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Energy democracy in the warmth transition

the potential of collective approaches in the transition to individual all-electric warmth solutions

Master thesis Spatial Planning
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Utrecht University

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Dom square, Utrecht (©Getty Images)

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Masterscriptie
Ter verkrijging van de graad van Master of Science (MSc) in Planologie
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Beoordelaar: dr. Patrick Witte

door

ing. (Niels) Julius Nicolaas Maria Driessen
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Utrecht
University

ARCADIS

You were not born a statue
Nor rooted like a tree.
You were born a wild one;
A spirit pure and free.

No cage should hold you captive.
No title should define.
You're flexible and fluid,
So can change at any time.

With nothing set in stone
And so much to explore
Wander down a million paths
And rattle every door.

Never stop adventuring.
Embrace your inner child.
Stay fearless & stay curious.
Stay positive. Stay wild.

` *Ms. Moem*

Preface

The creation of our living environment by the interventions we undertake, has always amazed me. After completing my studies in Civil Engineering back in 2015, I realized how we can easily adapt our surroundings, as given by nature, to accommodate our wishes. As a Dutch citizen I grew up with the idea that we can shape this living environment the way we like to. Many engineers before me have been successful in transforming our waters to land, the development of our infrastructure and the creation of comfortable spaces to live in. Working as a civil engineer at Arcadis I feel part of this transformation of our environment.

Being part of the field of engineers comes with responsibilities as well. In my work I started to ask myself why certain suburbs are expending in some directions, and not in others. Why are we even expending these suburbs in the first place? And based on what incentives and beliefs are these transformations in our living environment being started? Are there other ways in approaching these transformations? All deeply analytical questions I could not easily answer.

With my growing interest, I started the master Spatial Planning alongside my work at Arcadis. During several courses my knowledge on the history of our planning interventions and important philosophers, on which our planning discussions are based, grew bit by bit. Reflecting on this period made me realize the answer to my questions is highly dependent on my own beliefs, my own worldview. In one specific spatial planner I kept a growing attention. Jane Jacobs connected the interventions we make in our living environment with the fragility of democracy. In her book The Death and Life of Great American Cities (1961) she wrote: “Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody.” During the master program Spatial Planning I understood that as a civil engineer and spatial planner I am for my part responsible for keeping the democracy in planning stable, away from the fragile.

The way we shape and organize our transitions, like the warmth transition, is one concrete example of this influence we have. By writing this research thesis I hope the large societal impact of this transition is seen in the light of the opportunities it provides to improve our democracy. Therefore, this research thesis on the warmth transition is based on the concept of energy democracy.

Back when I started this master’s program at the Utrecht University three years ago, I frequently cycled past the academy building standing prominently at the Dom square. At all these times, I dreamed about the day I would eventually attend my own diploma ceremony in this building. At moments I did not have the belief I would truly complete this master, I looked up the sky and thought of my mother Marion, who then gave me strength from a place far away. Together with my father they have been, and still are, the solid foundation on which I was given the freedom and ability to study, explore and develop my own beliefs and visions.

I would like to thank my colleagues at Arcadis, and especially Marijn van Vlijmen, Jolanda Haasken and Niels van Geenhuizen, for giving me the opportunity and support to start this adventure. At some moments throughout these three years my study time was prioritized above my projects at work. I would like to thank my colleagues for their understanding, support, and interest in this period.

Completing a part-time master program alongside my work at Arcadis hasn’t always been easy for the Utrecht University as well. I would like to thank Patrick Witte for his support and flexibility in trying to manage these three incredible years. Starting from the master’s information session three years ago until your role as my thesis supervisor, I really enjoyed working together. I would also like to thank Jaimy for her support in being my classroom buddy since day one. Apart from the scientific writing you taught me, I would never think a master program could be that much fun.

When thinking of starting this master my family had always been exited and supportive from the beginning. Bart, thanks for making sure I took some breaks in between. You make me forget the though days at work or at the university whenever I see you. Now it’s time for a great holiday together. Thanks, dad, for the talks whenever I was feeling stressed. You are truly able to put things in perspective and make me feel relaxed. Petra, Karlijn and Maartje, thanks for all the help, support, and cuddles whenever I needed them. Lastly, I want to thank my friends for their interest in my university adventure, some partying in between kept me going!

My adventures at the Utrecht University are over, three years felt like three wild months. The interesting lectures, debates with teachers, and great laughter with students have been an unforgettable experience. Walking around the campus between students and teachers I had the feeling of challenging my mind like I haven't done for years.

To you, the reader of this thesis, who is thinking about an additional studying program like my masters, or even a small course in whatever your interests are: just do it! Time is no excuse. Once you have noticed your curiosity in developing and enriching your knowledge and understanding of your worldview, time will fly.

Utrecht, August 5th, 2022

Summary

According to the Dutch national government all neighborhoods need to be transitioned to sustainable heating sources by 2050. This goal, related to the phasing out of natural gas, is following up on the globally agreed sustainability goals and is recently strengthened by the will to become independent from Russian imported natural gas. Often, this warmth transition is approached from a technical perspective, but more importantly it is as much as a societal transition as well. The goals previously stated ask for speed and efficiency in the transition. The societal aspects however create an opportunity for the redistribution of power relations and enabling of collective participative communities. In the literature these collective principles are combined by the concept called energy democracy.

In this study, the current transitional approaches taken by the Dutch municipalities have been researched. This is done by adding focus to suburbs focusing on the transition to individual all-electric solutions, better known as heat pumps. These approaches have been analyzed based on the concepts of transition management and governance modes. Those concepts helped describing the way municipalities organized their transitional pathways and how they were interrelated with market parties and civil society. The main objective in this research was to understand whether and how a collective approach would lead to a more efficient and effective transitional process in the transition to all-electric warmth solutions.

By the use of qualitative methodologies, 17 municipalities have been interviewed. These interviews were held with policymakers working at the municipality or project managers hired by the municipality to manage their suburban warmth transition. Several topics in relation to transition management, governance modes and energy democracy have been discussed. Since most policymakers had no scientific background, these topics were discussed in a practically understandable manner on a policy and project level. The interviewed municipalities have been selected based on their percentage of homes build between 1995 and 2005. These homes are relatively well insulated and are often constructed in the same architectural design. These factors possible improve the success rate for implementing principles of energy democracy and a collectively organized transition.

Municipalities were seen operationalizing their plans which were set in their Transition Vision Warmth (TVW). This was done through a multitude of projects, pilots, and experiments. These projects were focused on either the entire municipality or just one suburb or neighborhood. These multiple cyclic approaches reflect the way transition management literature describes the pathway of a transition. During the writing of the TVW municipalities took a traditional hierarchical top-down approach in combination with a mode of network governance. When the transition shifted from the visioning stage to its operationalization a change to new modes of governance was seen, which can be linked to the socio-institutional approach.

Several approaches were seen to promote collective participation in the transitional projects. Municipalities organized ways to collectively and efficiently provide advice on insulation measures and had thoughts on initiating collective purchasing programs. These generic approaches are especially effective for citizens living in the selected neighborhoods for this research, constructed between 1995 and 2005. Apart from the similarity in insulation standards and design these suburbs are often characterized by citizens who are able to financially invest and have the knowledge to do so. These aspects contribute to the increased participation within these generic measures in these suburbs. In suburbs with a relatively lower level of knowledge and less financial capabilities these generic measures do not have the same effect. In these cases, this generic municipal wide approach is leading to exclusion since not every citizen is able to financially invest, or has the knowledge, to contribute. Projects focusing on specific neighborhoods which include intense participation processes adapted to the target group are an opportunity for the promotion of energy democracy.

Apart from the scale and focus the energy democracy approach also comes with a change in the current governance mode. By making use of existing citizens' networks, such as energy corporations, the power is able to be transferred from municipalities and market parties to civil society. As concluded in this research, a transition becomes theirs when they are able to decide and organize a collective transition themselves with the support of the government. Only then the sustainable energy system becomes democratically owned as in line with the principles of energy democracy. This is currently not the case in the operationalization of the transition. In this transitional phase municipalities have the potential to shift their mode of governance to self-governance and take a more supportive role. However, additional financial support from the national government is needed for municipalities to truly have the ability to implement the principles of energy democracy.

In reflection, municipalities argue that this shift is seen as complex since market parties are more benevolent in taking financial risks compared to private citizens. Large scale collective programs need pre-investments in research, tenders to select contractors and above all courage of local initiators to start without knowing if success is achieved. In comparison, market parties are used to taking these risks. This makes upscaling the principles of energy democracy questionable. More research should be conducted to the practicalities of implementing ideas on energy democracy in the field. On the other hand, municipalities are seen experimenting with multiple innovative ideas to collectively organize the all-electric transition. Sharing these innovations on nationwide platforms would help government officials in this early stage of the transition. Additionally, municipalities could make more use of the already existing energy corporations run by citizens and support them financially and give them more autonomy.

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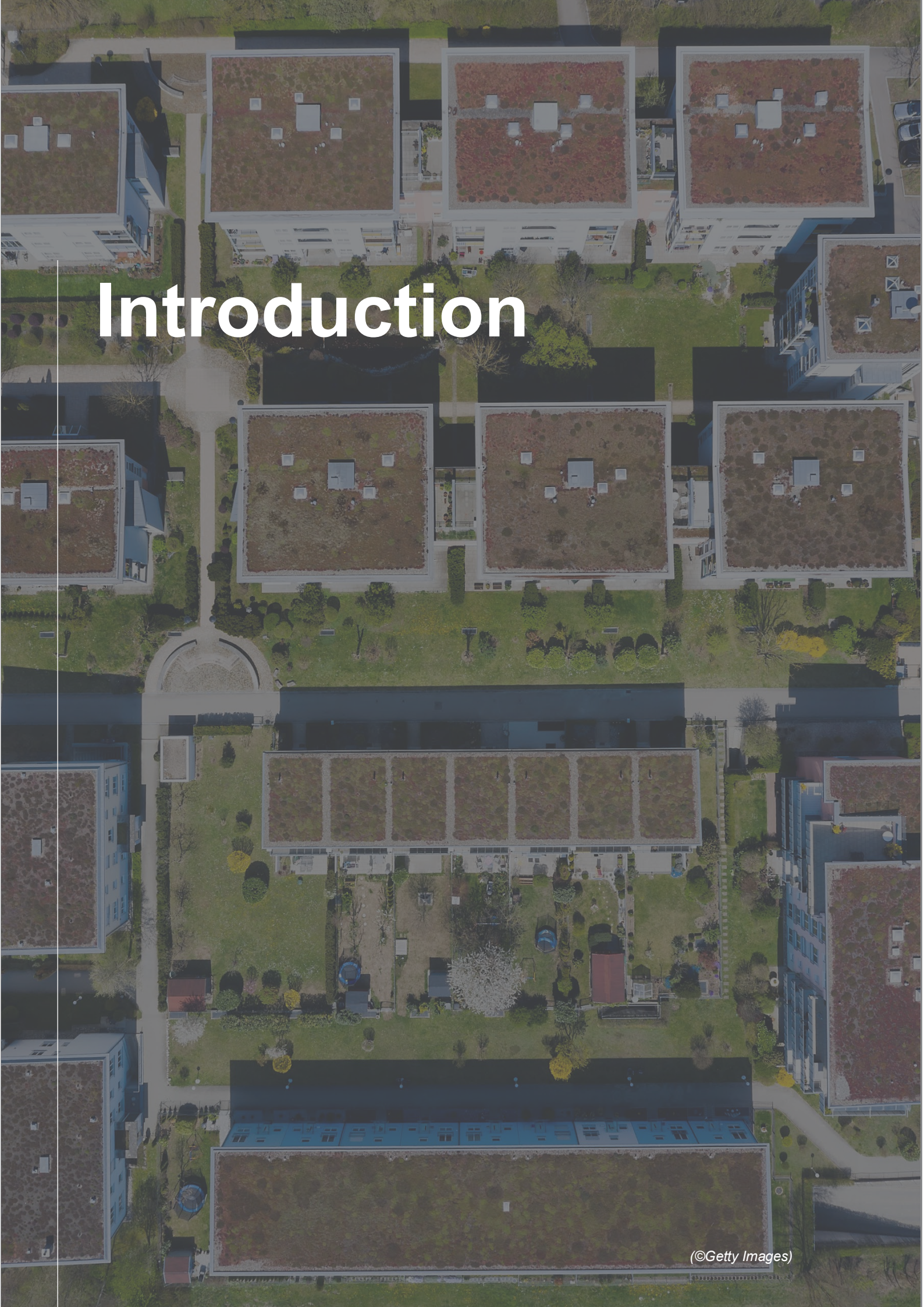
Introduction



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1 Introduction

The international Paris agreement (COP21) has resulted in a climate agreement on a national level in the Netherlands (Ministry of Economic Affairs and Climate Policy, 2019). This climate agreement was presented on 28th of June in 2019 and explains how the Dutch national government wants to achieve a 49% reduction of greenhouse gases by 2030 in comparison to the situation in 1990. By 2050 all Dutch neighborhoods need be transitioned to gas-free heating (Ministry of Economic Affairs and Climate Policy, 2019). One of the goals set in the agreement is to transfer from natural gas to more sustainable energy sources. This includes the phasing out of natural gas in Dutch residential areas, in other words the warmth transition.

In addition to the sustainability goals mentioned above, the Russian invasion of Ukraine has resulted in an intensification of the debates around the warmth transition. The major geo-political and economic consequences have made Europe feel the need to become independent from Russian gas. Around 15% of Dutch natural gas is imported from Russia. The Dutch cabinet wants to stop importing this Russian gas by the end of 2022 (BNR, 2022). As a result, coal fired-power stations are allowed to increase their production to compensate for the shortage of natural gas. Parallel to this decision, the Minister of Climate and Energy argues the climate goals cannot be “lost out of sight” and carbon reduction measures will be intensified to still achieve the mentioned goals (NOS 2022b, par. 3).

In total this situation is increasing the pressure on the phasing out of natural gas and the transition to a sustainable warmth system in Dutch residential areas. Although speed and efficiency in transferring to sustainable warmth solutions are needed, the transition is not only a technical transition. Moreover, it can be regarded as a societal transition which has possibilities to redistribute power relations and enable forms of collective participation by communities. The concept behind these principles is called energy democracy (Szulecki, 2018). According to Kemp et al. (2007) the Dutch energy transition differs from the standard transition management model. The applied model is focused on the current stakeholders in the field of energy supply in the Netherlands. The “outsiders are barely involved” in the process (Kemp et al., 2007, p. 326). This asks for change in the societal aspect in this warmth transition.

Currently the warmth transition lies under the responsibility of the municipal governments. Each municipality has been working on completing their Transition Vision Warmth (TVW) in which scenarios and planning targets are set. Now the time has come to operationalize these plans, which is mainly done in two approaches. In suburbs with a dominance of apartment blocks, owned by housing corporations, collective transitions to heat networks are seen (CE Delft, 2022). In suburbs dominated by a privately owned housing stock, a transition to a heat network is estimated to be too expensive or technically not possible. In these suburbs the majority of transition visions describe a focus on the installment of individual warmth pumps, called the all-electric approach.

Compared to the approach focusing on collective heat networks signs indicate that the all-electric approach is harder to be influenced and managed by local governments. While local governments take a more directing role with market parties in the development of heat networks, houseowners are left to organize their own all-electric transition (TNO, 2022). Houseowners are only incited to invest in warmth pumps by small and complex subsidy measures and their own sustainable beliefs. On the other hand, electricity grid owners are experiencing net congestion, but are less benevolent to pre-invest in networks since no clear collective transition plans in these specific suburbs are created, which works discouraging as well (CE Delft, 2022).

With the rising gas prices, the political desire to end the supply of natural gas imported from Russia and the increasing sustainability debate, the momentum to transition is here. Individual all-electric approaches seem to be lacking progress and first signs of lock-in situations are present within the current transition approach (PBL, 2021). The question rises whether a focus on more collective approaches in the individual all-electric transition helps increasing transitional efficiency and speed. Based on the principles of energy democracy both the technical and societal transition to sustainable warmth solutions might be combined.

This research tries to understand whether and how the current individual approach in suburbs transitioning to heat pumps is possible in a collective approach based on the concept of energy democracy. It connects the transition to a process of democratization by which communities have an increasingly important role. It brings power from corporates to citizens, creates community ownership of decentralized energy systems and promotes a fair distribution of the benefits (Williams & Sovacool, 2020). It therefore promotes collective approaches and combines the challenge of the transition to sustainable warmth solutions with the social challenge in becoming a more democratic and inclusive society.

1.1 Objectives and research questions

The main objective in this research is to understand whether and how a collective approach would lead to a more efficient and effective transition to all-electric warmth solutions. Within this research the collective approach is based on the principles of energy democracy. This objective is tried to be reached in the following steps:

- First, examining the current transitional approaches of municipalities, it is expected to understand what possibilities there are to increase the efficiency of collective approaches. This is done by adding focus to municipalities with suburbs constructed between 1995 and 2005 for their assumed comparative constructions and relatively well insulation standards.
- Secondly, this analysis is based on the applied transition management model, the modes of governance and the principles of energy democracy. These theories form the scientific background in understanding the transitional approaches.

The above objectives lead to the following main research question:

How can principles of energy democracy be an accelerator in the warmth transition in suburbs with a focus on individual all-electric solutions?

This main research question is supported in the following sub research questions:

1. How is transition management theory in the active governance mode influencing the warmth transition at the municipal level?
2. How are the observed governance modes influencing the warmth transition approach at the municipal level?
3. What are opportunities and limitations of the collective approach based on principles of energy democracy taken by municipalities in transition strategies focusing on all-electric solutions?

1.2 Societal relevance

It is important to understand the conditions and structures in which municipalities are supposed to manage the phasing out of natural gas. This warmth transition is seen as complex since innovations in sustainable solutions are relatively young and therefore less predictable. They come with drastic changes to homes and do not only require an open mindset from homeowners, but also ask for intense participation in the transitional process (Tigchelaar et al., 2019). No clear transitional approach for municipalities is available since there is a lack of experience. Government officials working on the transition are dealing with issues on capacity and financial budget to gain advise or start transitional projects (NU, 2022). To prevent overly complex and inefficient situations where municipalities must invent and organize transitional approaches themselves, collective approaches must be used as much as possible. Therefore, it is in society's interest that research is conducted into what actions municipalities can take to collectively organize the transition in suburbs where current individual approaches are chosen. This research has the potential to obtain a clear view on current challenges in operationalizing the transition and could bring forward possible alternative approaches and pathways to an efficient collective transition.

1.3 Scientific relevance

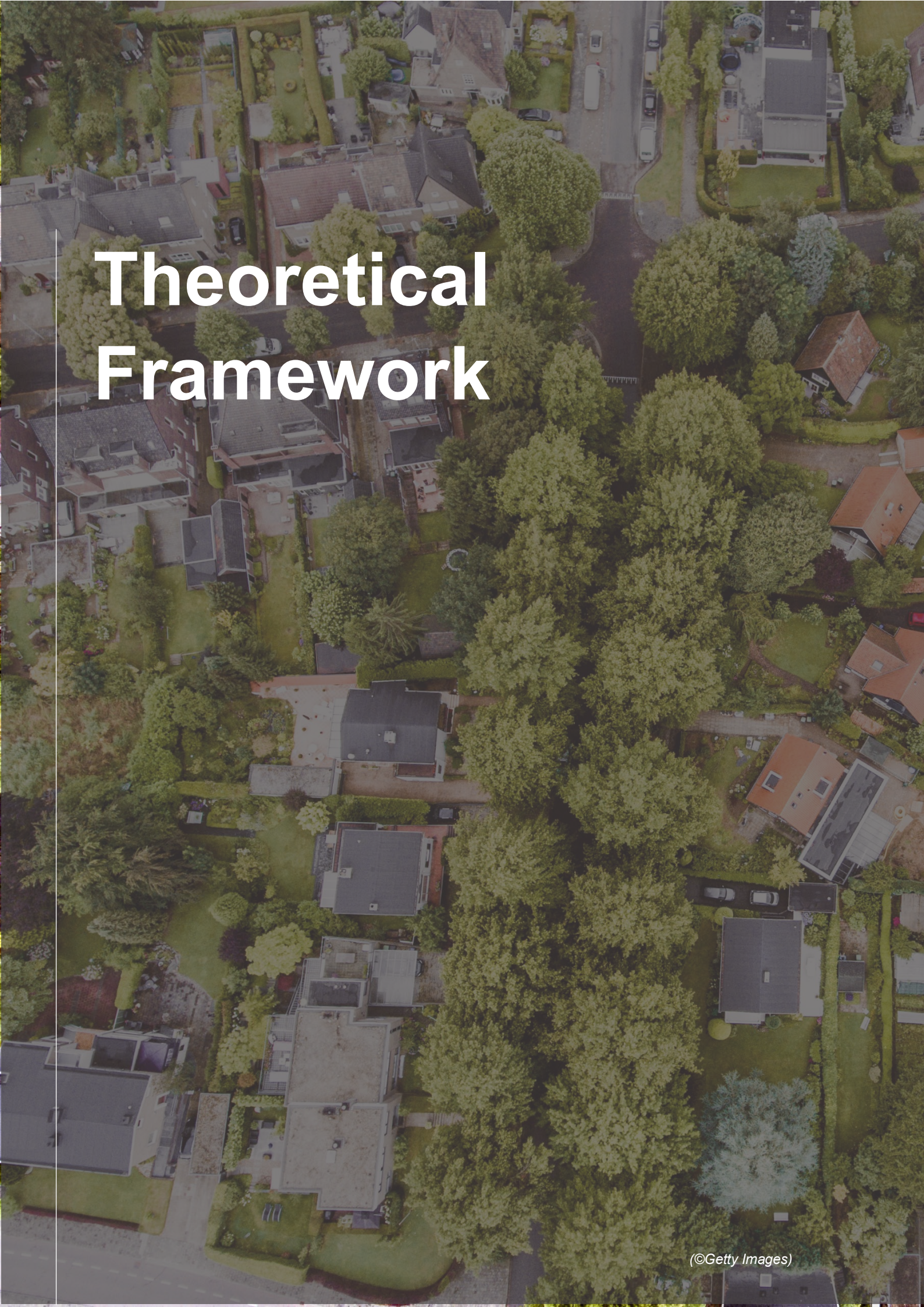
As Cramer (2020) stated, transitions to sustainable systems are requiring large scale behavioral changes in the complete energy chain, which need to be governed. The effects of these transitions have been analyzed in different ways but mostly on a large-scale level (Rotmans et al., 2001; Kern & Smith, 2008; Köhler et al., 2019; Cramer, 2020; Loorbach, 2010; Bresters, 2021). Since the phasing out of natural gas is reaching the municipal level in the Netherlands, this research adds scientific relevance to the field by examining the previously mentioned transition on this scientifically untouched local level. This local transition has been recently shaped over the last couple of years which is resulting in a relatively small amount of available research. Effects on concepts like transition management, governance modes and energy democracy have been researched in large amounts (Johnson & Hall, 2014; Naus et al., 2015; Beauchampet & Walch, 2021; Wahlund & Palm, 2022), but not on the municipal level in the warmth transition. Scientific debates have occurred on collective participation in an energy democracy (Wahlund & Palm, 2022). However, these debates have not been linked to existing modes of governance and transition management models which are used in this transition. Specifically, the role of public and democratic engagement has been overlooked by the technically focused field of research (Wahlund & Palm, 2022). Wahlund and Palm (2022) claim that: "recent conceptual […] reviews shows that there

is a need to strengthen the conceptual foundations of energy democracy" (p. 2). The combination of these concepts might give explanations of complex lock-in situations in transitions. Recommendations can be made which are able to help further research into the governance debate on transition management and the concept of energy democracy.

1.4 Reading guide

This research is organized in nine chapters. The first chapter contains this introduction together with the research objectives and questions, thereafter an elaboration on the societal and scientific relevance is given. In the second chapter a theoretical framework is providing insights into the existing literature on transition management, governance modes and energy democracy, followed by the conceptual framework, designed for this research thesis. In chapter three the current debates on the energy transition are placed in the international and national context. In chapter four the methodology used in this study is explained. Arguments for the chosen research approach are given and the qualitative research approach is further explained. The results are analyzed in chapter five, six and seven in which subsequently the theoretical concepts of transition management, governance modes and energy democracy are discussed. The eighth chapter is providing answers to the research questions based on the findings. A reflection on these findings is given in the ninth chapter following up with recommendations for the academic and policy field.

Theoretical Framework



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2 Theoretical Framework

The warmth transition can be analyzed from different perspectives. This research thesis is focused on the role municipalities take in shaping the transition. This focus is sharpened by analyzing three theoretical concepts. These are transition management, the modes of governance and energy democracy. The transition management theory describes the way systems can transfer from one state to another (Rotmans et al., 2001). This theory can be linked to the transitional approaches which are set up by the municipalities in the warmth transition. The theory on governance modes describes the way municipalities, the market and civil society are linked to each other during this transition (Driessen et al., 2012). Lastly the theory on energy democracy is based on egalitarian beliefs, linking collective approaches to the transition of sustainable warmth solutions (Szulecki, 2018). In the fourth section, all theories are combined in a conceptual framework.

2.1 Transition management

During the last years, researchers and policy makers are challenged to restructure our current energy systems into alternative forms, which are more sustainable (Kern & Smith, 2008). In their research Kern and Smith (2008) are stating that “energy systems can be characterized as socio-technical systems” (p. 2). The links between the several elements, needed to meet functions in society, can be seen as the energy services (Geels, 2004). The topic of this research, the energy system, is providing services like power, light and warmth. The transitions of these energy systems have been studied as ‘social transformation processes’ by which a system is changed to a state in which it will not change back to the previous situation and remains structurally in place (Rotmans et al., 2001). Sustainable (warmth) transitions can be seen as complex processes in which the focus lays on the long term with a multitude of actors and cause/effect relationships. When thinking of ways to undergo this transition, no one size fits all solution is thinkable. Therefore, the outcomes are uncertain when starting the transition (Köhler et al., 2019). As such, the warmth transition can be seen as a system transition. Transition management is defined as a structure proposing principles to approach this transition.

The above phenomena have been analyzed in the field of research of transition management. Literature around transition management has been starting to form around the start of the 21st century with a focus on sustainable transitions (Cramer, 2020). Transition management theories are formed around the question on how to prevent un-sustainable systems from staying in locked-in situations from which no sustainable transition can be started. Transitions to more sustainable situations are requiring large scale changes in current supply, production, and consumption chains. It requires behavioral changes of producers and consumers which need to be governed (Cramer, 2020). Rotmans et al. (2001) framed the first ideas around transition management. The process in a certain transition is described in four chronological ordered phases:

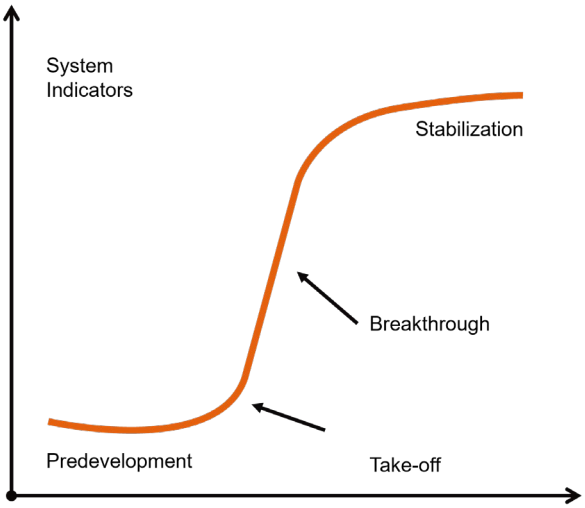

Figure 1, multi-phase and multi-level models of a transition (Rotmans et al., 2001).

1. A pre-development phase where the status quo does not visibly change;
2. A take-off phase where the process of change gets under way because the state of the system begins to shift;
3. A breakthrough phase in which structural changes take place through an accumulation of socio-cultural, economic, ecological, and institutional changes that react to each other; and
4. A stabilization phase where the speed of social change decreases and a new dynamic equilibrium is reached” (Rotmans et al.,2001, p.2).

Through these several phases the former relatively unsustainable energy system transforms to a more sustainable energy system, as seen in Figure 1.

Following up on the findings of Rotmans et al. (2001), Loorbach (2010) tried to operationalize the concept for implementation in the field of policy making. This 'transition management cycle' consists of the following components or steps:

- Structure the problem in question, develop a long-term sustainability vision and establish and organize the transition arena;
- Develop future images, a transition agenda and derive the necessary transition paths;
- Establish and carry out transition experiments and mobilize the resulting transition networks;
- Monitor, evaluate and learn lessons from the transition experiments and, based on these, make adjustments in the vision, agenda and coalitions (Loorbach, 2010, p. 306)."

Contrary to the chronological phases as described by Rotmans et al. (2001), the components of Loorbach (2010) describe a cyclic order which steps need to be undertaken but does not suggest a starting point, as seen in Figure 2. The formulation of Loorbach (2010) on transition management can be used on strategic and operational levels.

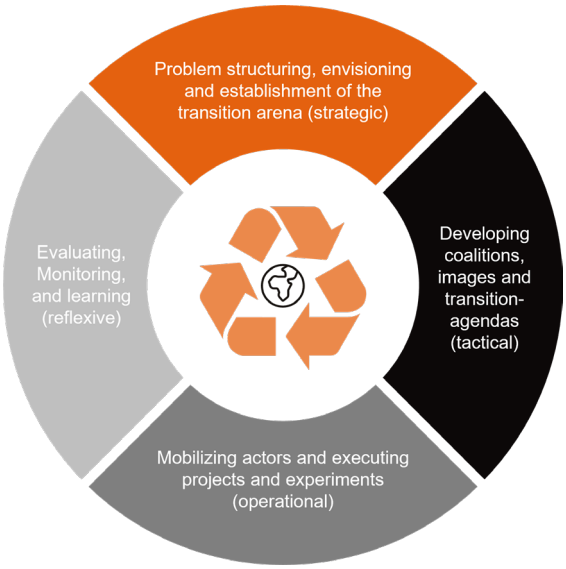

Figure 2, transition management cycle (Loorbach, 2010).

Since empirical evidence on transition management was absent in the beginning of the 21st century most literature was focused on the theoretical aspects as described above. This focus did not explain the true complexity of the implementation of these models in practice. In the years following, case studies have emerged trying to understand the practicalities of the transition management theory. By analyzing these case studies Cramer (2020) has found that transition management heavily relies on governments to take the initiative in transitional processes. However, these governments heavily rely on the readiness of market parties to contribute. It is found that businesses are often doubtful in changing their successful operations. A focus on innovative start-ups is possible although they are often confronted with the lack of acceptance in the free market regarding their innovative operations (Cramer, 2020).

Cramer (2020) sees transitions into sustainable systems as a "continuous renewal and an accumulation of a variety of sustainable initiatives at different speeds, being accelerated through the taking away of fundamental barriers" (p. 7). Instead of seeing the sustainable system as a fully achievable end goal, Cramer (2020) argues "this ultimate goal may perhaps never be achievable. At least completing as many building blocks as possible can bring the sustainable future much closer" (p. 7). By focusing on the implementation of the transition management cycle as described by Loorbach (2010), Cramer (2020) complements this process. In addition to the sequential order of the transition management cycle, Cramer (2020) argues that this process is seen as repetitive, as shown in Figure 3. A cyclic continuation of the transition model as described by Loorbach (2010) creates a graph with multiple lines showing the transitional initiatives taken over time.

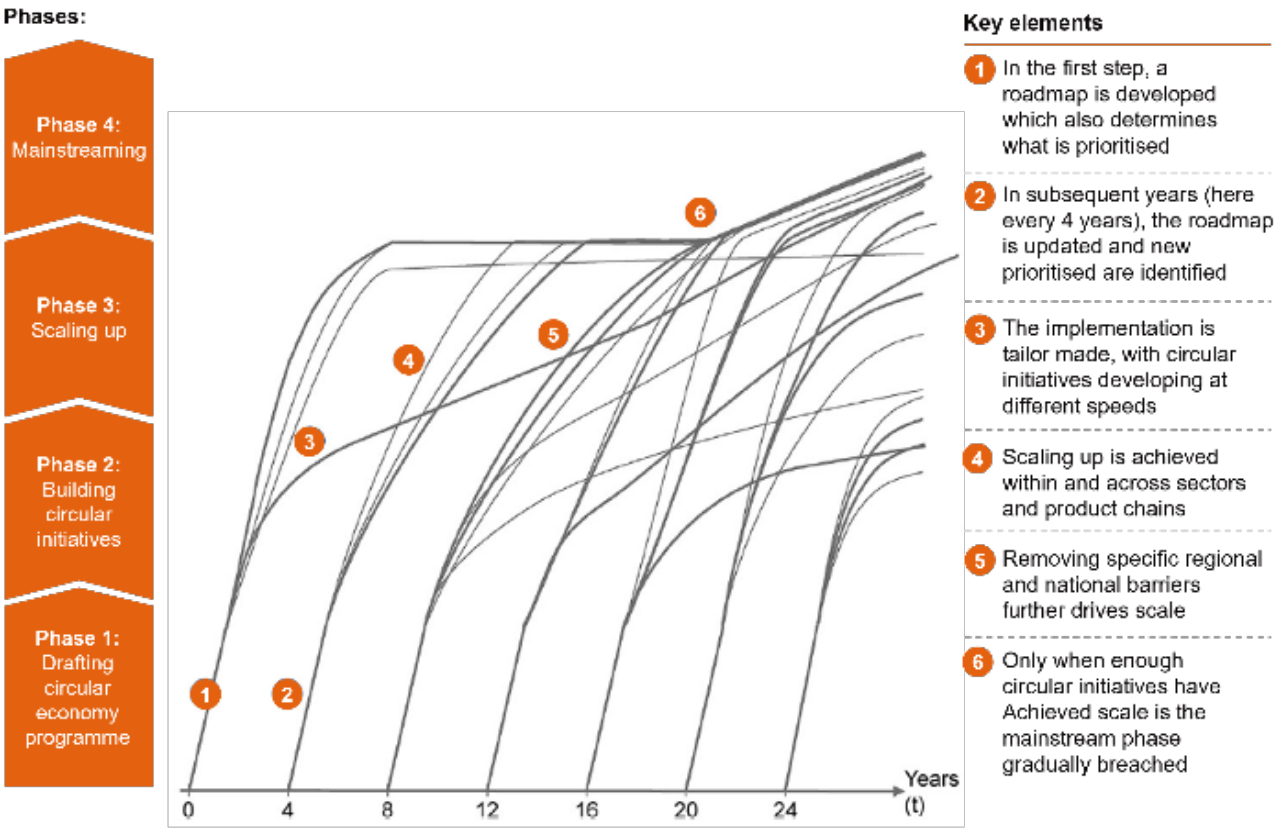

Fig. 1 Practice-based model for implementing circular economy.

Figure 3, accumulation of transitional initiatives over time (Cramer, 2020).

The sustainable initiatives as described above are defined as niche experiments in the warmth transition literature. A niche is regarded as a structure formed by a relatively small group, initiated separately from the current regime. It is trying to minimize the incumbent regime and builds up the new regime that is able to replace the current one (Bresters, 2021). The sustainable initiatives as described by Cramer (2020) can be seen as these niches following up on each other. The warmth transition niches are getting into the foreground by means of market solutions as well as policy interventions.

Action in governance is needed for the creation of the links between different niches and between niches and regimes to help the transition (Loorbach, 2010). This is leading up to the principle saying that niche and front running organizations need to be empowered to achieve progress in the transition (Bresters, 2021). Empowering these niche organizations entails the provision of “knowledge, finance, competences, lobby mechanisms, exemptions of rules and laws, and space for experimenting” (Bresters, 2021, p. 6). In relations to technology, policies are regarded as more important. This does not mean that technologies do not play a large role, but policies are able to suppress niche change. Therefore, policies related to transition management are needed for regime change in the warmth transition (Blazquez et al., 2020). These policies are formed through action in governance. The intensely debated concept of governance, and the modes it can take, is discussed in the next section.

2.2 Governance modes

The history of our former energy system influences the transition to a large extend. The policy time frames of energy transitions are much larger compared to other transitions which also leads us to rethinking current governance structures while applying transition management (Loorbach, et al. 2008). During the last decades the number and intensity of debates on what ‘governance’ entails are growing (Lange et al., 2013). Most research is describing governance as the practice to govern societies. This is also understood by Jessop (1998) who has argued society can be seen as an organization consisting of two approaches: the market approach and the hierarchical approach or state. According to Jessop (1998) both have failed in trying to solve the societal challenges. Both have led to negative externalities; they are thus not fully able to deal with the complexity. In his words the ‘governance response’ is an answer to the shortcomings of the other two approaches (Jessop, 1998). Although its frequent occurrence in debates, governance remains a broad concept interpreted in many ways (Levi-Faur, 2012).

Governance can be divided in the structural and the procedural dimension. The former refers to the arrangement and design of institutions, the latter is referring to the involvement of actors and their combined interactions (Lange et al., 2013). There is however an ambivalence in the literature about the exact role of these actors in the field of the energy transition. A large variety of actors is having their own agenda and are represented by different kind of organizations. There is no clear agreement on how to determine and name the several actors (Loorbach, et al., 2008).

Driessen et al. (2012) came up with a meta-framework dividing the actors in three groups namely, government, market, and civil society. They argue that: “only a multi-dimensional approach giving consideration to political processes (politics), institutional structures (polity) and policy content (policy) adequately captures the complexity of governance phenomena” (p. 403). In their research they have provided a highly detailed conceptual framework in which five modes of governance are explained which are shown in Figure 4.

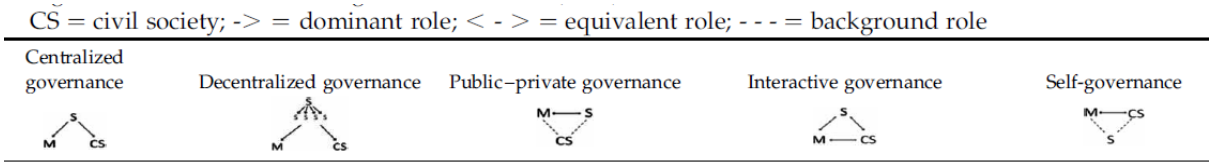

Figure 4, governance modes by Driessen et al. (2012).

In this conceptual framework the first two modes are seen as traditional and hierarchical. The other ones are regarded as new non-hierarchical modes of governance. All together they resemble the understanding of structure, process, and context in a complex way. The framework set up by Driessen et al. (2012) provides a basis for understanding the true complexity of the field of practice (Lange et al., 2013).

Understanding what kind of governance structure is the best fit for sustainable development and warmth transitions is complex. Debates have formed rapidly over the last years since ambitious warmth transition goals are set by governments. Analyzing the literature that has formed around this debate one can argue “the promotion of sustainable development especially calls for collaborative, deliberative and polycentric governance modes (frequently labelled as ‘new’ modes) that emphasize partnership among multiple actors and relations among various policy levels” (Lange et al., 2013, p. 16). It is thought these modes are more easily able to handle “the complex, multi-scale, cross-sectoral and long-term temporal aspects of sustainable development in a more adequate manner than hierarchical ones” (Lange et al., 2013, p. 16).

After the literature analysis as described above, Lange et al. (2019) followed up on this research by conducting an analysis on the sustainability impact of the range of government modes. In this research, conducted in Switzerland, the relation between the several modes and the Swiss energy policy has been analyzed. It was found the above claim saying that new modes of governance are better in promoting sustainability in comparison to the traditional modes is not supported. Lange et al. (2019) opts for a combination by which “The potential of new modes can best be realized in combination with hierarchical governance” (Lange et al., 2019, p. 178). Hajer et al. (2015) concluded the same in general as well. Top-down steering by governments and intergovernmental organizations alone cannot address the global environmental problems (Hajer et al., 2015). Both top-down steering and bottom-up self-organization are likely to be needed, as transformations will emerge from co-evolutionary interactions across multiple sectors of human society and scales over time (Patterson et al., 2017). It is vital to consider how both top-down steering (e.g., the role of a ‘strong state’) and bottom-up self-organization can contribute to transformations (Patterson et al., 2017). Top-down planning and market dynamics only account for a part of the societal transformation. Representation and interrelations are shaping networks additionally (Loorbach, 2010). Therefore, the governance of sustainability transitions has a dual character: it requires an interactive dynamic between public governance and network governance (Cramer, 2020).

What is unclear however is what actual combination, as concluded by Lange et al. (2019), is best for warmth transitions. Hoppe and Miedema (2020) continued the discussion on governance structures in relation to the previously mentioned transition management model and gave the governance debate in warmth transitions more direction. According to Hoppe and Miedema (2020) transition management develops concepts and approaches that support instrumentation and agency in these to eventually achieve systematic change. In this situation the government is seen as the agent of change in the multi-actor environment in which this is taking place. Transition arenas support multi-actor development of visions as well as deliberative decision- and policymaking. The coordination of actions that need to be set up is happening in this arena where management and evaluation of niche developments and experiments are taking place. Decision-making in the warmth transition therefore takes place in multiple consecutive deliberative rounds. In practice warmth transition

management is active in multiple levels, i.e., the strategic level, the tactical level, and the operational level (Hoppe & Miedema, 2020). The governance mode fit for multi consecutive deliberative round decision-making processes is one called the socio-institutional approach. It provides more room for multi-actor networks that can empower context-specific transformative solutions. It includes multiple possible modes of policy and decision-making (e.g., hierarchical, market and network), and multiple possible actors (e.g., government, industry, research, civil society) (Patterson et al., 2017).

The above discussed new modes of governance in relation to transition management have led to an increase in debates on inclusiveness in energy transitions. These debates are for a part structured around the concept of energy democracy, which is discussed in the following section.

2.3 Energy democracy

Due to the 'governance response' in the sustainability debate the political landscape has shifted towards a polyarchy in which self-organization had taken a crucial role in spatial planning (Kearns & Paddison, 2000). This has resulted into a shift from a centralized governance to a mode giving more attention to citizen support and initiatives from the society (Swyngedouw, 2005).

This is also seen in current energy transitions strategies. The new modes of governance are focused around the debates on 'energy citizens' and 'energy democracy'. These notions are seen as "political, social and cultural concepts tightly connected with an increased awareness of a need for a rapid but also fair and inclusive energy transition" (Wahlund & Palm, 2022, p. 1). Both concepts are contributing to debates on how to accelerate the energy transition by decentralization and increasing local ownership of the energy system (Wahlund & Palm, 2022). The main difference between the two concepts can be summarized in the first advocating structural change and the latter individual agency. In energy democracy the current energy system is perceived as undemocratic. The view on the current energy regime together with the existing collective organizational forces are shaping the main arguments for individuals to participate. Energy citizenship derives from the more individual believes. Instead of participation, terms like active engagement are mentioned in the literature. Active participation is started from beliefs in induvial responsibility and one's personal journey. Instead of being critical, individuals see the benefits of becoming engaged to deepen the democracy of the transition of the energy system (Wahlund and Palm, 2022). The two concepts are further visualized and summarized by key words in Figure 5.

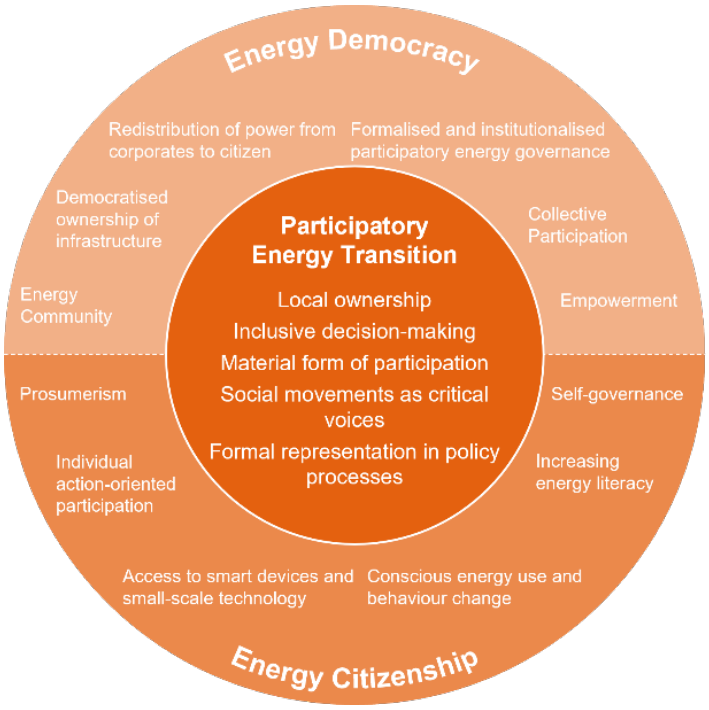

Figure 5, visualization of Energy democracy and Energy citizenship (Wahlund & Palm, 2022).

According to Wahlund and Palm (2022), the image above can support the debate on citizen engagement in the warmth transition. It can help to understand differences and conflicting approaches. In relation to scientific research, it can give entry points to understanding citizen participation in the warmth transition. For policy makers it is giving guidance in their transitional strategies.

Previous research has mainly focused on a more normative approach taken on by civil servants working at municipalities in the energy transition. Understanding the true beliefs, attitudes, and actions of these public officials in relation to the transition have not been centered in previous research (Beauchampet & Walsh, 2021). On their turn energy politics and practice are mainly guided by principles and understandings that the public has an insubstantial level of knowledge or interest in the transition (Devine-Wright, 2007). Strategies to engage citizens in transitions nowadays focus on raising awareness and education by beliefs that citizens will act more sustainable if they gain more knowledge. Though, citizens are influenced by many additional local factors such as social, political, and financial ones (Owens & Driffill, 2008). In the next paragraph the concept of energy citizenship is placed in the practical context. In the second paragraph the concept of energy democracy is

elaborated upon in the transitional context of the warmth transition. In the last paragraph the concept of energy democracy is elaborated upon with a focus on its collective approach.

2.3.1 Energy citizenship in practice

Participation of citizens in the energy transition is opening-up to new forms of cooperation. Those new forms are seen between households (horizontal opening-up and advocating energy citizenship), and between households and energy cooperation's (vertical opening up and advocating energy democracy). In general households are supportive towards these new forms, although it is also concluded that they face problems regarding privacy and autonomy. These setbacks even create resistance against participation. In relation to the modes of governance the decentralized participatory systems are found to be promising for promoting householder participation, as they have to possibility to negotiate horizontal and vertical forms of opening-up (Naus et al., 2015). Creating energy citizenship, by horizontally opening boundaries, is also seen in the rise of social movement boundary organizations (SMBO's) which try to accelerate the energy transition. They assist local citizens in their initiatives by becoming a self-proclaimed 'social movement'. But even these organized groups of citizens face barriers and dilemma's because they rely on governmental funding and lack on consistent and collective identity (Hisschemöller & Sioziou, 2013). In the next paragraph the concept of energy democracy is placed in the context of transitions.

2.3.2 Energy democracy in transitions

There are debates saying the decentralized participatory systems, or network governance modes, pose opportunities but also threats. Multi-actor partnerships "appear to lack responsiveness, public accountability and democratic legitimacy" (Hendriks, 2008, p. 1022). Strengthening the role of society in new modes of governance could reposition civil society in relation to market actors and state. "With strong and stable financial, regulatory and institutional support, the 'civic energy sector' and its new role as investor, developer, generator, supplier and consumer could have the potential to capture a range of social, environmental and economic benefits across the value chain" (Johnson & Hall, 2014, p. 161). These forms of governmental support can be linked to the concept of energy democracy in which collective participation is shaped by formalized and institutionalized forms of governance (Wahlund & Palm, 2022). According to Beauchampet and Walsh (2021) research has shown that there are a number of actions that can increase local social engagement through: "iterative dialogues between powerful stakeholders, timely communication and meaningful consultation, fair and inclusionary planning processes, increased control (e.g. trough individual/community, part/full ownership of renewables, electric cars etc.) and public dialogues" (Beauchampet & Walsh, 2021, p. 2). In the following paragraph the concept of energy democracy is connected to its collective approach.

2.3.3 Energy democracy; the collective approach

When examining more in-depth energy transition solutions, differences in the activation of citizens in participation processes are expected as well. It is thought that, for decentralized solutions like the installation of individual heat pumps in homes, the 'energy citizenship' approach is nearing its limits. The transition approach relies on individual agency and energy citizenship. A suburban heat network, because of its centralized and distant positioning will not feel the same need (Beauchampet & Walsh, 2021). On the other hand, policy makers could increase the need for citizen engagement by making citizens work together in the realization of the warmth transition together with energy corporations. This would place citizens in a setting related to energy democracy as described by Wahlund and Palm (2022). These cooperative forms have already been developed in countries like Denmark where 360 of the 430 heat networks are owned and controlled by consumers (Schwencke, 2019). These examples of energy democracy in suburban heat networks could possibly be working in the transition to individual heat pumps as well. It general it relates to bringing back collective approaches into the individual transition in these specific suburbs. It "attempts to achieve more democratic energy decision-making and greater community ownership of a decentralized energy system" (Williams & Sovacool, 2020, p. 1240). In short this is done by democratized ownership of the energy systems, bringing power from corporates to citizens and transfer discission making to formalized and institutionalized institutions by means of governance (Wahlund & Palm, 2022).

2.4 Conceptual framework

In this last paragraph of this chapter, the previously mentioned theories will be summarized and presented in a conceptual framework. This conceptual framework forms the basis for this research, it guides the thesis scientifically. All theory as described in the previous paragraphs are having their place in the conceptual framework, making it the scientific structure of the research. The relationships between the theory on transition management models, governance modes, energy citizens and energy democracy are visualized.

The transition management model can be regarded as the 'object' side of the energy transition. Through the several phases as described by Rotmans et al. (2001) and the transition management cycle by Loorbach (2010) a transition takes place. According to Cramer (2020) this cycle is repeated multiple times over the years to eventually come as close as possible to a stabilized sustainable energy system.

The governance structure or mode of governance in place can be regarded as the 'process' side of the energy transition. As Lange et al. (2013) has concluded there is a belief under researchers that one of the 'new' collaborative governance modes is the best mode for encouraging sustainable transitions such as the warmth transition. In later research by Lange et al. (2019) this claim is not supported. Rather, a mix of hierarchical with new modes is preferable in a so-called socio-institutional mode.

One of the actors in the transition is the actual local citizen, who is making use of the energy system. Wahlund and Palm (2022) have shown participation in the energy transition can take different forms. What can be assumed in theory is that the way this object (transition management) and process side (governance mode) of the energy transition is shaped is defining in great extend the position at which citizens are placed in the warmth transition. To further explore this analysis, the process model for analyzing energy strategy development by Faller (2014) is used.

To better understand the governance around the transition of energy systems, Faller (2014) has conducted an analysis of this transition in the greater Manchester region in the United Kingdom. Although this research is focused on regional energy transitions the presented model as designed by Faller (2014) is applicable to local scales as well, as in this thesis is the case. The model created by Faller (2014) is shown in Figure 6 and consists of 5 components. At the center of the model the *strategic concept* is placed. It entails the objectives that are set and is serving as a framework for all of the involved stakeholders and participants in the transition. The actions taken by the regulatory system in the energy transition are reflected by the *institutional context*. The multi-level dimension that is shown reflects the co-evolution of multiple processes and the embeddedness of these energy processes in the institutional frame. The *strategic discourse* is identifying the informal interactions and exchanges between various actors directly related to the strategical concept and actions. The *autonomous strategic behavior* is comprising all the activities and interactions between actors which do not have an interrelation with the strategic concept. In contradiction to the previous component, *induced strategic behavior* is reflecting all actions that are intentionally caused by strategical decisions. As you can see all components are direct or indirectly linked, it was found that they are all interrelated and affecting each other (Faller, 2014).

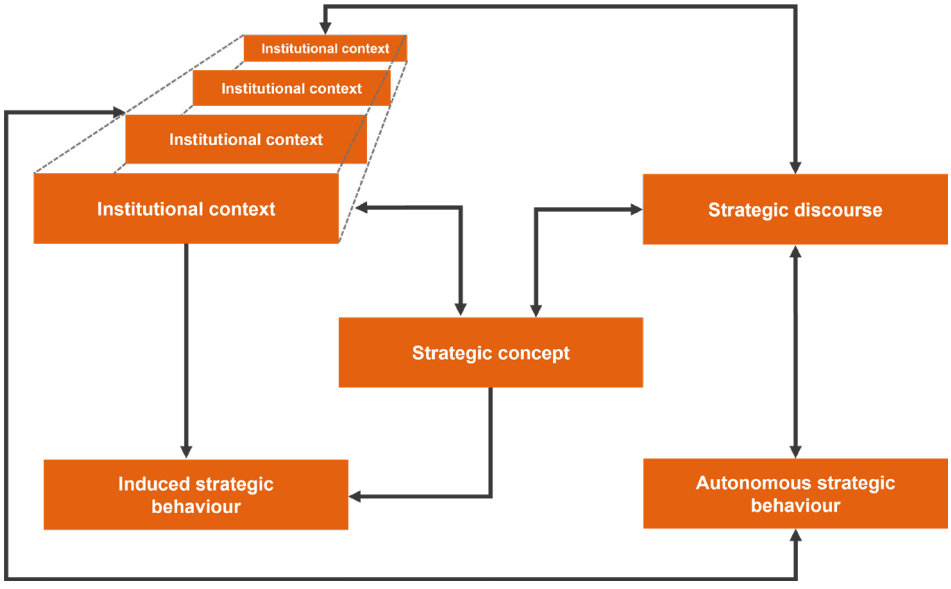

Figure 6, process model for analyzing energy strategy development (Faller, 2014)

An adapted form of Faller's (2014) process model is used as conceptual framework in this research. This conceptual framework is show in Figure 7. It represents the transitional process of the phasing out of natural gas in relation to the theories as described in this chapter in a simplified way. In grey the components as seen in Faller's (2014) process model are shown, in orange all adaptions for this research are visualized.

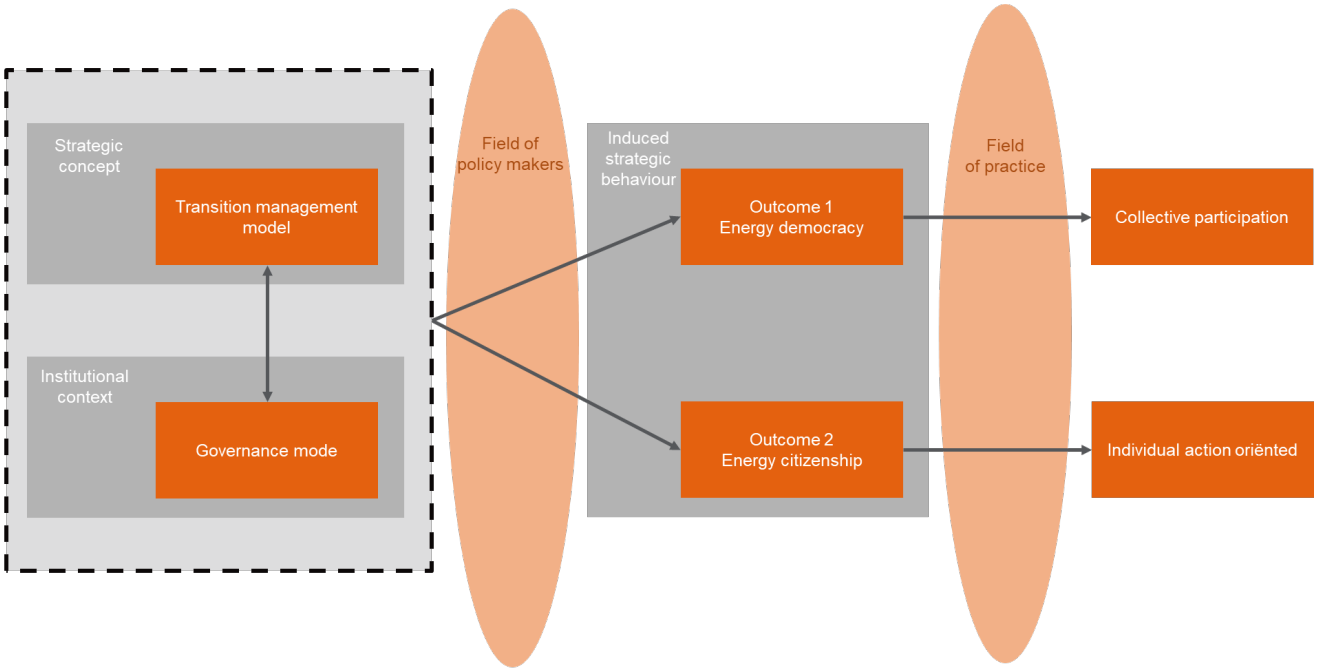

Figure 7, conceptual framework.

The conceptual framework starts at the strategic concept and the institutional context. They are both interrelated just as in Faller's (2014) process model. In this research thesis the strategical concept is represented by the *transition management model* describing the way the transition is strategically approached. The institutional context is reflected by the *governance mode* which is in place at that time. They both influence the field of policy makers in which the strategical concept is further translated to objectives and actions. Through the field of policy makers *induced strategic behavior* is seen in two outcomes. The first being *Energy democracy* the latter being *Energy citizenship*. For a large part, just as in Fallers (2014) process model, these outcomes are formed by the way the strategic concept and institutional context are shaped. Through the field of practice, the induced strategic behavior will eventually lead to either *collective participation* or an *individual action-oriented* transition. The latter two components are again a simplification of the model of Wahlund and Palm (2022) as described in paragraph 2.3.

This conceptual framework is used as a basis for the analysis of the results retrieved from the interviews. It marks the end of the theoretical background of this research. To better understand the context at which this transition is taking place an elaboration of the international and national policy debates is given in the next chapter.

Energy Transition Debates

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3 Energy Transition Debates

The energy transition is one taking place at an international level. The global political commitment agreed upon during the UN Climate Change Conference of the Parties (COP21) urged countries to transform their energy system (Hajer & Pelzer, 2018). The political debates between countries that followed upon this agreement shows the complex context in which this transition must be seen. Therefore, an elaboration is given on how the EU and several continental European countries are looking at ways to undergo this transition. Secondly an elaboration on the Dutch energy transition is given. Over the last couple of months these debates have shown drastic changes, which will be touched upon, and have not yet been analyzed or researched by scientists. This context is therefore largely based upon 'grey literature' or materials that are produces by organizations outside the traditional academic field.

3.1 International policy debates

To achieve the global political commitment made at the COP21 to contain global warming to 2 degrees Celsius the European Commission has proposed the Green Deal. In this Green Deal the European Union (EU) is aiming to be: "climate neutral by 2050 – an economy with net-zero greenhouse gas emissions. By 2030 the CO2-emissions should be brought back to 49% compared to the levels in 1990 and in 2050 the EU will not contribute to global warming by the emission of greenhouse gasses" (European Commission, 2022a, par. 2). As part of this Green Deal the European Union has proposed the phasing-out of natural gas. Long-term fossil gas supply contracts with a duration stretching after the year 2049 will no longer be concluded (European Commission, 2022a). To express the scale of impact the executive vice-president Frans Timmermans, responsible for the plans outlined in the Green Deal, gave a speech to the annual Eurogas conference. In front of the energy sector, he said "Fossil fuels have no viable future. That also goes for fossil gas, in the longer run" (European Commission, 2022b, par. 3).

In order to achieve the targets, set in the Green Deal the European Commission is defining 'sustainable' with the creation of a common classification system. The 'EU Taxonomy' system contains a list of sustainable economic activities and is meant to help sustainable investments in the EU. In this taxonomy list the use of fossil gas and nuclear energy are endorsed as green transition energies. (European Commission, 2022c).

EU member states have reacted differently to the plans proposed by the European Commission. In a letter to the commission the German government expressed its critique on the inclusion of nuclear energy. The German government finds this source of energy "risky and expensive" (Reuters, 2022, par. 3). Furthermore, the letter requests to downscale the restrictions proposed in relation to fossil gas. "A fuel in ultra-modern and efficient gas-fired power plants forms a bridge for a limited transition period" to enable Germany's "rapid phase-out of coal and thus achieve CO2 savings in the short term". It claims relying on other sources, such as hydrogen fuel is too uncertain. (Reuters, 2022, par. 4).

While Germany is arguing that large scale use of hydrogen fuel is too far away, the Dutch minister for climate and energy is including hydrogen and e-fuels in their strategy to phase out natural gas. To achieve the net-zero targets by 2050 the Netherlands is phasing out natural gas completely by 2050. These targets are set in their translation of the EU goals in the climate agreement (Ministry of Economic Affairs and Climate Policy, 2019).

France derives about 70% of its electricity from nuclear energy. It has therefore led the argumentation for adding nuclear power to the taxonomy list. Compared to Germany it is less reliant on natural gas. Their transition if focused on the expansion of nuclear powerplants to become less dependent on natural gas (Reuters, 2021).

Even though the United Kingdom (UK) is no longer a member of the EU they have set targets to reach net-zero by 2050 as well. These targets are legally binding under their own Climate Change act created in 2008. UK's 'Net Zero Strategy' has been released in 2021 and is focused on decreasing the reliance on natural gas without phasing it out completely (HM Government, 2021). Since 42% of the nation's overall energy consumption is produced by natural gas the UK has a large transition to make (Guardian, 2022).

Next to the three biggest EU economies large investors have reacted to the European Commission's decision to include natural gas as a temporal energy source in the taxonomy list. In an open letter a coalition including Blackrock and Vanguard is urging the European Commission to rethink the inclusion of natural gas. The decision would "seriously compromise Europe's status as a global leader in sustainable finance" (Time, 2022, par. 1).

Another major disruption in the worldwide energy market is the conflict between Russia and Ukraine. Europe's energy market is highly dependent on Russian oil and gas. As much as 15% gas being used in the Netherlands has its origin in Russia, for other European countries like Germany and Italy this percentage can be multiplied

by three. Effects of rising prices and energy uncertainties are felt and are influencing the policy decisions related to Europe's energy mix (NOS, 2022a). The European Commission wants to increase the speed of the transition as described in their Green Deal to achieve "more affordable, secure and sustainable energy" (European Commission, 2022d, par. 1). It has proposed an outline of a plan to: "Make Europe independent from Russian fossil fuels well before 2030" (European Commission, 2022d, par. 1).

The Green Deal and following taxonomy list, the history of energy mixes in the above-mentioned countries and the current conflict in Ukraine has become a transitional pressure cooker. The international debates as outlined above do not show a 'one size fits all' solution to the energy transition. A large range of different approaches show the complexity of the transition. This can not only be concluded on the international level but is also seen on smaller scales as outlined in the following paragraph in which the Dutch energy transition is described.

3.2 Dutch energy transition

According to its national climate agreement (Ministry of Economic Affairs and Climate Policy, 2019) the Netherlands wants to achieve a 49% reduction of greenhouses gas emissions by 2030 and by 2050 all Dutch neighborhoods need to be heated natural gas free. Two governance approaches of this agreement are explained in this context chapter to describe the political and governmental context in which the Dutch energy transition is taking place. Again, this context is mostly based on 'grey literature' due to its recent developments. The Dutch energy transition can be split in mainly two governance approaches. Namely the Regional Energy Strategy (RES), on the transition to sustainable energy production. And the municipal approach on the phasing out of natural gas of our housing stock (Figure 8).

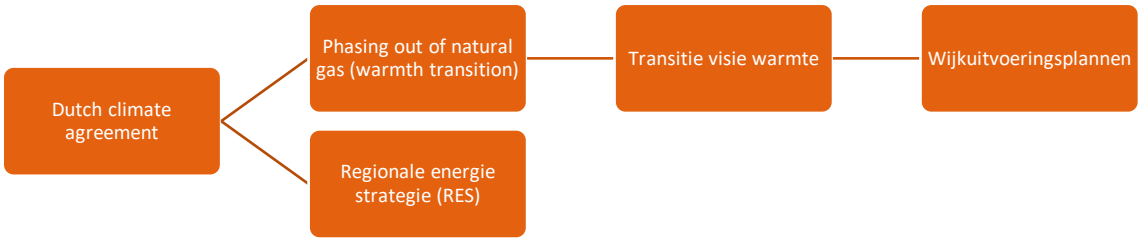


Figure 8, Dutch energy transition approach

3.2.1 Regional energy strategy

To structure the transition the Netherlands has been divided in 30 energy regions. Local governments, citizens, network operators and businesses are working together to explore where and how the best possible sustainable generation of electricity can take place within these regions. Secondly, they are assigned to conduct research into which warmth sources to use to accommodate the phasing out of natural gas. Together this exploration is described in the Regional Energy Strategy (RES). Results and conclusions are being formalized through the newly implemented Environment Planning Act (in Dutch: Omgevingswet) (Ministry of Economic Affairs and Climate Policy, 2019).

In the last years, this RES has been leading to the installment of large solar fields and windmills. These changes in landscape come with fear for deterioration of existing quality of the living environment and is leading to resistance from civil society nearby. At nearly all locations in the Netherlands where the construction of windfarms is being planned, citizens stand up and take action against these plans. Organized resistance often leads to trials in court and even worse, like threads and violation on personal levels (Laconi, 2021). This kind of resistance can be related to the NIMBY effect. Although it does not reflect the impact faced during the phasing out of natural gas, the example does show where resistance can lead to in spatial planning transitions (Devine-Wright, 2005). Support for the transition to more sustainable sources is widely felt (76% of the Dutch populations finds this important), this is not the case for the current policies related to the phasing out of natural gas. Just 49% percent of the Dutch society is supporting this warmth transition in some degree (Kluizenaar et al., 2020).

3.2.2 Warmth transition

In relation to the phasing out of natural gas the Dutch national government has one main target. In 2050 all Dutch neighborhoods need to be transitioned to sustainable alternatives (Ministry of Economic Affairs and Climate Policy, 2019). In practice this will mean the improvement of current insulation standards and an increase of the use of sustainable warmth and electricity. To achieve this goal an intermediary goal is set to transform 1,5 million houses by 2030. Municipalities are responsible for the organization of this warmth transition. The Dutch national government has set procedural guidelines to direct the process in the right way. Each municipality had to complete the Transition Vision Warmth (TVW) by the end of 2021. In this plan, the transition from the use of natural gas in suburbs to more sustainable forms are broadly formed. For each suburb the proposed sustainable alternative, a planning outlining when each suburb will transition, and possible consequences is determined (Ministry of Economic Affairs and Climate Policy, 2019). By now, all municipalities have completed their TVW. In the coming years municipalities are working on the 'wijkuitvoeringsplan' which follow up on TVW. This more detailed plan describes the transition on a suburban level. It is meant to be set up together with local citizens and homeowners and explains the local circumstances and financial consequences of the transition.

Mainly two scenarios are currently seen. Either suburbs transition to collective heat networks, or they transition to individual heat pumps called the all-electric approach. In the first a network of pipes makes sure heated water is flowing form a source to all the houses in the suburb (Figure 9). It is often realized and owned by market parties in corporation with the local government. In the all-electric scenario citizens are meant to transition to heat pumps themselves. The heat pump transfers thermal energy from the outside by the use of a refrigeration cycle (Figure 10). These induvial systems are giving citizens the possibility to produce their own warmth without being connected to market parties.

Figure 9, realization of a collective heat network.

Figure 10, an installed individual heat pump.

Methodology

(©Getty Images)

4 Methodology

In this chapter, the chosen research structure or design, methodology and different considerations are explained. The research design and method define in a great way the direction in which the research question in this thesis is answered. A thoughtful design is helping to answer the question in an efficient and structured way.

4.1 Methods and techniques

The research aim of this thesis is to understand if a collective approach would lead to a more efficient and effective transitional process in the transition to all-electric warmth solutions. In this research, different municipalities are approached to define their experiences with the transition. This research is making use of a comparative research methodology to analyze the differences and similarities between municipalities (Bryman, 2016). It is structured around a qualitative approach with a deductive form. The research is therefore based on theory, from which through empirical research, recommendations will follow (Bryman, 2016). Since the transition away from natural gas to sustainable sources is relatively young, not much data is available. Data, in this sense, will need to be gathered in a mainly qualitative way because quantitative numbers are not known yet. Theories surrounding the topic of energy transition in relation to energy democracy have not matured yet, this accounts for most spatial planning topics (Hartmann & Geertman, 2016). Since this research is focuses on people's opinions and choices the qualitative approach is able to understand the 'why' question in a much more thorough way compared to a quantitative approach. This type of question is important in understanding the governance arrangements around the transitional processes. Key municipal policy workers are interviewed and asked to elaborate their choices, on which follow up questions are asked to peel down their decisions. Apart from defining trends, this research is trying to understand 'why' these trends are occurring. After trying to answer this question, the 'how' question on improving transitional processes is tried to be defined. Both the transition approach chosen within the transition management model and the applied governance mode have an effect on the transition. As elaborated in the conceptual framework it defines the outcome in either an energy democracy or energy citizenship in a great way. In the next paragraph the operationalization of the chosen methods and techniques is touched upon.

4.2 Operationalization

In this comparative research, the variables between different municipalities are compared in a robust analytical framework. Different aspects of transitional approaches are analyzed in relation to the theoretical background of this research. With this focus as much 'noise' as possible is being left out of this analysis (Bryman, 2016). Attention is paid to differences on formal and informal approaches undertaken by policy makers. Comparing these approaches to the theoretical background in the literature gives an opportunity to structurally compare and analyze the results.

The interviewed municipalities were selected on the basis of several criteria related to the focus of this research. As describe the focus of this research is on suburbs transitioning to all-electric solutions. Suburbs with houses constructed between 1995 and 2005 are potentially ones focusing on these all-electric solutions since these houses are relatively well isolated and have the same construction standards. It is assumed this makes collective approaches in the transition more efficient. To focus this research on this specific group a selection is made based on the percentage of houses build between 1995 and 2005 in relation to the total number of houses in this particular municipality. These municipalities were ranked based on the above percentage. Municipalities with less than 15.000 houses are left out of this list because it is assumed they are differentiating from average municipalities, while this research focusses on the greater average.

Municipality	Total number of houses (-)	Houses build between 1995 and 2005 (%)
Almere	87259	33
Houten	20681	27
Haarlemmermeer	65214	23
Dijk en Waard	24439	22
Dronten	17730	20
Lelystad	33734	18

Etten-Leur	19154	17
Harderwijk	20677	16
Purmerend	37124	16
Assen	32538	16
Tiel	18271	15
Steenwijkerland	20276	15
Deventer	46224	15
Overbetuwe	20128	15
Noordoostpolder	20336	15
Lingewaard	20056	15
Amersfoort	68809	15

Table 1, interviewed municipalities (CBS, 2022)

The list of municipalities has no relation with the number assigned to respondents. References or quotes used in the results chapters have been randomly numbered to protect the privacy of respondents. The origin of references and quotes are only known by the writer of this thesis and its primary assessor.

It was expected to find similarities between challenges municipalities are facing. On the other hand, municipalities with successful alternative approaches can be leading up to recommendations for other municipalities. Interviews were taken until no other insights comparted to the already obtained insights were gained. Eventually the 17 municipalities as listen in Table 1 have been interviewed.

In preparation for the interviews the published information on the phasing out of gas by this municipality is carefully read. By the start of this research each municipality in the Netherlands had already released their Transition Vision Warmth (TVW) in which they describe the transitional approach on a suburban level. The vision on the energy transition, it's current status and approach gives insights in their current challenges. Again, a focus is given on retrieving information from suburbs focusing on all-electric solutions. This document analysis gave the possibility to deeper understand their choices and check their progress in the transition.

During these interviews a topic list is followed but deviations from this list were possible. It helped going in depth in certain topics when interesting information was shared by the interviewed policy maker (Bryman, 2016). The mentioned topic list, set up for this research, is attached in appendices of this research. The list is structured around the conceptual framework and its theories obtained from the literature. These theoretical take aways from the theoretical framework are shown in Table 2.

Transition Management		
Rotmans et al. (2001)	Take-off phase	- Process of change started
	Breakthrough	- Structural change - Accumulation of changes
	Stabilization	- Speed of change has slowed - New equilibrium
Loorbach (2010)	Transition management operationalization	- Sustainability vision - Establish arena - Develop agenda and transition paths - Experiments - Monitor and evaluate
Cramer (2020)	Transition management practice	- Cyclic transition initiatives - Multiple pilot projects in take-off phase at once
Bresters (2021)	Empowering niche organizations	- Knowledge - Finance - Competences

		- Space for experimenting
Governance Modes		
Lange et al. (2019)	Modes of governance	- Combination of hierarchical with new modes of governance
Patterson et al. (2017)	Socio-institutional approach	- Room for multi-actor networks - Contains multiple possible modes of decision making - Facilitating for multiple actors
Hoppe and Miedema (2020)	Active governance levels in energy transition	- Strategic level - Tactical level - Operational level
Energy Democracy		
Wahlund and Palm (2022)		- Structural change - Power from corporates to citizens - Collective organizational forces - Collective participation - Democratized ownership of energy systems - Discission making in formalized institutions

Table 2, theoretical take-aways.

The interviewees were approached via e-mail or telephone. In preparation the goal of this research and thesis, the goal of the interview and possible use of this research were explained. Personal information of interviewees are not mentioned in this research. At the start of the interview, they were asked their approval to record the interviews. By recording the interviews, it was possible to watch them again and interpreted the answers given in the best possible way. Recording makes the research more reliable compared to taking notes. Where interviewees did not agree to recording the interview, notes were taken as accurately as possible.

By the end of the interview a copy of the recording together with the transcription has been send to the interviewee. This transcription has been made as soon as possible after the conducted interview. To thoroughly analyze the interviews a coding system was used. These codes have been selected based on the topic list and the additional topics that arose during the interview. To understand in what way certain topics have been discussed in the elapsed interview-time, the codes have been added to the transcription. By filtering the transcribed interviews based on several codes it was possible to analyze and compare answers on certain topics.

Quotes that are used in this research have been selected to either complement results because they show similarities between municipalities or give relevant differences in the obtained results. Since all interviews were held in the Dutch language these quotes have been translated to the English language. This is done in the best accurate way without losing language specific details in language.

4.3 Methodological reflection

In this paragraph some reflections are given on the chosen methodology. These reflections were obtained after the research was completed.

As mentioned in the previous sections the interviewed municipalities were selected on the basis of the percentage of homes being built between 1995 and 2005. It was thought the basis of this ranking would make sure municipalities were selected with a high potential for all-electric solutions, since this warmth solution was the focus of the research. During the interviews it became clear however that in their transitional approach most municipalities had prioritized the collective heat network solution. It was thought these networks, often realized by market parties, were easier manageable compared to individual all-electric solutions. These heat networks were often planned in the same suburbs build in the 90's. Only when heat networks were seen as impossible, because for example there would be no high temperature source, the focus was put on the individual all-electric solutions. Therefore, a more thorough selection of municipalities fit for this research aim could have been made by better analyzing the Transition Vision Warmth (TVW) of each municipality. Instead of a generic, quantitative selection, a more in-depth qualitative selection based on their transition vision could have been made.

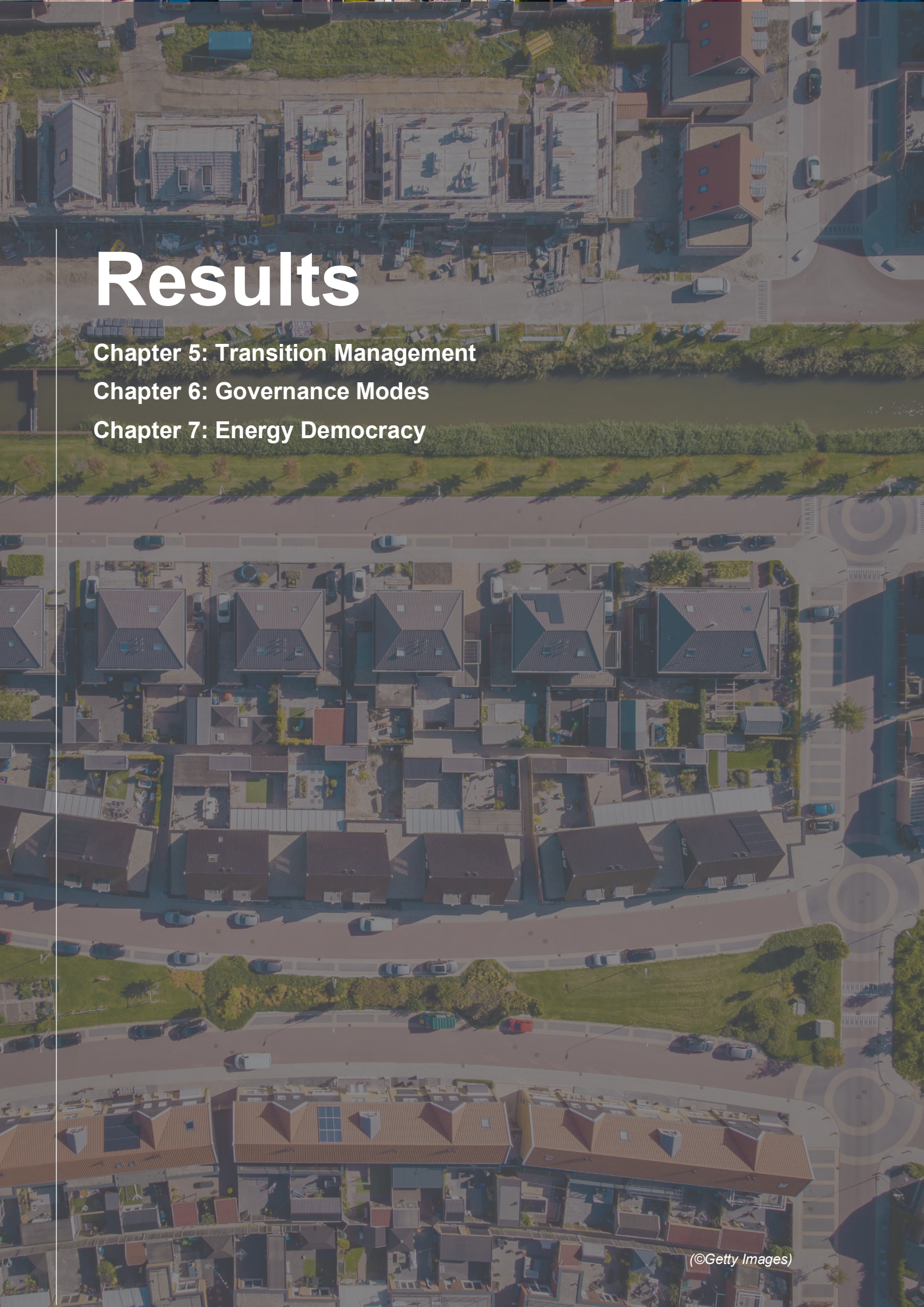
To truly understand the priorities of the interviewed municipalities in relation to the transitional scenario's respondents were first asked to elaborate on the process of setting up the TVW and the scenario choices which were made. Another methodological reflection is focused on the time at which this research has been performed. All municipalities had set up their TVW, but did not all start the operationalization of the goals set in this visional document. Most municipalities did not have experience in large warmth transitional projects which made analyzing and evaluating them challenging. In cases where respondents could only elaborate on transitional approaches, they were planning a through discussion followed on the true beliefs and arguments behind these plans. Discussions government officials had with each other about setting up these approaches were thoroughly asked about and explained. One can say this research thesis has been on the frontier of the warmth transition.

Results

Chapter 5: Transition Management

Chapter 6: Governance Modes

Chapter 7: Energy Democracy



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5 Transition Management

Within this chapter, and the following two, the results retrieved from the interviews are analyzed. This analysis is formed around the various theoretical concepts as discussed in chapter 2 of this research. Therefore, the results are structured in three chapters in which the following theoretical concepts are subsequently analyzed. In chapter 5 the results and analysis in relation to transition management is given, in chapter 6 the several governance modes are discussed, and lastly in chapter 7 the concept of energy democracy is elaborated upon. After having discussed the results on a theoretical concept an overall reflection is given at the end of each chapter.

In this chapter the results in relation to the concept of transition management are discussed. According to the conceptual framework, as set up in section 2.4, transition management relates to the strategical concept. Together with the institutional concept, or governance mode, it entails the basis on which the field of policy makers are doing their work in the transition. This chapter is structured around three sections. In the first section the phase in which the warmth transition is currently situated is described, secondly the operationalization of the transition management approaches is discussed, and lastly a reflection on this theoretical concept is given.

5.1 Transitional phase: Take off, Breakthrough or Stabilization?

Rotmans et al. (2001) formulated transition management as a process going through multiple phases. After the start in a 'take-off' phase a 'breakthrough' will follow in which a transition arena is established, and accumulations of changes are arising. All Dutch municipalities had to write their Transition Vision Warmth (TVW) in which their vision, plans and planning for the transition is described and politically adopted by the local council. Since the role-out of municipal TVW's is nationally obliged by the Dutch climate agreement (Ministry of Economic Affairs and Climate Policy, 2019) the 'take-off phase', in which national guided pilots have been started, is over. It has become clear that all interviewed municipalities have started the process of change and are now working on structural change through operationalizing the goals set in the TVW. The start of setting up the TVW is based on mainly three approaches. Some municipalities participated in the Programma Aardgasvrije Wijken (PAW).

"At that time, we had already received some resources from the Dutch municipality association (VNG) to set up a pilot. We have now in fact linked that pilot to the Programma Aardgasvrije Wijken"

Respondent 3

Other municipalities had already started preliminary explorations before the nation-wide goal to set up a TVW was announced by the Dutch national climate agreement (Ministry of Economic Affairs and Climate Policy, 2019).

"We started in 2016 with a warmth vision. Back then nothing was known, nobody had ever heard of the TVW. We calculated what we thought were the best solutions for the entire city"

Respondent 2

Here it becomes clear that municipalities have started small scale living lab pilots or desk research studies before they were obliged to set up the TVW. These small-scale living labs were often started by national programs funding pilots such as the PAW, or by other organizations providing funding for studies. In relation to Rotmans et al. (2001) transition management process these non-structural approaches can be linked to the take-off phase in the transition. For participating municipalities these gave a head-start in setting up the TVW compared to municipalities without preliminary transitional approaches. For them the TVW was the starting point for the transition.

"For us the starting point was the climate agreement that stated that a TVW had to be made. That was the reason for us to start and form there we picked up the transition"

Respondent 15

In the TVW municipalities have described their vision on which the transition is based. In almost all cases it describes the transition as a voluntary transition in which citizens will not be obliged to participate. Secondly it is mentioned that the transition needs to be affordable and achievable. On more in depth levels each municipality has described the transitional scenarios together with a corresponding long-term planning. These scenarios describe suburbs in which the transition is started, municipality-wide insulation programs, and desired sustainable warmth sources per suburb. The TVW can be regarded as the policy document by which structural change is meant to be started. One respondent explained how in their opinion this transition should be seen as

long-term transition in which building a collective memory within the city council is important. This is in line with the ideas on 'structural change' belonging to the characteristics of the 'breakthrough' phase as described by Rotmans et al. (2001).

"We have stated this is a long-term program that will run for a long time and you also have to have that internal memory in order. You can ask external parties to make a TVW for the municipality, but after completion in like a year and a half, then what? It has been very important to us to build up a collective memory in the council, in the board and also in our own organization."

Respondent 12

Another sign of the 'breakthrough' phase is the accumulation of changes (Rotmans et al., 2001). This is seen in cases where municipalities take on multiple approaches at once. Alongside the municipal-wide focus on improving insulation and providing knowledge for all-electric solutions, there are suburbs selected for an intensive transition approach guided by the municipality and numerous pilot projects. These will be elaborated upon later in this chapter. An important take-away is that each respondent gave insights in the accumulation of the multiple programs and projects within the municipality. During the interviews it became clear that municipalities are still in the early stages of the structural changes. Projects or programs deriving from the goals set in the TVW have only recently been started, cases of fully transitioned suburbs have not been seen. No signs of the 'stabilization phase' of the transition, as described by Rotmans et al. (2001) are shown.

5.2 Operationalization of transition management in the warmth transition

In the literature the theory around transition management describes a number of steps to operationalize the transition (Loorbach, 2010). These steps begin with developing a long-term sustainability vison and a transitional arena. As described above this first step relates to the various TVW's municipalities have set up. The following step results in the development of future images, the transitional agenda and transition pathways (Loorbach, 2010). Although variations are seen, all municipalities take on a dual focus and parallel approach in these transition pathways. A distinct division is seen between plans focusing on the entire municipality, supporting individual initiatives, and secondly a parallel focus is seen on suburb specific plans fit for collective approaches tightly organized by the municipality. Alongside municipalities facilitate several experiments and pilot projects mostly focused on innovative techniques. Due to the differences seen in the above-described municipal wide approach, the suburb focus, and the several pilots and experiments, this section is divided in subsections according to these different approaches.

5.2.1 Municipal wide approach

All TVW's are meant to describe a clear planning on how suburbs are one by one transitioning. There are therefore suburbs which are meant to be transitioned in 2040 or later. To make sure suburbs, which are not at the front of this planning still make progress in the transition, a parallel municipal wide approach is seen. This municipal wide approach is mainly focused on insulation measures since either a transition to an all-electric solution or to a heath network in the future always relies on well insulated homes. To encourage citizens to better insulate their homes, several programs are started. They are regarded as effective and helpful measures for citizens who lack knowledge on how to select insulation measures and make use of subsidies for their specific situations. Almost all municipalities make use of external organizations financed by one or more municipalities. These organizations are mostly relying on volunteers.

"We have indeed set up a supporting energy helpdesk for this. Anyone in our municipality can go to that helpdesk for advice about whether you can make your home more sustainable in phases, or in one project. They provide advise until you completely phase out from natural gas, so that support is there. For both homes and businesses, and the energy helpdesk is financed by the municipality."

Respondent 12

After insulating homes properly, the installation of an individual all-electric heat pump could follow. During the interviews it became clear however municipalities have not yet noticed an increasing need for advice on the selection of a specific heat pump. Municipalities do however talk about plans they are setting up for providing advice and support in the selection and procurement of all-electric individual heat pumps.

Citizens in suburbs transitioning to all-electric solutions would possibly be interested in collective purchasing programs. In that sense I'm talking about, collective is broader to me than just purchasing. So, I'm talking about collective advice, citizens collectively checking possible all-electric solutions there are and we could make a kind of checklist together to see what you need to do to be able to switch to all-electric or hybrid. And we could

think about if it would be possible to be able to buy collectively so that individual citizens, or groups of people, can participate in a procurement program."

Respondent 14

This however remains in ideas on possible role-outs of plans respondents are sharing. None of the interviewed municipalities have spoken about collective advise or procurement programs for individual heat pumps that are active at the moment.

5.2.2 Suburb focus

The transitional paths focusing on specific suburbs, are in most interviewed cases, initiated in suburbs with a focus on collective heat networks. Especially in municipalities where collective heat networks are in place, expansion of these networks seems to be the most effective way for policy makers to start their transition. In municipalities which are lacking possibilities for these heat networks a focus on the all-electric heat pumps is shown. In those suburbs municipalities try to collectively provide advice on insulation measures by dividing homes in groups with the same design. Although this approach, supported by the beliefs of Wahlund and Palm (2022), is found complex since generic advice is not effective enough but on the other hand there aren't enough advisors.

"There is a consultation hour with several experts, a technical advisor, an energy advisor, all working independent, who can answer questions. And we are still looking at how you can achieve that customization because you can offer standard solutions, but every house is different. (…) There is a real shortage on the market, so we don't have a can of advisors that we are able to just open and go give advice."

Respondent 9

Some municipalities have found project managers focusing solely on one suburb to increase the level of awareness, knowledge on all-electric solutions and collective will to transition. In this specific case this project manager did not follow the trajectory of the planning set up in the TVW but selected a starting suburb on his own beliefs.

"I reversed this trajectory, where there was bottom-up action among residents, that's where I started. (…) I just asked the residents of that neighborhood what they think is important to do. We asked people who came with plans if they would be interested in collaborations with the municipality. Gradually, after some webinars, we organized collective purchasing of technical advice which helped insulating their houses to eventually make the transition to all-electric solutions"

Respondent 1

These examples show the intense processes needed to create a breakthrough in the transition in that specific suburb. Operationalizing the chosen transition management approach as described by Loorbach (2010) is found challenging. Municipalities are struggling to form transitional pathways to collectively organize a transition to heat pumps in a selected suburb. Overall questions on affordability, feasibility and an overall lack of knowledge arise when policy makers contacted citizens in these selected suburbs. Establishing a transitional arena as promoted by Loorbach (2010) is found challenging since customized advise is needed to provide decent solutions for insulation and selection of the right all-electric heat pump. Due to the shortage of advisors in the current market it is found hard for municipalities to set up the needed transitional arena.

5.2.3 Pilots and experiments

Alongside the municipal wide approach and the suburb focused approach a number of pilots and experiments came across during the interviews. Municipalities try to cooperate with several innovative initiatives to create space for experimenting. Bresters (2021) encourages these initiatives to make sure niche organizations are empowered to create 'out of the box' solutions that otherwise would not have been found or analyzed. Some municipalities focused these pilots and experiments on citizens trying to completely transition to an all-electric solution or a completely 'zero emission' home.

"An approach you can imagine is that we are going to completely facilitate a few of those early adapters. In that way you can completely work out the transition and eventually say what the total financial investments were. There are citizens willing to participate in those pilots however, on the other hand, you want to reach vast majority instead of just a few citizens."

Respondent 14

If the operationalization of the transition management approach is too much focused-on pilots and experiments there is a possibility of missing out on the projects that might take longer and are more complex, but have greater impact in total.

"Back in 2015 we prioritized on geothermal energy, I started research into opportunities for this sustainable energy source. We are now 7 years later, and in those 7 years there have been dozens of times when the plan threatened to fall off the table. If you only focus on low-hanging fruit, you miss these kinds of opportunities for the future."

Respondent 2

Just as Loorbach (2010) states it is important to monitor and evaluate transitions, it is important to be able to assess and evaluate new innovations as well. Most municipalities however experience them as expensive and less efficient. They want to leave the implementation of those innovations to market parties.

5.3 Reflections

In sum several transition management approaches are seen. Before the national-wide goals for municipalities were set to draft their Transition Vision Warmth (TVW) some already started on their own initiative. In this 'take-off' phase of the transition they carried out research and started pilot projects. At the time of this research thesis the transition to sustainable warmth solutions is in its 'breakthrough' phase. The national government has setup a transitional agenda in which tasks are given to all municipalities. All Dutch municipalities are active in the transition and have set up their TVW and are in the process of starting the operationalization.

The operationalization takes place through multiple projects with differentiating purposes and goals. The operationalization process can roughly be divided in the municipal wide approach, the suburb specific approach, and pilots and experiments. In the first, measures are taken for all interested municipal citizens, while in the suburb specific approach a project is started within one specific area of the municipality. The diversity of approaches running parallel to each other reflects the ideas of Cramer (2020) in which multiple transitional approaches are coexisting.

Within the diversity of approaches several governance modes are seen. These governance modes are elaborated upon in the next chapter.

6 Governance Modes

The governance mode in which the transition is taking place defines the institutional context, as described in the conceptual framework of this research. It became clear how local governments, or municipalities in this case, market parties and civil society were related to each other within the context of the warmth transition. These relations differ between municipalities, phases in the transition and scales at which the transition is taking place. The first section analysis the results on the various traditional hierarchical top-down modes that were observed, in the subsequent sections the bottom-up modes of governance, network governance, and self-governance modes are elaborated upon. Thereafter the several new modes of governance are seen, specifically the network governance examples are elaborated upon. In the last section an overall reflection of this chapter is given.

Before going into the specific governance modes some general findings in relation to the responsibility in the warmth transition are given. The Dutch climate agreement (Ministry of Economic Affairs and Climate Policy, 2019) made local governments, in this case municipalities, responsible for the warmth transition. When drafting the TVW, all municipalities understood their role as taking the leading position in drafting this policy document. This position is relatable to the government as 'agent of change' as found in the literature. Hoppe and Miedema (2020) conclude that transition management is developing approaches that eventually will lead to systematic change. They see a role for the government as agent of change, however according to them this takes place in multi-actor environment. This is not always the case as is shown by the way municipalities sometimes take a traditional hierarchical top-down approach.

6.1 Hierarchical top-down governance mode

The traditional hierarchical top-down governance mode is seen in several phases of the transition. Differences are seen between the drafting of the Transition Vision Warmth (TVW) and the actual projects that are initiated in relation to this vision. Therefore, this section is split in two subsections analyzing these two phases.

6.1.1 Transition Vision Warmth

A few municipalities have set up the TVW without intensely consulting stakeholders such as market parties, citizens etc. This was done for various reasons. One respondent explained how the municipality wanted to prevent the TVW from becoming a policy document influenced by the agendas of market parties.

"We just tried to keep the process separated from market parties. We used the data from the national government, which provided the initial analysis, and we used our own local knowledge as well. Especially to not be influenced by market parties and their business cases. We really wanted to determine it based on the heat demand of the homes and estimated social investment costs."

Respondent 8

Another respondent reacted by saying they have drafted the TVW with an internal team because incorporating other stakeholders was seen complex and the level of abstractness was relatively high.

"We have set up the TVW internally. With some advisory parties that helped analyzing and a number of internal people, including our GIS specialist, so that we could also work with maps. We do have a group of residents who were contacted to share their ideas about the energy transition, they have also been allowed to think about this. But yes, it is still quite abstract, so it is difficult to form an opinion for them. And in the end, it was discussed by the representatives of the municipality in the city council with an information round. So, in the end we actually did that pretty internally."

Respondent 9

Municipalities often used existing advisory bodies that were used in other transitional processes like the transition to the new Dutch environmental planning act. Some found possibilities in consulting their previously mentioned energy helpdesk or energy cooperation. These advisory bodies mainly consist of volunteers with a technical background and represent a small part of the diverse society.

"We have an energy cooperation ourselves, which we do involve in these plans. They participate a bit on behalf of the residents, but of course they are also a bit of an island. We see them as representatives of our residents, that's why they also contributed in thinking and reflecting on the TVW. They helped determine things and we also approach them with the installment of a heat network."

Respondent 7

In total only a few respondents explained how their municipality is taking a top-down hierarchical approach in setting up their transition vision. The combination of the goal to objectively set up the TVW without being influenced by business cases of market parties, together with the challenges in involving citizens might have partially lead to this governance approach.

6.1.2 Projects to operationalize the transition

In the projects deriving from the vision set in the TVW municipalities adopted several modes of governance as well. Again, in this section, the focus is put on the traditional hierarchical modes of governance. Only in two cases the municipality had set up projects in a top-down governance mode.

In one municipality a transition to all-electric is initiated by the municipality in the rural area of a polder landscape. It is clear for inhabitants that other sustainable solutions such as heating networks are too expensive and therefore not possible. According to the respondent there is a consensus in this decision among inhabitants. However, the landscape, including the houses, is protected as world heritage which makes adaptions to exterior of homes nearly impossible. Outdoor units needed for all-electric solutions are therefore not possible by law.

"Together with the province, we are looking at how we can find solutions within the conservating regime to be able to implement all-electric solutions. There are houses of which some are on the monument list, even as a national monument. That is quite a challenge."

Respondent 3

In this case the municipality understands bottom-up, self-organizing approaches by inhabitants themselves are impossible. The municipality has set up a team working on amendments in the law to create possible opportunities for these specific cases. The intense actions taken by the local and provincial government are probably positively working on the level of consent. Collective self-organized initiatives based on principles of energy democracy are simply hard to implement in these specific challenging cases.

According to Lange et al. (2019) top-down governance modes only help supporting the potential of new modes of governance such as network governance. Across all interviews it became clear a top-down governance mode alone does not work in the support of energy democracy in the transition. Only in intensive consultation with citizens a hard decision can be made for a certain transitional heating alternative and timeframe. Citizens need the feeling they have been consulted and are being helped by the government when they are not able to arrange the transition themselves. Overall, most interviewed municipalities approach their all-electric projects from a bottom-up perspective, starting with suburbs which were already active in self organizing the transition.

6.2 Bottom-up governance mode

In this section the response of the municipalities in relation to bottom-up initiatives from local citizens is analyzed. This form of governance is open to intense forms of citizen participation in transitional processes and support citizens in organizing their own transitional projects.

6.2.1 Transition Vision Warmth

As touched upon in the previous section municipalities found it hard to include citizens in their process of setting up the Transition Vision Warmth (TVW). Participatory sessions were mostly attended by men with a technical background who show an overall interest in the transition. Through these participation sessions some municipalities found bottom-up initiatives organized by citizens which they included in the TVW as the starting suburb to support this initiative. This only occurred at a few municipalities, most have set up their TVW in a form of network governance, which will be elaborated upon in the next chapter. Some municipalities however altered their TVW according to the beliefs of the citizens. In the following case a certain suburb would originally transition to small-scale heat networks. However, these plans changed due to bottom-up initiatives that arose.

"When we looked at the model on which the TVW was based this suburb would actually be best suitable for all-electric solutions. The small-scale heating network plan was already initiated and supported by the community itself, so we certainly did not object to that. In fact, it is nice to see this happening. We are convinced (...) the transition must take place from the bottom upwards. These are lessons we incorporated in our TVW."

Respondent 13

Another municipality did set up their TVW in a governance mode related to network governance with a top-down focus. However, the described sustainable warmth solutions are only conceptual. The municipality is opening up to bottom-up citizen initiatives which might lead to the implementation of other sustainable warmth solutions compared to the ones opted in their TVW. These examples show the reflexiveness of local governments to adapt their top-down visions when bottom-up initiatives arise. This contributes to implementation of niche developments, as promoted by Hoppe and Miedema (2020).

6.2.2 Projects to operationalize the transition

On the project level the bottom-up governance mode is seen in most cases. Municipalities try to make use of existing citizen initiatives and try to expand them. All interviewed municipalities facilitate energy advisors who can be asked to give specific insulation advise or technical advice for the transition to all-electric solutions. The following municipality noticed an increase in requests for a consult by this energy advisors in specific suburbs.

"They noticed that at some point in some neighborhoods we are asked more often to visit an energy advisor. Those citizens, on their turn, advise other citizens of that neighborhood to ask for a consult as well. The municipality reacts on this increase in certain suburbs to focus their plans. If the enthusiasm is there, we try to feed it with additional projects."

Respondent 4

Many of the interviewed municipalities encourage these bottom-up initiatives taken by citizens. However, most of them are skeptical about the feasibility of these plans. In the initiation phase local citizens are enthusiastically organizing themselves, however when it comes to the implementation projects often come to a hold. Those initiatives are seen lacking organizational capabilities when market parties are not quickly involved.

"We had an citizen initiative in one suburb focusing on aqua thermal energy, but it recently failed again. There is also an active resident group in another suburb, but that has recently stopped as well. So, we are noticing these bottom-up initiatives, but those have not yet come to the implementation phase."

Respondent 8

The true coordination and management of these bottom-up actions is often missing. The create a structural change to levels of energy democracy a more professionalized approach is needed in which collective organizational forces are strong (Wahlund & Palm, 2022). These examples are lacking the support from the local government.

6.3 Network governance mode

The network governance mode was almost only seen in the visioning phase of the transition when municipalities were setting up their TVW. This section therefore does not elaborate this governance mode on the project level.

Most interviewed municipalities consulted relevant market parties when they started with the warmth transition. These consultations took place when municipalities where in the initiation phase of setting up the TVW. By organizing meetings with electricity grid owners, housing corporations, neighboring municipalities, and associations of local companies a draft vision was set up. The studies conducted in this phase were mostly focused on feasibility of plans and financial consequences. Societal aspects were in most cases later on involved in the process of setting up the TVW.

"We have set up a kind of structure with so called administrative and official heat tables to develop the TVW, which has worked very well. We are sitting around the table with all kinds of parties like cooperatives, network operators, etc. Together with these heat tables, we have looked technically at what our municipality looks like, how it is structured, what the residential areas look like, which possible heat sources we have, etc. Based on ten criteria, we have made a selection of which district will be the first to be phased out from natural gas."

Respondent 7

These professional stakeholders are involved by municipalities to provide context specific information. Effects of several transitional scenarios have been discussed as well as investment costs. On the regional scale municipalities collaborated in intergovernmental meetings. Through these meetings experiences and possible learnings are shared. Respondents mentioned how this transition is relatively new for them as well when it comes to technical solutions and experiences. Sharing policy approaches, technical insights, etc. gave them a better understanding of the challenges in this transition.

"Sessions have been held with a few other municipalities to look at what is going on and what opportunities are available in the various municipalities. What alternatives could you explore?"

Respondent 7

It is clear municipalities involve many professional stakeholders and neighboring municipalities to organize their warmth transition. These actors are all involved in different stages of the process in which they all have different levels of responsibility, input, and influence in the process.

6.4 Self-governance mode

Some municipalities create a large room for input and influence by market parties and civil society. This often derives from their political standing points in which in a liberal view this transition is left to the market. In some cases, it is leading to unwelcome surprises such as a biomass power station, a cheap heating technique in favor for market parties although it does not match the councils beliefs in sustainable energy production.

"Our municipality likes to leave the warmth transition to the market. A liberal municipality, so developing a heat network ourselves is not our plan. Market parties have become active based on that idea. (…) Well, sometimes we are surprised, suddenly there is an application for a biomass power station. But then there is not much we can do about it because it simply fits into the zoning plan."

Respondent 8

Other municipalities belief the transition should be left to market parties and civil society because it is believed they are responsible for their own transition.

"In the past, we were able to purchase natural gas collectively from 30 to 40 organizations. This will soon happen with insulation and hybrid heat pumps because the market is simply growing, and then you can also do it individually, that's up to you. But I don't have to organize that because it costs a lot of time and money. (…) We want residents to take responsibility for purchasing a heat pump and I want to leave that responsibility there. (…) I am not at all in favor of setting municipal goals to remove 5000 homes from natural gas, because then all those owners will lean back and then we have the responsibility."

Respondent 15

In sum a discussion is ongoing on what level the local governments should network or interfere with market parties. Although technically possible, it can lead to solutions that do not match sustainable beliefs of city councils. On the other hand, intervening in this transition is automatically followed by an increased level of responsibility for the transition. Civil society might become less active in taking initiatives when local governments are taking the lead which is not beneficial for promoting energy democracy.

6.5 Reflections

In the first stages of the transition, when policy is made through the drafting of the TVW, most interviewed municipalities showed a combination of network and hierarchical top-down governance modes. These two governance modes helped municipalities in setting up a transitional vision which is related to relevant context through market parties and other professional stakeholders. Civil society was often approached in later stages.

In transitional projects, which are later on deriving from this TVW, the focus is put on bottom-up initiatives since support from civil society is seen as crucial in the realization phase. One can conclude that in the project phase of the transition the governance modes shifts to more 'new modes of governance' such as interactive and self-governance modes.

This combination of governance modes is often linked to the socio-institutional approach. This approach is used for "multiple consecutive deliberative rounds of decision-making processes" which can work beneficial for promoting energy democracy in the energy transition (Patterson et al., 2017). According to Patterson et al. (2017) it creates possibilities for multi-actor networks in which context-specific transformative solutions are

empowered. The creation of these transformative solutions and its relation with the promotion of energy democracy is touched upon in the next section.

As described in the conceptual framework the transition management approach described in chapter 5 and the applied governance mode described in this chapter effects the success of energy democracy. Results in relation to energy democracy are analyzed in the next chapter.

7 Energy Democracy

According to the conceptual framework in section 2.4 the success of energy democracy is dependent on two factors. Firstly, on the strategical concept or the transition management approach, as discussed in chapter 5. Secondly the institutional context or governance mode as elaborated upon in chapter 6. Through the work of the field of policy makers the promotion of energy democracy is formed and leading to induced strategic behavior of stakeholders in the transition. In this section the results in relation to energy democracy are elaborated upon. These results are discussed in a number of sections which are chronologically in line with the transitional approach taken by municipalities in general. In the first section the results on the creation of awareness are discussed. In the subsequential sections an elaboration is given on technical advice, purchasing programs, natural moments that are seen to transition, ways citizens are approached, and the challenges municipalities are facing. In the last section an overall reflection of this chapter is given.

7.1 Creating awareness

According to Wahlund and Palm (2022) collective participation in energy democracy is formed in situations of formalized and institutionalized governance modes. To successfully organize these forms of collective participation citizens must understand why they need to participate. This relates to letting citizens become aware of the need to transition from natural gas to more sustainable sources. Interviewed municipalities are seen taking different approaches to create awareness among citizens. In most cases they organize community meetings in which the transition and municipal transitional approaches are explained. To reach a representative reflection of society several tactics are seen.

"You can always find a few enthusiastic residents who like to get on stage and present the story together with municipal officials. Naming the event correctly is of great importance, call it an energy café or call it a neighborhood meeting. When calling it an energy cafe you might as well have say the dress code is "checkered blouse with a breast pocket with a pen and reading glasses from Hema." While if you go to the neighborhood meeting you will see that there are couples in the room. In that case they come together with their partner, and you have a completely different setting."

Respondent 4

In its core energy democracy is about fundamental equality, managing collective affairs such as the energy transition should be done in an egalitarian fashion (Szulecki, 2018). Reaching a group of citizens which forms a reflection of society is therefore important but also found a challenge regarding the technical focus of this specific transition. An approach as seen initiated by respondent 4 contributes to the promotion of energy democracy in this transition. Other municipalities are seen organizing these kind of community events as well (Respondent 3, 11 and 12). Examples of different initiatives are the provision of technical help in quick insulation fixes by a technician going around the neighborhood (respondent 14), energy transition newspapers which share success stories and model houses which are fully transitioned and can be visited by locals (respondent 11). Innovative ways like thermal camera walk arounds are seen as well by which citizens can compare their insulation with neighbors.

Trying to reach the community in an inclusive way relates to energy democracy (Szulecki, 2018). Alongside collective awareness and resulting collective participation, decision making in formalized institutions is also part of energy democracy. This results in the feeling of democratized ownership of the chosen energy system and true structural change (Wahlund & Palm, 2022). Although the above examples of the community meetings and other initiatives are contributing to energy democracy they are mostly focused on informing citizens. These initiatives are lacking possibilities for citizens to actively make use of their collective organizational forces.

7.2 Advising citizens on the possibilities

After citizens are becoming aware of the need to transition to sustainable warmth sources such as all-electric solutions, they often feel the need to be properly advised in the possibilities. Before diving into the several approaches municipalities take to give advice, it is important to touch upon the focus that is needed in giving advice. While some citizens would like technical advice for selecting a certain warmth pump, others might need help filling in administrative forms for their subsidy. Municipalities press the need for customized approaches (respondent 4, 11 & 14). Some municipalities argue a clear pathway is needed for citizens to understand why they need to insulate their home to eventually transition to for instance all-electric solutions. They provide road maps which explain these several steps. Other municipalities encourage this approach as well (respondent 11 & 15). Generic advice or solutions are contributing to inequality in the provided municipal support. This is

contradictory to the goals pursued in energy democracy. These individual measures do lead to timely and costly processes.

At time of the interviews almost all municipalities focus their advice insulation measures. In sum this was done through mainly three approaches. Firstly, through the use of energy corporations, secondly by organizing collective advice and lasty by spreading information on national subsidy and sustainability loan possibilities.

An energy corporation is an initiative started by local citizens who organized themselves to help others in the phasing out from natural gas and becoming sustainable. By memberships and municipal subsidies energy corporations have the possibility to provide advice on, for example insulation measures, and the possibility to invest in local initiatives. They run on volunteers with often a technical background. In all interviewed municipalities energy corporations were active and working closely with municipal policymakers and project managers.

"At the moment, when we are talking about advice on insulation, we are letting this being done by the energy corporation in our municipality. They have received financial help from us, by which they are currently focused on giving technical insulation advice and the realization of small in-house insulation measures. We are trying to give as much public attention to this energy corporation as possible"

Respondent 6

These energy corporations are self-organized bottom-up systems that are recognized and supported by the municipalities. At the time they are mainly focused around on-demand advice. They have the potential however to further expand their influence and strengthen their collective organizational forces. By means of collective advice, procurement of insulation and all-electric solutions they are able to create affordable opportunities for a broad part of public society. According to Wahlund and Palm (2022), these kinds of collective organizational forces are needed to slowly transform to the democratized ownership of the energy system. The way collective advice and procurement is organized and encouraged by municipalities in the present situation will be touched upon in the following sections.

After municipalities have worked on creating awareness, they on their turn received valuable information on where active citizens or neighborhoods are located. Often, they focus on these active neighborhoods to start their all-electric initiatives. Most municipalities noticed a shortage in technical knowledge within the local community to pick the most effective insulation measures for their homes. This selection highly depends on how a certain house is constructed, the renovations that have been taken place, etc. To still be able to collectively, and thus effectively, organize this type of technical advice several solutions were found. One respondent mentioned a process in which a local town, transitioning to all-electric solutions, is split up in clusters in which houses are constructed in more or less the same way.

"As a municipality we pay one technical advice on insulation and heat pumps for of all those 16 clusters, which can then be placed on the platform so that citizens in that specific cluster can make cheaper comparable advice based on that one paid by us (…). That platform also provides people the ability to connect with other citizens in the same cluster."

Respondent 1

Several municipalities initiated, or planned to initiate, this same approach (Respondent 3, 6, 9 & 14). Citizens are able to join this advising process in a simple way without having to select their own advisor. On the contrary municipalities are aware of the time consuming and intensive process that is needed to correctly advise people. Some have discussions about what level of collective advise can really be achieved.

"Some houses have thinner insulation compared to others; some have underfloor heating others don't. So, how do you get that real customization that is needed? We don't really have an answer to that yet."

Respondent 9

If made possible, the approach in providing collective advice on proper insulation measures and even the selection of heat pumps will improve the equality of the transition and thus promotion of energy democracy. Citizens are able to organize such a platform themselves which contributes to their independence. Energy democracy takes power away from market parties and corporates and brings it back to citizens (Wahlund and Palm, 2022). The collective advising approach, which is available for all citizens of that clustered suburb, contributes to this belief.

Nationally organized there have been a number of subsidy measures which citizens can make use of to help finance insulation measures. For most cases these subsidy measures are ones in which citizens first have to invest in one or more measures whereafter they are given the subsidy. Additionally, some municipalities have their own subsidy system (respondent 3) or actively provide energy boxes with small scale insulation measures financed by national subsidies (respondent 6). A few municipalities are actively providing sustainability loans as earlier touched upon by respondent 15. In relation to the egalitarian beliefs of energy democracy these subsidy measures and sustainability loans are ones increasing the inequalities of the transition. Not all citizens are financially able to pre-invest in these insulation measures to eventually benefit from the subsidy that is only provided after the investment is made. More-over citizens who already live in financial depth situations are not able to get a sustainability loan.

Again, as touched upon in section 7.1, this shows how advice should meet the person needs and can't be too generic for the whole municipality. Some people do need advice on filling in the correct forms before they can be given advice on technical measures, they are able to choose from. The approach taken by respondent 4 makes the inequal subsidy and sustainability loan measures more accessible for everyone with benefits energy democracy.

Municipalities experienced a higher level of participation in collective programs in suburbs constructed between 1995 and 2005, as is the focus in this research. Within these suburbs communities generally taken have relatively high income and a high level of education. These factors help in understanding complex subsidy measures, the ability the finance measures and start renovation projects to insulate their homes.

7.3 Collective purchasing

The next step after being advised is the purchasing of the several chosen measures for insulation or even all-electric solutions such as the heat pump. Several municipalities are looking for ways to support or even organize a way of collectively purchasing these measures together with citizens. In all cases this comes down to setting up a program in which one or more market parties are involved who offer their products for reduced rates or delivery times to citizens who participate in this program. Only a few of the interviewed municipalities showed that they have experience in these collective purchasing programs (Respondent 4, 6, 9 & 10). None of them have experience with collective purchasing of heat pumps. One respondent explained how citizens were involved in the process of selecting market parties.

"In the past we had set up collective purchasing programs for solar panels. We have also organized it locally on a low profile. There was an information evening about solar panels, then the question was asked, who wants to be in the jury for the tender? That's how we got started and I think eventually between 200 or 250 people purchased solar panels by this campaign."

Respondent 6

The main reason for municipalities to set up a collective purchasing program is to increase participation in the warmth transition by simplifying the organizational aspects for citizens.

"I try to include those behavioral components in what I do. To make it as easy as possible for people so that for examples quotations are linked to the program, people receive their specific advice and that they can sign the contract immediately. The whole organizing process is taken out of their hands."

Respondent 10

Organization of these collective initiatives does not solely need to come from the local government, although most municipalities belief they need to trigger the rest of society to start the transition. When it comes to the feasibility of these plans several opinions are heard. Some respondents think the actual shortage of heat pumps makes it hard to belief that benefits, like discounts and faster delivery, are not possible or only small.

"No, we are going to have a look at what is happening in the future. It takes 9 months to get a heat pump, now is not the time to for collective purchasing programs. As a municipality, you can't do anything about that. Citizens are able to get subsidy for these heat pumps, they will find their way. So we as a municipality are not going to do much with that."

Respondent 7

Municipalities seem willing to organize collective purchasing programs. They are a logical step after collective advise has been given. Although relying on investment capacity and knowledge of citizens they could increase participation levels. Alongside these generic measures municipalities are focusing on specific natural moments to transition as well.

7.4 Natural moments to transition

Parallel to the collective program's municipalities are setting up to transition to all-electric solutions, municipalities also try to make use of the natural moments in which a transition seems a logical step. Most interviewed municipalities try to focus on the moments on which citizens are buying and probably renovating their newly bought house (Respondent 4, 5, 6 & 15). Through the network of estate agents, they are trying to get in touch with that specific group of people offering free advice on insulation, heating systems, possible subsidies, etc. One interviewed municipality did already have some experience and found this idea more complex than initially expected.

"The real estate agent says that if he provides such a report, he will actually let you know what is technically missing in that house. (…) He then also dropped out at a given moment. The contractor, installer and architect find it all interesting, but they are not going to take on such a project because they are already very busy. They are looking for more volume from housing cooperatives."

Respondent 5

The above conclusion by respondent 5 in relation to housing cooperatives does create new insights. Once every few years the owner's association has to set up a maintenance plan with possible renovations. When they are given advice on possible warmth transition solutions, they might be more willing to adopt these ideas in these maintenance plans (Respondent 4).

Other respondents mentioned focusing on suburbs realized with heating system based on natural gas around 15 years ago (respondent 14). The lifespan of their boilers is coming to an end, which is again a logical moment to actively advice on sustainable solutions or initiate collective initiatives. This same suburban focus is given by municipalities based on statistics. On average citizens of some suburbs are moving houses more often compared to other suburbs where citizens stay longer. In the latter situation people are probably more willing to invest in an all-electric heat pump since earning back this investment takes a long time.

7.5 Ways to approach citizens

Throughout the municipalities it is felt that citizens are increasingly interested in sustainability and transitions to becoming carbon neutral and these active citizens want to be seriously involved. Especially when on the project level transitional plans are being formed. This respondent mentioned the term 'procedural justice' which reflects the fairness and transparency of the chosen approaches in the transitional projects.

"Sometimes it can also help not to say we have opted for a heat network for your district. No, we will do research together and come to the joint conclusion that the heat network is an attractive option. And when you approach it this way, the response is often very different."

Respondent 4

The above conclusion is also supported by other interviewed municipalities when the involvement of citizens in this transition in relation to energy democracy was discussed (respondent 2, 9 & 12). To shape an approach in which collective participation is set centrally as promoted by Wahlund and Palm (2022), municipalities must take citizens seriously.

One respondent mentioned the approach to include citizens should be defined by citizens instead of communication advisors and consultants. According to this respondent especially in the early stages of this transition participation processes should be formed together with citizens. Additional it was argued by this respondent that municipalities should actively include the early adapters in these approaches. Citizens with practical questions such as transitioning from a natural gas boiler to a heat pump will have more trust in local citizens compared to a salesman of a market party.

"We always talk about target groups instead of with target groups. Everyone always falls into this very same trap because they are used to working together but not with the target group itself. Stop that and just start asking the citizen what they think is important. (…) Learn from the stories told by early adapters. Precisely those small projects that emphasize the chance of success are meaningful for others. Look at what they encountered?"

Respondent 1

7.6 Challenges in promoting energy democracy

When municipalities signed the Dutch national climate agreement (Ministry of Economic Affairs and Climate Policy, 2019) they mentioned that the financing of the realization phase needed to come from the national government. Municipalities argue that this promise is still not met (respondent 2, 12, 13 & 14). Municipalities have mentioned that by the drafting of the TVW their role is completed until the national governance is financing additional plans such as the suburban transitional plans.

"We must first obtain the financial resources that we were promised two years ago from the national government. Because drawing up suburban transitional plans takes time, well there just isn't more capacity, so we can't do that either. In the meantime, we try to do something with sustainability loans, government subsidies, etc., but we are not setting up large transitional programs."

Respondent 15

On the level of technical solutions several municipalities mention challenges as well. Some situations are too complex to be handled in collective and general approaches. Respondent 3 gave insights in how in rural area's citizens are not able to implement sustainable heating solutions because cultural heritage laws forbid to do so.

But even general almost half of the interviewed municipalities mentioned the large amount of customization needed when looking for insulation measures or the selection of heat pumps. Simply because the housing stock differs greatly, even in suburbs which are set up by one developer in the same architectural style. Some renovate their home in different ways than others, which make insulation and heating solutions differ as well (respondent 3, 4, 5, 9, 10, 13, 16, 17). However, focusing on suburbs constructed between 1995 and 2005 does increase the chances of success for collective approaches since these citizens are often more able to financially invest and have the knowledge.

When transitioning to all-electric solutions the usage of the electricity grid will increase. In the past years the Netherlands has seen an increase in the number of solar fields, wind energy parks. For many regions this has been leading to net-congestion, a situation in which the electricity grid capacity is not sufficient. Some respondents mentioned they felt these issues in their municipalities and are considering consequences for their warmth transition.

"Now it is also the case that grid operators are experiencing congestion. The electricity grid simply cannot handle the situation. Also, within our own municipality we see this happening, you just see that solar panels stop delivering to the grid. In that sense as a result everyone is hesitant to set up an transitional process to all-electric solutions as a result."

Respondent 7

A large player in the warmth transition and also advisor for many households who want to replace their boiler is the installation industry. By request mechanics in this industry visit households to give advice on the replacement of their boiler. Instead of opting for sustainable solutions like an all-electric or hybrid heat pump they often recommended installing a new boiler which is still running on natural gas. One respondent, often in contact with this industry, argues for change.

"The installation industry really needs to change. At the moment you always see them advising a heating boiler running on natural gas. We regularly meet with the local industry. They argue that those homes cannot handle an all-electric solution. That's their opinion but that is often nonsense and simply not true. Central heating boilers are simply the standard for them, and they don't want complicated changes."

Respondent 14

The above-mentioned challenges result in a slower transitional speed and a lack of true structural change in the current energy system.

7.7 Reflections

In the first stages of operationalization of the transitional plans, municipalities work on creating awareness. This is mainly done in an informative way by organizing community meetings, thermal camera scans of houses and letters. In this stage however citizens are not asked to form active groups which help or even initiate transitional programs. Especially in the first phases of a transitional project is important to involve citizens in formalized institutions to let them make decisions to collectively cooperate (Wahlund & Palm, 2022).

In the following, but often parallel stages, advise is given on mainly insulation measures. This advice is organized around two approaches, the first being the municipal wide approach with generic measures. The latter being the suburb focused projects for a specific part of the municipality. In the municipal wide approach participation is based on the beliefs and interest of citizens, and relatively a relatively large investment capacity is needed. This approach is more effective in suburbs constructed between 1995 and 2005 since income and educational standards are relatively high. In other suburbs, where these standards are limited, the approach is less effective. This is leading to exclusion of a large group of citizens in relation to energy democracy.

In the suburb specific approach, a more in-depth analyses is seen to understand what the citizens' needs actually are. Organizational forces of citizens are used to set up collective advise and possibly organize purchasing programs. These make sure citizens who drop out because of complicated tendering processes stay involved. Although experienced as intense and time-consuming these suburb focused approaches have the opportunity to benefit principles of energy democracy.

In the following chapter the results as discussed in chapter 5,6 and 7 are brought together to answer the research questions. Thereafter, a general conclusion is formed.

Conclusions

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8 Conclusions

In this chapter an answer is given to the research questions of this thesis. Through a municipal perspective the warmth transition has been analyzed. With a focus on suburbs transitioning to all-electric solutions it was tried to understand whether and how a collective approach would lead to a more efficient and effective transitional process. This collective approach is linked to the concept of energy democracy, which is based on the principles of democratic politics. In practice this relates to creating an energy community, democratized ownership of infrastructure, redistribution of power from corporates to citizens, and above all, collective participation (Wahlund & Palm, 2022). Through qualitative methodologies 17 municipalities have been interviewed. The analysis has been based on the way they organize their warmth transition around the concepts of transition management, governance modes and energy democracy.

8.1 Sub questions

First, the transition management approaches shaped by municipalities are illustrated. Second, the aspects of the current municipal governance modes are elaborated upon. Third, the limitations of individual and collective approaches in the transition are defined. Lastly, possible opportunities for collective approaches based on the principles of energy democracy are discussed.

8.1.1 Sub question 1: Transition management approach

Based on the theoretical review, aspects of transition management have been further clarified. The transformation of the energy system is seen as several social transformation processes. In these processes the system changes to a new state in which it will not return to the previous state and will remain in place. This is happening through the following subsequent stages: ‘take-off’, ‘breakthrough’ and ‘stabilization’ (Rotmans et al., 2001). According to the conceptual framework of this research the transition management approach defines the strategical concept of the transition (Faller, 2014). Together with the institutional context, or governance mode, it influences the induced strategic behavior, being energy democracy.

Before municipalities were nationally obligated to write the TVW, some municipalities organized transitional pilot projects and performed studies in transitional approaches. These initiatives were not conducted by all municipalities, resulting in municipalities having a head-start in the warmth transition. This period can be regarded as the ‘take-off’ phase of the warmth transition as described by Rotmans et al. (2001).

Currently the warmth transition can be placed in the early stages of the ‘breakthrough’ phase. All interviewed municipalities were focused on taking action and accept their leading role in this transition. Another sign is the accumulation of changes. To establish a transitional arena as elaborated upon by Loorbach (2010) they were focusing on operationalizing the plans set in the TVW’s. The operationalization of the transition to all-electric solutions is found complex due to the need for customized advice. The diversity of insulation and heat pump options in regard of the diverse constructions of houses make generic types of advice less efficient.

The transition is seen as one consisting of multiple cyclic projects and initiatives which run parallel to each other in time (Cramer, 2020). This is clearly observed in municipalities balancing between municipal wide insulation programs, suburb focused advisory projects, and scattered experiments and pilots. The suburb specific approach however is mainly focused on the implementation of heat networks and not on the role out of individual all-electric solutions. Existing transitional all-electric pathways are currently only focused on giving advice on insulation measures. Municipalities struggle to initiate multiple collective transitional pathways for the all-electric transition as overall questions on affordability, feasibility, and an overall lack of knowledge exist. These challenges are elaborated upon in the following sections.

8.1.2 Sub question 2: Governance modes

In this thesis, the interrelation between local governments, market parties and civil society in the warmth transition was studied. These relations have resulted in several governance modes that were seen, as touched upon in the theoretical review (Driessen et al., 2012). In all the governance modes that were seen the local government saw their role in this ‘breakthrough’ phase of the transition as the agent of change. As Hoppe and Miedema (2020) concluded this role is crucial for the development of transitional approaches eventually leading to the needed systematic change.

During the process of writing the Transition Vision Warmth (TVW) municipalities were seen in mainly a combination of two governance modes being the traditional hierarchical top-down mode and the new network

governance mode. In two municipalities, where solely a traditional hierarchical top-down governance mode was seen, the situation was either too complex, or the municipality had chosen to select a suburb to start the transition without consultation of its citizens. The latter case resulted in large forms of protest organized by these citizens. In sum it is concluded a traditional hierarchical top-down governance mode alone does not improve support in the energy transition and thus decreases the possibilities for a collectively organized transition. This conclusion is in line with the findings of Lange et al. (2019). What can be learned from the latter case however is the potential of citizens to collectively organize themselves in the warmth transition, albeit in forms of protests in this case. This form of citizen power relates to one of the fundamentals of energy democracy (Wahlund & Palm, 2022).

In most interviewed cases, municipalities were seen consulting relevant professional stakeholders and market parties while setting up the TVW. They created a professional network with whom they regularly held meetings and discussions on overall feasibility of their transitional approaches. Besides consulting with non-governmental organizations municipalities exchanged experiences with neighboring municipalities and regional transitional networks. Within these inter-governmental meetings feasibility of possible collaborations was discussed. In some cases, the network governance mode was leaning to a form of self-governance where the local municipality took a less prominent role. These municipalities were open to market initiatives based on ideas that the government should be on the sideline. Due to the earlier mentioned ‘breakthrough’ phase of the transition citizens are questioning market party initiatives and are sometimes even found skeptical which does not benefit collective participation.

Transitional projects appointed in the TVW were in most cases selected on the basis of existing bottom-up initiatives. Some municipalities even altered their vision when these initiatives arose after the publication of the TVW. This approach in the realization phase of the plans in the TVW showed a different governance mode where more focus is put on the beliefs and ideas of citizens. Niche-developments are therefore possible to be implemented (Hoppe and Miedema, 2020). On the other hand, it can be concluded these initiatives do not lead to actual transitioning projects since knowledge, time and financial resources are missing among these citizens. In reaction, the local governments argue those bottom-up initiatives are lacking true commitment and transitional impact. This conclusion can be seen as a loop from which true aspects of energy democracy have no ability to succeed. A more professionalized and supportive role from the municipality is needed to help these citizen’s initiatives become realized. The current collective organizational forces in energy democracy as described by Wahlund and Palm (2022) are not strong enough and need support from local governments.

By this research it is concluded that a multitude of governance modes is seen. In setting up the TVW most municipalities organized a consultation network around them, creating a mix of the traditional hierarchical top-down governance mode, together with a form of network governance. On the project level of the transition more focus is put on bottom-up forms where citizens have a larger influence in the interrelation with the local government and market parties. This conclusion is in line with the conclusion of Hoppe and Miedema (2020) in which they state that transitions are taking place on multiple levels. On the theoretically described strategical and tactical level links are seen with the visioning phase of the transition, or the TVW. In the operational level, or in this case the project implementation phase of the transition, several citizen initiatives are seen as well. In the theoretical analysis this approach asks room for multi-actor networks that can strengthen niche experiments and transformative solutions. These networks include: “multiple possible modes of policy and decision making, and multiple actors” (Patterson et al., 2017, p. 404).

8.1.3 Sub question 3: Recommendations and limitations in relation to energy democracy

As described in the theoretical analysis of this research, energy democracy is based on the fundamentals of egalitarianism, in other words equality (Szulecki, 2018). Managing transitions collectively is therefore seen as one of the main focal points. Higher levels of energy democracy can be reached by strengthening collective organizational forces of citizens, collective participation in transitional processes and bringing power from corporates to citizens (Wahlund & Palm, 2022).

During the interviews several initiatives, which are contributing to the enforcement of principles of energy democracy, were observed. In the first stages of the transition municipalities focused on creating awareness. This was mainly done through the use of community meetings, thermal camera scans, and pilot projects serving as examples for others. These actions where mostly focused on informing citizens, created collective awareness and resulted in higher levels of participation. According to Wahlund and Palm (2022) collective decision making

should be part of this phase as well. Municipalities could have gone further by organizing formalized institutions in which decisions are made for future transitional scenarios.

Advise on several aspects is given parallel to creating awareness among citizens. Municipalities organized their advisory role in mainly two approaches. The first can be seen as the municipal wide approach for all municipal citizens who are interested. The second shows advise focused on specific suburbs or projects. In the former, the focus was mainly on providing advice on technical insulation possibilities and ways to make use of national subsidies and sustainability loans. This municipal wide approach can be regarded as generic approach mainly helping citizens with technical interest and financial capabilities to finance measures. This was especially effective in suburbs constructed between 1995 and 2005 as was the focus of this research. To counteract the consequences of being too generic, there are municipal wide measures for specific target groups in place, focused on citizens experiencing energy poverty. These measures however are only small steps in relation to the large transition away from the use of natural gas. Municipalities could improve the equality of the transition, and thus increase the success of collective approaches and energy democracy, by focusing more on citizens who financially cannot make use of the municipal wide generic approaches.

In the latter approach, where advise is focused on a specific suburbs, citizens are often approached more directly and personally. This way it is better understood what the actual needs of citizens are, on which advise can be personalized. These personal suburban approaches work more effectively. In the projects where advise on technical insulation and all-electric solutions is organized citizens are able to strengthen their collective organizational forces and collectively participate in their suburban transition. With the several ideas on collective purchasing the principles of energy democracy are even increasingly strengthened. Collectively those citizens are meant to organize their tender to select their suppliers. After the transition to individual all-electric solutions people have become independent, they no longer rely on their supplier of natural gas or owner of a heat network. They have become the owner of their own energy system, which is in line with the principles of energy democracy.

This research shows that current advisory and collective procurement programs are often organized by either the municipality or its energy corporation run by volunteers. The latter can be regarded as the main accelerator of the warmth transition based on the principles of energy democracy. These energy corporations are already run by municipal citizens, they have the capabilities to truly bring power from corporates to themselves. This transfer of power is regarded as one of the pillars of energy democracy (Wahlund & Palm, 2022). There are some limitations and challenges to empowering these energy corporations. Just like municipalities they are understanding the need for customization in transitional approaches to reach equal benefits (Szulecki, 2018). The number of technical experts in the field is limited, just as the financial resources provided by the government to set up these time-consuming customized approaches.

8.2 Main question: Energy democracy in the warmth transition

In conclusion the following actions are taken by local governments which either have a positive or negative effects in relation to the principles of energy democracy (Wahlund & Palm, 2022). Transitioning from natural gas networks to individual all-electric approaches makes citizens energy independent. In comparison to the transition to heat networks, where citizens are meant to sign a contract with the heat network owner, citizens can experience autonomy. The transition to individual all-electric solutions alone can therefore be regarded as one bringing power from corporates to citizens.

This research shows that the way this transition takes place however, effects the level of applied energy democracy as well. By means of collective organizational forces of citizens, collective participation should arise. Overall municipalities struggle to engage their citizens in collective programs such as collective advising and purchasing programs. These programs are especially effective for citizens who have the financial capability to invest in their homes and knowledge on understanding the technical solutions and subsidy schemes. Generic approaches therefore seem to be relatively effective in suburbs constructed between 1995 and 2005, as was the focus of this research. What must change however is the organizational role of the municipality in this phase of the transition. The Transitional Vision Warmth (TVW) was set up in a more traditional hierarchical top-down and network- governance mode. In the operationalization phase of this transition the self-governance mode should come to the front in which the municipality is only supporting citizens where needed.

By this research it is demonstrated that, instead of organizing generic programs themselves, municipalities should make use of existing citizens' networks such as energy corporations to support them in organizing these projects themselves. Only when these citizens make their own decisions and organize their own collective transition, a level of democratized ownership of the energy system arises.

In conclusion, the current transition approaches, organized by municipalities do have the potential to implement the principles of energy democracy by which an acceleration could take place. However, the role of the municipalities in the operationalization phase of the transition needs to change to a supportive role in a self-governance mode. In addition, national financial support is needed to give the municipalities the ability to fully take this supportive role.

Reflections

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9 Reflections

In this chapter, a reflection on the thesis is given. At first the theory used for this research thesis is analyzed and reflected upon. Secondly a reflection is given on the methodologies used and thirdly recommendations for further research are discussed. These recommendations are focused on both theoretical recommendations for scientists as well as recommendations for municipalities.

9.1 Theoretical reflection

The theoretical background of this paper rests on mainly three concepts. Those concepts are, transition management, governance modes and energy democracy. In this section a theoretical reflection is given on these theories.

The theories around transition management in general are found applicable to the Dutch warmth transition. The described phases a transition is going through by Rotmans et al. (2001) is found somewhat simplistic. The warmth transition is not just one line on the graph, although the additions described by Cramer (2020) and Bresters (2021) show the complexity of the transition. They describe a transition as one undergoing multiple approaches, experiments and innovations. This multitude of approaches is reflecting the warmth transition to all-electric solutions as researched in this thesis.

When it comes to the governance modes described by Driessen et al. (2012) a large diversity of these governance modes in the warmth transition is seen. Just as the transition management model of Rotmans et al. (2001), these governance modes are again an overly simplified version of the reality. Municipalities take on a combination of multiple governance modes at one time in the transition. Although the social institutional approach as described by Patterson et al. (2017) explains this complexity it combines basically all governance modes as well without clear differences. In this research thesis it is concluded that during the phases a warmth transition is going through, a shift in modes of governance is seen throughout all interviewed municipalities. In the visioning phase of the transition traditional hierarchical top-down modes are seen in combination with new modes of network governance. Later on, in the project phase a shift is seen to modes of public-private and self-governance modes. These are insights additional to the existing literature on governance modes in transitional context.

By this research thesis it became clear that implementing the principles of energy democracy as described by Wahlund & Palm (2022) is found complex. Due to the innovativeness of the transitional measures there a lot of financial risks involved in undergoing the transition collectively with your neighborhood. Pre-investments are needed as well as courage and technical knowhow on selecting suppliers and setting up effective decision-making structures which all contributors agree upon. Market parties are more willing to take those risks and are more easily able to organize collective programs. Therefore, bringing power from corporates to citizens is found complex according to government officials. This research has shown that the above challenges can be described as a possible lock-in situation in preventing citizens from becoming powerful owners of a inclusive energy system as promoted by Szulecki (2018). Citizens, transitioning to individual all-electric systems, are owning their energy system, although Wahlund and Palm (2022) refer to energy democracy in a greater scale and context. True structural change in these power relations and ownership of energy systems as envisioned by Wahlund and Palm (2022) seems only possible on small scales.

9.2 Recommendations for further research

Following up on the conclusions and theoretical recommendations in this research thesis several recommendations for further research are made. The above concluded shift in governance modes throughout the operationalization of the transition could be further explored. In comparative studies this conclusion could be mirrored with transitions other than the warmth transition. Possible additional findings in the light of governance modes and transition management might help better understand the role of government agencies in the transition.

Additional research can be carried out on the applicability of the principles of energy democracy as described by Wahlund and Palm (2022) in a specific governance context. Following this research thesis, it is still unknown if implementation of the ideas on energy democracy is fully applicable in the current governance setting. It seems that only in small scale situations a true democratized ownership of the energy system is possible. Studies on energy democracy are still vague and not yet found applicable in our societal system focused on the free market dominating our behavior. Conducting further research into the applicability of the principles in

several case studies might lead to a more in-depth analysis compared to this generic study on the warmth transition.

9.3 Advice for municipalities

In this section advise is given to government officials working for municipalities in the warmth transition. This advice is based around the analysis of the results and conclusion. At first it is mentioned that the respondents showed interest on what collective approaches for all-electric solutions are currently known. Although several innovative approaches were seen, they were not shared nationally. Municipalities are found having intergovernmental meetings within their region, where these solutions are discussed. What is lacking however is a nation-wide platform in which experiences on collective approaches can be shared. Especially in an innovative transition like the all-electric warmth transition, sharing the lessons learned is key to success.

The first phase of the transition in which the Transition Vision Warmth (TVW) is set up is now over. Visioning, discussing scenarios, and setting up transitional plans was mainly done in a governance mode with a top-down hierarchical focus in combination with network governance. Currently the focus is put on the several transition approaches and projects deriving from the TVW. When organizing collective initiatives related to energy democracy, municipalities should gradually move away from this top-down and network governance focus. A form of self-governance and public-private governance is seen as the best mode for supporting collective approaches in this specific part of the warmth transition. The primary focus should be on giving power to citizens and only provide support in their actions when needed as Wahlund and Palm (2022) ask to do so.

To support the above shift in the governance mode municipalities could make more use of often existing municipal energy corporations. These corporations These corporations run on volunteers living in the municipality and are a trusted link between municipal policy and citizens of transitioning neighborhoods. They have the organizational capacity and existing structures to formalize decision making among citizens. Accelerating the all-electric transition based on the principles of energy democracy is only possible when citizens are able to strengthen their collective organizational forces (Wahlund & Palm, 2022).

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Illustration references

Appendices

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Appendices

Appendix I: Dutch Language Summary

De Nederlandse overheid heeft als doel gesteld dat alle wijken in 2050 moeten zijn overgeschakeld op duurzame warmtebronnen. Dit doel, om van het aardgas af te gaan, sluit aan bij de wereldwijd overeengekomen duurzaamheidsdoelen en wordt recentelijk versterkt door de wil om onafhankelijk te worden van Russisch geïmporteerd aardgas. Vaak wordt deze transitie vanuit een technisch perspectief benaderd, maar belangrijker nog is de maatschappelijke kant van de transitie. De eerder genoemde doelen vragen om snelheid en efficiëntie in de transitie. De maatschappelijke aspecten creëren echter een kans voor de herverdeling van machtsverhoudingen en het mogelijk maken van collectief participerende gemeenschappen. In de literatuur worden deze collectieve principes gekoppeld aan het begrip energy democracy.

In dit onderzoek is de huidige transitieaanpak van de Nederlandse gemeenten onderzocht. Dit wordt gedaan door focus aan te brengen op wijken die overgaan op individuele elektrische oplossingen, beter bekend als de warmtepomp. Deze transitieaanpakken zijn geanalyseerd op basis van de concepten van transitiemanagement en governance modes. Die concepten hielpen bij het beschrijven van de manier waarop gemeenten hun transitieaanpak ingericht hebben en hoe ze verweven waren met de markt en de maatschappij. Het hoofddoel van dit onderzoek was om te begrijpen of en hoe een collectieve aanpak zou leiden tot een efficiënter en effectiever transitieproces in de transitie naar individuele elektrische warmteoplossingen.

Door gebruik te maken van kwalitatieve onderzoeksmethoden zijn 17 gemeenten geïnterviewd. Deze interviews zijn gehouden met beleidsmakers die werkzaam zijn bij de gemeente, of met projectmanagers die door de gemeente zijn ingehuurd om de gemeentelijke transitie te organiseren. Verschillende onderwerpen met betrekking tot transitiemanagement, governance modes en energy democracy zijn besproken. Omdat de meeste beleidsmakers geen wetenschappelijke achtergrond hadden, werden deze onderwerpen op een praktisch begrijpelijke manier besproken op beleids- en projectniveau. De geïnterviewde gemeenten zijn geselecteerd op basis van hun percentage woningen dat tussen 1995 en 2005 is gebouwd. Deze woningen zijn relatief goed geïsoleerd en zijn vaak gebouwd in dezelfde bouwstijl. Deze factoren verbeteren mogelijk het succes van het implementeren van de principes van energy democracy en dus een collectief georganiseerde transitie.

De gemeenten zijn op het moment bezig met het operationaliseren van de plannen die waren vastgelegd in de Transitie Visie Warmte (TVW). Dit gebeurd middels verschillende projecten, pilots en experimenten. Deze projecten waren gericht op ofwel de gehele gemeente of op slechts één wijk. Deze aanpak van meervoudige projecten en benaderingen weerspiegelt de manier waarop de literatuur transitiemanagement beschrijft. Bij het schrijven van de TVW hanteerden gemeenten een traditionele hiërarchische top-down benadering in combinatie met een network governance aanpak. Op het moment dat overgegaan werd van visievorming naar het operationaliseren van de visie, werd een verandering naar nieuwe vormen van governance modes waargenomen. Deze kunnen worden gekoppeld aan de socio-institutional benadering.

Er zijn verschillende aanpakken gezien om het succes van collectieve transitieprojecten te bevorderen. Gemeenten organiseerden manieren om gezamenlijk en efficiënt te adviseren over isolatiemaatregelen en dachten mee over het initiëren van collectieve inkoopprogramma's. Deze generieke benaderingen zijn vooral effectief voor inwoners die in de geselecteerde buurten wonen voor dit onderzoek, gebouwd tussen 1995 en 2005. Afgezien van de gelijkenis in isolatienormen en ontwerp, worden deze wijken vaak gekenmerkt door inwoners die financieel kunnen investeren en de kennis hebben om dit doen. Deze aspecten dragen bij aan de verhoogde participatie binnen deze generieke maatregelen in deze specifieke wijken. In wijken met een relatief lager kennisniveau en minder financiële mogelijkheden hebben deze generieke maatregelen niet hetzelfde effect. In deze gevallen leidt deze generieke gemeente brede aanpak tot uitsluiting, omdat niet iedere burger financieel kan investeren of de kennis heeft om dit te organiseren. Projecten die zich richten op specifieke wijken en daarop intensieve participatieprocessen inzetten die zijn aangepast naar de doelgroep, hebben de kans om de principes van energy democracy wel te bevorderen.

Naast de schaal en wijkgerichte focus gaat een verandering naar energy democracy ook gepaard met een verandering in de huidige bestuursvorm of governance mode. Door gebruik te maken van bestaande burgernetwerken, zoals energiecoöperaties, kan zeggenschap en eigenaarschap van de transitie overgaan van gemeenten en marktpartijen naar inwoners van de gemeente. Zoals in dit onderzoek wordt geconcludeerd, wordt de transitie daadwerkelijk van hen wanneer zij met steun van de overheid zelf een collectieve transitie kunnen organiseren en hierover kunnen beslissen. Alleen dan wordt het duurzame

energiesysteem democratisch eigendom zoals in lijn met de principes van energy democracy. Bij de operationalisering van de transitie is dit momenteel niet het geval. In deze overgangsfase hebben gemeenten de potentie om hun bestuursvorm te verschuiven naar zelfbestuur en een meer ondersteunende rol op zich te nemen. Er is echter aanvullende financiële steun van de rijksoverheid nodig om gemeenten daadwerkelijk in staat te stellen de principes van energy democracy te implementeren.

Gemeenten geven aan dat deze bestuurlijke verandering als complex wordt ervaren, omdat marktpartijen welwillender zijn in het nemen van financiële risico's dan inwoners. Grootschalige collectieve programma's vereisen voorinvesteringen in onderzoek, aanbestedingen om aannemers te selecteren en vooral moed van lokale initiatiefnemers om te starten zonder te weten of het succes bereikt gaat worden. Marktpartijen zijn gewend deze risico's te nemen. Dit maakt opschaling van de principes van energy democracy twijfelachtig. Er zal meer onderzoek gedaan moeten worden naar de praktische aspecten van het implementeren van ideeën over energy democracy in de praktijk. Aan de andere kant zie je gemeenten experimenteren met meerdere innovatieve ideeën om gezamenlijk warmtetransitie te organiseren. Het delen van deze innovaties op landelijke platforms zou overheidsfunctionarissen in dit vroege stadium van de transitie helpen. Daarnaast zouden gemeenten meer gebruik kunnen maken van de reeds bestaande energiecoöperaties, draaiend op vrijwillige inwoners, door hen financieel te ondersteunen en meer autonomie te geven.

Appendix II: Topic-list Interviews

Research questions					
1	How can collective transitional approaches be a solution to assumed lock-in situations in the phasing out of natural gas in 1990's suburbs with a focus on individual heat pumps?				
1.1	How is transition management theory in the active governance mode influencing the energy transition at the municipal level?				
1.2	How are principles of energy democracy integrated in the energy transition approach at the municipal level?				
1.3	What are limitations to the individual approach taken by municipalities in transition strategies focusing on individual heat pumps?				
1.4	What are opportunities for a collective approach regarding the energy transition strategies focusing on individual heat pumps?				
Topic list					
Interview phase	Theory and source of theory	Topic	Principle	Question	Possible links to other relevant theory
Introduction interview	**Introduction**				
	N/A			What is the current status of the Transitievisie Warmte?	N/A
	N/A			What is the current status of the Wijkuitvoerings plannen?	N/A
	N/A			What actions is the municipality are currently undertaken in relation to the transition to individual heat pumps (all-electric)?	N/A
Current municipal transition approach (Sub question 1.1, 1.2)	**Transition management**				
	Rothmans (2001)	Take-off phase	- Process of change started	How did the municipality start the transitional process?	N/A
				Which pilot projects have been set-up and how has the municipality	Governance structures

				supported these pilot projects?	
		Breakthrough	- Structural change - Accumulation of changes	How did the municipality transform individual pilots project to an accumulation leading to program management?	N/A
				In which of these pilot projects are containing collective approaches in which cooperation is a key factor?	Energy democracy
		Stabilization	- Speed of change has slowed - New equilibrium	If so, how have suburbs fully transitioned or in what way is tried to achieve this stadium?	N/A
	Loorbach (2010)	Transition management operationalizatio n	- Sustainability vision - Establish arena - Develop agenda and transition paths - Experiments - Monitor and evaluate	In what way are the planned transitional paths being operationalized ?	Governance structures
				What parties are involved to operationalize these transitional pathways?	Energy democracy
				What collective municipal initiatives have been started in relation to the installment of heat pumps?	Energy democracy
	Cramer (2020)	Transition management practice	- Cyclic transition initiatives - Multiple pilot projects in take-off phase at once	Alongside the transition vision warmth which processes have been set up as well to initiate the transition?	N/A

	Bresters (2021)	Empowering niche organizations	- Knowledge - Finance - Competences - Space for experimentin g	How does the municipality create space for experiments that do not fit day to day procedures or plans?	Governance structures
	Governance structures				
	Lange (2018)	Modes of governance	- Combination of hierarchical with new modes of governance	Which direct policy measures and obligations have been put in place for market parties and citizens?	N/A
				What is expected from citizens in self-organizing the transition to heat pumps in suburbs where no alternatives are possible?	Transition management
	Patterson et al. (2017)	Socio-institutional approach	- Room for multi-actor networks - Contains multiple possible modes of decision making - Facilitating for multiple actors	How have pilot projects been supported by the municipality?	Transition management
				Which networks between the municipality, market parties and citizens have been set up in relation to the transition to heat pumps?	N/A
				In which of these networks are collective approaches at hand and what do they entail?	Energy democracy
				In what way is the municipality activity communicating with grid owners to make transition to all electric	Transition management

				solutions possible?	
	Hoppe & Miedema (2020)	Active governance levels in energy transition	- Strategic level - Tactical level - Operational level	On which levels within the organization of the municipality has the transition approach been formed?	Transition management
Opportunities for collective approaches (Sub question 1.2, 1.3, 1.4)	**Energy democracy**				
	Wahlund (2022)	Energy democracy	- Structural change - Power from corporates to citizens - Collective organizational forces - Collective participation - Democratized ownership of energy systems - Discission making in formalized institutions	Which changes in municipal regulation have been formed in relation to citizen participation?	Transition management / Governance structures
				Are there changes in processes of citizen participation for the energy transition in relation to the Omgevingswet?	N/A
				Do citizens collectively organize the installment of heat pumps or are there plans to do so?	N/A
				Is what way is the municipality proactively organizing collective participation?	Governance structures
				How would it be possible for the municipality to actively organize collective procurement processes for individual heat pumps?	Governance structures

Appendix III: Applied warmth transition approaches by municipalities

In this research several warmth transition approaches undertaken my municipalities were seen. To increase the level of shared knowledge in this transition, especially for policy makers, a practical overview of these measures is given in this appendix.

Increasing awareness / energy saving solutions

- **Warmth camera**
  These cameras are often uses to show possible heat leakages of our homes. Municipalities organized warmth camera walks by which neighbors walked together through their neighborhood comparing each other's homes. In other examples warmth camera pictures were taken and delivered at their home to create awareness before community meetings were held.
- **Community meetings**
  Several community meetings were held. Municipalities paid attention to the naming and framing of these meetings. Calling it an energy café will lead to the attendance of mostly technically schooled men while calling it community gathering made sure families would join.
- **Model houses**
  Houses which were fully transitioned to all-electric solutions or a heat network served as an example for citizens within the municipality.
- **Energy boxes**
  Handing out energy boxes with small scale measures to better insulate homes. Together with information leaflets explaining the purpose of the warmth transition.
- **Handyman (Dutch: Klusbakfiets)**
  In relatively poorly insulated suburbs a handyman was sent in the suburb to install quick fixes like attaching insulation foil behind heating elements. Meanwhile education on insulation and the warmth transition was given.

Collective advice

- **Route to transition**
  Municipalities with experience in organizing collective advice mentioned the need for a future perspective. With a step-by-step explanation or guide perspective was given by which citizens were able to see the bigger picture. This increased the success of following collective approaches.
- **Clustering neighborhoods**
  The division of neighborhoods into clusters with houses that are constructed the same. Within one subarea a house would be totally screened to provided insulation advice as well as advice on selecting the best heat pump. Neighbors living in the same subarea are then able to apply this piece of advice for their house to a large extend as well.
- **Online networks**
  Advice given in clustered neighborhoods can be shared on online platforms easily accessible for other neighbors.
- **Local energy corporations**
  Energy corporations, mainly run by local volunteers, actively approaching neighborhoods to organize a pool of external advisors. These advisors were regularly reviewed by a committee to control the quality of the given advice.
- **Subsidy measures and sustainability loans**
  The application process for subsidy measures and sustainability loans are often found complex by people who might be financially able to invest in sustainable measures with the help of these systems. Giving support and education in these application forms might contribute to an increase in participation in the warmth transition.

Collective purchasing

- **Tendering**
  Some municipalities organized a collective purchasing program for installing insulation measures. Together with energy corporations a tender was started to select several suppliers which were regularly checked on their performances by the tendering committee. Citizens experiences this service as one taking away their own barrier in contracting suppliers themselves.
- **Secured delivery deadlines**

In collective purchasing programs the effects of lower prices was not seen or expected due to the high demand. However, advantages of secured delivery deadlines were experienced were seen when several suppliers were acting in the same pool with large scale deliveries.

Making use of natural moments

- **Moving houses**
  Through contacting estate agents or checking municipal registrations policy workers are able to contact people who are moving. At these moments people are often renovating their newly bought home which can be combined with insulation measures or the transition to a heat pump.
- **Average time between moving places**
  Suburbs in which citizens stay relatively long are expected to be more willing to invest in insulation measures and alternative heating systems.
- **Heating system replacement**
  In suburbs which have been constructed about 15 to 20 years ago natural gas boilers have come to the end of their duration. Focusing on these suburbs might help the level of participation in transitional approaches.
- **Renovation plans of owner associations (Dutch: onderhoudsplan VVE)**
  Owner associations are obliged to plan their scheduled maintenance. This obligation can be used effectively to make sure these owners are transitioning to sustainable warmth solutions.

Colophon

Energy democracy in the warmth transition

the potential of collective approaches in the transition to individual all-electric warmth solutions

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