

Municipalities on a mission without power?

An investigation about how the local government views the role of the end user (owner-occupier) in the natural gas phase-out, and its consequently constraining or enabling effect on the end users' decision-making about an alternative for natural gas to heat their existing houses in the Netherlands.

Masterthesis

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Foreword

Before you lies the master thesis 'Municipalities on a mission without power?'. This research aims to investigate how the local government views the role of the end user in the natural gas phase-out in the Netherlands. This thesis is written as a final assignment to fulfil the master Spatial Planning at the University of Utrecht in Utrecht. In the master Spatial Planning, an internship is optional, but I was lucky enough to be able to conduct the master thesis at Aveco de Bondt in Amersfoort, under the guidance of Alex van Doorn. The natural gas phase-out in the Netherlands was the inspiration for this subject, at the internship this subject was properly introduced. Over time the subject was refined and the texts were rewritten, several times, to come to the document it is.

I owe my supervisor of the university special thanks. During this thesis I was supervised by Mathias Koepke who guided me, to eventually make a thesis I can be proud of. Next to my supervisors at the University and internship I would like to thank the respondents for clearing time in their agendas to participate in an interview. Lastly, I would like to thank my friends and family who have supported me with positive energy throughout my academic journey which is concluded with this master thesis.

Hendi de Greef Bsc.

Woudenberg, 9th August 2019.

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Abbreviations list

Concept (NL)	Abbreviation	Concept (ENG)
Verenigde Naties inzake klimaatverandering	UNFCC	United Nations Framework Convention on Climate Change
Hernieuwbare energie bron	RES	Renewable energy source
Regionale energiestrategie	RES	Renewable energy strategy
Wil om te betalen	WTP	Willingness-to-pay
Rijksdienst voor ondernemend Nederland	RVO	Government Agency for Enterprising Netherlands
Vereniging Nederlandse Gemeenten	VNG	Dutch municipalities association
Centraal bureau voor statistiek	CBS	Central bureau for statistics
Vereniging van Eigenaren	VvE	Association of owners
Planbureau voor de Leefomgeving	PBL	Netherlands Environmental Assessment Agency
Centraal Planbureau	CPB	Bureau for Economic Policy Analysis
Multi-level perspectief	MLP	Multi-level perspective

Summary

The Netherlands are member of the UNFCCC [United Nations Framework Convention on Climate Change] and have ratified the Paris Agreement so they have to contribute to the goals set in the Paris Agreement. 30% of the total energy consumption in the Netherlands is used for the heating of houses, buildings and greenhouses. Specifically, 90% of the energy we exploit to heat houses is derived from natural gas (Energieagenda, 2016). Thus, significant emission reductions can be achieved with the elimination of natural gas. The national government Therefore has decided to set a goal to phase-out natural gas by 2050. To achieve this goal, an energy transition is necessary. The unique aspect of the energy transition in the Netherlands is, the goals set by the government requires intervening in private property which is individual possession. Kollmuss & Agyman (2002) and Ryghaug et al. (2018) recommend to execute a more comprehensive study that would include external factors related to the decision space of citizens regarding energy transitions. The municipality has an executing role in shaping the phase-out of natural gas, a role obligated by the national government. Thus, this research focusses on the end user who is owner and occupier of an existing house and the local government as executor of the natural gas phase out. So, the purpose of this qualitative study is, to investigate how the local government views the role of the end user (owner-occupier) in the natural gas phase-out, consequently constraining and enabling the end user in making their decision about an alternative for natural gas to heat their existing houses in the Netherlands.

The research started by stating the uniqueness of the case in the Netherlands namely, national policies which intervene strongly in private property. The second chapter elaborates on the scientific literature regarding energy transitions and the role of the end user and municipality. Consequently, stating the gap in the literature which will provide the base for the aim and research question, which is chapter three. The fourth chapter is concerned with the methodology used for this study. The study will use qualitative methods, semi-structured interviews. The interviews are used to uncover and unravel the intertwined relationship and dynamic between the municipality and the end users regarding the phase-out of natural gas. Chapter five will analyse policy documents of the research cases, but also the regional and national policy regarding the natural gas phase-out. Next, the data analysis will be presented, this chapter (six) analyses the data collected from the interviews and draws results. The last chapter, seven, will state the conclusion. Here an answer will be provided to the two sub questions: 1. How does the local government view the process of the natural gas phase-out in their municipality regarding the role of the end user? 2. How do the local government and the end user constrain and enable each other in the phase-out of natural gas? Lastly, the limitations of this research are discussed together with recommendations for further investigations and implications.

The finding emerging from this study is, the end user is the only actor who has the hard power to make a decision about their house, within the current circumstances. However, in this research the municipality has been defined to be the key actor in the natural gas phase-out. The results from the policy analysis uncovered a variety of processes at the municipalities, all respondents were under the impression that their municipality is in the starting phase of developing a plan for the process to phase-out natural gas. Additionally, the respondents stated that citizens initiatives are embraced by municipalities. Also, municipalities focus on “no-regret measures” because of insecurities about how techniques and laws will develop. This theme of uncertainty recurred throughout the interviews. The next section was concerned with the power of the municipality and end user. The results indicated that the municipality struggles in finding the balance between hearing everybody and efficiency. Furthermore, the municipality is obligated to interact with its inhabitants and, there are no legal obligations that provide coercion measures. Lastly, the respondents expect people to wait for the

next even better technical innovations in the future and therefore delay the implementation of an alternative for natural gas.

The purpose of this qualitative explorative study was, to investigate how the local government views the role of the end user (owner-occupier) in the natural gas phase-out, and its consequently constraining or enabling effect on the end users' decision-making about an alternative for natural gas to heat their existing houses in the Netherlands. The answer to this question is twofold. Based on the scientific literature and the results of this study there is a high possibility that the reason for a lack of a systematic approach of the municipality to phase out natural gas is a) uncertainty about the future (thus different predictions to base plans on and consequently developing different approaches) and b) a lack of pressure, which is needed to prioritise the process of phasing out natural gas.

Notwithstanding the limited sample, the study confirmed that the municipality has a leading role in shaping the energy transition, but does not know how to execute this role because the municipality is weak in enforcement, because the end user has the hard power to make a decision about their house, within the current circumstances.

1 Introduction

In the 'Energieagenda' [Energyagenda] (Energieagenda, 2016), a policy document of the national government, it has been determined that the Netherlands needs to reduce their use of unrenovable energy sources. This goal arises from the Paris Agreement. 185 of the 197 UNFCCC (United Nations Framework Convention on Climate Change) members have ratified the Paris Agreement, that global warming must not exceed pre-industrial global average temperature by more than 1.5 degrees. Therefore, the emission of greenhouse gases must decline to be consistent with the goal of limiting global warming as written in the Paris Agreement (2015).

30% of the total energy consumption in the Netherlands is used for the heating of houses, buildings and greenhouses. Specifically, 90% of the energy we exploit to heat houses is derived from natural gas (Energieagenda, 2016). Houses can be categorised into new building projects and existing housing. First, the elimination of gas at new projects does not greatly influence the progression of the greenhouse gas reduction (Energieagenda, 2016). Moreover, in the refinement of the gas law (Gaswet, 2018), it is stated that all new housing projects will generally no longer have a natural gas connection. Conversely, for existing houses there is a challenge, because there is no general, definitive solution proposed or even envisioned by the national government (Energieagenda, 2016). Also, the amount of older houses made in Holland is substantial. From the 7.74 million houses (100% in Holland only 1.664.051 houses (21.50%) have been built after 1995 (CBS, 2018). Older houses are commonly more difficult to change a heating system, for example because of a lack of isolation (hierverwarmt.nl, n.d.).

Following, the current Dutch government policies on the matter will be described. First, the 'regionale energiestrategie' [regional energystrategy] is introduced by the national government in order to provide local governments with a useful tool (regionale energiestrategie, 2018). The regional energystrategy, is an instrument for collaboration, to help local governments develop a plan regarding the distribution of renewable energy sources to fulfil the ambitions of the Paris Agreement together (with the implementation of a renewable energy supply for households as a focus point)(Paris Agreement, 2015).

Second, the national government developed a 'green deal Aardgasvrije wijken' [green deal neighbourhoods free of natural gas]. Here, there are 31 pilot-municipalities selected. These municipalities will participate in an interactive knowledge platform in collaboration with other stakeholders like VNG (Vereniging Nederlandse gemeenten)[association of Dutch municipalities], involved energy suppliers and the national government (RVO, 2018). In addition, the collaboration with residents is essential since the technical implementations need to be installed within their homes (Ryghaug, Skjølsvold & Heidenreich, 2018; Perlaviciute et al., 2018; Cowell & Devine-Wright, 2018). The national government made it mandatory for all municipalities to have a 'Warmteplan' [Heatplan] by 2021. The Heatplan must contain a planning of the elimination of all natural gas connections at houses in the municipality before 2030 and what the alternatives for natural gas are (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2018)

To be able to phase-out natural gas in the Netherlands an energy transition is necessary. Schot, Kanger & Verbong (2016) use the term energy transition to refer to wide-ranging and long-lasting shifts from one socio-technical regime to another, resulting in the establishment of a newly configured socio-technical system. Although, considerable research has been devoted to the transition of energy systems as socio-technical systems, less attention has been paid to the role of the end user in this system (Smith, Stirling & Berkhout, 2005; Verbong & Geels, 2007; Cherp et al., 2018). Therefore, Figure 1, adopted from the research of Schot et al. (2016), is considered to match the research since the focus is also on the end user, so this will be used to provide context to this

research. The red dotted outline in Figure 1 provides an area of research, but to be able to validate this outline, first the figure and current situation in the Netherlands have to be described.

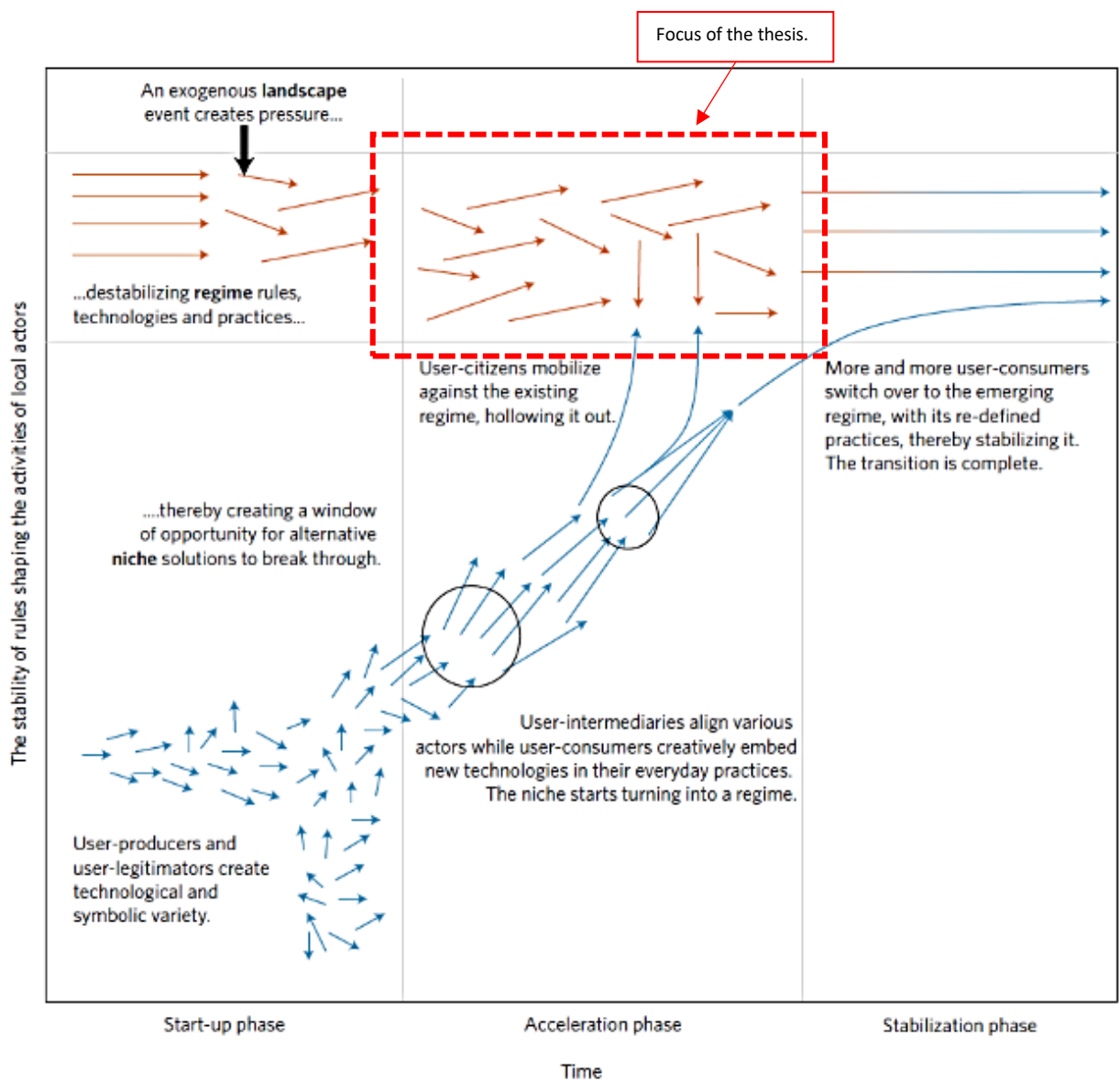


Figure 1. User roles and transition dynamics. Reprinted from “The roles of users in shaping transitions to new energy systems” by J. Schot, L. Kanger & G. Verbong, 2016, *Nature energy*, 1, p. 5.

The situation and developments regarding the natural gas phase-out in the Netherlands is similar to the definition of an energy transition as used by Schot et al. (2016). Namely, the natural gas phase-out aims to eliminate the use of fossil fuel, specifically natural gas to replace it with renewable energy sources [RES]. Both the production and consumption of fossil fuel as the production and consumption of renewable energy, share similarities to those of a socio-technical regime. Since the national government imposed the elimination of natural gas, an attempt will be made to shift to a socio-technical regime consisting of renewable energy sources thus, the gas phase-out is an energy transition (Energieagenda, 2016). Furthermore, the study of Schot et al. (2016) is best fitting as part of the methodological design because they focus their study on the role of the end user, as does this thesis.

In order for an energy transition to initiate, external (landscape) pressure has to be present (Schot et al., 2016). The Netherlands extract natural gas from the province of Groningen. However, this is harmful for this area since it causes local earthquakes (van der Voort & Vanclay, 2014). In the natural gas phase-out the external landscape pressure is climate change, and domestic pressure from external actors, like environmental groups and social movements. Both are concerned with the aggravating earthquakes in the province of Groningen which cause a deteriorating security environment (Schot et al., 2016; van der Voort & Vanclay, 2014). Verbong & Loorbach (2012) point out that the liberalization of the energy market gives more of the responsibility of the production and transmission of energy, to the actors in the incumbent socio-technical regime. Multiple renewable energy sources such as solar power will make the end user both consumer and producer of energy. Thus, the pressure of the external landscape will press on all actors in the incumbent socio-technical regime, but due to liberalization of the energy market there is more pressure on the end user. The earthquakes in Groningen exacerbate over time, in 2019 the highest magnitude was measured of 3.4 on 22nd of May (KNMI, 2019). An illustration of the growing amount of earthquakes is shown in figure 2 (NAM, 2019, Aantal aardbevingen in het Groningen-gasveld). These earthquakes are no longer accepted by society and as a consequence also by the (national) government (KNMI, n.d.; Mouter, de Geest & Doorn, 2018). It is decided by the national government of the Netherlands to end the gas extraction from Groningen (Rijksoverheid, 2018).

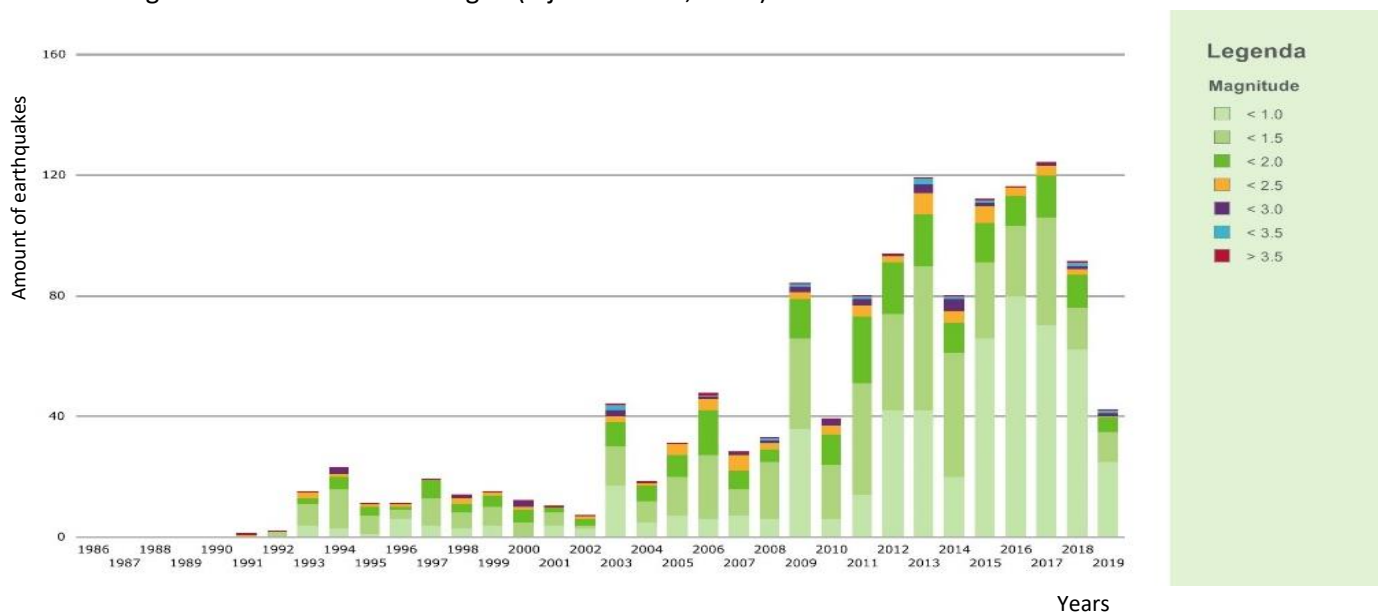


Figure 2. Aantal aardbevingen in het Groningen-gasveld. Reprinted from NAM 2019 website, by Nederlandse Aardolie Maatschappij, 2019, retrieved from https://www.nam.nl/feiten-en-cijfers/aardbevingen.html#iframe=L2VtYmVkl2NvbXBvbmVudC8_aWQ9YWYyZGJldmluZ2Vu [2019]

Thus, this research will focus on the study area in the red outline in Figure 1, because this is the place where the new developments start to compete with the incumbent regime. In this research that means the process of phasing out natural gas will compete with the established regime of fossil fuel production and consumption. Also in this phase all factors come together, the changing rules (obligation to phase out natural gas), user behaviour (the choice of the end user to implement an alternative for natural gas) and pressure to change (social movement groups).

While Bosman et al. (2014) investigated the disruption of an incumbent regime they recommend further research on the dynamics of de- and restabilization of socio-technical systems. Correspondingly, the study area of this research comprehends the phase in which the incumbent regime is challenged. If the incumbent regime is successfully destabilized, this will lead to a new rule

set (Schot et al., 2016). The characteristics and implications of this phase are further clarified in the literature review. Schot et al. (2016) recommend further research regarding the relationship between the end users of energy and other actors in the socio-technical system. This is also confirmation for why this study focusses on the end user. Schot et al. (2016) conclude that the end users can influence the shaping of energy transitions. Moreover, the end user can be an active participant in the process of a socio-technical change. Thus, the validation for this study to focus on the end user is because the end user can be an active participant that influences the energy transition, which is crucial to the succeeding of the natural gas phase out in the Netherlands because the new energy goals imposed by the national government, extend to intervene in private property of the end user. A case of an energy transition in another country will be discussed in the next paragraph.

The case of the energy transition in Germany will be discussed to point out why the Dutch energy transition is an unique case and therefore interesting to research. Strunz (2014) describes the development of the energy transition in Germany, a regime shift from a fossil-nuclear regime to a renewable energy source-based regime. He explained, that political changes lead to policies that encourage the implementation of renewable energy sources in Germany, namely RES-support policies. These policies effected primarily the production side of the energy system. Moss, Becker & Naumann (2014) confirm this statement and add, that the outcome of the energy transition in Germany is uncertain. They point out that the policies from the state will adapt to the local conditions (political, structural or socio-economic conditions), therefore it is difficult to assess the outcome of policies. Subsequently, Moss et al. (2014) focus on the actors that are effected by the changing policies. They state that actors will explore ways to derive benefit or avoid harm from the policy changes. Strunz (2014) and Moss et al. (2014) state that the objective of the German energy transition is to achieve a full renewable energy source supply, accordingly they mention dominant energy companies as the most relevant actors in the transition.

The previous section underlines the unique case of the Netherlands in contrast to the energy transition in Germany. In Germany the national policies affect the production of renewable energy in which companies are the actors with the most influence. Controversially, the researches indicate that the main problem in the Netherlands is, that the new energy goals imposed by the national government, extend to intervene in private property, houses. The goal of the national government is to replace the energy source in the houses of end users, in which case the end user has the biggest influence in fulfilling the national policy because the end user has the choice for placing an alternative for natural gas in their house. Thus, in Germany the responsibility for the energy transition lies with the companies that produce energy. In the Netherlands the responsibility lies with the end user that consumes energy, because they individually have to decide to eliminate their natural gas connection.

The sections above stated the significant role of the end user when striving towards a successful energy transition in the Netherlands, in which natural gas is phased out (Ryghaug et al., 2018; Perlaviciute et al., 2018; Cowell & Devine-Wright, 2018). The definition of citizens as 'recipients of technology' derives from the previous role of end users to be passive consumers of a centralised energy system. Previous studies describe that, inhabitants passively used the energy source and energy infrastructure, that were predetermined by the incumbent regime (Ryghaug et al., 2018; Schot et al., 2016). Currently, the role of the end user is further investigated and it is claimed that citizens have an active relationship with energy. To explain, end users are involved in the decision making process regarding energy policies and have technologies within the domestic sphere of a house which makes an end user not only a consumer but also a producer of energy (Ryghaug et al., 2018). In addition, there is a worldwide rise among individuals awareness of, and interest in renewable energy sources and the willingness-to-pay for renewable energy sources according to Soon & Ahmad (2015). Furthermore, the end user nowadays has the potential of involving in

(collective) actions to enforce a transition (Ryghaug et al., 2018). Thus, the end user is an increasingly important study object in energy transition research because the end user can influence the shape of an energy transition and his relationship with energy is increasingly active.

The reason for tension in an energy transition is a will from the incumbent socio-technical regime to maintain the current situation against the pressure of change (Danielson, Ekenberg & Komendatova, 2013). Thus, the changes in the incumbent socio-technical regime as a result of an upcoming energy transition, could evoke negative emotions which can lead to negative reactions. Negative reactions from inhabitants have proven to cause delay or even cancel projects (Mouter et al., 2018). There would therefore seem to be a definite need for a well-considered approach towards the end user in order for an energy transition to proceed successfully. Danielson, Ekenberg & Komendatova (2013, p. 191) emphasize the implications of a challenged incumbent regime namely, the tensions that rise from it:

“Energy transition could be seen as action fields or arenas where different individual or organized stakeholders are competing for legitimization of their actions and organizational survival in the future”

Proka, Hisschemoller & Loorbach (2018) confirm this statement, but elaborate that a conflict does not necessarily has to result in a negative outcome. However, Proka et al.'s (2018) analysis does not take into account that an outcome could be positive for one actor but negative for another actor. Moreover, how to avoid a negative outcome and for whom is not yet clear in scientific literature. With this in mind, numerous studies recommended more research to be done regarding energy transitions (Bosman et al., 2014; Schot et al., 2016; Smedby & Quitzau, 2016).

More specifically, the results of the study of Bosman et al. (2014) suggest that if stakeholders of the incumbent socio-technical regime successfully adapt to pressures it will lead to a stronger socio-technical system. Therefore, they recommend to investigate the complex dynamics related to energy transitions regarding the socio-technical system. Schot et al. (2016) highlights the importance of dynamics between actors and specifically the role of the end user in the socio-technical system. The reason for this is that the evidence from this study (Schot et al., 2016) suggests that the end user has a substantial influence on the outcome of transitions. They advise to look at interactions between users and other actors. Moreover, Smedby & Quitzau (2016) add to this advice to investigate this system specifically on the local level, thus research municipal governments to reveal the limitations and opportunities in governing sustainable transitions. In addition the research of Greene (2018) showed that an individual's action is strongly driven by context. Thus, since the context is an overriding factor according to Greene (2018), the context of end users, which is the main object of this research, will be investigated in relationship to the local government.

All things considered, Schot et al. (2016) state that the end user can influence the process of shaping the energy transition. Since the new energy goals imposed by the national government, extend to intervene in private property of the end user, the end user is crucial in the succeeding of the natural gas phase out. Moreover, the national government has transferred the executive role towards the local government, which supposedly should be the most responsive government layer towards the citizens. Furthermore, Greene (2018) stated that individual action is driven by context. This data suggests that to succeed in the energy transition the local government has to provide a context in which the end user will undertake action to eliminate natural gas. However, it is established that the Netherlands are a unique case and therefore a proven successful approach to create a context does not yet exist.

The purpose of this qualitative explorative study is to investigate how the local government views the role of the end user (owner-occupier) in the natural gas phase-out, and its consequently constraining or enabling effect on the end users' decision-making about an alternative for natural gas to heat their existing houses in the Netherlands.

To fulfil the aim stated above, the local government in the socio-technical system regarding the energy transition in the Netherlands has to be taken into account. Therefore, multiple perspectives will be viewed through interviews with employees of the municipality. Drawing upon the transition literature of a socio-technical system as described by Schot et al. (2016), this study attempts to uncover the relationship between the municipality and the end user regarding the natural gas phase-out of the Netherlands. Within this, the study seeks to obtain data regarding the hard- and soft power, as described by Nye (2009) of the organisations that the respondents are part of. This data will be categorised by the three dimensions of a socio-technical system by Verbong & Geels (2007).

Perlaviciute et al. (2018) draws attention to the relevance of support from society for the success of sustainable projects. Thus, this research will contribute to the growing area of research by exploring the way municipalities currently handle the relationship with the end user regarding the natural gas phase-out. The outcome of this research will probably contribute to more effectively implementing new sustainable regulations by the local government. Subsequently, this research will offer the end user insight in what their place is in the socio-technical system regarding the natural gas phase-out and where they can exercise influence. Consequently, citizens can assist in the construction of mediation spaces and even take up certain tasks. Given the problem statement outlined above, the research question is stated as follows:

How does the local government view the role of the end user (owner-occupier) in the natural gas phase-out, consequently constraining and enabling the end user in making their decision about an alternative for natural gas to heat their existing houses in the Netherlands?

To answer the main research questions two sub questions will be used:

1. How does the local government view the process of the natural gas phase-out in their municipality regarding the role of the end user?
2. How do the local government and the end user constrain and enable each other in the phase-out of natural gas?

Thus, in the introduction it is argued that for the unique case of the Netherlands the most relevant stakeholders are the local government (by law they have to make a plan to phase-out natural gas because of the obligation of the national government which is transferred to the local level) and the end user (because they can influence the process of shaping the energy transition and the plans of the government intervene in their private property). The introduction points out the uniqueness of the case in the Netherlands. The second section will elaborate on the scientific literature regarding energy transitions and the role of the end user and municipality. Consequently, stating the gap in the literature which will provide the base for the aim and research question, which is the next chapter. The fourth chapter is concerned with the methodology used for this study. Chapter 5 will analyse the result of policy analysis. Next the data analysis will be presented, this chapter analyses the data collected from the interviews. The last chapter will state the conclusion and discuss the limitations of this study together with recommendations for further investigations and implications.

2 Literature

2.1 The socio-technical system of an energy transition

This section will offer an overview of the most relevant academic literature for this research. Starting, the definition of transition and socio-technical system of Schot et al. (2016) will be explained. Then, for the purpose of being more specific, dimensions will be described regarding the socio-technical transition as by Verbong & Geels (2007). Based on this, an explanation is given for why the future is so hard to predict when dealing with a socio-technical transition.

The definition of Schot et al. (2016) for 'transition' will be used to explain how an energy transition will be defined in this thesis. Schot et al. (2016) define transitions as "large-scale and long-term (50-100-year) shifts from one socio-technical regime and system to another, involving interactions between landscapes, regimes and niche dynamics". In this definition multiple terms are used, the socio-technical system as described in the introduction will be further investigated in this chapter. Falcone (2018) states that a successful energy transition can be achieved if all involved stakeholders change their behaviour and believes. In other words, there also has to be a transition from a social- and governance point of view. The research of Schot et al. (2016) supports aforementioned statement and elaborates. Schot et al. (2016, p. 2) define the term socio-technical regime as: "a shared, stable and aligned set of rules or routines that guide the behaviour of actors on how to produce, regulate and use energy, transportation, food production or communication technologies". The incumbent socio-technical regime in the Netherlands consists of a centralized system of fossil fuels, (individual) energy intensive practices and laws that preserve a system based on fossil fuels (Schot et al., 2016). Moreover, the aforementioned regime is embedded in the elements of a socio-technical system (Schot et al., 2016). They identify the socio-technical system as "a configuration of technologies, services and infrastructures, regulations and actors (for example, producers, suppliers, policymakers and users) that fulfils a societal function such as energy provision. These elements are aligned and fine-tuned to each other, forming a system" (Schot et al., 2016, p. 2). These definitions take into account the interdependence of all factors associated with the production and consumption of energy, however are too vague to be used to investigate the natural gas phase out. Thus, different academic debates will be reviewed to clarify the socio-technical system. In essence, changes in the prevailing energy production and -consumption are dependent on the changes in socio-technical regime and -landscape. In other words, the interaction between socio-technical regimes and the socio-technical landscape, shape the future of energy provision and consumption, an elaboration of this process as described by Schot et al. (2016) will be provided in the next paragraphs.

In addition, it is important to further explain how an energy transition is started. Therefore, Schot et al. (2016) use the term 'the socio-technical landscape' to refer to exogenous macro-events and trends that shape the dynamic between niches and regimes. Another term used to describe the landscape is 'external pressure' (Schot et al., 2016). Putnam (1988) defines external pressure in a similar way, but categorises it differently. Firstly, an international pressure is defined as the decision of multiple countries to pursue one goal and describes domestic pressure as social groups that pursue an interest by pressuring the government to adopt favourable policies. Secondly, domestic resonance is needed to make a policy shift. Thus, according to these researches international and domestic pressure is needed to destabilize a regime. The landscape pressure in the Netherlands consists of two elements, namely; the Paris agreement which is similar to the definition of international pressure and social movements who are dissatisfied with the situation in Groningen and demand change which is similar to the definition of domestic pressure. It is not yet clear to which extend domestic resonance as described by Putnam (1988) is present in the case of the natural gas phase out in the Netherlands. Bosman et al. (2014) describes pressures to destabilize a regime

but adds one, namely bottom up innovations. Thus, in order for a regime to destabilize and a government to adopt favourable policies, pressure and domestic resonance is essential (Schot et al., 2016).

The landscape pressure is part of the first phase and starts to destabilize a regime which can lead to an energy transition. Schot et al. (2016) describe three phases of an energy transition which they have visualised in Figure 1. The energy transition starts with the start-up phase in which the incumbent regime is facing pressure. Simultaneously, a window of opportunity occurs for a niche to develop (Schot et al., 2016). Schot et al. (2016) focus their research on the origination and impact of a niche in an incumbent socio-technical regime and the role of the end user in this. Therefore, they make no attempt to explore specific relationships between actors. This research however, will focus on the relationship of two specific actors (end user and municipality) who are the most relevant (in the acceleration phase) in the socio-technical system (Geels, 2011). The acceleration phase, is the phase in which the set of rules and user needs are redefined combined with collective learning. If the incumbent socio-technical regime is successfully destabilized, this phase will lead to a new stable rule set (Schot et al., 2016). The last phase of the energy transition is the stabilization phase in which increasing numbers of users use new technologies and the socio-technical regime is re-defined. As described, for this research the acceleration phase is the key focus.

Recently, (inter-)national laws changed and now force an energy transition in the Netherlands deriving out of a fossil fuel-based system towards sustainable production and consumption of energy (Schot et al., 2016; Energieagenda, 2016). The pressure from climate change and social groups (socio-technical landscape) and changing laws originating from the Paris Agreement regarding energy production and -consumption, could create a window of opportunity for new renewable technologies to be used on a mass scale (Schot et al., 2016). The increasing production of renewable energy sources uses this window of opportunity to develop and spread in the Netherlands. Thus, in this case, the production of renewable energy sources is destabilizing the current socio-technical regime regarding the use of fossil fuels. Schot et al. (2016) define the 'space' created in the window of opportunity as a 'niche'. The term 'niche' is defined as a 'space' protected from direct market pressure, so few actors are involved. Moreover, the niche is in a web of rules in constant flux trying to develop a (new) technology and set the interrelationships (Schot et al., 2016). However, the niche concept is not of relevance for this research because the natural gas phase out originates from an obligation by the national government and so this research will not have a focus on technology.

This section has made an attempt to provide an outline of how researchers view an energy transition based on scientific literature. However, because of the diversity of actors influenced and diversity of factors that influence the socio-technical system, every (energy) transition has its own distinctive pathway with their own result (Schot et al., 2016). Different sustainable energy transitions are widely discussed in scientific literature based on case studies in several countries (Dowling et al., 2018; Michelsen & Madlener, 2016; Sgouridis & Csala, 2014). These researches all have in common that they describe an incomplete energy transition. For example, Michelsen & Madlener (2016, p. 95) mention that the transformation in Germany was from a '*fossil fuels-based to an almost completely renewables-based energy system*', the word 'almost' specifies that this transformation is not (yet) complete. Sgouridis & Csala (2014) named multiple examples of energy transitions and revealed that (low) price and (wide) availability are the main reasons to keep using certain energy sources, such as natural gas, for some purposes, such as heating houses.

The gas phase-out in the Netherlands is different from the energy transitions that have been described in previous studies, because the gas phase-out arises from a goal set by the Dutch government, contrary to the formation of a niche which gradually intervenes with the incumbent regime (Klimaatberaad, 2018; Schot et al., 2016). Furthermore, the gas phase-out of the Netherlands, predominantly implements mature technics. Therefore, the niche in the gas phase-out is of fewer

significance than in traditional socio-technical research regarding energy transitions. What the specific implications are of the Dutch approach, for the end user and the municipality, will be discussed in this research.

The definition of Schot et al. (2016) the socio-technical system included technologies, services and infrastructures, regulations and actors. Verbong & Loorbach (2012) argue that the socio-technical system includes more also; markets, cultural aspects, regulatory paradigms and consumer behaviour. The aforementioned elements, construct an intertwined system of which there is no proper understanding yet about the consequences when this system is interrupted (Verbong & Loorbach, 2012). The consequence of an interruption in this intertwined system is unpredictable because of the multiple factors that indefinitely influence each other, so every pathway of a transition is unique. For example, the energy market can be a barrier, but also a catalyser for a regime to (re)stabilize (Dowling, McGuirk & Maalsen, 2018). Thus, no prediction can be made of the consequences of major discontinuities in a socio-technical system (Verbong & Loorbach, 2012; Schot et al., 2016). Eventhough a prediction cannot be made, Falcone (2018) stated that for an energy transition to succeed a social- and governmental change is necessary. Therefore, it is foremost to acquire a better understanding on the actors in a socio-technical system and how they are influenced. However, before a better understanding about the actors can be achieved, the context of the situation should be clear because the actions of actors are interdependent of the context of the situation (Greene, 2018).

Aforementioned, has made clear that multiple researchers (Verbong & Geels, 2007; Bosman et al. 2014; Schot et al, 2016) have tried to conceptualize what the socio-technical system beholds. To be able to research a transition the elements used to define the socio-technical system need to be more precise. The classification of the socio-technical system of Verbong & Geels (2007) is similar to the classification of Bosman et al. (2014). Bosman et al. (2014) identified three characteristics of a socio-technical system. Namely, a socio-technical system consists of a long-term coalition of actors, wherein (in)formal rules guide the activities and collective knowledge within this coalition forms the base of a shared vision for the future (Bosman et al., 2014). Earlier Verbong & Geels (2007) described a more elaborate categorisation. Verbong & Geels (2007) categorised the aforementioned elements of the socio-technical system into three (interlinked) dimensions. Namely, (1) the network of actors and social groups, (2) rules that guide the activities of actors and (3) material- and technical elements.

Verbong & Geels (2007) elaborate on these dimensions and relate them to the energy system regarding electricity. First, the network of actors consist of incumbent actors. The incumbent actors such as: the ministry of economic affairs, large industrial users and social networks (that could consist of households) have a vested interest, their perceptions and activities are embedded in routines (Verbong & Geels, 2007; Geels, 2005). The latter actors, social networks, have 'organizational capital'. Second, formal-, normative- and cognitive rules. The formal rules, consist of regulations, standards and laws, these may stabilize regimes. Next, normative rules are role relationships and behavioural norms. Furthermore, cognitive routines may negatively impact actors as they are not open for change. For example; belief systems, problem agenda's, guiding principles and search heuristics. The third dimension is, material and technical elements. These material elements are obdurate and so form the conditions for actions. These elements, for example: existing machines like power generation plants and energy infrastructures like the grid, constitute a stable energy system because of sunk investments and complementarities between components. Eventhough these elements are obdurate of nature, they are not unchangeable. However, they are constrained by technical possibilities and scientific laws (Verbong & Geels, 2007; Geels, 2005).

Groves, Munday & Yakovleva (2013) have established that, the current decision-making process regarding energy (infrastructure) has been depoliticalized. This is due to the shift of decision-making

to technical arenas and with that, private actors (companies) who make decisions. There is no general consensus if this development, depoliticalizing, is positive or negative. This is relevant in terms of the natural gas phase-out, because the Dutch government has set a goal (2050 The Netherlands off natural gas), but does not have clear instruments to reach this goal. Therefore, the Dutch government will be in need of the collaboration of private parties. The research of Dowling et al. (2018) connects to this dilemma, they state that the liberalisation of energy systems has limited the power of the government to change the energy system. They point out the fact that the socio-technical configuration of the energy system is so intertwined that the idea of the government on itself, steering the energy transition in one direction is an unrealistic expectation. However, Ehnert et al. (2018) concludes his research with the statement that sustainable transitions are embedded in wider political-institutional contexts. Ehnert et al. (2018) stated that, to understand a transition on the local level, research has to be executed beyond the local government level (Ehnert et al., 2018). Moreover, this context causes that (public) actors enable and constrain other actors in the socio-technical system in making a decision towards an (energy) transitions (Ehnert et al., 2018).

Verbong & Loorbach (2012, p. 238) state: *“However, the energy transition is increasingly about tensions, pressure and power as well”*. This quote of Verbong & Loorbach (2012) is a statement to a challenge they expect the Dutch natural gas phase-out to come across in the future regarding the energy transition. Dowling et al. (2018) identified three points of tension in the process of transition namely; tensions across levels of government, disjunctures between national and local priorities and independent pursuit of local energy objectives. They state that these tensions could be resolved by consensual, integrated policy coordination. Contrary, Verbong & Loorbach (2012) believe that the energy transition cannot be completed if the government does not coerce people to change, that only frontrunners will transition to renewable energy sources by communication and financial incentives. Furthermore, they believe that coercion will lead to tension, but that this is unavoidable when a transition occurs (Verbong & Loorbach, 2012). Moreover, coercion by the government is not possible without political- and social support as is confirmed by Falcone (2018) and Ehnert et al. (2018). Both Verbong & Loorbach (2012) and Dowling et al. (2018) reported that the political-institutional context is relevant, but they have failed to reach a general agreement to offer an explanation of how the political-institutional can be positively used to diminish tension in an energy transition. The matter of pressure has been discussed as initiator of the destabilizing of incumbent regimes (Schot et al., 2016).

Thus far, the thesis has argued that the future of energy provision and consumption is shaped by the interaction between a socio-technical regime and socio-technical landscape. For this research the acceleration phase of an energy transition is the focus point, because in this phase the set of rules and user needs are redefined. The pressure on the incumbent socio-technical regime in the Netherlands comes from climate change, the Paris agreement and social movements which are dissatisfied with the situation in Groningen. If this pressure is enough to destabilize the regime is unknown, because different from known energy transitions, the energy goals of the Netherlands intervene in private property. Firstly, this is a unique situation but moreover the consequence of a discontinuity in a socio-technical system, cannot be predicted. However, to be able to research the natural gas phase-out in the Netherlands the dimensions of Verbong & Geels (2007) will be used. They stated that the socio-technical system consists of three (interlinked) dimensions that form constraints and mutually influence each other. These dimensions are (1) the network of actors and social groups, (2) rules that guide the activities of actors and (3) material- and technical elements. How these dimensions are used to research the cases will be explained in the methodology.

2.2 relationship municipality – end user

Perlaviciute et al. (2018) confirms that, the relevance of support from society, is crucial for the success of sustainable projects and with that, the energy transition. Perlaviciute et al. (2018) investigated which factors influence the public opinion regarding a sustainable energy transition. Some examples of experts dealing with negative reactions among individuals are, seeing people and opinions as irrelevant because emotions obstruct rational thinking, avoiding projects that evoke negative emotions or ignore negative emotions (Perlaviciute et al., 2018). Aforementioned examples all have the same consequence, namely the project at hand could receive (more) resistance. Moreover, if the negative public opinion worsens it could lead to the point where as a construction project has to be terminated (Perlaviciute et al., 2018). However, actors are 'flexible' in a way that their ambitions and emotions can shift, due to different circumstances (Cowell & Devine-Wright, 2018). For example, when public authorities implement new regulations (Geels, 2005). Thus, when emotions are viewed as 'practical rationality' and thus relevant, it can be used to positively influence the general opinion of a project. Moreover, viewing emotions as 'practical rationality' can create a positive reaction regarding sustainable development (Perlaviciute et al., 2018).

In existing literature, there is a lot of research done about the willingness to pay (WTP) for renewable energy sources (Bergmann, Colombo & Hanley, 2007; Ntanos et al., 2018; Kosenius & Ollinainen, 2013). Also, the preference of citizens for a renewable energy source as an alternative to natural gas is researched (Michelsen & Madlener, 2016). However, aforementioned studies often fail to acknowledge the significance of external influences from the environment, when focussing on the choice of citizens for an alternative renewable energy source. For example, Cowell & Devine-Wright, (2018) reject the assumption that a situation that lacks of public participation is always problematic. They state that when a stable institutional context has to be made for a change that has to be implemented in society, a degree of closure during the designing process can be something positive. In other words, early studies are based on a concept in which citizens have an ultimate freedom to choose their own energy source, not taking into account the existing routines and relationships and governmental framework (Kollmuss & Agyman, 2002). Cowell & Devine-Wright (2018) emphasize that actors and their actions cannot be secluded in just one position or category. Also, the role of the public changed in the last years, researchers reinvestigated the role of the public. Ryghaug et al. (2018) express concern about the marginal amount of research done about the aspect of public support in energy transitions. To come to this statement Ryghaug et al. (2018) gathered multiple studies regarding the perspectives on the current role of the public. Thus, a more comprehensive study would include external factors related to the decision space of individuals (Kollmuss & Agyman, 2002; Ryghaug et al., 2018).

The research of Greene (2018) showed that an individual's action is strongly driven by context. Additionally, in the previous chapter it is argued that the context regarding an energy transition consists of the socio-technical system and political-institutional context. Furthermore, Kollmuss & Agyman (2002) determine two factors, internal and external, which can form a barrier to pro-environmental behaviour, for this study that is phasing out natural gas. The study of Kollmuss & Agyman (2002) focusses on the internal factors that form a barrier to pro-environmental behaviour, but recommends further research regarding the external factors. The external factors which they describe are infrastructural-, political-, social- and cultural- and economic factors all part of the socio-technical system and political-institutional context, so these can be used to further investigate the natural gas phase out (Kollmuss & Agyman, 2002; Ehnert et al., 2018). Moreover, they advise to further research the barriers that prevent sustainable action regarding external factors (Kollmuss & Agyman, 2002). All recommendations and found shortcomings in previous studies considered, this study will specifically focus on the external factors that affect homeowners who are also occupants of that house, the end user.

The current action from the national government in the Netherlands, regarding the transition away from natural gas, consists of encouraging people through communication or financial incentives. However, Verbong & Loorbach (2012) stated that this approach will only remove some barriers, so it is only effective with a certain group of end users, namely the front runners in the energy transition. Verbong & Loorbach (2012) expect that most citizens, who are indifferent towards the disconnection of natural gas, are not convinced unless there is a win-win situation created for these end users. From this perspective, they point out the call for regulation for sustainable policies but, recognize the obstacles to do so. Namely, in a democratic society, such as in the Netherlands, regulations need to be supported (by society and politics) to be implemented (Verbong & Loorbach, 2012). Ehnert et al. (2018) elaborates that the government does have a key role in the energy transition however, actors have to collaborate for a transition to be successful. Moreover, the principle of subsidiarity regarding government responsibility is relevant in this case. This principle assumes that, the government on the lowest level is the most responsive and has a large amount of power, in the Netherlands this is the municipality (Ehnert et al., 2018).

This research focusses on the local government and end user, but as Ehnert et al. (2018) argues it is relevant to take other actors in the socio-technical system in consideration. Moreover, because in recent years there are less dominant actors in the socio-technological system regarding energy transition, according to Verbong & Loorbach (2012). They explain, that the energy system turns into a hybrid system due to fluctuating output of some renewable energy sources (wind- and solar power). This means that the power for a household cannot be produced by one energy source. Thus, in contrast with the past, where there were a limited amount of producers that were companies and consumers that were the households, nowadays households can be both consumer and producer (Verbong & Loorbach, 2012). This transformation makes the socio-technical system more complex because of more actors that have a stake regarding energy and less dominant actors with a large amount of (hard) power (Verbong & Loorbach, 2012).

Furthermore, when a regime is destabilized all actors will be effected in some way. Thereupon, the composition of the stakeholders in the socio-technical system could change because of mergers or takeovers. On the contrary, a stakeholder that remains in the socio-technical system could change its role or strategy to adapt to the changing situation and hence secure their existence (Verbong & Loorbach, 2012). How actors can influence other actors and elements of the socio-technical system is dependent on their amount of power. In this research the definition of power by Nye (2009) is used (Verbong & Loorbach, 2012; Nye, 2009). Nye (2009) has provided a definition of power, namely the ability to affect the behaviour of others to get what one wants. Specifically, Nye (2009) divided the definition of power in two categories. First, soft power which is the power to get other people to share your ideas and vision. Second, hard power is the use of coercion (Nye, 2009; Ehnert et al., 2018). Hard power is, more than soft power, linked to the established regulations of the political system (Ehnert et al., 2018). However, Ehnert et al. (2018) argue that the power of actors are interdependent of the context of the situation.

With the socio-technical system in mind the focus is now on the relationship of the local government and the end user. The research of Cowell & Devine-Wright (2018) focusses on the participation dilemma of policy versus public engagement regarding energy infrastructure. They point out the diversity in this challenge considering the wide variety of consequences of implementing different (renewable) energy sources. Cowell & Devine-Wright (2018) state that all actors linked to energy transitions struggle with how to shape the transition to alternative energy sources. Since there is no standard for how to deal with these dilemmas, every actor attaches their own weight to the dimensions relevant to their project (Cowell & Devine-Wright, 2018). Moreover, Cowell & Devine-Wright (2018) found that actions from governments are often perceived as inconsistent. They uncovered the reason to be, a tension between goal delivery in an unique situation versus legitimacy

to the end user. Moreover, Cowell & Devine-Wright (2018) suggest that actions of the government are based on the perceived effect on the public, in this case the end user, which is always different as argued before. Thus, previous research has not come to a consensus for an ideal approach for getting end users off natural gas, but the subject of encouraging people to pro-environmental behaviour is excessively researched.

As an illustration, the functions of the city as an actor in the socio-technical system regarding energy transitions will be described based on Dowling et al. (2018). Firstly, the city as intermediaries enacting municipal experimentation and institutional innovation. Secondly, as sites for pro-environment civic action. Thirdly, as nodes of transnational network connections, and last as sites for the fluid formation of cross-sectoral and multiscalar alliances (e.g. across political institutions, NGOs, global consulting, construction and utility firms)(Dowling et al., 2018). Dowling et al. (2018) emphasize on the paradox of the cities place in the energy network. Which is, the city has a crucial role in shaping the energy transition, but is dependent on multiscalar policy orchestration (Dowling et al., 2018; Ehnert et al., 2018). However, local governments do have the capacity to disrupt existing energy infrastructures and to facilitate new energy technologies (Dowling et al., 2018). They use a multi-level perspective analysis to research the city, this is fitting because the governance of energy networks is a multiscalar actor network. In case of the natural gas phase-out the municipality is even more important as they have been given the obligation to execute national energy goals. Thus, the transition is legally set and thus forced, instead of a transition that gradually reaches an unknown goal from a bottom up initiative as is the focal point in technology focussed socio-technical research.

In summary, the relevance of support from society for the success of sustainable projects and thus the energy transition, has been shown in this literature review. Accordingly, it is recommended to do a more comprehensive study that includes external factors related to the decision space of citizens. Additionally, it is proven that an individual's action is strongly driven by context. The context is conceptualized by the socio-technical system as described in the previous chapter. In recent years, the socio-technical system regarding energy, consists of more actors and less dominant ones due to a hybrid system. The literature review stated that the city has a crucial role in shaping the energy transition, but is dependent on multiscalar policy orchestration. Moreover, the scientific literature indicates a call for regulation for sustainable policies despite of the obstacles (societal- and political support). Important to keep in mind with this recommendation the power of actors is interdependent of the context of the situation. Besides the necessity of public support for succeeding in sustainable projects, specifically in the democratic society of the Netherlands the power of the government is dependent on the support of their inhabitants.

3 Methodology

For conducting explorative research, qualitative methods are a recommended method ('t Hart, Boeije & Hox, 2009). Input for this research comes from different data sources. Namely, scientific literature, experts from the field and from existing data (secondary data), namely; laws of The Netherlands and policy document on collaboration regarding sustainability. The research will be executed in the Netherlands in a timeframe of one year around 2019. In this period of time the current energy transition towards a system of renewable energy sources is developing in the Netherlands. In 2019 a concept version of the 'regionale energiestrategie' [regional energy strategy] should be formed by municipalities, and at the end of 2019 the definitive documents should be published. These strategies will have a substantial influence on how the energy transition of the Netherlands will be formed. These document compel the current distribution of energy sources and the plans for the distribution of renewable energy sources in the future. Therefore, the research is conducted in this period of time while the goal of the energy transition is legally set but, the process is not yet developed. This period, in which all actors are still experimenting and are open to sharing knowledge and experiences is positive for the availability of data (Schot et al., 2016). A possible disadvantage to be expected in this period is, that there are only a limited amount of projects realized to analyse since the natural gas phase-out is a new phenomenon in the Netherlands.

3.1 Case studies

Bryman (2016, p. 60) describes a case study as: *'the detailed and intensive analysis of a single case'*. For this study, four municipalities are investigated and their processes regarding the natural gas phase out are compared, so this research can be defined as a multiple-case study with a comparative design. In this research a case consists of a municipality, a community confined by the territory they are vested on and the authority that controls this territory. In other words, for this research the cases are the territory over which the municipality has the authority. The case study used in this research has an idiographic approach, this means that the unique features of the case are revealed. For this research that connects to the first sub question 'How does the local government view the process of the natural gas phase-out in their municipality regarding the role of the end user?'. Thus, an idiographic approach is fitting because in order to develop an answer to this question it is necessary to gain a detailed picture of the process of every individual case, municipality. (Bryman, 2016).

As aforementioned, for this research, four cases were selected. Namely the following municipalities Gooise Meren, Stichtse Vecht, Huizen and Almere. The cases were selected by means of the snowball method. During and after the interviews the respondents gave advice to interview other municipalities that were further along with the natural gas phase-out in their municipality. In addition, during the research the respondents indicated that it is relevant to take into account the regional scale. Two of the municipalities (Huizen and Gooise Meren) are part of the joint venture the 'Gooi en Vechtstreek' which operates on the regional scale. This scale was mentioned several times during the interviews and seemed to influence the way the municipality shapes the process of the natural gas phase-out. The reason is the *regional energy strategy* that has to be made in collaboration with multiple municipalities. To include this in the research one region is interviewed and their policy documents were investigated to uncover how their relationship is, regarding municipalities and the end user. This subject is part of the first sub question and so it seemed relevant to gain the perspective of the region regarding the cooperation with the municipality. However, the respondents at the region pointed out that the connection to the end user is nihil and not direct, therefore they advised not to investigate this further because they expect it to be of little value to the research. Based on this revelation the scale of the region is not further analysed as it was assessed to be of little contribution to this research.

3.2 Theoretical framework

This research uses the energy transition theory as is seen in the diagram of Schot et al. (2016) “user roles and transition dynamics” Figure 1 and the concept of power by Nye (2009).

First of all, it is argued in the literature review why the energy transition theory is applicable to this research. Bosman et al. (2018) states the importance of the further examination of the function of socio-technical regimes. Schot et al. (2016) emphasize the active role of the end user in the energy transition and elaborate that the end users’ decisions are largely configured by shared routines embedded in socio-technical systems. Schot et al. (2016) describe the role of the end user and in what way they influence an energy transition. To do this, they set the framework of an energy transition and the role of other actors in this dynamic. In addition, the socio-technical system describes multiple functions of end users in the energy transition (Schot et al., 2016). The socio-technical system has three analytical levels, the niche, socio-technical regime and socio-technical landscape (Schot et al. 2016; Geels, 2011). Geels (2011) argues that the regime level is of primary interest because the other levels are defined in relation to the regime. In the gas phase-out there is predominantly made use of mature technology that have already proved to be effective, so the niche level is not of relevance in this research (Schot et al., 2016; Geels, 2011). Moreover, the socio-technical regime is also the primary focus of this research. The reason being, in the regime the rules and action of actors have mutual impact and this research focusses on the government who makes the rules, as in laws, and the actor that reacts is in this research the end user (Geels, 2011). As argued in the literature review, the socio-technical regime cannot be investigated on its own but has to be seen in relationship to the wider socio-technical system. For this reason the socio-technical system is used as a guideline for this thesis. The socio-technical system is divided in three dimensions, as is argued in the literature review by Verbong & Geels (2007), and based on these the current socio-technical system in the natural gas phase out in the Netherlands will be investigated.

The first dimension is, the network of actors and social groups. This first category will be investigated by the use of personal interviews with employees of the municipalities and the end user, based on the literature review. The process will be further described later in this chapter at the data analysis section and the results of the interviews are in chapter 4. The second dimension is the rules that guide the activities of actors. For the purpose of analysis all relevant policy documents are investigated. Publications were only included in the analysis if they described, even partially, the process of the natural gas phase out in relationship to the end user. The first step in the analysis was to gather all policy documents regarding sustainability of one case, a municipality. Then, the documents were narrowed to only the documents regarding the elimination of natural gas. Once the relevant documents were extracted the focus was on the process described to eliminate natural gas from the municipality. Thereafter, roles of the municipality and end user in this process was researched based on the concept of ‘power’ by Nye (2009). The sub-sections of the policy analysis conclude with stating the role of the end user according to the municipality and the sort of power of each actor in relationship to the other. Further data collection proved to be required during the interviews because the rules and laws on the regional- and national had a direct effect on the process on the local level and power of the local government. Also, the transition described in Figure 1 originates from a technical innovation whereas the gas phase-out originates from legal regulations set by the state. For the two aforementioned reasons, the national policy is further investigated for the purpose of specifically describe the requirements that the national government imposes to the local level. Also, the regional level is investigated similarly to the national level to determine if there is an effect regarding the obligations of the region to the local level and the end user, and if so what that effect is. The third and last dimension is the material- and technical element. To establish what the material- and technical implications to an existing house are, in the natural gas phase out, three mature techniques used as alternatives for natural gas are described. It is not of added value to

describe more techniques because of the relatively low amount of implementation and high number other techniques.

3.3 Interviews

The respondents to the interviews are stakeholders in the Dutch natural gas phase-out, namely representatives of the end user and governmental employees with a close connection to shaping the process of the natural gas phase-out in the local government of Huizen, Almere, Gooise Meren and Stichtse Vecht and the regional Gooi en Vechtstreek. In the appendix an elaborate description of the respondents is included. The public actors are in service of the Dutch government and the other respondents have a direct link to the end user. A precondition is that the respondent has to have influence in the decision making process regarding an alternative for natural gas or has close relations with different stakeholders in the socio-technical system. The respondents have no obligation to contribute to this research, therefore the research is dependent on the willingness of people to participate in this research. The snow-ball method will be used to gather respondents ('t Hart et al., 2009). Contact to the first respondent was established through contacts at the internship (Aveco de Bondt). This respondent provided contact information for getting into contact with other respondents that could contribute to the research. Eventually, the respondents consist of four respondents employed by municipalities, two end users with a close connection to the municipality involved in the process of the natural gas phase-out and two respondents working at the regional government.

Thus, the interviews used in this research are qualitative semi-structured interviews. These interviews are the primary source of empirical data. In the interviews the goal was to obtain as much information as possible about the relationship of the municipality and end user regarding the natural gas phase-out in the Netherlands.

3.4 Types of data

To answer the questions, primary and secondary data will be used. Secondary data will provide a scientific- and societal background to be able to put the problem stated in this research in a wider scientific debate. The primary data will be used to untangle the complex relationships and dependencies of multiple actors on different governmental levels. The research has elements of both a inductive and deductive approaches. The research is inductive because, the analysis of the transcripts searches for meanings and interpretations. This data is investigated for relevant themes therefore the research is inductive. However, scientific knowledge is consulted by forehand to uncover the gaps in the literature regarding energy transitions and therefore the research is also deductive. This scientific literature is also used to improve the searching strategy and enhance perception ('t Hart et al., 2009).

Primary data

For the empirical part of this research, primary data is gathered by means of qualitative methods, interviews. The advantage of collecting primary data is, the questions asked in the interviews are specified to the aim of this specific research. Also, the researcher knows what the conditions were in which the interview is undertaken ('t Hart et al., 2009). After exploring secondary data, research questions can be composed based on the literature review for (semi-)structured interviews. Qualitative research methods are applicable for this research for the following reasons, a) it focusses on the meaning of words rather than the outcome of numbers as in quantitative research, which is relevant for uncovering relationships, b) it focusses on contextual understanding which is relevant because of the socio-technical system the subjects are part of. Thus, qualitative methods are used to acquire new insights and to uncover new relationships which fits the purpose of this research as it

tries to investigate a relationship between two groups of actors namely, end users and the local government ('t Hart et al., 2009; Bryman, 2016). The research units or respondents in this research are employees of the municipality with a close connection to shaping the process of the natural gas phase-out in the local government and leaders of citizen initiatives. These respondents will be questioned in-person in one-on-one interviews guided by the guideline which is added in the appendix (in Dutch and English). Interviews are used to uncover and unravel the intertwined relationship and dynamic between the municipality and the end users regarding the phase-out of natural gas ('t Hart et al., 2009). A condition to successfully extract data at interviews is to have it clear what information wants to be gained by conducting that interview, for this reason the literature review is developed.

After conducting the interviews these were transcribed. The transcriptions and recordings will stay in possession of the researcher and handled with confidentiality. Next, the transcriptions will be coded by using the software NVIVO. The codes will be derived from the scientific literature review and will contain the main theme of the text selected in the appendix the coding scheme is incorporated. After generally coding the next step will be 'axial coding'. Additionally, a code can be part of multiple axial codes. The data and categories are based of the literature review that was composed from existing research and theories. This knowledge will place the new data into perspective and improve the searching strategy because of contextual knowledge ('t Hart et al., 2009). The data will be examined to uncover the patterns and relationships based on the codes derived from the literature review.

The categories for coding are based on the main subjects of the literature review. The categories will contain the following subjects (1) the pressure for starting with the process of natural gas phase-out, (2) the power dynamics between actors (hard- and soft power), (3) the prediction if the natural gas phase-out is relevant within the current circumstances, (4) if the local government has a key role in the natural gas phase-out, (5) how important the collaboration and participation of actors is. Axial coding means that codes that have a common characteristic will be joined to an overall code. Another point, more codes are used but when the data was processed these codes made no contribution to developing an answer to the sub question.

Secondary data

The secondary data used in this research will consist of scientific literature and policy documents. In short, the scientific literature will be used to gain a substantiated perspective on the research problem, as is stated in the introduction namely, an energy transition as a socio-technical system that is in a transition. First, the national policy regarding the natural gas phase-out has been investigated to provide context about the obligation towards the local government. Furthermore, policy documents belonging to the cases will be investigated, the municipal policy documents. These policy documents contain information regarding the vision of the municipality towards sustainability. In particular the vision of the municipality to execute the natural gas phase-out regarding the role of the end user. Also, the regional and national policies are included. In the following chapter it will be explained how these documents are analysed.

3.5 Data analysis

Policy documents are the most definitive source of information to be compared for how much the municipalities included the phase-out of natural gas in their policies. The purpose of the policy document analysis is twofold. Firstly, the policy document analysis is used in order to assess to what extend municipalities have a definitive process planned regarding the natural gas phase-out. Secondly, the policy document analysis is used to uncover, based on the concept of Nye (2009) of hard- and soft power, the power of the government. Thirdly, the policy document analysis will describe what role the governments views for themselves and for the end user. In addition, since the

policies developed on a national level have a significant influence on the regional and local level, also the regional and national policy is included in the document analysis.

Three mature alternatives for natural gas will be described to establish what the material- and technical implications are when implementing an alternative for natural gas. The purpose of this description is to gain knowledge about the material implications that have to be made to the home of the end user when an alternative for natural gas is installed. Also, to gain knowledge of what alternatives can be used for individual and multiple homes.

The analysis of the data of the interviews will be done in order of the two sub questions. Analysing the data will be done based on the information gathered in the literature review. The first sub question is: How does the local government view the process of the natural gas phase-out in their municipality regarding the role of the end user? In order to assess how a municipality views the role of the end user, first the process of the municipality must be clear. The interviews will be analysed to determine how far along the municipalities are in the process of the energy transition. In order to make a transformation pressure is required, as is stated in the literature review. Thus, first the pressure for a municipality to start the process will be defined. Then, the goal of the energy transition will be discussed. The question that rises is if all actors share the same vision for the future within the current circumstances. Next the process so far of the municipality is discussed. Within this discussion the focus is on the relationship of the government and the end user. Simultaneously, the published policy documents of the municipalities will be discussed to confirm what plans are definitive and how the municipality plans to continue the process of eliminating natural gas.

The second sub question is: How do the local government and the end user constrain and enable each other in the phase-out of natural gas? This question is about enabling and constraining of two actors in the socio-technical system regarding energy transitions. To conceptualize this question the concept of power of (Nye, 2009) and the categorisation of the socio-technical system by Verbong & Geels (2007) will be used. To enable or constrain another actor, power is necessary, Nye (2009) divided power in hard- and soft power and this division will be used to structure the results. However, Ehnert et al. (2018) argued that the power of actors is not independent, but interdependent of the context of the situation. Therefore, not only the policy documentation of the municipalities is described but also the relevant regional and national policy documentation to understand how the higher governments limit or enable the local government. Also, local governments each create their own institutional-political context therefore different cases, municipalities, are investigated. In other words, the purpose of uncovering the similarities and differences in the relationship between the municipality and end user in different institutional-political contexts. Furthermore, it is argued in the literature review that an individual's action is strongly driven by context (Greene, 2018). The context of this research is conceptualized based on the socio-technical system regarding energy transitions. To further specify this concept, the structure of the results will be based on the categorisation of the socio- technical system described by Verbong & Geels (2007). The socio-technical system consists of three elements according to Verbong & Geels (2007), namely (1) the network of actors and social groups, (2) rules that guide the activities of actors and (3) material- and technical elements. Thus, the power of the municipality and end user regarding these elements will be described.

3.6 Research ethics

Replication

The replication of a research concerns the question if it is possible for others to replicate the findings (Bryman, 2016). First thing to notice is, that because of the qualitative nature of the research, a second attempt of carrying out the research will not give the same results. In qualitative studies,

there are multiple issues when attempting to perform the same research. Firstly, because there is a high possibility that the respondents will answer the same question differently since they have been asked these questions before. Secondly, the research will be conducted later in time than the first occasion and therefore will have different results (Bryman, 2016). In a second interview later in time the respondents will have gained more information and have more experiences. Therefore, the respondents will be able to answer more questions, however they could answer them differently since the process of the natural gas phase-out in the Netherlands will have developed.

Reliability

The reliability of a research concerns the question of whether or not the results are trustworthy (Bryman, 2016). In qualitative research interviews are mostly used as a method to gather primary data. The weakness of this method is that it is difficult to replicate, for multiple reasons. Firstly, because the researcher has to be flexible in an interview, the researcher should follow up on relevant subjects when these are mentioned by the respondent. Secondly, because an interview is most likely to achieve the best result if there is a pleasant 'flow' in the conversation. To keep the flow in an interview it may be necessary to shift the order of the questions. Thirdly, occasionally after the audio-recording device is turned off the respondents tend to elaborate on the subjects treated in the interviews (Bryman, 2016). To ensure the reliability in this research all questions for the interviews are written fully instead of a topic list, this is to be sure that the subjects are addressed in the right context. During the interviews it was necessary to switch the order of the questions to keep the flow of the conversation, as was expected. The questions asked, are based on the literature review to obtain results that are coherent with the research and will form a logical sequel to answer the main and sub questions. For the purpose of reliability, an attempt has been made to make the research replicable by means of the methodology chapter.

Validity

The validity of a research concerns the integrity of the conclusions generated. For this research only the external validity is relevant to discuss, because the internal validity concerns whether a conclusion incorporates a causal relationship. The external validity of a (multiple-)case study design is minimal in terms of the generalisation beyond the specific territory, this is also correct for this research because these cases are not an accurate representation of all the municipalities in the Netherlands. However, theoretical generalisation is present, because the research will investigate gaps in the scientific literature regarding energy transition. The theory concerns energy transitions and is further investigated by means of a unique case namely, the natural gas phase out in the Netherlands. This research will investigate based on an 'extreme or unique case' on the scale of the Netherlands as is stated in the introduction (Bryman, 2016).

4 Results

The main instruments for the government to influence the physical environment is rules and laws. These instruments are 'hard power' because they have the power to coerce people to do something (or not) (Nye, 2009; Ehnert et al., 2018). In the Paris Agreement most members of the UNFCCC have recognized that global warming must not exceed pre-industrial global average temperature by more than 1.5 degrees. In addition, the emission of greenhouse gases must decline to be consistent with the goal of limiting global warming (Paris Agreement, 2015). Thus, the goal is set, but what hard- and soft power does the government possess to achieve the goals described in the Paris Agreement? The national government of the Netherlands does not have the hard power to coerce the end user to eliminate natural gas at this moment in time (Rijksoverheid.nl, 2019).

4.1 Document analysis of the National policy

The Design of the Paris Agreement stated that the government has to create broad public support for sustainable action, however there are no specific requirements or guidelines for how to create public support. The main philosophy behind this approach is to get everybody involved in the process of improving sustainability and the fair distribution of benefit and burdens while implementing it (Paris Agreement, 2015)

Thus far, there is no law to coerce occupants to eliminate natural gas in their house, so they have to be convinced to invest in a house free of natural gas. In other words, because the legal "setting" of the energy agenda faces limits to the amount of hard power governments get. The way to convince people to phase-out natural gas is written down nationwide in the 'Ontwerp van het Klimaatakkoord' [Design of the Paris Agreement]. This document has been compiled by the Dutch government to translate the goals derived from the Paris agreement for the Netherlands. The commitment that comes with his document consists of a range of agreements, measures and instruments to reduce the CO₂ emission by 49 percent by 2030 compared to 1990. The parties that can commit to this document consist of; the Dutch government, social organisations, unions and the business community. The document will be binding after official signing, which is expected to be after the final assessment of the PBL (Planbureau voor de Leefomgeving [Netherlands Environmental Assessment Agency]) and CPB (Centraal Planbureau [Bureau for Economic Policy Analysis]), the respondent of the Cabinet and debate of the Lower House (Klimaatberaad, 2018).

The Design of the Climate Agreement (Klimaatberaad, 2018) underlines the objective of this thesis. It states: *"But especially if we realise that the biggest challenge of this renovation is not a technical, financial or administrative challenge, but a social challenge. It is about people"* (Klimaatberaad, 2018, p. 21, own translation). In addition, this statement is further underlined in the Design of the Paris Agreement, namely that it is crucial to have broad social support. Namely, the transition is a joint challenge of citizens, companies, government, societal organizations and science. Thus, a condition for tackling this challenge, the energy transition, is a connection through the entire energy system. This involves commitment from every party for: executing agreements, compose (mutual) ambitions and agreements and achievign of the goal of the Paris agreement (Klimaatberaad, 2018; Paris Agreement, 2015).

One of the approaches chosen by the Dutch government is to get existing houses off natural gas neighbourhood by neighbourhood. The Dutch government believes that the scale of neighbourhoods is optimal for the municipality to get a connection with the residents, which they believe are crucial for the success of the natural gas phase out. To execute this approach the government believes that the municipalities have a crucial role in the success of the energy transition. Moreover, projects are introduced to increase knowledge gathering regarding elimination of natural gas in the

neighbourhood. These projects are nationally funded, because the aim is to gain more knowledge to benefit the successful upscaling of the energy transition measures (Klimaatberaad, 2018).

The national government is planning to introduce measures and standards and expects these to help the natural gas phase-out develop fluently. The standards are a net demand for heating and standard for isolation based on a price versus profit consideration per type of residence. These standards will be developed with the expectation of implementing an optimal heat source in all houses in a neighbourhood which has similar residences in the future. The standards will provide the base of further (subsidy) programme(s) e.g. distribution of subsidy and provide perspective to house owners who want to take action. This means that actions that can be done now, without it being negated by future measures. For example, an insufficient isolation for the alternative heat source that can be efficiently implemented in the entire neighbourhood. The aforementioned standards and measures that the government wants to introduce are based on the construction of buildings and technical possibility in combination with financial feasibility (Klimaatberaad, 2018).

Eventhough, the national government has provided a document which describes the implementation of the Climate Agreement, it is stressed that this is not a blueprint planning. Additionally, the Dutch government wants to be flexible to respond to technical innovations and with that, changing costs and understandings. With the expectation of innovations regarding sustainable heating systems the government foresees more variety and with that, more complexity in the energy system of the future (Klimaatberaad, 2018).

In conclusion, within the current circumstances the Dutch government does not have the hard power to coerce the end users to implement an alternative for natural gas in their houses. The role the national government perceives for itself is to develop and gather information on a national scale to then distribute for the purpose of supporting lower governments to execute the natural gas phase out. The national policy describes the role of the municipality to get a connection with their inhabitants and convince them to get off natural gas, so the municipality then only uses soft power.

4.2 Document analysis of the region Gooi en Vechtstreek

The region scale is a scale between provinces and municipality. The national government stated that this layer will be based on collaborations between parties that are most effective in reaching the common objective. Additionally, regions have the obligation to produce a concept version of the 'regionale energiestrategie' [regional energy strategy] and at the end of 2019 the definitive documents should be definitive. These document compel the current distribution of energy sources and the plans for the distribution of renewable energy sources in the future.

The region *Gooi en Vechtstreek* is a partnership between the municipalities of Blaricum, Eemnes, Gooise Meren, Hilversum, Huizen, Laren, Weesp and Wijdemeren. This partnership aims to complete tasks together if, it is of added value to perform these tasks at a regional level over a local level. The slogan the region illustrates accurately the philosophy from which the region works namely: "voor inwoners, met gemeenten" [for residents, with municipalities] (regio.vn.nl, 2019a).

One of the main topics that is discussed in the regional partnership is the energy transition. The obligation of the region is to develop an 'uitvoeringsprogramma voor de regionale Energiestrategie' [implementation program for the Regional Energy strategy] (regio.vn.nl, 2019a) The base of this document is the 'Regionale Energiestrategie Gooi en Vechtstreek' [Regional Energy strategy Gooi en Vechtstreek], this document is published on the 14th of November 2017. An agreement has been made between residents, grid operator, water board, municipality and housing corporations to take responsibility for the energy transition in the regional area of the 'Gooi en Vechtstreek'. How the region plans to shape the energy transition is displayed in textbox 1 (Regionale Energiestrategie Gooi en Vechtstreek, 2017).

Textbox 1: Process & planning of the energy transition of *Gooi en Vechtstreek*.

The implementation program for the Regional Energy strategy is currently prepared. The base for this document is the 'Regional Energy strategy Gooi en Vechtstreek' of 24th November 2017. We start with 5 program lines in the implementation program:

- Gain experience in the region with a neighbourhood approach, getting started with opportunities together with our partners.
- Make a regional heat- and energy opportunity map (available sources, energy demand, neighbourhood characteristics, linking of infrastructural opportunities).
- Facilitate private home owners (savings, financing constructions, sustainable energy)
- Develop a regional policy framework (principles and heat vision) for heat plans on a neighbourhood level.
- Collaboration (supra)regional/knowledge exchange.

Source: Regio.vn.nl, 2019b. Own translation.

In the energy strategy of Gooi en Vechtstreek the end user is defined as a key factor to succeed in the energy transition because the consequences, the change of a heating system, intervene in private property. The document emphasizes that the first point of contact for residents will still be the municipality. However, citizens that unite in an energy corporation can be a stakeholder with a direct connection to the region (Regionale Energiestrategie Gooi en Vechtstreek, 2017). An energy corporation can be compiled in a variety of ways, for example as a collaboration between citizens and a supplier of solar panels or a collaboration of citizens that started an isolation business focussed on their municipality.

Thus, the region will have a supporting role to the municipality, the region will aim to make a contribution to the natural gas phase-out by gaining and sharing knowledge and data. The region has the hard power to distribute energy (sources) among municipalities, but only in collaboration with the member counsels. The region expects input from the municipalities and conversely the

municipality expects information based on the collected experiences from the region. The region only has a direct link to the end user when the end users gather in a corporation and thus the regional level will not be further investigated as this is not inside the scope of this research.

4.3 Policy document analysis per Municipality

The following chapter will go further into detail about the cases investigated in this research. Four municipalities will be described, namely Stichtse Vecht, Gooise Meren, Huizen and Almere. At first, a brief description of the municipality and their sustainable energy goals will be provided. Then, if present, a description of the investigated citizen initiative will be provided. Last, the focus will be on the specific subject of the natural gas phase-out regarding the end user. The policy document analysis will be used to assess to what extent municipalities have a definitive process planned for the natural gas phase-out specifically focussed on the end user. Also, the soft power of the municipality in relationship to other actors will be described. The hard power of the municipalities is already established in the policy document analysis of the national policy, namely that the government cannot intervene in houses of individual house owners without their permission.

Stichtse Vecht

The municipality of Stichtse Vecht has 64.372 inhabitants (allecijfers.nl, 2019). The goal of the municipality Stichtse Vecht is to have a climate-neutral energy balance in 2030. However, there are no documents published (yet) that specify the interventions that the local government has to carry out to achieve a climate-neutral municipality regarding the elimination of natural gas.

The following policy documents concern sustainability in the municipality of Stichtse Vecht. However, in all this document the term 'natural gas' is only mentioned once. In 2013 the document 'Stichtse Vecht Energiek 2014-2020' has been produced and established by the city councils. In June 2016 the document was updated to 'programma Duurzaamheid Gemeente Stichtse Vecht 2016-2018' [program sustainability municipality Stichtse Vecht 2016-2018]. In August of 2017 this document was evaluated to identify what got implemented and where there is room for improvement. Next, the 'Woonvisie 2017-2022' (2016) [Housing vision document 2017-2022], this document does not mention anything regarding getting houses off natural gas. There is however, a focus on getting houses NOM (nul-op-de-meter) [energy-neutral housing].

In aforementioned documents the term 'natural gas' is mentioned once, in the evaluation of August 2017 of the sustainability program (eerste Monitor Programma Duurzaamheid Stichtse Vecht, 2017). In the evaluation document it is mentioned that the municipality of Stichtse Vecht joined the regional partnership. This partnership, named 'U-Thuis', initiates multiple pilot projects regarding the eliminating of natural gas. The municipality of Stichtse Vecht can use the information that will be produced in the pilots, in its advantage. However, how and by whom this information will be processed and used, is not further specified. Together these results indicate that the municipality of Stichtse Vecht has no definitive approach to phase-out natural gas. Thus, the municipality has no role envisioned for both themselves and the end user, consequently the power distribution is not clear.

Gooise Meren

The municipality of Gooise Meren has 56.696 inhabitants (allecijfers.nl, 2019). The goal of the municipality Gooise Meren is to be free of natural gas in 2050 (Municipality of Gooise Meren, 2018). The municipality has selected a special division to sustainability namely: 'samen-sneller-duurzaam' [together faster sustainable]. This is a collective of citizens, entrepreneurs, organizations and the local government to start a movement to gather local knowledge, skills and instruments. For this research the workgroup 'all buildings fossil free 2030' is especially of interest. In the action plan of samen-sneller-duurzaam a pilot free of natural gas is an action point. However, there is no specific plan present regarding the natural gas phase-out for how to reach the goal of 2030, neither is there an argument for why they want to deviate from the national goal of 2050. The goal is set and multiple action points are identified but without a planning or distribution of instruments or responsibilities (samen-sneller-duurzaam.nl, 2019). The division of 'samen-sneller-duurzaam' does

not have any hard power within the municipality, however they are a group with a close connection to the civil servants.

The neighbourhood platform of 'RemCom' is created by citizens' from two neighbourhoods (Rembrandtpark & Componistenkwartier). RemCom strives to create a more beautiful, (socially) safe and sustainable neighbourhood together. A subsection of RemCom is 'Sustainable RemCom', this neighbourhood team is committed to improve the sustainability of the neighbourhood. The campaign of Sustainable RemCom is in anticipation of the Warmtevisie [Heat vision]. In the Heat vision the municipality of Gooise Meren, the local government will identify how and when they will eliminate natural gas on their territory. Until the document of the municipality is published sustainable RemCom tries to create awareness in energy consumption, thus inform about ways to reduce energy consumption (remcom.nl, 2019).

The neighbourhood team of sustainable RemCom organised a kick-off meeting for the inhabitants of the municipality of Gooise Meren of the sustainability campaign on 24 September 2018. Invited to the kick-off were occupants of Rembrandtpark and Componistenkwartier, councillor Barbara Boudewijnse (portfolio of sustainability) and partners (companies) in sustainability 'Duurzaam Bouwloket' and 'Greenhome'. The goal of the campaign is to enhance awareness, commitment and willingness to sustainable action. In the kick-off meeting five housing types that are representative for the neighbourhoods were scanned for possible isolation- and energy production measures and a plan is presented for a joint purchasing of isolation for multiple houses in the neighbourhood for RemCom (Bewonersbrief, 2018a; Bewonersbrief, 2018b).

In October 2018 the neighbourhood team of Sustainable RemCom published the concept action plan 'Duurzaam RemCom'. This plan describes the goal of sustainable RemCom and how to get there, including the resources required. The financial resources are planned to be derived from local, regional or national subsidies or sponsoring. Regarding communication, the team uses communication instruments like flyers, organise residents meetings and make use of digital information channels operated by neighbourhood platform RemCom and 'samen-snel-duurzaam' (plan van aanpak 'Duurzaam RemCom' 2018-2020, 2018).

The stakeholders listed in the action plan 'Duurzaam RemCom' are the following. Firstly, the municipality of Gooise Meren. According to the neighbourhood platform, most of the action will have to come from inhabitants of the municipality because the current planning of the municipality is insufficient to reach the goal of phasing out natural gas by 2050. The municipality could help with financial support for executing the actions of RemCom and hiring external skills and knowledge. Additionally, it is written that there is a need for external parties, because of the need for professional detailed expertise regarding the process or technical knowledge implementing alternatives for natural gas. The platform preferably works with actors who live in Rembrandtpark, Componistenkwartier or Gooise Meren, otherwise at least in close proximity of the neighbourhoods or municipality (plan van aanpak 'Duurzaam RemCom' 2018-2020, 2018). There are multiple reasons for this preference for proximity of external parties. Firstly, a longer distance equals more overall emissions because there is a bigger changes of using a motorised vehicle. Secondly, when travel costs are included it will be more expensive to hire a party further away. Thirdly, a party within or close by RemCom has a high probability to have some knowledge and binding with the area. Currently, two companies are involved 'Greenhome' and 'Duurzaam bouwloket'. Greenhome is involved for their technical knowledge of implementing alternatives for natural gas and Duurzaam bouwloket is involved for their expertise about shaping the process of the phase-out (plan van aanpak 'Duurzaam RemCom' 2018-2020, 2018). These companies are invited to resident meetings to inform house owners about the technical possibilities and to fluently guide the process of the natural gas phase-out.

In conclusion, the municipality of Gooise Meren has two groups of residents constituted to organize action regarding the natural gas phase-out. However, only one group of end users has concrete plans which have already occurred. This group has the hard power to make decisions regarding local activities to inform about alternatives for natural gas. Conversely, the municipality is aware of their obligation to execute the natural gas phase-out but, yet have to develop plans regarding the process of phasing out natural gas their role and that of citizens.

Huizen

The municipality of Huizen has 41.280 inhabitants (allecijfers.nl, 2019). The goal of the municipality of Huizen is to be free of natural gas and climate neutral in 2050. To further this objective the city council agreed to strive for a more sustainable municipality, by first creating a policy document. This resulted in the policy document 'Huizen klimaatneutraal 2050' [Huizen climate neutral 2050] (Municipality of Huizen, 2015). In this document the current situation and vision for the desired actions and goals, with the required instruments and expected costs is described.

The policy document 'Programma milieu'[Program milieu], is created to be a logical extension of Huizen klimaatneutraal 2050 (Municipality of Huizen, 2015). In both aforementioned documents, the municipality based the objective on six themes. In four out of six themes the elimination of natural gas is included, what this means is further described in the next paragraph. In the interim report a reflection has been provided on the actions that occurred in 2018 and a preview is provided for the planning of 2019 (Derde tussenrapportage Milieuprogramma 2016-2020, 2018). The next section will describe the results of this report.

In the context of 'Huizen klimaatneutraal 2050' the municipality set up a campaign in 2015 to encourage sustainability among the citizens. In November of 2018 a specific 'Huizen aardgasvrij' [Huizen free of natural gas] campaign has been launched. The objective of the 'Huizen aardgasvrij' campaign is to create awareness and involvement among citizens regarding the process to eliminate natural gas in the build environment of the municipality. The result of the campaign is that multiple citizens have shown interest into contributing in shaping the energy transition in Huizen. These citizens agreed to provide input about how the energy transition is shaped best, how to it is planned in 2019 . The municipality is planning in 2019 to engage into discussions with the citizens on how this can best take shape. Currently, two neighbourhoods are chosen as a pilot to strive to make a 'roadmap' of the process to be free of natural gas the best way possible. On 11 December 2018 and 14 January 2019 the municipality organised citizen meetings, but no concrete actions are registered derived from this meeting (yet) (Municipality of Huizen, 2019).

In conclusion, the municipality of Huizen has made a start with participation with the citizens without having a approach or planning by forehand, so the municipality uses no hard power. Thus, the role of both the citizens and the municipality is not yet defined. Some citizens have indicated to have an interest in bringing the municipality further with a planning by providing a citizens perspective. However, how this collaboration will be shaped still has to be determined, this also will be done in collaboration with these citizens. A power distribution will be planned in collaboration with the citizens but is not yet present.

Almere

The municipality of Almere has 207.819 inhabitants (allecijfers.nl, 2019). The municipality of Almere aims to be 'energy neutral'. This is further specified as, the energy that the municipality of Almere consumes is produced from renewable energy sources (Municipality of Almere, 2018). The *warmtevisie* [heat vision] of Almere has been published on 10 July in 2017. The heat vision contains a phased plan until the horizon of 2022. The aim is to reduce more than 30% of the emission of

greenhouse gases in comparison with 2016. In the approach the stakeholders and their roles are described and the actions the municipality plans to execute (Warmtevisie Gemeente Almere, 2017).

Textbox 2: six tasks of the municipality regarding the gas phase-out before the alternative for natural gas is defined.

1. Sustainable generation of energy. In particular large-scale solar and wind projects.
2. Natural gas-free neighbourhoods. In which residents have a choice for connecting to the heating grid or all-electric.
3. Making the heating grid more sustainable by the use of sustainable heat sources such as residual heat from data centres or geothermal heat.
4. Reducing energy demand. Using energy-saving measures for residents, companies and organizations, such as insulation or sun-on-roof in combination with the development of storage options.
5. Balancing energy demand. Balancing production and energy demand by using smart solutions and innovations.
6. Developing financing structures. Sustainable loans or building related financing such as WOAB.

Source: Monitoringsrapportage Energie Werkt, 2016. Own translation

In the heat vision residents are defined as important stakeholders. In the document the bottom-up approach is emphasized, with the focus on communication. The documents describes preconditions for seducing the end user to get of natural gas. These conditions focus on the end users situation namely: raising awareness (about isolation and need for renewable energy sources), financial compensation or even profit, lack of burdens and inconvenience and possible upgrade in comfort.

In the heat transition a reference is made to *Energie Werkt!* [Energy Works!] a program initiated by the municipality to stimulate the energy

transition in the municipality of Almere. *Energie Werkt!* describes, in short, a programmatic approach needed to provide the optimal conditions to get an end user off natural gas. Therefore, the municipality started with an approach to encourage the end user to isolate their house. They have a six step plan written down as shown is textbox 2 (Monitoringsrapportage Energie Werkt, 2016).

Also, the municipality of Almere initiated the *Energie ambassadeurs* [Energy ambassadors]. This initiative consists of inhabitants of the municipality of Almere who have made their houses more sustainable by means of isolation and renewable energy sources and are willing to actively share their experiences. This network is organised to deploy inhabitants to preform heat scans (by means of infrared cameras) and give advice on sustainability regarding houses. The organisation also has a connection to housing corporations and gives advice to renters if called upon. The city council supports this organisation financially because it contributes to achieving the goals of the municipality (Almeerminder, 2019).

In conclusion, the municipality of Almere does has a specific plan for encouraging inhabitants towards the elimination of natural gas. Firstly, the municipality does have developed a plan with conditions which will, according to the municipality, provide an optimal context for end users to make a decision for an alternative for natural gas in which they experience as little inconvenience as possible or even gain in comfort or financials. This is reflected by a focus on actions that can be done now, without it being negated by future measures, this is called the no-regret approach. Hereby no hard power is used and the role of the end user is to spread information and enthusiasm about renewable energy sources and isolation. However, this role for the end user is voluntary. Secondly, the municipality perceives their role as a gatherer of information about benefits and burdens of all (technical) opportunities in a neighbourhood, for the purpose of providing the optimal options to the end user for eliminating natural gas. Thus, the role of the end user in this is passive and minimal. The municipality partly uses hard power because the municipality makes the choices for public instruments such as making the heating grid more sustainable and providing a sufficient electricity supply. In addition the municipality uses soft power to make people share the vision of the municipality to get free of natural gas, for example with the 'Energieambassadeurs'.

5. Data analysis

5.1 Technical solutions

In the interviews multiple mature technologies that could be an alternative for natural gas in an existing home will be discussed next to establish what the material- and technical implications to an existing house are. There are three alternatives for natural gas categorised, namely district heating, green gas (gas originating from renewable sources) and electrical solutions. These three alternatives are mature technologies and have already been proved to be effective.

The technical solutions mentioned in the previous section will now be further explained. First, a heating grid can be an alternative for heating a house. A heating grid distributes warm water through a network of pipes (underground) to heat one or multiple houses. When the water originates from a renewable source like geothermal heat, proper isolation is necessary to achieve the same level of comfort as heating from a non-sustainable power plant. The source that is responsible for heating the water can differ. However, alternative is only applicable for the replacement of the heating system not for cooking. The second alternative is the use of green gas, the most widely used green gas is 'biogas'. The source of biogas is waste material derived from organic waste such as sewage sludge. Innovation in green gas are biogases, synthetic gas or hydrogen, this gas is produced in a sustainable way. The replacement of natural gas for biogas will have a limited influence on the house since the gas completely replaces natural gas in heating and cooking. Also, the gas pipeline infrastructure does not have to be modified. The last alternative for natural gas is to replace the use of gas by electrical technologies. This is called "all-electric" living. The transition in a house is larger since the gas connection is fully replaced by alternatives like cooking on induction and heating by a heat pump. Also, there is a possibility that a heat pump is not sufficient for the provision of heat in the winter, in this case hybrid solutions have to be implemented. Examples of hybrid solutions mean a combination of multiple alternative technologies. For example, the combination of a heat pump with one of the next technologies; a 'gasgestookte HR-ketel' [gas-fired HighEfficiency-boiler] running on green gas, a pellet stove or infrared heating (hierverwarmt.nl, 2019).

5.2 Sub question 1 How does the local government view the process of the natural gas phase-out in their municipality regarding the role of the end user?

As is argued in the literature review, pressure is required for the process of an energy transition to start (Schot et al., 2016). When the respondents from local governments, were asked about the reason for starting with the energy transition, they could not offer a clear answer. Answers to the question why the municipality started, were general. The answers included, the Paris Agreement. Replacement of the sewage system, if the sewage has to be replaced groundwork has to be done which can provide a chance to replace some pipework for the purpose of an alternative for natural gas with less extra costs and inconvenience for citizens. The last answer referred to 'everybody else' is working on sustainability. It is not specifically mentioned what is meant by this statement, but in the interviews it related most to the fear of falling behind on other municipalities. Interestingly, in the cases researched (municipalities and region) there are barely any policy documents published about the process of phasing out natural gas. Thus, pressure as described by Schot et al. (2016) could not be specifically identified by the respondents for the local level.

Furthermore, all respondents were asked about the achievability of the phase-out of natural gas in their municipality. The general expectation is that only a minority of intrinsic driven people will eliminate natural gas without coercion. With this in mind, the respondents believe that a group of people that will benefit financially will therefore switch to a renewable energy source. Furthermore,

it is expected that most people will switch when a win-win situation is created. A side note mentioned is that a win-win can also mean a profit in comfort (for example less draught in the house) instead of just financial. However, unanimously the respondents emphasized that there are people that will not switch from natural gas even though all external factors are positive like a positive financial outcome and technically being able to implement comparable alternative techniques for natural gas. This leads back to internal reasons such as routine or another vision of the future. It was suggested by multiple interviewees that the pressure towards the end user to change their energy source should come from an obligation from the national government. Thus, the respondents do not believe that a successful elimination of natural gas in the Netherlands is possible within the current circumstances where an end user cannot be forced to eliminate natural gas.

So the data confirms the expectation that an energy transition cannot be completed if the government does not coerce people to change as is stated in the literature review by Verbong & Loorbach (2012). All of the respondents expect the national government to eventually develop a law to provide the government with the hard power to shut off natural gas and implement an alternative chosen by the municipality. Furthermore, Verbong & Loorbach (2012) stated that only frontrunners will transition to renewable energy sources by encouragement of communication and financial incentives and this is also confirmed by the respondents. Interestingly, even though a compelling law is expected in the future and respondents believe that a successful elimination is not yet possible, they all agreed that a start has to be made to eliminate natural gas. In the next section the process in the different municipalities will be described.

Process per municipality

Consequently, the respondents were asked how they viewed the process of phasing out natural gas. A variety of procedures were expressed. When asked about how the municipality started the process, a respondent from the municipality of Huizen elaborated that they gave the end user a chance to participate before the municipality had made any decisions regarding alternatives for natural gas and how to shape the process towards elimination of natural gas. All citizens were invited to an informational evening and could give input in what their view was for the process of eliminating natural gas as well as ask (technical and financial) questions to independent advisers that the municipality hired. This manoeuvre was viewed as positive by the municipality. The reason the municipality viewed this as a positive approach was a) the municipality got a lot of input, b) the end user got informed and c) any negative responses from the end user were tackled by the independent expert.

In contrast to the municipality of Huizen, that involved the end user before gathering information, the municipality of Almere, has gathered (technical) data and created a vision based on this information to later share with the end user. The municipality of Almere already accumulated data to create a multifaceted plan, this way the end user has a choice from a predefined set of material- and technical measures for eventually implementing an alternative for natural gas. The respondent employed at the municipality of Almere has had a wide variety of responses when implementing this approach with homeowners. For example, negative reactions included concerns about the finances, but could occasionally be overcome due to municipal subsidy. Positive responses were primarily caused by the information provided by the government which benefited the end user. Examples are information about the return time of investments in sustainable energy or isolation, information about profit in comfort by implementing isolation or alternative heating and (financial) instruments provided by the (local) government. The municipality of Almere does not have this approach fully evaluated yet.

The local government of Gooise Meren did not initiate the process in their municipality. Inhabitants came forth to ask help from the local government to start the process of phasing out natural gas in

their neighbourhood. This resulted in an agreement for close collaboration in the future between the citizen initiative and the local government to shape the process based on data and experiences which they will gather together, which could benefit the entire municipality. The municipality has no published plans for eliminating natural gas, but the citizen initiative of RemCom does have an action plan to start the process by encouraging isolation and giving information. The municipality stated in the interviews that only one person, the respondent himself, is occupied with the natural gas phase out. This respondent has just started with gathering information from multiple sources for the purpose of getting technical information and getting to know the public opinion. What the municipality emphasized is that they view the end user as an important factor in shaping the process, but could not specify how they view the role of citizens yet. Both respondents (of the local government and citizen initiative) mentioned that it was too early in the process to evaluate since the process started only recently.

The municipality of Stichtse Vecht started recently with the first meetings with a group of frontrunners within the end users, regarding the natural gas phase-out. These end users as a group, came to the municipality to find information about making their house more sustainable. The municipality is not (yet) approaching citizens. Nothing about the natural gas phase-out is yet documented in policy documents. The respondent working at the municipality confirmed that the local government is just starting to gather information about phasing out natural gas but has yet to come up with a plan or vision.

Findings

As mentioned before, a variety of processes were described by the interviewees. This variety was also mentioned in the scientific literature review, it is stated that the intertwined socio-technical system is so complex that every transition pathway is unique (Verbong & Loorbach, 2012; Schot et al. 2016). The municipality of Almere had the natural gas phase-out prioritised by the politics, so the institutional-political context was supporting the development of a process by the municipality. Consequently, the citizen initiative was supported and made positive process. Although the municipal resources were not sufficient to structurally monitor the progress of the citizen initiative, this results in a large degree of dependency of the municipality on the citizen initiative. Controversially, the municipality of Gooise Meren and Huizen do not have any preformed process planned out. However both municipalities have a different path, as expected from the literature review. The municipality of Huizen invited their citizens to give input to shape a process while the municipality of Gooise Meren wants to go along with the information they will acquire from a citizen initiative that has a lot of organizational power and therefore is able to gather and spread a lot of information, but only on a neighbourhood scale. Based on these results there appears to be support for the assumption that every pathway of a transition is unique due to the intertwined socio-technical system and institutional-political context it develops in.

Eventhough, the municipalities do not have a fully defined process of phasing out natural gas, two recurring elements are recognized. The first element is that citizens initiatives are embraced by municipalities. Respondents gave multiple reasons for this phenomenon, namely a) it is obligated by the national government (it is stated in the Energy Agenda) for municipalities to participate with their inhabitants. b) All respondents agree that the municipality has a duty to fulfil the gas phase-out but, does not have the power and instruments to fulfil the transition by itself, therefore needs citizens (initiatives). c) Since municipalities have no specific plan (yet) so multiple respondents found it best to go along with the vision of active citizens. The last two reasons given by the respondents connect to the statements of Dowling et al. (2018) and Perlaviciute et al. (2018) that the government is in need of the support of society to succeed in the energy transition.

However, for citizen initiatives to contribute to the elimination of natural gas, more steering is required according to the end user respondents. The respondents involved in the citizen initiatives both felt that the individual ambition and skills present in inhabitants of the municipalities were key in forming the group that they are in now. This finding suggests that the success of a citizen initiative depends on the skills and knowledge of the people in a certain area. In addition, the lack of steering of the local government provided both an advantage and disadvantage. The advantage is the speed in which the citizens can undertake action and the respondents feel they can do that because of the skills and competences present in the people who are part of their group. Secondly, the disadvantage, every initiative goes in their own direction which is positive as long as the initiatives achieve the desired results. Controversially, in the situation when an initiative does not deliver the desired results, the municipality has to have some structured strategy of evaluation to have the chance to intervene in a timely manner. Also, these respondents feel that more steering from the local government could accelerate the actions of the citizen initiative. Citizens initiatives wait for a vision of the municipality, the municipality waits for a vision from the region and these governments both wait for the national government to provide coercive instruments. This result will be further clarified. The respondents employed at the municipality state that they await the lessons learned on the regional scale to implement them into their own plan to phase-out natural gas. The reason respondents gave is, that the municipality does not have the capacity to investigate how to phase-out natural gas on their own. This struggle is illustrated by the following quote:

“Yes that [developing and executing of the neighbourhood plans] are tasks for the municipality that currently are not taken into account in the occupation of employment hours. While the national government says that the direction lies with the municipality. So that is really a bottleneck”

Transcription employee of Huizen, 2019. Own translation.

Additionally, respondents at the region state that actors have to collaborate to fulfil the nationally set standards for generating renewable energy sources. Nevertheless, when the standards are not met there is no legal way to force the stakeholders regarding the natural gas phase-out. The region therefore states that it is currently to the goodwill of the actors and on the long term wait for more information from the national government regarding coercive measures. These struggles are already mentioned in the literature review by Dowling et al. (2018).

The second recurring element is, that municipalities focus on “no-regret measures” because of insecurities in the future. This theme of uncertainty recurred throughout the interviews, demonstrated by one respondent saying:

“Yes, insecurity about what you are working to. You have some kind of target set, 2050 free of natural gas, but the road to it is still uncertain.”

Transcription employee of Regio Gooi en Vecht, 2019. Own translation.

This quote underlines the uncertainty regarding the rules and laws and about technical innovations that will develop over time. All respondents agreed that end users feel that if the municipality decides upon a collective system then an early adoption may have been a waste of money. However, as mentioned before, there is a common view amongst the respondents that action regarding the natural gas phase-out is necessary now. The uncertainty about the future vision of the municipality leads respondents to engage in ‘no-regret measures’. Municipalities and citizen initiatives started the process of the natural gas phase-out with encouraging isolation. The reason is, isolation is beneficial, both financially as in comfort, regardless of the alternative technique implemented later on. When asked about the future, the no-regret measures were the only certainty the respondents could give to the rest of the end users to undertake action.

Interestingly, multiple respondents from different backgrounds, the end users as well as the municipalities, underlined the positive effect of an independent adviser, in different topics. In the municipality of Huizen the advantage of the professional adviser was that he could counter and eliminate public criticism. In the municipality of Almere a group developed named the 'Energie ambassadeurs' [Energy ambassadors], this group is on-call to give advice on how to make a house more sustainable. Since this group is not employed at the local government the end user is not sceptic about them, as they are towards the municipality. Lastly, the respondent of the municipality of Stichtse Vecht commented that an adviser should have the skills and knowledge find out the best fitting measures for a specific end user. Thus, the respondents see significant profit in including an external adviser in the process of the natural gas phase-out on the condition that this adviser has sufficient knowledge and social skills.

5.3 Sub question 2 How do the local government and the end user constrain and enable each other in the phase-out of natural gas?

To structure the result regarding the second sub question the definition of hard- and soft power of Nye (2009) and the categorization of the socio-technical system of Verbong & Geels (2007) will be used. The first category of the analysis is the network of actors and social groups. The data uncovered an interesting contradiction. The respondents all agree that the municipality has a leading role in shaping the energy transition, but is weak in enforcement because it has minor to no possession of pipeline infrastructure and houses. The literature reasons, that the socio-technical system is so intertwined that it is indeed not possible for, not only the municipality, but the government to steer the energy transition on its own (Dowling et al., 2018). The respondents agreed that there is not one dominant actor in their network, but that the municipality has the biggest role in the energy transition, since they have to execute the natural gas phase-out. However, the municipality does not have a vision about what the responsibilities and actions are with this role. One respondent commented:

“Sometimes people complain that it takes so long to do business with the municipality, but there is also a kind of diligence test attached to it. You cannot just do something with a random company, but you have to carefully decide who you are going to collaborate with and what is necessary to involve everyone, but also what is needed to get an offer of good quality or to make a project of good quality.”

Transcription municipality of Goose Meren, 2019. Own translation.

This quote illustrates the struggle of the municipality in finding the balance between hearing everybody and efficiency. In other words, it is the obligation of the government, in this case the municipality, to include everyone. They need to execute a fair procurement procedure and this may cost time since multiple companies have a right to time to respond to a request. However, at the same time an actor that is dependent on the decision of the municipality wants to be able to act quickly and so expects a quick and clear response from the government. This struggle is recognized in scientific literature, Cowell & Devine-Wright (2018) described this dilemma of the government as a struggle of legitimacy versus goal delivery.

In the previous chapter it is stated that municipalities do not yet know how the process regarding phasing out natural gas will be shaped, therefore the respondents expect that the reaction of the local government to the end user cannot be clear yet. However, even though the municipalities just started with the process of phasing out natural gas, the respondents emphasize the positive influence of the networks they have already formed. Although, there are barely hard agreements made within the networks mentioned by the respondents. The respondents from the regional and local government mentioned two reasons for this. Firstly, the municipalities struggle with what is expected from them in terms of formulating legal documents and visions and therefore struggle to make definitive decisions. Secondly, the actors involved in the socio-technical system all have only hard power over their own possession and soft power over some of the actors. Ehnert et al. (2018) argued that the power of actors is interdependent with the context of the situation. Conversely, the respondents of the municipalities stated that all actors have hard power over their possessions and that this will only change at their will. To achieve the goal of phasing out natural gas, a compromise has to be made, this can only be accomplished in agreement with multiple actors. To achieve a compromise some sort of consultation has to be organized. The end users state that this is a responsibility of the local government.

However, in the previous chapter it is argued that the municipality embraces citizens initiatives. Additionally, the governmental respondents stated that when citizens organize as a group, they

increase their influence towards the municipality. For example, the citizens' initiative in Gooise Meren is initiated by end users and facilitated by the municipality. These groups are now in close cooperation for further establishing plans for the entire municipality regarding the phase-out of natural gas. Then again, the respondents point out that it is impossible to find a group of people that can represent a group of end user since this is such a diverse group. As one interviewee said:

"That is always a difficult point, can you find a group of people that represents all inhabitants? In theory, you will never accomplish that"

Transcription employee of Huizen, 2019. Own translation.

Thus, the end users do have hard power over their own house which is argued in earlier paragraphs, but are dependent on the decisions of the municipality, however the municipality is due to a lack of recourses dependent on citizens to execute the natural gas phase out. So, both actors, the municipality and end user, are dependent on each other and therefore the amount of power of each actor is an equivalent of this dependency.

The second category is rules that guide the activities of actors. The respondents employed at governmental organizations state that the municipality has a legal obligation to cooperate with other governmental organizations and to ensure participation with their inhabitants. However, these legal obligations provide no hard power since there are no specific requirements that the cooperation or participation should meet. Interestingly, based on the data from the respondents inside the municipality, two divisions with their own power dynamics can be distinguished, politics and the civil service. Ehnert et al. (2018) already describe the political-institutional context in which the energy transition is embedded. The municipalities made clear that the politics have the most hard power because this group divides the resources over the executing civil service. The municipalities agreed that their leeway is dependent on the will of the politics. Thus, the politics constrain the civil service in their agreements with citizens since they cannot give a final verdict. Also, an ending of an election period could mean that the political priorities change, which could alter the resources and plans for the process if this is not laid down in a policy document. Commenting of the power dynamics between the local politics and civil service, an interviewee said:

"I make a plan I constantly have to keep in mind how the politics are going to respond to that. So If I make a plan now and I have made agreements with residents and the politicians abandons it, then I have a lot of explaining to do."

Transcription employee of Stichtse Vecht, 2019. Own translation.

The third category is material- and technical elements. Verbong & Geels (2007) state that these elements form the conditions for action as the goal of the natural gas phase-out is a technical change. Although the current situation revolves around some existing installed materials, they are not unchangeable, new techniques develop and installed material can be removed. For this research regarding the natural gas phase-out in the Netherlands the most important element is the existing houses of the end user with a natural gas connection. The main and unique challenge of the Netherlands is, the goal the government wants to reach, phasing out natural gas, involves intervening in the private property of the end user. The end user has hard power regarding this material element, because the house is property of the end user, all respondents are aware and acknowledge this as a struggle. This is the reason that all respondents confirmed that hard power is the most present at the end user. The second element, the technical element is also mentioned by the respondents, they notice that people expect technical innovations in the future and therefore wait for the next even better technique. However, the respondents point out that this could go on infinitely because something better could always be developed.

6 Conclusion & discussion

6.1 Key findings & implications

In this research, an attempt has been made to explore how the local government views the role of the end user regarding the natural gas phase-out by answering two sub questions. The uniqueness of the case of the Netherlands is, that the energy goals, set by the national government, intervene into private property, namely private homes. The energy goals arise from worldwide agreements made in the Paris Agreement to limit global warming. In the Netherlands 90% of the energy we exploit to heat houses is derived from natural gas, therefore a significant contribution can be made by phasing out natural gas. Thus, the focus of this research is on the end user, identified as owner-occupier of an existing house. Verbong & Loorbach (2012, p. 238) stated that “*the energy transition is increasingly about tensions, pressure and power as well*”. This quote illustrates the consequences of the energy goals as currently set by the national government. Multiple scientists have recommended further research to obtain a better understanding on the actors in socio-technical transitions and how they are influenced (Bosman et al, 2014; Schot et al., 2016; Smedby & Quitzau, 2016). Furthermore, it is recommended to investigate the external factors related to the decision space of citizens since an individual’s action is strongly driven by context (Kollmuss & Agyman, 2002; Ryghaug et al., 2018; Greene, 2018). In conclusion, the Netherlands is a unique case because national regulations intervene in private property and it has been justified that it is relevant to focus on the relationship between the municipality and end user. Therefore, the main question of this research is:

How does the local government view the role of the end user (owner-occupier) in the natural gas phase-out, consequently constraining and enabling the end user in making their decision about an alternative for natural gas to heat their existing houses in the Netherlands?

The first sub question that will be answered is: How does the local government view the process of the natural gas phase-out in their municipality regarding the role of the end user?. In the literature review it is already stated that municipalities are judged for being inconsistent, because they have to balance their actions between legitimacy towards the end user and goal delivery from the obligation to the national government (Cowell & Devine-Wright, 2018; Verbong & Loorbach, 2012). The investigation of multiple municipalities has shown that each municipality investigated, has their own approach for how to deal with citizens regarding the energy transition. A detailed argumentation will be provided in the following sections.

The literature states that pressure is needed to disrupt an incumbent socio-technical regime (Schot et al, 2016), this research uncovered that the pressure that made municipalities start with investing in the energy transition originated from the national governments push for more sustainability in the energy system. Thus, there is no specific pressure for municipalities to start working on the natural gas phase-out. Consequently, the interviews indicated that municipalities yet have to start or just recently started with the process of including the end user in the process of phasing out natural gas. Analysing the municipal documents regarding the energy transition showed that the municipalities have yet to develop (definitive) approaches to the end goal of phasing out natural gas. The interviews and policy analysis showed that municipalities do have a similar focus on no-regret measures, which is isolation. Although, the municipalities do this in their own pace and magnitude. For example, the municipality of Gooise Meren leaves the gathering and distribution of information for now to the citizen initiative, while the municipality gathers all information on its own.

This study uncovered the following argument for this phenomenon. The policy document analysis shows a lack of nationwide standards for how to deal with citizens regarding the natural gas phase-out. In the interviews this has been characterized as an obstacle. However, above all this study has confirmed the findings in the literature review which state that it is uncertain how the future will

develop, because of the intertwined socio-technical system regarding the energy transition. In other words, all actions of actors mutually influence each other and the power of these actors, also this happens in a specific space which will provide a unique context. Therefore, one action can create infinite different pathways, thus the consequences of a discontinuity as the natural gas phase out cannot be predicted.

Based on the scientific literature and the results of this study there is a high possibility that the reason for a lack of complete plans and a variety of the partial plans that do exist of the municipality is a) uncertainty about the future. The reason for this is different predictions arise which are the base of actions and policy to phase-out natural gas. Also, these developments take place in a unique space as every space comes with his own obdurate material elements and unique institutional-political context of different municipalities which influences the outcome, so consequently different approaches develop. b) Insufficient pressure on the local scale, for this reason there is a high possibility that the process of phasing out natural gas will not be prioritised on the local level. Municipalities are hesitant to write policy and therefore go along with citizen initiatives. However, these initiatives demand more steering from the municipality to be able to send a clear message to other end users and consequently take more efficient action.

The second sub question that will be answered is: How do the local government and the end user constrain and enable each other in the phase-out of natural gas? Notwithstanding the limited sample, the study confirmed that the municipality has a leading role in shaping the energy transition, but is weak in enforcement because the end user has the hard power to make a decision about their house. However, what this leading role of the municipality comprehends is not clear, the national policy gave the municipality the obligation to execute the natural gas phase out because the municipality has the closest connection to their inhabitants. Nevertheless, the obligation of the national government was not accompanied with an plan for execution or the extra resources for municipalities to make such a plan. Nonetheless, it is stated that the local government could not steer the energy transition on its own, because of the intertwined socio-technical system of which there is no good understanding yet of the consequences of discontinuities (Dowling et al., 2018). Scientific literature stated that the socio-technical system is so intertwined that the action of an actor consequently constrains or enables other actors (Ehnert et al., 2018; Verbong & Loorbach, 2012). The results of this study confirmed this statement, the respondents recognized that there is not one actor that can individually complete the natural gas phase-out in their municipality and the rest of the Netherlands. To argue coherently, the degree of influence a municipality has towards the end user is discussed per element of the socio-technical system. The degree of influence conceptualised by the degree of power the municipality and end user have toward each other.

Since it is argued that not one actor can complete the natural gas phase-out, the next question is how the natural gas phase out then should be formed to achieve the desired result. In the literature the factors for a successful transition are a collaboration of actors, within regulation for sustainable policies (Ehnert et al., 2018; Verbong & Loorbach, 2012). Controversely, it is stated that the energy transition cannot be completed if the government does not coerce people and even more that a prediction cannot be made about these major discontinuities in the socio-technical system (Verbong & Loorbach, 2012). This contradiction in the scientific literature created an interesting research case.

To coherently argue the constraints and enablers, the term hard- and soft power of Nye (2009) will be used in order of the categorisation of the socio-technical system regarding energy of Verbong & Geels (2007), namely network of actors and social groups, rules that guide the activities of actors and material- and technical elements.

Firstly, the network of actors and social groups. The research confirmed that the municipality has a key role, the responsibilities that accompany this role have been identified as follows. Balancing a)

the legitimacy towards the end user for actions the government takes that cause inconvenience and cost resources of the municipality and b) accomplishing the energy goal set by the national government. Currently, the networks that were uncovered in this research are based on voluntary participation, but a demand for more commitment has been expressed within groups and between groups of actors. Although the current study is based on a small sample of participants, the findings suggest that the networks could benefit from more binding agreements, the lack of it is obstructing the effectiveness of shaping the process to get people off natural gas.

Secondly, the rules that guide the activities. It is clear that rules are yet to be developed by the government, so far only financial- and communicational encouragement is definitive. The reason for this situation is that the local government is dependent on the wider institutional-political context, as is stated in the literature. The local government has no hard power yet, until the national government develops a law that directly provides the (local) government with the power to intervene in private property or creates other coercive measures but, as expected, this has multiple obstacles as described in previous section of sub question one.

Thirdly, the material- and technical element. The key obstacle of reaching the energy goal of the national government and thus an important element of this study is, the end user is the only actor that has the hard power to make a decision about their house, within the current circumstances. This is the main challenge since the local government has the obligation to fulfil the natural gas phase-out but does not have the hard power to execute.

6.2 Limitations and recommendations for further studies

Throughout all interviews there was a sense amongst respondents that their municipality is only just starting with the process of phasing out natural gas. During and after the interviews the respondents gave advice to interview other municipalities that were further along with the natural gas phase-out in their municipality. For example, the employee of the municipality of Huizen recommended Almere. However, when following through on this advice, the following municipality gave advice to interview (in their perspective) more advanced municipalities and so on. Thus, also the end user respondents viewed their municipality in the starting phase of developing a plan for the process to phase-out natural gas. This is an result that supports the further recommendations as the main process of research is still in early stages and therefore difficult to evaluate.

One of the limitations in this research is the selection of respondents, this selection is dependent on availability and willingness of actors to participate in an interview. The extent of this research is not sufficient to uncover all consequences of the implications of the Dutch gas phase-out due to the complexity of this system. However, this selection did cover multiple perspectives from the layers most relevant in the attempt to answer the research question. The scope of this study was limited in terms of the specific focus from the local government on the end user as an owner and occupier of an existing house. It was not possible within the timeframe to expand this focus to another actor. Therefore, the influence of other actors has not been fully taken into account in this research. Further research could include more actors involved in the socio-technical transition regarding the natural gas phase-out in the Netherlands.

The study is also limited by the minimal experiences of the chosen approaches of the municipalities to include the end user in phasing out natural gas. Municipalities have yet to choose their approach to the end user, therefore the long term consequences of the chosen approaches are not yet known. A study, later in time could uncover these consequences. Further research could also be conducted to determine how many end users have switched to a renewable energy source to replace natural

gas. Additionally, uncover the factors that influenced the decision of these end users who made the choice for an alternative for natural gas.

Ehnert et al. (2018) stated that, to understand a transition on the local level, research has to be executed beyond the local government level. This statement is recognized in the result of this research. The result section uncovers a dilemma on the local versus the regional scale and the regional versus national scale. The municipality states that they expect more information from the region. Likewise, the region here states, that they need more clearance from the national government. Although this raises multiple interesting questions regarding the relationship between scales of government, this was not in the scope of this research. Therefore, recommendations for further studies would be to investigate the dilemmas of how the process is shaped between the local- and regional scale and between the regional- and national scale regarding the phasing out of natural gas in the Netherlands.

A methodological limitation while using snowball sampling is the random selection of respondents. This method makes it unlikely that the sample will be representative of the population (Bryman, 2016). However, for the limited time and instruments available it was not possible to acquire a larger sample from more municipalities in the Netherlands. Also, Bryman (2016) argues that snowball sampling may be a better approach to use in a qualitative research than conventional probability sampling. The reason being the focus on reflecting relationships between people, in this research the relationship between the local government and citizen (initiative) representatives.

6.3 Implications

The main social implication will be discussed in this chapter, this will reveal what the conclusions of this research will mean for society. The theoretical implications are already partially discussed while describing the answers to the sub questions in the conclusion, but the main implications will be elaborated on in this chapter.

First, the main social implication of the conclusion of this research for the local government will be stated. This research found a lack of pressure on the local level, consequently most of the municipalities are aware of the end goal, to phase out natural gas by 2050, but lack a systematic approach to reach this goal. The municipalities have an obligation to phase-out natural gas, this obligation comes from the national government. The national government does have pressure from the Paris agreement, but this is not enough to prioritise the energy transition on the local level. These result thus indicate that the natural gas phase-out needs to be prioritised at the local level in order to achieve the deadline of 2050. Regardless of the amount and quality of the organizational capital of citizens, the municipality has to develop a plan to give some guidelines for these initiatives to perform actions in an efficient way. However, for the municipality to make a plan resources are required in terms of people and finances. Where these resources can and should come from is a new question, the answer is dependent on the politics, that are responsible for the distribution of resources. Thus, the conclusion of this thesis contributes to the prioritising of the natural gas phase-out on the local level.

Secondly, the main theoretical implication. The general expectation expressed by all respondents, both from the governments and the end users is, that the natural gas phase out will not be completed is the government cannot force people. The general impression is, that there are always individuals who will not switch to an alternative for natural gas, even when a win-win situation is created. However, this general expectation is in contrast to another one of the conclusions. Namely, that the consequences of a discontinuity in the socio-technical system cannot be predicted because of the interdependent characteristics of the system. This contrast shows a new interesting subject to investigate, namely the value of the expectation of the actors in the socio-technical system. The

literature review did state that emotions viewed as practical rationality could contribute to the succeeding of sustainable projects and controversially lead to their termination. The conclusions of this research raise the question how relevant the expectations of the actors are in an energy transition in which the consequences of discontinuities cannot be predicted.

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Appendix

1 Respondents

All respondents gave permission to use their name in the research.

Municipality Stichtse Vecht

Hans Kostense – Project leader Sustainability at the municipality of Stichtse Vecht

Hans Kostense is recruited by the municipality of Stichtse Vecht to achieve the goal they set to be climate neutral in 2030. One of the challenges in this is to be free of natural gas. He made clear that the municipality is starting with a pilot neighbourhood, but has not yet a concrete idea of how the process will be shaped. Based on this information there has not been made effort to plan further interviews regarding the municipality of Stichtse Vecht.

Municipality Gooise Meren

Karin van Schuppen – Member of the neighbourhood team RemCom. Karin van Schuppen is chairman of the neighbourhood platform of RemCom. Miss van Schuppen and her team of six citizens took the initiative to start a team that are frontrunners in the municipality of Gooise Meren for a neighbourhood free of natural gas. The motivation of Karin van Schuppen is to make the neighbourhood more sustainable and conduct in shared learning with the municipality to better the approach in the next neighbourhood. There are no other parties mentioned but the municipality of Gooise Meren, that are involved in the decision-making process, but there are two parties mentioned which conducted the technical research ('Greenhome' & 'Duurzaam Bouwloket').

Gerard Verweij – Project leader sustainability and participation at the municipality of Gooise Meren since the moment the municipality was founded. Previously, mister Verweij had a similar job at the municipality of Bussum, which is one of the three municipality that merged to be the municipality of Gooise Meren. The participation aspect implies the collaboration of people in the community regarding sustainability themes.

Municipality Huizen

Eelco Weijland – Policy officer of Milieu at the municipality of Huizen in the team policy making. The responsibilities of mister Weijland include but are not limited to sustainability and the energy transition in the municipality. In addition mister Weijland keeps close connections to surrounding municipalities to exchange experiences .

Municipality Almere

Anja de Graaf – Miss de Graaf is program manager 'Energie werkt' [Energie works] since 2000. Miss de Graaf only works on programs and projects and has worked as an area manager. The previous project Miss de Graaf worked on comprehended the zero-waste city of Almere and so was the connection made with the energy transition. In her private life miss de Graaf also invested in making her house more sustainable, among others the actions include solar panels and a battery to store energy.

Reiner Swaen – Mister Swaen is a retired gentleman who has had a career in banking and came to Almere in 1970-80's. After he was retired he read in the local newspaper a plea from the municipality for energy ambassadors. As a result mister Swaen attended a meeting and was asked to lead this initiative. Mister Swaen is now chairman and forms the board of the energy ambassadors together

with his college Wietse who is the secretariat. The energy ambassadors consist of a group of 40 divers in gender, background and age.

Regio corporation Gooi en Vechtstreek

Bart van Manen & Lisan Wieringa - Gooi en Vechtstreek is a partnership of the municipalities of; Blaricum, Eemnes, Gooise Meren, Hilversum, Huizen, Laren, Weesp and Wijdemeren. The added value of the partnership is to achieve economies of scale and shape the Regionale energiestrategie [Regional Energy Strategy].

2 Guideline

Guideline in Dutch

Aardgasvrije wijken = bestaande woningen

Eindgebruiker = bewoner & eigenaar

Algemene vragen m.b.t. u en uw organisatie

Hoe draagt uw organisatie bij aan de afkoppeling van aardgas in een wijk(en hoe)?

- Wat beperkt uw organisatie om een wijk van aardgas af krijgen?
- Welke druk ervaart(/ervaarde) uw organisatie om het proces te starten?

Welke ervaringen heeft u binnen uw organisatie met betrekking tot een wijk van aardgas af krijgen?

Welke kansen ontstaan tijdens het proces om een wijk van aardgas af te krijgen? (bij wie en waarom?)

- Hoe kunnen deze kansen benut/versterkt worden?

Welke spanningen/conflicten ontstaan tijdens het proces om een wijk van aardgas af te krijgen? (bij wie en waarom?)

- Hoe kunnen deze spanningen worden voorkomen en als dat niet mogelijk is, opgelost worden?

Het participatieproces

Hoe zou het huidige participatieproces om een wijk van aardgas af te krijgen omschrijven?

- Is dit optimaal en waarom wel of niet?

Hoe wordt specifiek de eindgebruiker meegenomen in het participatie proces?

Wat denkt u dat de eindgebruiker tegen houdt om van aardgas af te gaan en waarom (en hoe kan dit opgelost worden)?

- Op dit moment worden burgers door de overheid aangemoedigd door middel van communicatie over de alternatieven van aardgas en financiële stimulansen (subsidies), is dit voldoende om een wijk aardgasvrij te krijgen en waarom?
- Zo niet, wat voor een (type) burger zal overtuigd worden met eerder genoemde instrumenten en waarom?
- En hoe zullen burgers meegenomen worden die niet met voorgaande middelen overtuigd kunnen worden?

Hoe kan uw organisatie invloed uitoefenen binnen het besluitvormingsproces van aardgas af in Nederland?

- Welke middelen kan uw organisatie inzetten om invloed uit te oefenen in het besluitvormingsproces? En welke aard hebben deze middelen? (hard- of soft power)
- En op wie hebben deze middelen effect en op welke manier? (hard- of soft power) (Specifiek met betrekking tot de eindgebruiker)

Hoe limiteren/beperken of bevorderen eindgebruikers de transitie naar een aardgasvrije wijk?

- De verschuiving van het energie management van de overheid gestuurd naar markt gestuurd (oftewel de depolitisering/liberalisatie) een kans of barrière in het proces om van aardgas af komen (en voor wie)?

Overheid

Met betrekking tot factoren buiten de invloed van u en uw organisatie, wat moet volgens u veranderen om een wijk van aardgas af te krijgen?

- Zijn er (andere) dominante actoren or factoren in het energie netwerk? Zo ja, wie en waarom? Zo nee, is iedereen dan gelijk (en hoezo dan)?

- Heeft (*hiervoor genoemde dominante actor*) een sleutelrol in de transitie tot een aardgasvrij Nederland en waarom?

Welke overheidslaag is het meest betrokken bij de afkoppeling van aardgas in een wijk en op welke manier?

- Op welke manier gaat de gemeente om met de eliminatie van aardgas, ziet u dit als positief of negatief?
- Op welke manier neemt de gemeente de eindgebruiker mee in dit besluitvormingsproces bij de afkoppeling van aardgas in hun woning?
Zo niet, wie dan wel en hoe dan?

Met betrekking tot de huidige context van politiek, regels en wetgeving, welke obstakels en/of kansen brengt dit voor u in het bereiken van aardgasvrije wijken?

Laatste vraag

Welke barrières/kansen ziet u nog meer bij deze energie transitie naar een aardgasvrij Nederland?

Heeft u nog punten die u toe wil voegen?

Guideline in English

The neighbourhoods free of natural gas = existing houses

End user = occupant & owner

General questions regarding u and our organisation

Why does your organisation contribute to the elimination of natural gas (and how)?

- What pressure does your organisation experience?

What experiences do you and your organisation have regarding getting a neighbourhood off natural gas?

What tensions/conflicts occur during the process to get a neighbourhood off natural gas? (at whom and why)

- How can these tensions be prevented, and if that is not possible, resolved?

What chances occur during the process to get a neighbourhood off natural gas? (at whom and why)

- How can these chances be used/reinforced?

Government

What has to change in Holland to eliminate natural gas (regarding factors outside the influence of your organisation)?

Are there (other) dominant actors or factors in the energy network? If so, who and why? If not, is everybody equal (and how so)?

- Does (*aforementioned actor*) have a key role in the transition of the Netherlands free of natural gas and why?

What government layer is most involved with the elimination of natural gas and in what way?

- In what way does the government deal with the elimination of natural gas (do you view this as positive or negative)?
- In what way does the government include the end user in this decision-making process to eliminate natural gas in their house?

What barriers and/or chances does your organisation experience because of the context of politics, regulations and laws in achieving natural gas free neighbourhoods?

The participation process

How would you describe the current participation process? (is this optimal and why?)

- What is the added value of a participation process in getting a neighbourhood off natural gas?

How do other actors compose the participation aspect?

How is the end user included in the participation process?

- On this moment citizens are encouraged by the government by communication about the alternatives of natural gas and financial incentives, is this enough to get the Netherlands off natural gas and why?
- If not, which 'type' of citizen will be convinced by aforementioned instruments and why?
- And how will citizens be convinced that are not convinced by aforementioned instruments (and what is keeping them in the first place)?

How can your organisation influence the decision-making process to get the Netherlands off natural gas?

- What instruments can your organisation use to influence the decision-making process? And what is the nature of these instruments? (hard- or soft power)
- And who do these instruments affect and in what way? (hard- or soft power)

(Also specifically how does it affect the end user)

Chances and barriers

What limits your organisation;

- In getting a neighbourhood off natural gas
- In the energy transition to get the Netherlands off natural gas

What is keeping the end user to get off natural gas and why (and how can this be resolved)?

How do end users limit or catalyse the transition to a neighbourhood off natural gas?

Is the shift of the energy management from the government to the market (e.g. depoliticalizing/liberalisation) a barrier or catalyser in the process to get off natural gas (and for whom)?

Last question

What more barriers/opportunities do you see in the energy transition of the Netherlands clear of natural gas?

3 Coding scheme

Name of the Node	Description based on the literature reviews	Subject in short
Decision making in sustainable development	How can a decision-making process be shaped 'best'? Every actor differently since they attach different weight to the dimensions relevant to their project so what is meaningful? lack of participation is ok because an institutional context has to be made.	The process is shaped best when all actors who are affected by the decision can participate (in a meaningful matter) in the decision making process.
Justifying the social dimension in the energy transition	Why is it important to focus on the social aspect of an energy transition?	The energy challenge is above all a social challenge.
Opportunities and barriers in the gas phase out	What opportunities and barriers does the gas phase out behold? When non-governmental actors unify it can expedite the process and they can develop competences/skills.	When actors collaborate they can increase their influence in the decision-making process regarding the natural gas phase out.
Outline of the energy transition	How does an energy transition happen? "Falcone: a successful energy transition can only be achieved if all involved stakeholders change their behaviour and believes" Alles is in relatie tot elkaar maar niemand kan iets afdwingen. Er is 'druk' maar geen prioritering (vanuit de politiek), fte, budget.	A successful elimination of natural gas in the Netherlands is possible within the current circumstances.
Power in governance	who has the power to make a change in the energy system? Because there is a hybrid system there are no dominant actors but the municipality has a crucial role in shaping the energy transition (has the most hard power). the power of actors are interdependent with the context of the situation	The municipality has a key role in the natural gas phase out.
Tension	Where do tensions in the energy system come from? Tensions= across levels of government, disjunctions between national and local priorities and independent pursuit of local energy objectives. Does it need more steering?	A lack of central steering results in tensions.

<p>The complexity of the socio-technical system</p>	<p>Why is the energy system so complex? Because it is an intertwined system within political-institutional context of technology, markets, infrastructure, cultural aspects, regulatory paradigms and consumer behaviour of which is no good understanding. So no predictions can be made.</p>	<p>A prediction of the consequence of the elimination of natural gas can't be made yet.</p>
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