures related to income are

discussed in the literature on the socioeconomic context of neighbourhoods. Boardman & Robert (2000) for example talk about the socioeconomic context of a neighbourhood in terms of levels of poverty and wealth to provide a more complete depiction of the financial context. Whereas understanding poverty levels within a neighbourhood can help to identify potential barriers towards participation, incorporating wealth can show the potential for participation within a neighbourhood. Important indicators here are employment and unemployment rates.

2.2.2 Homeownership and tenure

Second, following Lovasi et al. (2011), levels of homeownership and tenure are important factors in explaining the socioeconomic context of a neighbourhood. Homeownership is for example associated with higher levels of financial stability, a stronger sense of community and civic engagement, and longer-term commitment to a neighbourhood as compared to renting (Middleton & Groves, 2005). Within the heat transition, there is a difference between the role and perception of homeowners and tenants. Whereas homeowners need to take action and invest in the transition themselves, tenants usually depend on their housing corporation or landlord (Jansma et al., 2020 p2). Because certain aspects are out of their reach, tenants may have fewer incentives to participate in the heat transition. The other way around, homeowners might feel more commitment to participate as it affects their own property. This may for example result in higher levels of participation in for example public meetings by homeowners.

2.2.3 Educational levels and knowledge

Third, educational and knowledge levels in a neighbourhood can be of influence on the success of participation processes (Ebrahimigharehbaghi et al., 2019). For example, van der Werff et al. (2014) did a study on participation in local energy initiatives and found that individuals with higher levels of education were more likely to participate in local renewable energy initiatives. This is mainly attributed to their greater environmental awareness, interest in sustainable development, and access to information and networks. Radtke (2014) states that educational levels might predict if citizens will attend the participation meetings, but not if they will engage actively. Instead, as stated by Ernst (2018), knowledge among citizens about climate problems has a bigger influence on their participation rate. This knowledge level will also increase during the participation process. Furthermore, certain occupations may come with relevant knowledge that is applicable to the heat transition. Finally, Kollmus and Agyeman (2002) state that higher educational levels of citizens have a positive influence on knowledge of climate problems, although this does not necessarily mean that they will actually behave sustainably.

2.2.4 Interactions between context factors

An important note to make is that although the socioeconomic context of a neighbourhood consists of several context factors, these are not to be seen in isolation. Instead, the socioeconomic context should be seen as a whole with the context factors being related and influencing one another. For example, higher educational levels in a neighbourhood will probably be reflected by higher income levels which in turn increases the share of homeowners in the neighbourhood.

2.2.5 Socioeconomic context and community effects

Although this research focuses on the role of the socioeconomic context of a neighbourhood in explaining the participation of citizens in the heat transition, the community effects that are at play within a neighbourhood cannot be neglected. These can have a significant influence on the success of the participation process. Therefore, this research will also elaborate on the role of such community effects in explaining the participation of citizens in the Dutch heat transition.

When addressing community effects within neighbourhoods, the concept of social cohesion is at the centre of the literature. Ziersch et al. (2013) define social cohesion as the social networks and connections between people within a neighbourhood, also including the existence and strength of organizational networks. Parlaviciute and Steg (2014 p.367) state that important psychological factors explaining social cohesion within a neighbourhood are place-attachment and place identity. Place attachment refers to one's emotional bonds with the local area, whereas place identity reflects the extent to which physical and symbolic aspects of the place contribute to one's sense of self or identity.

Social cohesion is often mentioned as an important factor in explaining the success of participation processes. Bouw et al. (2022 p4.) for example state that higher social cohesion within neighbourhoods could increase the likelihood of participation. In neighbourhoods where people know each other and interact with each other well, there is a better basis for community participation in the heat transition than in neighbourhoods with weaker social interactions. Continuing, they underline the idea that strong social interactions between people lead to a better chance of collective action towards solving problems, such as the heat transition.

According to Altschuler et al. (2004), social cohesion within a neighbourhood is influenced by the socioeconomic context. citizens in more advantaged areas may be relatively richer in all forms of capital making them more able to participate in locally based community groups and mobilise and work together to improve their local environment or the quality of their lives (Ziersch et al. p.383). Furthermore, the socioeconomic conditions of more disadvantaged neighbourhoods are linked to higher levels of residential instability, leading to lower levels of community group involvement in those areas (Baum et al., 2000). However, one of the limitations here is that the literature assumes homogeneity of citizens within neighbourhoods. In reality, there may however be large differences within neighbourhoods among citizens, for example in socioeconomic status. It would therefore be interesting to see whether neighbourhoods with heterogeneity in terms of socioeconomic status perform better in terms of social cohesion, leading to more participation in the heat transition.

2.3 Conceptual model

Figure 3 below shows the conceptual model that will be used in this research. It shows the relationship between the socioeconomic context of neighbourhoods and the participation of citizens in the Dutch heat transition (Burgler, 2022). Hypothetically, the model assumes that the socioeconomic context influences the success of the participation process in terms of citizens' their willingness to participate, ability to participate, opportunity to participate and whether they are actually participating. The socioeconomic context consists of the context factors income, wealth and poverty (1), homeownership and tenure (2), educational levels and knowledge (3), and community effects (4) as discussed in the previous section.

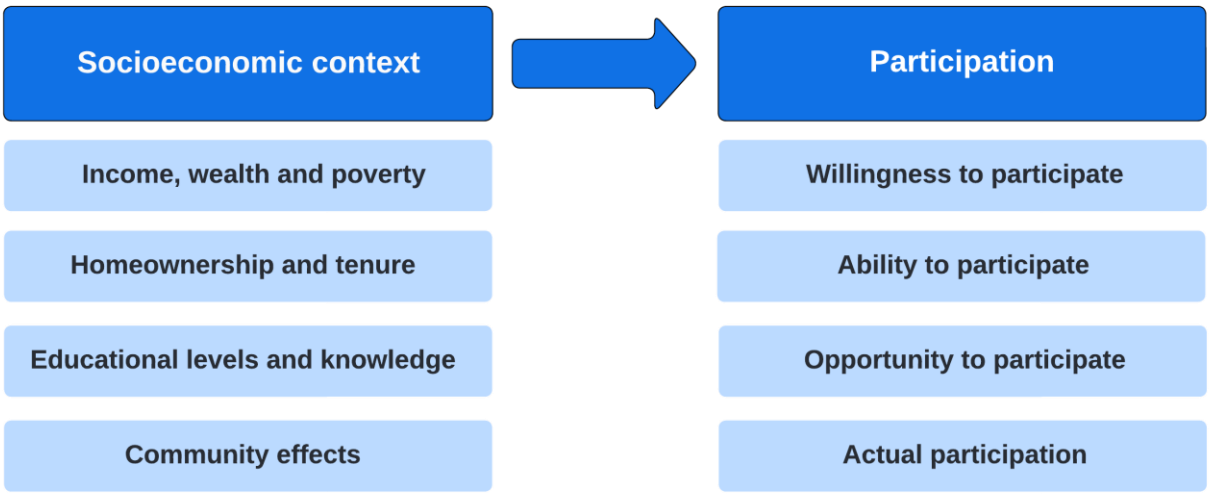

Figure 3. Conceptual model (made by author)

3. Methods

3.1 Research Design

In order to identify the role of the socioeconomic context of a neighbourhood in explaining the participation of citizens in the Dutch heat transition, this research uses a qualitative approach. Qualitative research can be defined as the type of research that finds out about people's experiences (Silverman, 2020; Burgler, 2022 p.23). In order to do this, semi-structured interviews are conducted with key actors involved within selected neighbourhoods (see 3.3). One of the major strengths of this qualitative approach is that it enables researchers to identify the underlying processes by which events and actions take place. Furthermore, the particular context in which people act and how this has influenced their actions can be studied as well (Maxwell, 2008; Burgler, 2022 p.23). These are two useful strengths of qualitative research to discover how the socioeconomic context of a neighbourhood can influence the participation of citizens. The heat transition is a relatively new phenomenon consisting of a lot of controversial procedures, complex societal interactions, and highly uncertain processes that are behind achieving the goal of natural gas-free neighbourhoods. To understand these, the experiences of the people involved are crucial. As the interviewees are interacting with the context on a daily basis, they have a good view of the ways in which the socioeconomic context influences participation, and whether this stimulates or weakens the participation of citizens in the neighbourhood (Burgler, 2022 p.23).

The research is conducted by means of a comparative case study of four neighbourhoods that are appointed as experimental learning areas in the context of the Dutch program of gas-free neighbourhoods (PAW). These are two neighbourhoods with a rather poor socioeconomic context, one neighbourhood with a good socioeconomic context, and one neighbourhood that can be placed in between. The choice for these neighbourhoods is based on neighbourhood data from AlleCijfers.nl, a website that collects, processes, and presents neighbourhood data obtained from Statistics Netherlands (CBS) and Kadaster. More on the neighbourhood data can be found in the next section (3.2).

A comparative case study allows us to identify patterns, differences and similarities in the participation process between neighbourhoods with similar and different socioeconomic contexts. This is in line with literature on comparative case studies, which states that it is particularly useful for understanding which factors influence the success of a programme or project, and how better to tailor these to the specific context to achieve the intended outcomes (Goodrick, 2014; Burgler, 2022 p.23).

The full structure of this research is visualised in Figure 5. below.

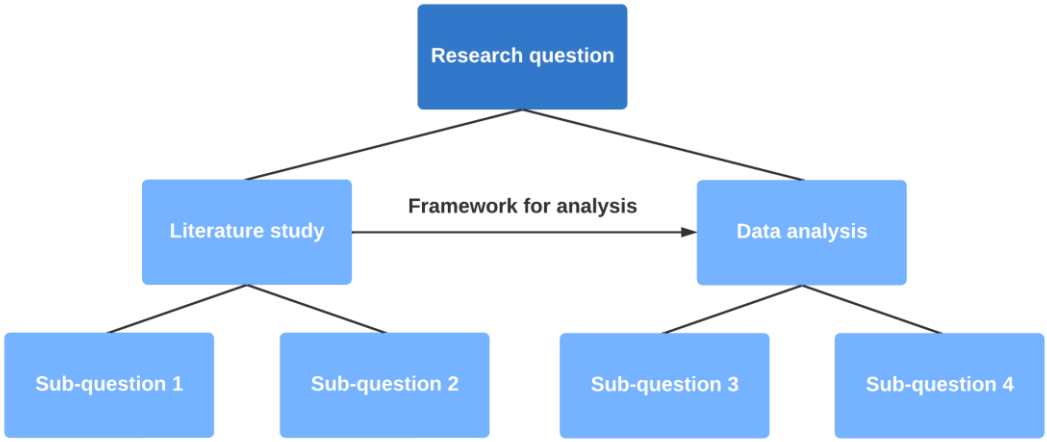

Figure 4. Research outline (made by author)

3.2 Case selection

Every neighbourhood in the Netherlands is unique in a great variety of aspects. Therefore, to design a well-argued and justified comparative case study, a number of considerations have been made prior to the selection of the neighbourhoods. First, this research does not aim to make a comparison between rural and urban neighbourhoods in the Netherlands, which vary in institutional and cultural aspects such as norms, values and beliefs, but also in community structures and social cohesion (de Haan et al. 2019). Due to the fact that such aspects may overshadow the socioeconomic comparison between the neighbourhoods when it comes to participation, all selected cases are located in a comparable urban environment within the Randstad agglomeration in the west of the Netherlands. Second, the role of the socioeconomic context in explaining the participation of citizens in the heat transition may differ significantly between different heat alternatives for natural gas. For example, whereas heat pumps require higher individual investments in appliances and equipment, heat networks are only financially attractive for neighbourhood residents when the transition is made collectively. Therefore, the neighbourhoods were selected on having the same sustainable heat alternative, a collective heat network.

The selected neighbourhoods are Ramplaankwartier in Haarlem, van der Pekbuurt in Amsterdam, Overvecht-Noord in Utrecht, and Bospolder-Tussendijken in Rotterdam. All four neighbourhoods are appointed as experimental learning areas in the context of the PAW. In this programme, 66 frontrunning neighbourhoods received a subsidy to make the transition from natural gas towards one or more sustainable sources of heat that fits the local neighbourhood context best. Within this learning-by-doing process, valuable lessons and experiences are exchanged on the programme level with the goal to accelerate the heat transition (Rijksoverheid, 2023). Since PAW neighbourhoods are generally the most progressed when it comes to the heat transition, they are more suitable for research than other cases where the heat transition process is at the beginning phase and citizen participation may be still very limited.

Whereas Ramplaankwartier has a good socioeconomic context, Overvecht-Noord and Bospolder-Tussendijken belong to the poorest neighbourhoods in the Netherlands. Furthermore, van der Pekbuurt is a revitalized neighbourhood that is on the rise with a socioeconomic context that can be classified as neither good nor bad. The neighbourhood selection is based on data from Allecijfers.nl including average property value, average income, and educational attainment. Furthermore, all four cases received media attention, making it easier to collect information and contact the key actors involved. The next sections will provide short descriptions of the neighbourhoods.

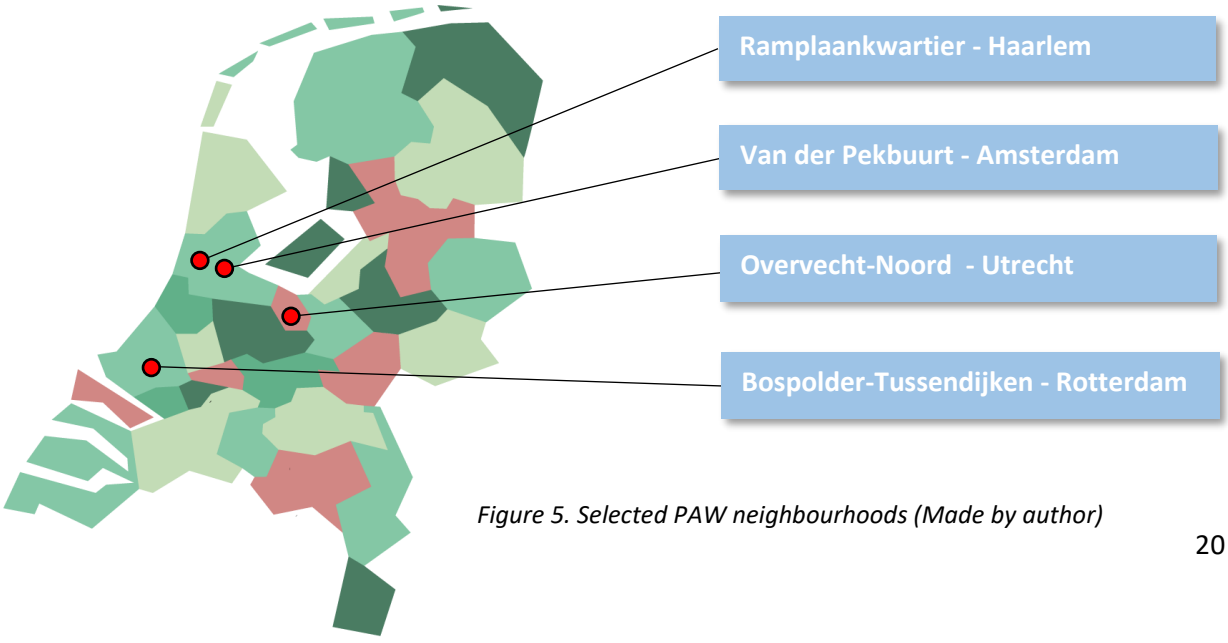

Figure 5. Selected PAW neighbourhoods (Made by author)

3.2.1 Ramplaankwartier (Haarlem)

Ramplaankwartier is a neighbourhood in the city of Haarlem with 2715 inhabitants. Most of the houses were built in the period 1925-1950 and are possessed by homeowners with a family. In 2022 the average property value was €597.000 which is 89.5% higher than the national average of €315.000. The majority of the neighbourhood is highly qualified and the average yearly income per inhabitant is €37.100 (Allecijfers.nl, 2023a). The neighbourhood is known for its location close to natural parks and the beach. Ramplaankwartier is making the transition to a special type of heat network where the heat is generated by solar PVT panels on the roofs of the houses and stored in an underground buffer. In this way, citizens become the supplier and consumers of their own heat. This does however require a considerable amount of individual investments in appliances and equipment.

Figure 6. Ramplaankwartier (Gemeente Haarlem, n.d.)

3.2.2 Van der Pekbuurt (Amsterdam)

Van der Pekbuurt is a revitalized working-class neighbourhood in the city of Amsterdam with 4652 inhabitants. Most of the houses were built in the period 1900-1925 and are largely owned by the housing corporation Ymere. About 83% of the inhabitants are tenants, mostly consisting of families. The average property value was €287.000 in 2022 which is 9.8% lower than the national average of €315.000. Approximately 64% of the people in the neighbourhood are high to middle-high qualified. The average yearly income per inhabitant in the neighbourhood is €21.600. Although the property values and average incomes are not that much higher than Overvecht-Noord and Bospolder-Tussendijken, this is not reflected in social problems such as criminality, poverty and school drop-outs (Allecijfers.nl, 2023b). The neighbourhood is located close to the centre of the city and after the large-scale renovations that took place from 2015 onwards, the neighbourhood became an attractive place to live for young professionals.

Figure 7. Van der Pekbuurt (Gemeente Amsterdam, 2020)

3.2.3 Overvecht-Noord (Utrecht)

Overvecht-Noord is a large neighbourhood in the city of Utrecht with 11.215 inhabitants. It is a post-war neighbourhood with a lot of high-rise apartment blocks. About 70% of the neighbourhood consists of tenants. The average property value was €255.000 in 2022 which is 23.5% lower than the national average of €315.000. More than 80% of the neighbourhood has a non-western background. About 40% of the inhabitants are lower qualified. The average yearly income in the neighbourhood is €20.800. Overvecht-Noord belongs to the poorest zip-codes in the Netherlands. The neighbourhood has several parts where a considerable share of people is living below the poverty line and suffers from related social problems (Allecijfers.nl, 2023c).

Figure 8. Overvecht-Noord (Gemeente Utrecht, 2021)

3.2.4 Bospolder-Tussendijken (Rotterdam)

Bospolder-Tussendijken is a large pre-war neighbourhood in the city of Rotterdam with 14.480 inhabitants. About 62% of the neighbourhood consists of tenants. The average property value was about €216.000 in 2022 which is 45.8% lower than the national average of €315.000. More than 80% of the neighbourhood has a non-western background. About 45% of the inhabitants are lower qualified. The average yearly income in the neighbourhood is €20.000. Similar to Overvecht-Noord, Bospolder-Tussendijken belongs to the poorest neighbourhoods in the Netherlands. The neighbourhood is lagging behind on several aspects of society, the housing supply is unilateral, and social problems are prominently apparent. Therefore, parallel to the heat transition, a programme is being implemented to make the neighbourhood more economically and socially resilient (Allecijfers, 2023d; Allecijfers, 2023e).

Figure 9. Bospolder-Tussendijken (Gemeente Rotterdam, 2021)

3.3 Methods of data collection

Primary data is collected by means of semi-structured interviews. These are held with key actors that are responsible for steering and guiding the participation process in the selected neighbourhoods. Key actors in this research are considered to be people in leading roles within the heat transition participation process such as project leaders, process supervisors, and participation or communication managers (Burgler, 2022 p.28). Since all interviewees were involved in the heat transition process in the neighbourhoods from the beginning stages, they have a good view of the participation process. Furthermore, they developed a lot of knowledge about their neighbourhoods throughout the heat transition process and are therefore familiar with the local socioeconomic context.

The interviewees were searched for via the websites of the municipalities from the selected cases, the website of the Dutch programme of gas-free neighbourhoods (PAW), newspaper articles, or the social platform LinkedIn. From here, possible participants were selected based on their occupation in the selected neighbourhood. Through this, a shortlist was developed with potential participants who were then contacted via a phone call, email, or LinkedIn message. If someone was willing to participate, an appointment for the interview was made. All interviews were conducted by means of an online video

call and took approximately one hour. The interview questions were asked in Dutch and can be found in Appendix 1 (Burgler, 2022 p.28).

Although a list of predetermined questions is prepared, semi-structured interviews allow interviews in a conversational manner, offering participants the chance to explore issues they feel are important (Clifford, et al., 2016). These interviewee-specific views on the cases are important for this research since the interviewees all have different experiences, opinions and emotions. Therefore, the interviews need to be flexible. Every interview was recorded and transcribed afterwards using the Trint transcribing software. After this, the transcript was adjusted into logical sentences and unnecessary parts like small talk and introductions were removed (Burgler, 2022 p.28). All interviewees can be found in Table 7. below.

Table 7. List of interviewees

Interviewee and case	Organization	Occupation	Date of interview
1. Respondent-1 *Ramplaankwartier*	Zonnewarmte.NL	Communication advisor gas-free neighbourhoods	05-05-2023
2. Respondent-2 *Van der Pekbuurt*	Municipality of Amsterdam	Coördinator gas-free neighbourhoods	20-04-2023
3. Respondent-3 *Van der Pekbuurt*	Municipality of Amsterdam	Director gas-free neighbourhoods	17-04-2023
4. Respondent-4 *Overvecht-Noord*	Municipality of Utrecht	Environmental manager	13-04-2023
5. Respondent-5 *Overvecht-Noord*	Municipality of Utrecht	Programme manager gas-free neighbourhoods	21-04-2023
6. Respondent-6 *Bospolder-Tussendijken*	Municipality of Rotterdam	Programme manager gas-free neighbourhoods	20-04-2023
7. Respondent-7 *Bospolder-Tussendijken*	Eneco	Business development manager heat network	17-04-2023

3.4 Methods of data analysis

The transcripts of the interviews are analysed using Atlas.ti coding software (Burgler, 2022 p.29). Here, at least two code labels are assigned to every part of text that is selected for analysis based on the coding tree that can be found as Figure 11 on the next page. First, this includes at least one code label based on the socioeconomic context factors as described in section 2.2. In addition, at least one code label is assigned after this to indicate whether the labelled socioeconomic context factor influences citizen's willingness to participate, ability to participate, opportunity to participate, or actual participation in the neighbourhood, as described in section 2.1.5. When all transcripts were coded, every socioeconomic context factor and its influence on participation in the neighbourhoods could be analysed systematically.

To give an example, the screenshot below shows an interviewee indicating that there is a difference in motivation between homeowners and tenants in the neighbourhood to participate. This is then labelled with the label 'homeownership and tenure' to highlight the socioeconomic context factor we are dealing with and 'willingness to participate' to show how this affects participation in the neighbourhood.

Figure 10. Coding in Atlas.ti (made by author)

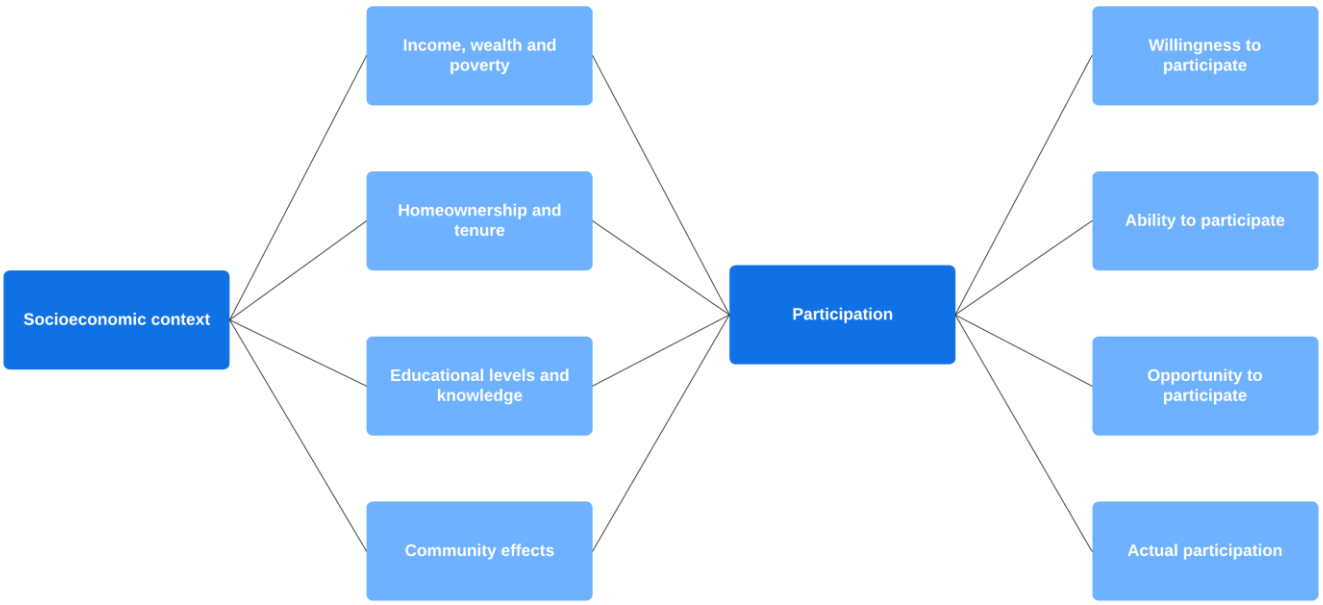

Figure 11. Coding tree (made by author)

3.5 Ethical considerations

In order to act ethically, the participants were informed in advance about the intentions, objectives, and data processing of this research. Next to this, they were formally asked if the interviews could be recorded. Afterwards, every interviewee signed a document confirming they are aware of the use of the interview and the data processing. The elaborated transcripts were sent back to the respondents so that they could review their given answers in order to make sure no harm is done. They were informed about their rights to change factual inaccuracies and remain anonymous (Burgler, 2022 p.30).

Some ethical considerations about the quality of the data include that the participants were possibly not willing to share everything due to political interests or answers that could lead to disagreements between involved stakeholders. Next to this, the respondents could have an interest to promote a positive image of the participation process in the neighbourhood as they are involved and responsible themselves. This may have led to biased responses concerning the quality of the participation processes (Burgler, 2022 p.30).

4. Results

This chapter presents the results of the empirical research. The results are presented per category of socioeconomic context factors as presented in the conceptual framework (Figure 3) and the coding tree (Figure 11). These categories are income, wealth and poverty (1), homeownership and tenure (2), educational levels and knowledge (3), and community effects (4). For each of these categories, their role in explaining citizens' willingness to participate, ability to participate, opportunity to participate, and actual participation in the neighbourhoods will be discussed. Furthermore, at the end of each section, the results will be interpreted and related to the literature.

4.1 Income, wealth and poverty

Bospolder-Tussendijken, Overvecht-Noord and van der Pekbuurt all have a relatively low average yearly income per inhabitant. However, whereas in Bospolder-Tussendijken and Overvecht-Noord this is related to social problems such as unemployment, poverty, criminality, and school drop-outs (Respondent-6, 2023; Respondent-7, 2023; Respondent-5, 2023), van der Pekbuurt suffers less from such issues (Allecijfers, 2022). This is probably due to the big revitalizations that took place in the last decades, attracting young middle to high educated citizens to settle in the neighbourhood and leading to a process of gentrification (Respondent-2, 2023). Finally, Ramplaankwartier has a significantly higher average yearly income per inhabitant compared to the other three neighbourhoods, which is reflected in its high housing prices due to its location near natural parks and the beach (Respondent-1, 2023).

4.1.1 Willingness to participate

The interviews show that levels of income, wealth and poverty are of influence on the willingness of citizens in the neighbourhoods to participate. The motives behind participation are different between the various economic contexts of the neighbourhoods. In Bospolder-Tussendijken for example, the low average income per inhabitant leads to the observation that the costs of the heat transition are the far most important reason to participate in the heat transition process. Respondent-6, programme manager of the gas-free neighbourhood project, states the following:

"For a lot of people in Bospolder-Tussendijken, the motivation to participate is not to become natural-gas free, but it is about a financial perspective. If they are not financially disadvantaged, they are willing to participate. The major concerns that these people have need to be removed first."

With roughly similar levels of income, wealth and poverty as Bospolder-Tussendijken, the willingness to participate in Overvecht-Noord is also dominated by the costs of the transition. Here, a survey from the municipality was distributed throughout the neighbourhood and received over a thousand responses. The results showed that affordability was the most important motivation for inhabitants to participate in the heat transition process. Furthermore, environmental manager Respondent-4 observed that people in the neighbourhood generally prefer the alternative to natural gas that requires the smallest investment instead of, for example, the most sustainable one. Respondent-5, programme manager of Overvecht-Noord, states that the financial motivations to participate increased even more when the energy bills were raised significantly.

Compared to Bospolder-Tussendijken and Overvecht-Noord, the much more wealthy context of Ramplaankwartier leads to other motivations among inhabitants to participate in the heat transition process than financial ones. According to Respondent-1, communication advisor and inhabitant of the

neighbourhood, the motivation of citizens to participate in Ramplaankwartier is mainly related to environmental awareness:

"Within a neighbourhood meeting, we used an interactive tool to measure the motivations of the citizens to participate in the project, sustainability came to the surface as the most important argument."

According to Respondent-1, this willingness to participate due to environmental awareness can be explained by the good economic situation of the inhabitants:

"People here are generally highly educated and have good jobs. In that sense, Ramplaankwartier is an ideal experimental leaning area. People are finding the investments worth it and accept that the process might take some longer or is somewhat more expensive than expected."

Despite having similar levels of income to Overvecht-Noord and Bospolder-Tussendijken, the financial motivations to participate are somewhat less apparent at van der Pekbuurt in Amsterdam. This can partially be explained by the fact that 83% of the houses are owned by the housing association Ymere. Ymere is covering all the heat transition investments for its tenants and renovating their houses up to 200.000 euros per house. Therefore, the renovation process itself and temporarily being housed somewhere else is the most important incentive for the citizens to participate. Respondent-2, coordinator of van der Pekbuurt, does however state that he observed more willingness to participate when the energy bills got higher. On top of this, he believes that tenants in the neighbourhood are quite critical of the financial advantages of the heat network because they generally earn less and just want the solution with the lowest costs. Respondent-3, director natural-gas free at van der Pekbuurt, states the following about this:

"Since last winter people are increasingly aware of their energy bills. Whereas some get more critical towards the heat transition, another group thinks 'we should just do it' since the prices will continue to rise."

4.1.2 Ability to participate

The most obvious way in which levels of income, wealth and poverty have an effect on the ability of citizens to participate in the heat transition is through the financial capabilities that are necessary to do investments in physical measures or equipment at their houses. In both Bospolder-Tussendijken and Overvecht-Noord for example, the low average income is reflected by the relatively small number of citizens that invest in energy-saving measures or sustainable heat technologies themselves. Observations show that the majority of the citizens rather adopt a wait-and-see attitude. Respondent-7 from Bospolder-Tussendijken for example states that the vast majority of the people in the neighbourhood will wait until the municipality and/or housing association comes with a plan or an offer. Adding to this, Respondent-6 explains that individual investments in appliances and equipment such as insulation are scarce in Bospolder-Tussendijken because of the relatively low share of homeowners in the neighbourhood. Tenants to a large extent depend on their housing association for this. Small measures like LED lights, weather strips, or radiator foil on the other hand were provided for free in the neighbourhood and applied collectively due to the savings it results in. Regarding citizens' ability to do investments in Overvecht-Noord Respondent-4 states the following:

"There are people who undertake action themselves independently from the municipality. In Overvecht-Noord this does however occur on a minimum level. People wait for the offer we are going to give them."

Again, this is partly a consequence of the high share of tenants in the area. Respondent-5 and Respondent-4 both state that lower-income households in Overvecht-Noord generally live in rental homes and are therefore dependent upon their housing association to do such investments. However, following Respondent-5, participation in the form of investments is also not very popular among the homeowners in the neighbourhood since the majority of these are also not that wealthy:

"The financial abilities are not that great in large parts of the neighbourhood. A heat pump can quickly cost 8.000 euros. When you have to insulate your house too, the total costs can get up to 15.000 to 20.000 euros. Therefore people wait for what the heat network has to offer."

These observations are in sharp contrast with Ramplaankwartier. Here, a heat network is combined with a special type of thermal solar panels (PVT). As a consequence, inhabitants need to invest in these PVT solar panels and other appliances and equipment themselves. The financial ability to do this is therefore essential to participate in the heat transition here. Respondent-1 describes that this financial ability is present in the neighbourhood and is for example reflected by the high number of people willing to participate in the first round of purchasing the PVT panels. Furthermore, in contrast to the other three neighbourhoods, a considerable amount of people in Ramplaankwartier seem to be eager to invest in energy-saving measures and sustainable energy themselves. Respondent-1 states the following about this:

"More and more people are insulating their homes. Furthermore, people invest in solar PV panels on their roofs. That is even unhandy because those are the wrong panels for this system. People do however have large roofs so there might also be space left for PVT panels."

In addition, Respondent-1 explains that the financial ability of the citizens also leads to more trust:

"Taking a loan comes with a lot of tension for lower-income people. Even though they might have the ability to pay it off and they will end up paying less for electricity and gas than they do now, it is difficult to have trust in this. Those people are more short-term oriented and for people with more financial abilities, this is easier. They will also be more patient."

Related to this, an important effect of the levels of income, wealth and poverty that can be observed in both Bospolder-Tussendijken and Overvecht-Noord is the mental ability to participate. Following Respondent-5, citizens with problems like poverty and debts in the neighbourhood are mainly focused on making it to the next day and allocating their limited budget to basic needs, instead of participating in something as complex and abstract as the heat transition. Although van der Pekbuurt also scores relatively low on average incomes, there are considerably fewer people living below the poverty line here compared to Bospolder-Tussendijken and Overvecht-Noord. Therefore, the argument about the mental ability to participate seems to a lesser extent to be the case in van der Pekbuurt.

4.1.3 Opportunity to participate

From the interviews, it can be observed that all neighbourhoods put a lot of effort into reaching, inviting and including people with all levels of income, wealth and poverty in the participation process.

Next to communication means like letters, flyers, websites, WhatsApp messages or just ringing doorbells, innovative and low-barrier participation forms like energy dialogues at a coffee cart, energy dialogues at the kitchen table, participative theatres, induction cooking sessions, do-it-yourself sessions to apply energy-saving measures, and heat transition walk-in hours are only a small selection of the means that are applied in the neighbourhoods to reach people. It can however be observed that Overvecht-Noord and Bospolder-Tussendijken invest more in such means compared to the other neighbourhoods. It is however difficult to say whether this is due to the levels of income, wealth and poverty or because these are also larger neighbourhoods with more inhabitants and therefore more people to reach. In contrast, Ramplaankwartier tries to keep communication and participation means limited because it can get a bit intrusive. Despite this, it can be stated that citizens in the selected neighbourhoods with different levels of income, wealth and poverty at least all have the opportunity to participate by means of getting invited and included in the process. After this, it is up to the citizens themselves to start moving. Respondent-7 from Bospolder-Tussendijken states the following about this:

"You need to do everything to lure people out of their homes and motivate them to start participating. However, if you don't want to participate in the end, you don't participate, it's simple as that."

Respondent-5 states that, although having the opportunity to participate, you always have people within lower-income neighbourhoods like Overvecht-Noord that just don't want to due to the social problems they have. According to him, these people are more difficult to reach:

"Some people just don't want to participate. People with serious problems such as poverty and debts won't even open a letter from the municipality or the housing association because they simply have other things on their minds."

Within Ramplaankwartier and van der Pekbuurt, people that are living below the poverty line and are difficult to involve in the participation process are less apparent.

4.1.4 Actual participation

As stated in section 4.1.2, levels of income, wealth and poverty have a significant influence on the actual participation of citizens in the form of investing in and applying energy-saving measures and/or sustainable heat technologies. However, the results indicate that it is questionable whether this can only be assigned to the income of citizens. Respondent-7 from Bospolder-Tussendijken states that income is only a one-dimensional variable in explaining such dynamics. For example, as stated by Respondent-4, the low average income in Overvecht-Noord affects the participation of citizens, but this has also to do with factors that are a consequence of the low income:

"The people in the neighbourhood with a lower income generally live in social housing. Then the question is whether they are participating less because of their low income or whether the housing association unburdens them. The same applies to large energy-saving measures such as insulation, for that they will also look at the housing association."

More on the effects of homeownership and tenure on participation can be found in section 4.2.

Next, the interviews show that levels of income, wealth and poverty have less influence on actual participation of citizens in the form of attending participation activities. In Bospolder-Tussendijken for

example, Respondent-6 reports high levels of involvement among people with different levels of income, wealth and poverty. To motivate citizens to participate, she underlines the importance of a societal approach. Respondent-6 illustrates this with the following example:

"It is important for citizens in the neighbourhood to get financially rewarded for their volunteering activities. In order to stimulate participation we therefore work with financial compensations for volunteers and sometimes we even try to create jobs. Citizens are then for example trained to be energy coaches and advice others in the neighbourhood about energy saving measures."

This is a good example of a municipality that is looking at how the heat transition can contribute to the economic situation in the neighbourhood, instead of seeing it as a barrier. Respondent-6 states that Bospolder-Tussendijken is showing that levels of income, wealth and poverty in a neighbourhood do not necessarily shape the participation process. Respondent-2 from van der Pekbuurt confirms this with the observation that some inhabitants in the neighbourhood with lower incomes are even more apparent in the participation process because of their critical stance towards the authorities.

Finally, from the interviews, it can be observed that actual participation in the form of resistance is considerably lower in Ramplaankwartier compared to the other three neighbourhoods. Although in van der Pekbuurt this mainly has to do with community effects (see 4.5), Respondent-5 and Respondent-4 report that in Overvecht-Noord people are providing resistance against the costs of the alternative for natural gas. Citizens here are critical about whether the heat network is actually cheaper than gas.

4.1.5 Interpretation

Levels of income, wealth, and poverty have several roles in explaining the participation of citizens in the heat transition in the selected neighbourhoods. First, regarding willingness to participate, different economic contexts lead to different motivations and incentives for citizens to participate. Whereas in neighbourhoods with lower levels of income and wealth, the motivation to participate is mainly related to financial motives, in more economically privileged neighbourhoods other motives like environmental awareness and feeling part of a community are more apparent. This observation is to a large extent in line with the literature from Germes et al., (2021), stating that economic and environmental-related motives are among the most prominent in explaining the participation of citizens.

Second, addressing the ability to participate, it can be observed that in wealthy neighbourhoods like Ramplaankwartier citizens have more ability to do investments in heat transition-related appliances and equipment. This leads to more patience and trust in the heat transition process. The other way around, in less financially privileged neighbourhoods, citizens might not have the mental ability to participate because of their short-term focus on getting by. This mental ability seems to have a larger effect on the participation process than the disability to do investments. This is in agreement with the statement from Bouw et al. (2020) that citizens won't behave sustainably if they cannot afford it. However, the neighbourhoods provided several means to increase the ability for citizens to participate. Easy-to-implement measures like weather strips were for example provided for free and implemented in even larger numbers in the less financially privileged neighbourhoods.

Third, due to the wide range of participation and communication means that are applied by the authorities in the selected neighbourhoods, citizens with different levels of income, wealth and poverty

all have the opportunity to participate in the heat transition process in some way, according to the respondents. They state that their neighbourhoods successfully implement participation and communication means that can be categorized in the inform, consult and involve levels as described in the spectrum of participation (IAPP, 2018). However, it can be observed that people with financial and/or social problems are more difficult to reach and involve in the process as they have other things on their minds.

Finally, regarding actual participation of citizens, it can be observed that participation by means of investing in equipment and appliances is more apparent in more wealthy neighbourhoods like Ramplaankwartier. This confirms the observation from Forest and Kearns (2001) that income has a positive effect on the capacity to act. However, this does not seem to be the case for other forms of participation like attending activities or being an energy coach. High levels of involvement in the participation process can be observed in for example Bospolder-Tussendijken. Furthermore, in van der Pekbuurt and Overvecht-Noord, participation in the form of resistance is also high due to citizens' critical stance towards the financial consequences of the heat alternative to natural gas. These two observations are in contrast with the statement from Kalkbrenner (2016), who reports that higher levels of income tend to increase the willingness of citizens to participate. Instead, the motivations behind the willingness to participate differ.

4.2 Homeownership and tenure

As already briefly discussed in the previous section, the levels of homeownership and tenure play an important role in explaining the participation of citizens in the heat transition. Among the cases, van der Pekbuurt has the largest share of tenure with about 83% of the houses being rental homes. The neighbourhood is followed by Overvecht-Noord (70%) and Bospolder-Tussendijken (63%). Finally, only 21% of the houses in Ramplaankwartier are rental homes.

4.2.1 Willingness to participate

Regarding citizens' willingness to participate, all interviewees reported that there is a difference in the motivation to participate between homeowners and tenants. Respondent-1 from Ramplaankwartier for example observes that homeowners are more motivated in the neighbourhood to participate. She states the following about this:

"The motivation for homeowners is to invest in their own property. So get control of their energy costs and maintain or even raise the real estate value of their houses. It is an investment in the future. The tenants are generally less interested because they are not in charge."

The last mentioned is also something that is also observed in the other three neighbourhoods. Here, the high shares of rental homes have a significant effect on the motivations to participate. This is a consequence of the housing associations and landlords being responsible for doing investments on behalf of the tenants. Following Respondent-7 from Bospolder-Tussendijken, this leads to a wait-and-see attitude among tenants when it comes to participation:

"The willingness among homeowners to participate is stronger compared to tenants. A lot of tenants think are thinking: the housing association is in charge anyway, let me know when something will happen."

Similar observations can be made in Overvecht-Noord and to a lesser extent in van der Pekbuurt. In the latter, the housing association Ymere combines the heat transition with large-scale renovations of their real estate. According to Respondent-2, the perspective of tenants that their houses will be improved increases their willingness to participate in the heat transition process. At the same time, Respondent-3 states that the tenants are also participating because they are being very critical of the large-scale renovations that the housing association is doing. This willingness to be involved has both financial and environmental motivations:

"The tenants argue that the housing association is not going far enough in limiting the energy demand of the houses. Furthermore, they have the opinion that the heat network as an alternative to natural gas is not sustainable enough."

Finally, according to Respondent-2, the willingness of tenants to be involved in these decisions sometimes leads to a difficult situation:

"A group of tenants wanted to decide things from the beginning of the project themselves. The difficult thing is that they don't have the wallet and responsibility to do so. That is a tough combination."

Because homeowners do have the responsibility to make investments themselves, Respondent-2 reports that their motivations to participate have an extra financial dimension on top of the monthly energy bill that tenants also have to deal with.

4.2.2 Ability to participate

The interviews show that in neighbourhoods with high shares of tenants like Bospolder-Tussendijken, Overvecht-Noord and van der Pekbuurt there is less financial ability among citizens to participate in the heat transition process by means of doing investments. This is not solely a consequence of the shares of homeowners and tenants within the neighbourhoods, but related to a combination of factors like income (see 4.1.2) and family situations. No further effects of the shares of homeownership and tenure on the ability to participate in the heat transition are observed.

4.2.3 Opportunity to participate

From the interviews, it can be observed that tenants have different opportunities to participate in the heat transition than homeowners. While homeowners can generally be involved in the heat transition process more directly, tenants have to deal with the fact that there is a housing association or a landlord between them and the authorities. This mainly applies to participating by being involved in making the more important technical choices. Respondent-4 from Overvecht-Noord states the following about this:

"Insulating your home and having a voice in the heat system that will be installed at your house, those are things that are beyond the scope of tenants. Homeowners have a lot more freedom here."

This does however not mean that tenants don't have the opportunity to influence such decisions. Both Respondent-7 from Bospolder-Tussendijken and Respondent-5 from Overvecht-Noord underline that housing associations need 70% permission from their tenants to proceed. Therefore, the housing associations itself do also have an interest in a good participation process. This is reflected in van der

Pekbuurt, where the housing association Ymere has taken over large parts of the participation process. Respondent-3 states the following about this:

"Throughout the project, we gained the insight that housing associations should be responsible for the participation process with their tenants. In the beginning, we invited both homeowners and tenants, which was confusing for everyone due to the difference in perspective."

As a consequence, Ymere became quite professional in having a well-designed participation process with their tenants, in which the municipality assists where necessary. Respondent-2 states that the municipality now mainly feels responsible for the homeowners in the neighbourhood. Although less intensive, similar observations can be made in Overvecht-Noord and Bospolder-Tussendijken, where the role of the housing associations in the participation process is also getting more important.

Finally, all interviewees report that tenants are equally included in participation activities compared to homeowners. In Ramplaankwartier for example, activities are organized for tenants specifically. Respondent-1 namely states that tenants are a difficult group to reach and involve in the heat transition process in the neighbourhood. Furthermore, tenants in van der Pekbuurt, Bospolder-Tussendijken and Overvecht-Noord have the opportunity to participate in a tenant committee. Tenants hiring from commercial landlords on the other hand are difficult to reach and include in the heat transition process according to Respondent-6 and Respondent-3. Respondent-6 addresses that this can partly be explained by the fact that commercial landlords are less able and willing to do investments in their real estate compared to housing associations.

4.2.4 Actual participation

Due to the fact that housing associations own most of the real estate within Overvecht-Noord, van der Pekbuurt and Bospolder-Tussendijken, citizens here are more hesitant to invest in appliances and equipment for their houses. Respondent-7 from Bospolder-Tussendijken states the following about this:

"Homeowners voluntarily start to invest in the heat transition. In the neighbourhood of Kralingen, the majority is homeowner and there you see that a lot of people are investing in sustainable technologies like heat pumps. But in a neighbourhood where the majority of the houses are owned by a housing association like Bospolder-Tussendijken that is just not going to happen."

Despite this, Respondent-6 states that the homeowners in the neighbourhood are also not that proactive in doing these investments. According to her, this can be explained by the high number of owner's associations (VVE) in the neighbourhood. These are organisations that are responsible for the common interests of the homeowners within an apartment building. She states the following about this:

"In Bospolder-Tussendijken nearly all homeowners are part of an owner's association. As an owner's association, it is logical to choose an alternative system to natural gas collectively. This is because when you are living in an apartment building, it is not sensible to individually invest in individual technologies like a heat pump. Therefore, the homeowners from the owner's association are more likely to connect to the collective heat network. They do get a financially attractive offer from us to do this."

Furthermore, when it comes to other forms of participation than doing investments and applying larger energy-saving measures, Respondent-6 observes equal levels of participation between homeowners and tenants in Bospolder-Tussendijken. Tenants are for example widely involved in participation activities such as energy markets, neighbourhood meetings, and walk-in-hours or are volunteering in the tenant's committee or as energy coaches. This is in contrast with observations from Respondent-4, who states that the attendance of homeowners in Overvecht-Noord is higher in participation activities compared to tenants. Respondent-5 confirms this by giving the following example:

"When we formed an advisory board of citizens in Overvecht-Noord, the homeowners were willing to take place because they saw their interest directly involved. This shows the importance to use different participation means that appeal to different groups."

In van der Pekbuurt, Respondent-2 states that housing associations repeatedly organize meetings with tenants to discuss their plans regarding the heat transition and the implications for the houses. Although not that far-reaching, similar observations can be made about the housing associations at Bospolder-Tussendijken and Overvecht-Noord. In Ramplaankwartier there are more homeowners and therefore less influential housing associations and tenant committees.

4.2.5 Interpretation

The role of the levels of homeownership and tenure within neighbourhoods in explaining participation is multifaceted. First, being a homeowner or a tenant affects citizens' willingness to participate. Whereas homeowners are investing in their own property, the housing association is doing this on behalf of the tenants. As a consequence, within the neighbourhoods with larger shares of tenants citizens are more hesitant to invest. This is in accordance with the statement from Middleston & Groves (2005) that homeowners have more incentives to participate due to their longer-term commitment. Van der Pekbuurt does however show that the willingness to participate among tenants can be strong, including both environmental and financial motivations. To a large extent, this can be explained by the thorough participation process that the housing association Ymere is having with its tenants. On the other hand, community effects are also at play here (see section 4.5). Although the intensively participating tenants from Ymere wanted a more sustainable alternative than the heat network, they did not get it. This is related to the ideology from Arnstein (1969) that participation does not necessarily mean influence. Although citizens are involved in public decision-making, their views, meanings, and other inputs can in the end be ignored she states.

Despite the fact that homeowners generally have more financial means compared to tenants, the effects of the levels of homeownership and tenure on the ability to participate are limited. The opportunity to participate is however somewhat different for both groups. Whereas homeowners are more directly involved in the participation process when it comes to making the more important technical choices, tenants are confronted with the fact that the housing associations and landlords are having this conversation with the municipality on their behalf. Despite this, the interviews show that tenants can equally participate in participation activities that are organized. Their opportunities to participate are however also partly dependent on how the prominent housing associations in the neighbourhood organize their own participation process.

Finally, within neighbourhoods with a less privileged socioeconomic context, there are small differences between homeowners and tenants when it comes to doing investments in appliances or

equipment. Such differences are much more apparent in a neighbourhood with a good socioeconomic context like Ramplaankwartier. These observations are both contrasting and aligned with Jansma et al. (2020), who state that homeowners are more eager to invest in the heat transition themselves.

4.3 Educational levels and knowledge

When it comes to educational levels, Ramplaankwartier shows higher shares of people with more knowledge-intensive educational backgrounds compared to the other neighbourhoods. For example, in Ramplaankwartier about 89% of the citizens are high to middle-qualified. In van der Pekbuurt this is 64%, in Overvecht-Noord 63%, and in Bospolder-Tussendijken 53% (Allecijfers.nl, 2023).

4.3.1 Willingness to participate

From the interviews, it can be observed that the motivation of citizens to participate generally increases with higher levels of knowledge about the heat transition. Respondent-7 from Bospolder-Tussendijken states the following about this:

"Citizens are not likely to participate in something they don't know much about. Unknown is unloved."

In Overvecht-Noord, Respondent-4 makes similar observations. Citizens with technical knowledge in the neighbourhood are for example experimenting with energy-saving measures themselves. The other way around, he observes that there are also citizens that are less motivated to participate because they think that they don't have the required knowledge level to do so. When it comes to educational levels, the group of citizens that is most involved in the participation process in Overvecht-Noord are generally all highly educated, Respondent-5 observes Respondent-4 does however state that the willingness to participate in the organized process among highly educated people is not always that high:

"People with higher educational backgrounds tend to figure things out themselves. People with lower educational backgrounds on the other hand are more dependent on the municipality."

Respondent-5 confirms this observation:

"While being higher educated may lead to societal commitment, these people are also approaching the heat transition more individualistic. In my own neighbourhood in Arnhem, there are for example a lot of higher educated people who want to do things themselves, they also have the financial means to do this. This is not really the case in Overvecht-Noord."

In order to increase the willingness of citizens to participate, Respondent-5 states that it is important that people gain knowledge about the advantages of the heat transition:

"You need to turn the switch so that people are getting aware of what they can do. In order to do this, a period of knowledge development is often necessary. If people are getting the feeling that the heat transition can benefit them, they get more motivated to participate."

Respondent-2 observes that citizens in van der Pekbuurt with more knowledge of the heat transition are more willing to participate because they have a better view of how things should happen. In

Ramplaankwartier the people participating in the heat transition are also generally highly educated. Respondent-1 believes that the knowledge level of these people motivates them to participate:

"If you don't have certain knowledge, you also don't know what questions you should ask. Then the barriers to participate in for example meetings are also higher. People who generally struggle with the topic tend to wait and see what happens. Therefore it is very important to keep the participation process easily accessible for everyone."

4.3.2 Ability to participate

The majority of the interviewees believe that the educational and knowledge levels of citizens should not determine whether citizens are able to participate. Respondent-6 for example states that in Bospolder-Tussendijken there are different levels to enter the participation process:

"On the one hand, you have sessions where people talk about what they think the heat transition is about, on the other hand, there is also a group of higher educated people that are debating about things like sustainable techniques."

Respondent-4 from Overvecht-Noord underlines that it is important that different participation methods serve different needs of inhabitants to be able to participate. To illustrate this, he mentions the example of their advisory board:

"Participating in the advisory board requires time and a certain knowledge level to be able to contribute. They have regular meetings where they debate complex and large documents. When we would only use the advisory board as a participative method, there is a bias in the people you include in the process."

Although Respondent-4 states that higher education and knowledge levels of citizens are not a requirement to be able to participate, he does believe that it helps citizens to start participating:

"People with higher educational backgrounds and levels of knowledge sooner start to participate themselves, while the other group first needs to be activated. Furthermore, the assumption that you need a certain knowledge level to be able to participate also raises barriers."

Respondent-3 believes that this is not the case at van der Pekbuurt. She states that people start to participate when they start caring and get critical, unrelated to knowledge or educational levels. She does however observe that citizens with more knowledge are exerting more influence on the participation process.

In Ramplaankwartier, Respondent-1 observes high educational and knowledge levels. She for example sees that groups of citizens are able to calculate their PVT solar energy yield and regularly ask technical questions at neighbourhood meetings she does not know the answer to. Respondent-1 believes that being higher educated and having more knowledge about the heat transition increases citizens' ability to participate:

"Those people are generally more assertive, dare to ask questions and are getting along with the topic more easily."

Finally, both Respondent-5 and Respondent-2 underline the idea of the participation process being a learning-by-doing experience, increasing the knowledge about the heat transition throughout the process.

4.3.3 Opportunity to participate

The interviews show that the educational and knowledge levels of citizens don't have much influence on the opportunity to get involved in the participation process. All neighbourhoods provide accessible ways to participate. In Overvecht-Noord and Bospolder-Tussendijken the interviewees do however report that it is difficult to reach people with language barriers. Respondent-7 for example states the following:

"When you are low literate or low educated, there is a chance that you don't understand the letters that are being sent. Therefore, the municipality has to invest in accessible means to communicate so that these people can be reached."

Respondent-6 gives the example that citizens who speak a foreign language in Bospolder-Tussendijken are for example trained to be a energy coach in order to reach people with a similar language. Overvecht-Noord also works with translators and communication in different languages. In van der Pekbuurt and Ramplaankwartier problems reaching people with language barriers are not mentioned.

4.3.4 Actual participation

There are differences in the ways citizens participate with different educational and knowledge levels. Within neighbourhoods with lower educational backgrounds like Bospolder-Tussendijken and Overvecht-Noord, the interviewees report that the majority of the citizens need to be activated by the authorities. They underline the importance of organizing activities that are easily accessible to get people to participate. Because this is the case within the studied neighbourhoods, there is little difference observed in how much citizens participate with different educational and knowledge levels. Respondent-4 from Overvecht-Noord states the following about this:

"I don't think there is more participation among higher educated people. Maybe they are even less participating in activities because they rather find things out themselves."

Highly educated citizens that take matters into their own hands can be observed in Ramplaankwartier. Here, the whole heat transition process started bottom-up with a group of citizens with knowledge about energy systems. One of these was working at Delft Technical University and examined nine alternatives to natural gas for the neighbourhood based on their sustainability and feasibility. Respondent-1 states the following about this:

"The process started with knowledge from within the neighbourhood. These people know a lot about the heat transition and related systems."

This bottom-up process is not something that can be observed in the other three neighbourhoods. In van der Pekbuurt however close involvement of a group of tenants can be observed from very early on in the process. Within Bospolder-Tussendijken and Overvecht-Noord it are the authorities that determine the pace of the participation process.

4.3.5 Interpretation

First, levels of education and knowledge have an effect on the willingness of citizens to participate. While more knowledge generally increases citizens' motivation to participate, not having certain knowledge also raises barriers to participation. For example, citizens often believe that they need a certain knowledge level to participate. This is however not needed as all studied neighbourhoods offer low-barrier activities to participate in. These are important means to develop knowledge among citizens about the urgency and the advantages of the heat transition. This increase in knowledge level due to the participation process is something that is also mentioned in the study from Ernst (2018), stating that the participation process is a learning experience in itself.

Because of the low-barrier activities, educational and knowledge levels have no significant influence on the opportunity to participate. The same largely accounts for the ability to participate. However, in practice, it can be observed that higher educated people are more likely to exert influence during the participation process because of their ability to get along with the topic and their assertiveness to be involved. Nonetheless, it should be noted that real influence as described in the 'collaborate' and 'empower' levels on the spectrum of participation is only to some extent apparent in Ramplaankwartier (IAPP, 2018).

Regarding actual participation, the main difference between the neighbourhoods with lower and those with higher education and knowledge levels is how they participate. Whereas citizens in Bospolder-Tussendijken and Overvecht-Noord tend to follow the organized process by the authorities (inform, consult and involve), in Ramplaankwartier citizens like to take matters into their own hands (collaborate and empower) (IAPP, 2018). Here, the heat transition process started bottom-up with a group of highly educated citizens. While the municipality is responsible for constructing the heat network, the citizens themselves are still largely in charge. In the climate act such an advanced collaboration, also described by the collaborate level on the spectrum of participation, is referred to as co-creation (Rijksoverheid, 2019). In addition, the inhabitant researching the feasibility of several energy systems for the neighbourhood at her job at Delft Technical University is a good example of the observation from Ernst (2018) that certain occupations may come with relevant knowledge that is applicable to the heat transition.

Finally, some interviewees observed that citizens with higher educational levels are approaching the heat transition more individualistic and are less present in participation activities. This observation is in contrast with the statement from Radtke (2014) who argues that higher educational levels have a higher tendency of attending participation meetings. Werff et al. (2014) state that higher educated people are more likely to participate because of their environmental awareness and interest in sustainable development. This is something that can be observed in Ramplaankwartier.

4.4 Community effects

Community effects within the selected neighbourhoods play an important role in the participation process. Community effects are difficult to quantify and therefore no data was available on forehand. The two most important community effects that are considered for this section are social cohesion and place attachment. Whereas the first refers to the social networks and connections between citizens, the latter includes the emotional bond that residents form with their neighbourhood. This section presents the results from the interviews on the role of community effects in explaining the participation of citizens in the heat transition.

4.4.1 Willingness to participate

From the interviews, it can be observed that place attachment is an important motivation to participate in the heat transition. In Bospolder-Tussendijken, Respondent-6 states that people are proud to live in the neighbourhood, feel connected, and don't want to move out. Considering the fact that the heat transition affects the place they feel at home, this increases their willingness to participate. Furthermore, she also believes that big topics like the heat transition may increase social cohesion within the neighbourhood due to the emotions it evokes among citizens. Respondent-4 from Overvecht-Noord confirms this observation:

"People tend to unite themselves when it comes to the plans of the municipality to make the neighbourhood natural gas free. Having one common goal can lead to social cohesion."

Furthermore, he observes that being active within communities in the neighbourhood increases the willingness to participate in the heat transition process. According to him, place attachment is an important motivation here:

"Feeling involved within the neighbourhood is an important reason for some people to participate. The heat transition has a lot of impact on a lot of citizens who value their neighbourhood. Therefore, they are eager to participate."

To strengthen this argument, he illustrates the example of a richer part of the neighbourhood:

"In Antonius Kwartier, located at the edge of the neighbourhood, housing prices are around 600.000 euros. The people living here are barely involved in the neighbourhood and also do their shopping somewhere else. Those people are generally less willing to participate."

Respondent-5 states that this is in contrast with other parts of the neighbourhood, where place attachment is more apparent. The willingness of those people to participate is reflected in the fact that they tend to unite themselves in neighbourhood communities regarding the heat transition.

Both Respondent-2 and Respondent-3 report high levels of social cohesion among the citizens of van der Pekbuurt. Respondent-3 states the following about this:

"Historically, van der Pekbuurt is an old working-class neighbourhood where people have a no-nonsense attitude with a culture of protesting and activism. Not everything that the government wants needs to be just accepted."

Furthermore, both interviewees state that the willingness to participate in the heat transition process significantly increased due to the large-scale renovations in the neighbourhood. Within this process, there were discussions about demolishing all the houses from the housing association Ymere. As a consequence, the citizens protested and won the battle. Respondent-3 states the following about this:

"This example shows that there is social cohesion and a fighting spirit within the neighbourhood. Citizens know that being critical and having a voice can be rewarded. The citizens know how to fight the authorities."

Following Respondent-2, this is reflected in the active movement of tenants to participate, amongst others in tenant committees. He states that this does not always benefit the heat transition process:

"Some citizens already had a very clear opinion about the heat transition before the process even started. They were almost *in a tunnel vision: it should happen this way and otherwise, I will protest against it."*

Partly, Respondent-2 believes that this is also an outcome of the top-down heat transition process in van der Pekbuurt:

"It depends whether the municipality is in charge of the process or the citizens started things in a bottom-up manner. If the latter is the case, more people are generally motivated to participate."

This is the case in Ramplaankwartier. Here, Respondent-1 believes that the high level of social cohesion in the neighbourhood benefits the participation process.

4.4.2 Ability to participate

The interviews show that the community effects are limited in explaining citizens' ability to participate.

4.4.3 Opportunity to participate

From the interviews, it can be observed that the high reported levels of social cohesion in the neighbourhoods make it easier to involve people in the participation process. These networks are important means for the authorities to reach citizens. Respondent-7 from Bospolder-Tussendijken states the following about this:

"People are involved in networks, for example around certain amenities like the church or a school. Using these networks is important to reach people. Knowing the social structures of a neighbourhood and where people come together is important for the participation process. You need to create a movement where citizens start to activate each other to participate."

In addition, Respondent-7 states that they try to increase social cohesion in the neighbourhood by creating places where people come together to talk about the heat transition:

"We for example created a neighbourhood living room. Here people come together to discuss the heat transition, participate in heat transition-related activities, or attend information sessions. This helped to create social cohesion regarding the heat transition topic. One of our goals was to make use of the existing social cohesion and expand it even more."

This indicates that social cohesion is not only an independent variable here but also an intervention strategy from the side of the authorities. Respondent-6 confirms this:

"You want that everyone has the possibility to participate. For this to happen, it is important that involving the citizens happens organically. Although time-consuming, we invested a lot in community building."

Similar observations about involving citizens through existing networks and social cohesion can be made in Overvecht-Noord. Respondent-4 states that they make use of key persons in the neighbourhood to reach people:

"Those are citizens who know the neighbourhood very well. Via these, you can get in touch with a lot of communities and networks in the neighbourhood more easily. We try to use such people as ambassadors."

Working with ambassadors and key persons in the neighbourhood is also something that is applied in van der Pekbuurt, Respondent-2 states. However, the amount of effort to make use of community effects to involve citizens appears to be lower here. This also applies to Ramplaankwartier, where Respondent-1 mentions the neighbourhood newspaper as a means to make use of the social networks in the neighbourhood.

4.4.4 Actual participation

All interviewees report higher levels of participation due to the high levels of social cohesion. This applies to both attending organized activities as well as participating by for example applying energy-saving measures. Respondent-6 for example observed that citizens activated one another to participate because there is also a social component in the participation activities. She states the following about this:

"I believe that community effects and social cohesion are essential to participate. Participating is namely something that you often do with others. If you are not connected to others, you will therefore be less likely to participate."

In Overvecht-Noord and van der Pekbuurt, the high levels of social cohesion are reflected in the neighbourhood initiatives in which citizens are active. Respondent-4 states the following about this:

"Those neighbourhood initiatives take a prominent role in the participation process. This is also something which we then present in our newsletter to make others excited."

This is quite similar to what happens at van der Pekbuurt with their active tenant committees. When talking about participation in the form of investments, Respondent-5 gives the example that citizens collectively purchased energy-saving measures to reduce costs:

"Within such initiatives, twenty to ten households think about what energy-saving measures they want to apply at their houses and then collectively buy these. An example is cavity wall insulation."

Social cohesion stimulates such actions, Respondent-5 states. In addition, he addresses that the neighbourhood initiatives themselves also organize participation activities such as heat transition discussions at the kitchen table. This in itself also contributes to social cohesion regarding the topic.

Finally, community effects played a big role in Ramplaankwartier starting the heat transition process. A small group of people with knowledge of the topic got things off the ground after which the plan spread through the community. Respondent-1 believes that social cohesion played an important role here.

4.4.5 Interpretation

First, community effects in the form of social cohesion and place attachment have an influence on the willingness to participate among citizens. Citizens who care about the neighbourhood and are part of communities are generally more willing to participate. This is in accordance with Tonkens and Verhoeven (2011) and Kearns and Forrest (2000), who stated that communities and high-quality social ties within neighbourhoods stimulate citizens to participate. In addition, Paralviciute and Steg (2014) underlined the importance of one's emotional bond with the local area. This is also applicable to all studied neighbourhoods to some extent. Other variables are however also at play here. In van der Pekbuurt for example, the fighting spirit also has a cultural and institutional background, related to what Paralviciute and Steg (2014) call place identity.

Second, with high levels of social cohesion and social networks within neighbourhoods, citizens can be reached more easily. Mainly Bospolder-Tussendijken, Overvecht-Noord and van der Pekbuurt actively make use of the existing networks to get people involved. At the same time, people within such networks motivate one another to participate, for example, due to the social component of the activities. Furthermore, knowledge is spread more easily. This is in line with the article from Bouw et al. (2022), who state that strong social interactions increase the likelihood of citizens participating. Because these community effects are so important for the participation process, the neighbourhoods also try to facilitate social cohesion regarding the heat transition. They do this for example by creating places where people come together to do relevant activities. Such means indicate that the municipalities from the neighbourhoods want to take participation further than the inform and consult levels from the spectrum of participation (IAPP, 2018).

Overall, higher levels of participation are reported in the neighbourhoods as a result of social cohesion. The heat transition within the selected neighbourhoods shows that people tend to unite themselves in order to represent their common interests. This is similar to the statement of Bouw et al. (2022) that strong social interactions between people lead to a better chance of collective action towards solving problems. Whereas in Bospolder-Tussendijken, Overvecht-Noord and van der Pekbuurt this mainly revolves around defending citizens' interests, this is somewhat different in Ramplaankwartier. Because the heat transition started bottom-up here, participating here is more like joining the heat transition community. Due to this, the observation from Edelenbos (2001) that citizens are more likely to support initiatives that they have a hand in creating is applicable to Ramplaankwartier.

Finally, the results are in contrast with the statement from Altschuler et al. (2004) and Baum et al. (2000) that social cohesion within a neighbourhood is influenced by the socioeconomic context. No significant differences can be observed in the selected neighbourhoods. The fact that these are quite equal in terms of socioeconomic status might explain this.

5. Conclusion & discussion

5.1 Conclusion

This research aimed to investigate the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition. To do this, a literature study was conducted first to define the concept of participation, explain the importance and advantages of a participative approach, discuss the levels of participation (Burgler, 2022), and describe the motivations and factors that drive citizens to become involved in participation processes. Furthermore, relevant socioeconomic context factors were defined that may influence the heat transition participation process within neighbourhoods. This resulted in a conceptual framework (figure 3) consisting of several socioeconomic context factors that can play a role in explaining citizens' willingness to participate, ability to participate, opportunity to participate and the actual ways in which they participate. This model was translated into a coding tree (figure 11) that formed the framework for the empirical analysis, consisting of semi-structured interviews with key actors involved in selected neighbourhoods. Applying this framework of analysis to the collected empirical data led to results that provide insights into the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the heat transition. This section will provide the conclusions of these results. It will do this by answering sub-question 3 and 4 based on the empirical study (Burgler, 2022). After this, the main research question "*What is the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition?"* will be answered. In section 5.2, the meaning of the results and conclusions are discussed. Finally, section 5.3 will provide some suggestions for further research.

5.1.1 Influence of socioeconomic profiles

This section will answer the sub-question: *Do neighbourhoods with a lower socioeconomic profile perform worse in terms of participation? (less willing, less able, fewer opportunities, and less participating?)*

First, within neighbourhoods with a lower socioeconomic profile, citizens are not less willing to participate in the heat transition and vice versa. Instead, the motivations to participate are different. Whereas in neighbourhoods with a lower socioeconomic profile the motivations to participate are mainly related to financial motives, in more economically privileged neighbourhoods other motives like environmental awareness are more apparent. Furthermore, neighbourhoods with a lower socioeconomic profile generally have a larger share of rental homes. Although this decreases the willingness to participate by means of investments because landlords or housing associations are responsible for this, the willingness to participate in other ways in these neighbourhoods is sometimes even stronger compared to the more wealthy neighbourhoods. Here, the heat transition can be approached somewhat more individually. Next to this, the results show that low levels of education and knowledge can raise barriers towards participation in the heat transition, but that in the neighbourhoods where this is the case the authorities offer low-barrier activities where everyone can participate.

Second, in neighbourhoods with a better socioeconomic profile, the ability to participate by means of doing investments in heat transition-related appliances and equipment is higher. This does not account for other forms of participation. There are however more groups of people observed in the less

wealthy neighbourhoods that don't have the mental ability to participate because of their short-term focus on basic needs and getting by.

Third, in neighbourhoods with a lower socioeconomic profile, according to the interviewees, citizens don't have fewer opportunities to participate compared to more socioeconomic privileged neighbourhoods. Due to the wide range of participation and communication means that are applied by the authorities, citizens with different socioeconomic backgrounds all have the opportunity to participate in the heat transition process in some way. This shows the importance of how the participation process is designed. It could even be stated that within neighbourhoods with a lower socioeconomic profile like Bospolder-Tussendijken and Overvecht-Noord more effort is put into the participation process and therefore the opportunities to participate are higher here. However, together with van der Pekbuurt, these neighbourhoods have high shares of tenure. Therefore, a large share of citizens here has less opportunity to exert influence on the important technical choices as the housing associations and landlords are having this conversation with the municipality on their behalf.

Fourth, the results show that citizens in neighbourhoods with a lower socioeconomic profile are not necessarily less participating in the heat transition. The main difference is how they participate. Citizens in neighbourhoods with a lower socioeconomic context tend to follow the organized process by the authorities. They are participating by means of attending activities, volunteering as energy coaches, and also by providing resistance. In contrast, in a more wealthy neighbourhood like Ramplaankwartier citizens are mainly participating by applying energy efficiency improvements at their houses (e.g. insulation) or investing in sustainable heat technologies.

Considering the above, the conclusion can be made that neighbourhoods with a lower socioeconomic profile do not perform worse in terms of participation. To a large extent, this can be explained by the effort that is being put into the participation process here. People are activated to participate by the wide range of opportunities that are provided. In a more wealthy neighbourhood like Ramplaankwartier on the other hand, citizens are in charge of the process themselves and follow their own path with the authorities assisting.

5.1.2 Important socioeconomic context factors

This section will answer the sub-question: *What socioeconomic context factors are most important when explaining the participation of citizens in the heat transition?*

First, levels of income, wealth and poverty mainly shape the ability of citizens to participate in the heat transition independently from the organized participation process, for example by investing in energy-saving measures or sustainable heat technologies. Furthermore, in neighbourhoods with a lower socioeconomic profile, there are more citizens with a short-term focus on getting by, instead of participating in something complex as the heat transition.

Second, levels of homeownership and tenure largely affect citizens' motivation to invest in energy-saving measures or sustainable heat technologies. Whereas for homeowners this is an investment in their own property, tenants rather adopt a wait-and-see attitude because their housing association or landlord is responsible for this. However, within neighbourhoods with a less privileged socioeconomic context, there are small differences between homeowners and tenants when it comes to doing these investments because of their limited financial abilities.

Third, levels of education and knowledge mainly influence the way in which citizens participate. In neighbourhoods with lower levels of education and knowledge, the participation process is a learning experience in itself, making citizens aware and trying to activate them to be part of the heat transition. In neighbourhoods with high levels of education and knowledge about the heat transition like Ramplaankwartier citizens are motivated to take matters into their own hands and be pioneers.

Fourth, community effects have an influence on all aspects of citizen participation. Social cohesion and place attachment increase citizens' willingness to participate as people tend to unite themselves in order to represent their common interests. Furthermore, high levels of social cohesion allow authorities to make use of existing networks of people through which people can be reached and knowledge is exchanged. Finally, citizens motivate and activate one another to participate when levels of social cohesion are high, also because of the social component the participation process itself has.

Considering the above, it can be concluded that levels of income, wealth and poverty are the most important context factors in explaining participation independent of the organized participation process. This is in turn stimulated by high levels of homeownership and knowledge about the heat transition. When it comes to the organized participation process, community effects are essential to reach and activate citizens, creating a domino effect. Furthermore, place attachment increases the levels of participation, both out of resistance and the willingness to collaborate for the best outcomes.

5.1.3 Role of the socioeconomic context

This section will answer the main question of this research: *What is the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition?*

From the results, it can be concluded that the answer to the main question can be divided into two parts. First, the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the organized participation process. Second, the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens independently from the organized participation process.

Regarding the first, the results show that the socioeconomic context of a neighbourhood should not have a role in determining whether citizens are able to participate, have the opportunity to participate or are actually participating. To a large extent, this depends on how well the participation process is organized. Within the studied neighbourhoods, there are opportunities to participate for both homeowners and tenants with various levels of income, knowledge, and education. In combination with community effects like high levels of social cohesion and place attachment, this leads to successful participation outcomes. The socioeconomic context of a neighbourhood does however play a role in influencing the willingness of citizens to participate. Whereas more wealthy citizens activate themselves to participate due to motivations like environmental awareness, for less-financial privileged citizens a financial perspective is needed to get moving. From this, the conclusion can be made that the role of the socioeconomic context in explaining the participation of citizens in the organized participation process can be kept limited when a well-designed and inclusive participation process is being implemented. Among others, this includes the provision of multiple participation methods serving various groups with different participation needs and preferences. When this is not the case, the socioeconomic context will have a more prominent role in explaining the participation of citizens in the heat transition.

When it comes to the second part, the socioeconomic context of a neighbourhood plays a large role in facilitating participation independent from the authorities. Ramplaankwartier shows that a combination of income and wealth, homeownership, education and knowledge levels, and community effects can lead to a bottom-up process in which citizens are in the lead of the heat transition process. Here, the citizens have the financial ability and willingness to do investments in their own property, are highly educated and/or have knowledge about energy systems, and are motivated to move against climate change. The combination of these factors is not present in neighbourhoods with a lower socioeconomic profile. Therefore, the authorities here will be in charge of the project and need to design and lead a participation process to activate citizens. From this, the conclusion can be drawn that the socioeconomic context of a neighbourhood can function as a catalysator for the participation of citizens in the heat transition independent of the authorities.

5.2 Discussion

The interviews were done with key actors involved in the transition process. Because these are largely responsible for the participation process in their neighbourhoods, their observations and opinions might be biased. The interviewees could for example have an interest to promote a positive image of the participation process in their neighbourhoods to the outside world. Furthermore, because of the intensive process they are having with the inhabitants and the fact that the interviewees are involved in the projects for years now, they may have developed a bond with the neighbourhood themselves. As a consequence, the interviewees don't want to make their neighbourhood look bad.

Second, the interactions between the socioeconomic context of the neighbourhood and the participation process as observed by the interviewees remain to some extent subjective. The observations might not always reflect reality. For example, while generalizations were made by the interviewees about different groups of citizens and their attitudes towards the heat transition participation process, in reality, this may differ per individual household. For further studies, it is therefore advisable to include citizens' perspectives (see 5.3).

Also, because this research used semi-structured interviews, the participants had a degree of freedom in providing their answers and addressing things they felt are important. This has led to a great variety of answers, observations and opinions in the data. Although this potentially increased the richness of this research, making comparisons between neighbourhoods was also made more difficult.

Finally, by providing insights into the role of the socioeconomic contexts of neighbourhoods in explaining the participation of citizens in the heat transition, policymakers can consider adapting their participation strategies to the socioeconomic context of different neighbourhoods. For example, be more of a facilitator of the heat transition process in neighbourhoods with more (financial) means, knowledge and homeowners, and be more in charge of the participation process in neighbourhoods with a lower socioeconomic context.

5.3 Suggestions for further research

This research approached the role of the socioeconomic context of neighbourhoods in explaining the participation of citizens in the Dutch heat transition from the perspective of key actors involved in the transition process. Although these have a good view of the relevant processes that are at play here, the perspective of the citizens themselves is largely neglected. A suggestion for further research would

therefore be to conduct a study on the role of the socioeconomic context of households in explaining participation as perceived by citizens. Qualitative means like interviews and focus groups could be implemented to discover how the motivations of citizens to participate or not are influenced by their socioeconomic context. This can in provide valuable insights for policymakers trying to include the citizens in the heat transition process. Furthermore, a quantitative approach by means of surveying and statistical analysis would also be useful to compare levels of participation between citizens along several socio-economic variables.

Secondly, this research focused on collective heat networks. Because these get more financially attractive and feasible when more houses are connected, the participation process comes with different dynamics than when every homeowner has to invest in individual techniques like heat pumps. Another suggestion for further research would therefore be to investigate the role of the socioeconomic context of households in explaining the participation of citizens in the heat transition by means of buying individual heat pumps.

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Appendix: interview guide

1. **Opening**

2. **Opwarmvragen over de wijk**

- Zoals gezegd bent u betrokken bij de proeftuin aardgasvrije wijk …., wat is daarin precies uw rol?
- Hoe zou u de wijk omschrijven?
- Zou u kunnen omschrijven hoe de warmtetransitie er in de wijk er ongeveer uit ziet?
    - Waar staat de wijk op dit moment
    - Uit welke activiteiten/stappen bestaat dit proces?
    - Hoe proberen jullie bewoners hierbij te betrekken? Dus het participatieproces

In mijn onderzoek heb ik het begrip participatie verdeeld in willen participeren, kunnen participeren, betrokken worden om te participeren en daadwerkelijk participeren. De volgende vragen hebben daar in dezelfde volgorde betrekking op.

Willen gaat over de bereidheid en de motivatie van inwoners om te participeren. Bijvoorbeeld voor het bijwonen van participatieactiviteiten of het aanbrengen van energiebesparende maatregelen in hun woning.

3. **Willen participeren**

- Wat zijn volgens u de voornaamste redenen voor inwoners in de wijk om te participeren in de warmtetransitie?
- Heeft dit ook te maken met…
    - Financiële redenen (bijv. hoge maandelijkse energielasten)
    - Ideologisch redenen (bijv. zorgen over het klimaat)
    - Buurtgevoel (bijv. begaan zijn met de gemeenschap)
- Zijn inwoners naar uw idee gemotiveerd om te participeren in de warmtetransitie?
- Zo ja, waaraan merkt u dat?
- Wat zijn de voornaamste redenen voor inwoners om niet te willen participeren?

Kunnen gaat over de middelen die inwoners tot hun beschikking hebben om te participeren in de warmtetransitie zoals tijd, geld en kennis.

4. **Kunnen participeren**

- Zijn inwoners in de wijk over het algemeen financieel in staat om te investeren in energiebesparende maatregelen?
    - Willen ze deze investeringen ook doen?
    - Zijn er ook middelen (bijvoorbeeld subsidies) beschikbaar voor inwoners om een deel van de kosten te dekken?
- In hoeverre denkt u dat beschikbare tijd van invloed is op het participatieproces in de wijk?
    - Is er bijvoorbeeld een merkbaar verschil tussen parttimers en fulltimers?
- In hoeverre denkt u dat een bepaalde basiskennis over de warmtetransitie nodig is om te kunnen participeren in de warmtetransitie?
    - Waarom wel/niet?
    - Zijn inwoners gemotiveerder om te participeren als zij over een bepaald kennisniveau beschikken?

    - Hoe heeft u dat ervaren in deze wijk, wisten bewoners al veel over de warmtetransitie?
- Denken inwoners zelf dat ze bepaalde kennis nodig hebben om mee te kunnen doen in het participatieproces?
    - Zo ja, zorgt deze aanname voor drempels/barrières tot participatie?
- Welke van de genoemde middelen zijn naar uw idee belangrijk voor deelname aan het participatieproces?
    - Geld
    - Tijd
    - Kennis

Betrokken worden gaat over de mate waarin inwoners de kans krijgen om te participeren, bijvoorbeeld door uitgenodigd te worden voor participatieactiviteiten.

5. Betrokken worden

- Kunt u beschrijven hoe jullie inwoners proberen te bereiken, uit te nodigen en te motiveren om te participeren in de warmtetransitie in de wijk?
    - Welke middelen worden er ingezet om inwoners van de wijk te betrekken in het participatieproces?
    - Hoe zorgen jullie ervoor dat alle doelgroepen worden bereikt?
    - Hoe gaan jullie om met inwoners die geen reactie geven?
- Zijn er groepen die u naar uw idee niet kunt bereiken?
    - Zo ja, welke groepen zijn dit en waarom zijn deze lastig te bereiken?
- In welke mate spelen jullie in op de bestaande sociale structuren in de wijk om inwoners te bereiken en betrekken?
    - Zoals buurthuizen, verenigingen, actieve groepen bewoners.

Daadwerkelijk participeren gaat over de participatie zelf, dus bijvoorbeeld het meedoen aan geplande participatieactiviteiten of het aanbrengen van energiebesparende maatregelen in huizen door inwoners.

6. Daadwerkelijk participeren

- Wat is uw mening over de opkomst van inwoners bij bewonersbijeenkomsten of andere participatieactiviteiten in de wijk?
    - Naar tevredenheid/te laag/ kan beter
    - Zijn sommige groepen in de wijk onder- of oververtegenwoordigd bij bewonersbijeenkomsten of andere participatieactiviteiten?
        - Zo ja, welke zijn dit en waarom denkt u dat dit komt?
- Hoe wordt er in de wijk aangekeken tegen de warmtetransitie?
    - Stuiten jullie naast (mogelijke) positieve ontwikkelingen ook op klachten of protesten?
- Organiseren inwoners van de wijk zich ook in energiecooperaties of andere bewonersgroepen?
    - Zo ja, welke rol hebben deze groepen in het participatieproces?
- Investeren veel inwoners in de wijk in energiebesparende maatregelen in hun huizen?
    - Bijv. Isolatie
- Investeren veel inwoners in de wijk in duurzame warmte technieken in hun huizen?
    - Bijv. zonnecollectoren of een warmtepomp

Dan zou ik nu graag in willen gaan op de invloed van de sociaaleconomische context van de wijk op het willen participeren, kunnen participeren, betrokken worden om te participeren en het daadwerkelijke participeren in de wijk.

7. Inkomen, welvaart en armoede

- Heeft het relatief lage/hoge inkomen in de wijk ook een effect op het participatieproces?
    - Zo ja, wat voor effect heeft het inkomensniveau?
    - Merkt u ook dat het makkelijker is voor hoge inkomens om te participeren?
- Is er ook veel werkeloosheid aanwezig in de wijk?
    - Wat voor effect heeft de relatief lage/hoge werkeloosheid in de wijk volgens u op het participatieproces?
- Is een goede economische basis van inwoners volgens u erg belangrijk voor het participatieproces in de wijk?

8. Koop en huurhuizen

- Heeft het relatief grote aandeel koop/huurhuizen in de wijk ook een effect op het participatieproces?
    - Zit er veel verschil in de participatie in tussen kopers en huurders?
        - Motivatie om te participeren/ financiële middelen/ betrokkenheid
- Gaan jullie in het participatieproces anders om met kopers dan met huurders?
    - Andere werkvormen/ benaderingen/ gesprekken
- Wat is de rol van woningcorporaties in het participatieproces in de wijk?

9. Opleiding en kennisniveau

- Wat voor effect heeft de relatief hoge hoeveelheid hoog/laag opgeleide mensen in de wijk volgens u op het participatieproces?
    - Maakt dit het participatieproces sneller/trager makkelijker/moeilijker beter/slechter?
- Kennisniveau reeds naar gevraagd bij 4.

10. Leeftijd

- Welke leeftijdsgroepen zijn het meest vertegenwoordigd in het participatieproces?
- Wat voor effect heeft de relatief grote hoeveelheid oude/jonge mensen in de wijk volgens u op het participatieproces?
- Waarom is het wel/niet van belang dat alle leeftijdsgroepen vertegenwoordigd zijn in het participatieproces?

11. Gemeenschap

- In hoeverre speelt de mate van sociale cohesie in de wijk volgens u een rol bij het participatieproces?
- In hoeverre kan deze mate van sociale cohesie ook worden verklaard door de goede/slechte sociaaleconomische context van de wijk?
- Is er meer/minder sociale cohesie in de wijk door de hoge/lage inkomensgelijkheid?