

PLANNING PRACTICE AND HEAT TRANSITION

A CASE STUDY ON THE PLANNING AND IMPLEMENTATION OF A DISTRICT HEAT NETWORK IN SELWERD, AN AFTER-WAR NEIGHBOURHOOD IN GRONINGEN



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Inhoudsopgave

List of figures, tables and abbreviations	4
<i>Figures</i>	<i>4</i>
<i>Tables</i>	<i>4</i>
<i>Abbreviations</i>	<i>4</i>
Abstract	5
1 Introduction	7
1.1 <i>An introduction to energy transition</i>	<i>7</i>
1.2 <i>An introduction to heat transition</i>	<i>7</i>
1.3 <i>Heat transition and planning</i>	<i>7</i>
2. Theoretical framework	10
2.1 <i>Theoretical foundations of energy transition</i>	<i>11</i>
2.1.1. <i>Path-Dependency and institutions</i>	<i>12</i>
2.2 <i>Energy Transition and use of the concept</i>	<i>13</i>
2.3. <i>Energy transition in the residential heating system</i>	<i>14</i>
2.3.1 <i>Heat networks: an overview</i>	<i>14</i>
2.4 <i>Planning and heat networks</i>	<i>15</i>
2.4.1. <i>Spatial planning and its context</i>	<i>15</i>
2.4.2. <i>Participatory planning and heat networks</i>	<i>17</i>
2.5 <i>Stakeholder management</i>	<i>17</i>
2.5.1 <i>Stakeholder management at the front-end of a project.....</i>	<i>18</i>
2.5.2 <i>Friction between stakeholders in the planning of heat networks</i>	<i>19</i>
2.6 <i>Governing the heat transition - Exploration, or exploitation?.....</i>	<i>19</i>
2.7 <i>Conceptual model.....</i>	<i>21</i>
3. Methodology	22
3.1 <i>Research strategy</i>	<i>22</i>
3.2 <i>Case study research</i>	<i>22</i>
3.3 <i>Case selection and Selwerd as a single case.....</i>	<i>22</i>
3.3.1 <i>An introduction to Selwerd</i>	<i>23</i>
3.4 <i>qualitative research.....</i>	<i>25</i>
3.5 <i>Data collection</i>	<i>26</i>
3.5.1 <i>Policy analyses.....</i>	<i>26</i>
3.5.2 <i>Semi-structured interviews</i>	<i>27</i>

3.6 Data Analysis	29
3.7 Ethical considerations.....	30
4. Policy Analyses	33
4.1 heat transition visions in Groningen	34
4.1.2 Masterplan 2011	35
4.1.3 Strategic Plan I	37
4.1.4 Strategic plan II	39
4.1.5 Execution Plan	41
4.1.6 PAW Selwerd	42
4.2 Analysis of the documents	43
4.3 A chronological review of the relevant policy documents.....	44
4.3.1 WarmteStad	44
4.3.2 Neighbourhood approach and sunny Selwerd.....	45
4.3.3. Participation and heat transition - a difficult situation	45
4.4.4. Putting the process together - an integrated approach.....	46
4.4 Stakeholder analyses	47
4.5 Involved stakeholders, exploration, exploitation, and governance style	48
4.5.1 The municipality	48
4.5.2 WarmteStad	49
4.5.3. Housing corporations	50
4.5.4. Governance style.....	51
5. Analysis of semi-structured interviews	52
5.1 Participation, implementation, and the district heat net	52
5.1.2 Location, location, location.....	52
5.2 Implementing a heat network and stakeholders	54
5.2.1 Interaction between the different stakeholders during the implementation	55
5.3 Governing the DHN project	57
5.3.1 Exploration - exploitation. Sunny Selwerd - WarmteStad	59
5.4 Space and place.....	60
6 Discussion and Reflection	62
6.1 Discussion	62
6.2 Reflection.....	64
References.....	65

List of figures, tables and abbreviations

Figures

Figure 1	Supportiveness/salience matrix from Mitchell (1997)
Figure 2	Four governance styles from Duit & Galaz (2008)
Figure 3	Conceptual model
Figure 4	Map of Groningen, Selwerd marked
Figure 5	Birds eye view of Selwerd
Figure 6	Financial construction on how to set up a heating company
Figure 7	Map of proposed gas alternatives in Groningen, Selwerd marked
Figure 8	Organisational structure of neighbourhood communication in Groningen
Figure 9	Timetable of events related to the heat net in Selwerd
Figure 10	Salience matrix during the planning phase of the heat net, before 2020
Figure 11	Organogram of the municipality
Figure 12	Planning of the heat net envisioned by WarmteStad
Figure 13	Salience matrix during the implementation phase of the heat net, after 2020

Tables

Table 1	Reading guide of the thesis
Table 2	List of documents used for the policy review
Table 3	Oversight of the interviewees
Table 4	Overview of the research steps
Table 5	List of the primary documents used
Table 6	List of the subsidiary documents used
Table 7	Neighbourhood approach steps according to Strategic plan I
Table 8	Four phases elaborating the process of becoming gas-free
Table 9	List of envisioned stakeholders in the DHN
Table 10	Categories mentioned in the interviews
Table 11	Interview quotes elaborating on the assignment of a DHN in Selwerd
Table 12	Interview quotes elaborating on conflicts between WS and Sunny Selwerd
Table 13	Interview quotes elaborating on the role of the municipality
Table 14	Interview quotes elaborating on the stance of the Selwerd on a DHN

Abbreviations

DHN	District Heat Network
WS	WarmteStad
PAW	Testing garden
NBG	Network-based Governance

Abstract

The heat transition - the transition from gas to sustainable alternatives as the primary source of heating has been taking off in the Netherlands. However, the implementation of heat transition projects is often faced with challenges. These challenges are related to the novelty of the projects, (non)participation, management, monetary issues and lengthy implementation processes. Therefore, the Dutch government assigned 'testing gardens', where municipalities can test projects related to the heat transition and can learn the necessary lessons for upscaling the transition. One of these testing gardens is Selwerd, an after-war neighbourhood in which the municipality of Groningen wants to realise a district heat network. This research conducts a case study on the implementation of the district heat net in Selwerd, dividing the project into the planning and implementation phases. During these phases, theories regarding participatory planning, stakeholder dynamics and the governance approach are applied to the case. Empirical data is obtained from two sources: policy analysis and semi-structured interviews with stakeholders. Combining these two data sources allows for a clearer picture of the project and its necessary context, giving in-depth information on the case. This study concludes with two implications related to stakeholder management and governance styles, which are expected to be important when constructing other heat nets in similar situations. They are (1) the involvement of all relevant stakeholders starting from the planning phase, in case of changing stakeholder dynamics and shifting stakeholder positions at a later stage, and (2) the importance of the role of the municipality during the whole process, in both the planning and implementation phase. For planning theory, an important finding is how challenging it is to implement such a large scale project in Dutch neighbourhoods, with high participatory and democratic standards but diverging interests and lacking citizen engagement. It raises the question of whether the current demands and expectations on municipalities regarding participatory planning and the heat transition are too high. The central government might need to seriously intervene through more top-down manners if it plans on following through on its climate agreement.

Keywords: District heating networks, heating transition, participatory planning, exploration, exploitation, governance style, project stakeholder management, stakeholder dynamics

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1 Introduction

1.1 An introduction to energy transition

One of the largest challenges our society faces is energy and fossil fuels. These problems surrounding fossil fuels and energy are widely known and have been addressed by different parties for decades. However, real drastic measures have mostly been set aside. Until recently that is: the Dutch central government proposed the climate agreement in 2019, aiming to reduce Dutch Co2 emissions by 49% by 2030 and by 95% by 2050 (Climate Agreement, 2019). The European Union even went a step further with its 'Green New Deal', aiming to reduce CO2 emissions in the EU by 50% in 2030 (as compared to 1990 levels), and to become climate neutral by 2050 (European Commission, 2020). In both these documents, the energy transition is addressed: the transition from fossil-fuel based energy towards carbon-neutral energy sources. However, energy has many different end uses, making it important to divide certain categories within energy use, to keep things uncluttered. Heating is one of those categories.

1.2 An introduction to heat transition

Heating is a large sector for energy use. In 2016, heating accounted for half of the EU's energy consumption (Nava Guerro, 2019). While this number is generally the average in most EU countries, the type of fossil fuel used for heating differs. In the Netherlands, over 50% of the heat supply is provided by natural gas (Henrich et al., 2021), making natural gas an important fossil fuel for energy and heating. In the Dutch residential sector, natural gas becomes even more important, as 86% of the heating in residential homes is done with natural gas (PBL, 2018). This means that around 17% of Dutch energy consumption comes from natural gas and heating (CIEP, 2017; Kieft et al., 2021). As such, an important key feature of the Dutch energy transition is the elimination of natural gas as a source for heating and substituting this natural gas for less-carbon intensive heating alternatives such as electricity (Feenstra et al., 2021). In the Netherlands, this is often called a 'heat transition'. This heat transition truly lifted off in 2018, when the Dutch national government decided to formally end natural gas extraction in the Netherlands by 2030, forcing local governments to look for alternatives to heat buildings (Henrich et al., 2021). Besides ending gas extraction in Groningen, Taxes on natural gas consumption for households will also be raised over time while simultaneously lowering taxes on electricity (Feenstra et al., 2021). It should be noted that with the current war in Ukraine, gas prices have also been rising rapidly over the past few months and relations with Russia, one of the main global gas suppliers, have been deteriorating. This makes the future of gas even more uncertain. While the long-term influence of this war on our usage of gas is uncertain, it seems that the rising gas prices as a result of increasing tensions with Russia are accelerating the heat transition.

1.3 Heat transition and planning

Heat transition is an intensive process. Fossil fuels and renewables come from vastly different sources, having different characteristics and qualities. Transitioning from one to another will require society to think differently of energy and paradigms to be shifted. One of those is the impact of energy on our

physical surroundings, and our relation with energy. Whereas gas, for example, is generated from highly centralised locations and transported with efficient, invisible infrastructure, this is often not the case for heating renewables (Burke & Stephens, 2018). Renewable energy is often highly dependent on geographical, spatial, social and other contextual factors (Van Kann, 2015). Transitioning from gas will have large impacts on our natural landscape and the built environment, both physically and socially.

Because of the aforementioned reasons, projects related to heat transition are often complex. They are interdisciplinary, expensive, and large, given the scale of the transition. As such, new disciplines which were usually not connected to energy are also becoming more relevant in the heat transition. Planning is one of those. However, these projects' complex and pressing nature also make project management, stakeholder dynamics, and a focus on project implementation/practice essential if we want to succeed with this transition. Yet, planning theory often does not address these topics (Alexander, 1997; Alexander, 2010; Pissourios, 2013). Therefore, this research aims to improve our understanding on planning practice related to the construction of District heat networks (DHN). This study will (1) conceptualise how the contemporary planning paradigm affects large heating projects, focusing on the DHN in Selwerd. (2) This study analyses how stakeholder dynamics and governance style of the municipality during the planning phase of the project influence the implementation of a project, a topic that has received little attention in stakeholder and project management research (Aaltonen & Kujala, 2010; Achterkamp & Vos, 2008; Eskerod & Vaagaasar, 2014). Besides this, this research contributes to planning theory by researching a large contemporary planning project and how this project is proceeding within the current planning paradigm. It researches how the participatory planning paradigm holds up in practice, and if the theoretical focus on bottom-up participatory practices is sustainable in projects of this scale. Does participatory planning work with projects of this scale and magnitude? The societal relevance of this thesis is related to the urgency of the topic researched. Executing the heating transition on time is essential to keep our population healthy. However, there is no one-size-fits-all solution, given that neighbourhoods and contexts differ. As such, finding tailored practices that can contribute to implementing projects related to the heat transition are useful to their project environment and in the grander scheme of things of energy transition and sustainability.

The main research question of this study is formulated as follows: *“During which project phase do different stakeholders have to get involved to ensure a smooth implementation of the district heating net in Selwerd, and how should these stakeholders be governed?”* To help answer the main research question, three sub-questions are devised. They are formulated as follows:

1. How does the contemporary planning paradigm influence the institutional context of implementing heat networks?
2. Which stakeholders are involved during the planning and implementation phase of the heat network in Selwerd and how do they interact with each other?
3. What governance style is used by the municipality during the project and what implications can be derived from this on the implementation of the project?

Table 1 gives an overview of the reading guide.

Table 1: reading guide of the thesis

Chapter	Description
Chapter 1 - Introduction	Introduction on energy transition, heat transition and the proposed research.

Chapter 2 - Theoretical framework	Literature review on the planning paradigm within the energy transition and stakeholder management. Based on this literature review, a conceptual model is developed.
Chapter 3 - Methodology	Here, the case research methods are discussed. The case presented is the construction of a DHN in Selwerd, an after-war neighbourhood in Selwerd. While this study focuses on a single case, the added value of the research lies within the type of neighbourhood studied. The results are not perse generalisable on their own, but can be useful as guidelines in similar neighbourhoods.
Chapter 4 - Policy analysis	Here, the relevant policy documents to the DHN in Selwerd are reviewed, clarifying processes during the planning phase, and the underlying rationale of the municipality.
Chapter 5 - Interview analysis	This is where the conducted interviews will be analysed. This data is used to understand how the implementation phase is lapsing, while also serving as a tool to connect certain observations from the policy review.
Chapter 6 - Discussion	In the discussion, the implications of the case study for the contemporary planning paradigm and suggestions for stakeholder management are discussed. Practical solutions and suggestions for further research are provided.



THEORETICAL PART

2 Theoretical framework

The theoretical framework starts by giving background information on energy transition in its contemporary context, progressively narrowing down to heating transition and practicalities. By doing so, the current context regarding energy transition becomes more concrete, emphasising on history, challenges and institutional context, creating a foundation for the case studied in this research. After this, literature addressing participatory planning, governance styles and stakeholder management theory are discussed, which create the basis for answering the main research question. Both the salience model from Mitchell (1997) and the governance axis from Duit & Galaz (2008) are well-known theories/models, play an explicit role in answering the main research question, and are therefore used. At the end of the theoretical framework, a conceptual model is given to visualise a summary of the theoretical foundations used in this thesis.

2.1 Theoretical foundations of energy transition

Over the last two hundred years, energy has played a crucial and ever-growing role in the life of human beings. Alongside this, partial energy transitions with the goal of accommodating us with sufficient and fitting energy sources have also taken place (Sgouridis & Csala, 2014). For example, during the middle ages, the main energy sources were animals and wood. Around 1800 during the industrial revolution, the primary source of energy shifted to coal. At the end of the 19th century, this transitioned to oil and eventually to natural gas (Unger, 2013). Of course, space and place are crucial to understanding energy transitions in different societies. The degree and pace at which these transitions take place often depend on economic prosperity, geography, politics, and more context (Bridge et al., 2013). Besides this, the term ‘energy transition’ oftentimes holds different meanings at different locations. For example, in the global south, energy transition implies an increase in the availability and affordability of modern energy services (Bradshaw, 2010). In central and eastern Europe, energy transition is primarily framed as a liberalisation of the energy sector (Bouzarovski, 2009). In western Europe and the UK, energy transition is often seen as a shift towards a low carbon future with the goal of a significant CO₂ reduction (Bridge et al., 2013). Sovacool (2016) defines this energy transition as a shift to 80% of the energy consumption in a particular sector.

While it becomes clear that energy transitions in different societies and contexts are unique and unfold differently (Bridge et al., 2013), there seems to be an overarching general theme: historically, energy transitions have been extremely slow and rare (Möllers, 2013; Myhrvold & Caldeira, 2012; Sovacool, 2016; Fouquet, 2016), with oftentimes complex drivers behind these transitions (Unger, 2013). Besides this, older forms of energy are also being used alongside newer forms of energy, meaning that in most cases, there is no real fade-out of older energy sources and no complete switch to new sources of energy (Unger, 2013). An example of this would be private households, where the slow fade-out of older energy sources is clearly visible, and the replacement of new energy sources can be seen alongside different older energy sources (Möllers, 2013). Fouquet (2016) concluded that when taking into account Sovacool’s (2016) definition of energy transition, the average duration to move from the invention of key technology to an 80% share of energy consumption was around 95 years. To put this in perspective: globally, coal Passed the 25% mark in 1871, 500 years after the first coal mines were developed in the UK and it took 90 years for crude oil to pass the 25% mark. The first wind turbine which produced energy was already invented in 1880 and solar power has been around since 1954; both have yet to pass the 25%

threshold (Fouquet, 2016; Sovacool, 2017). Lund (2006) found that part of the slow energy transitions is the lengthy market penetration phase of new energy systems, with short ‘take-over’ times taking around 25 years and longer ones spanning 70 years.

However, while most energy transitions have been slow, there are also exceptions. One of those is the Dutch transition from coal to gas. In around 20 years (1950-1970), the Dutch transitioned from coal to gas as their main source for space heating, beating all historical transition odds. Transition management, also originating from the Netherlands (Rotmans et al., 2001; Bosman et al., 2014) studied this transition extensively and found out that a lot of events coincide with each other to make this quick transition possible (Kemp, 2010). For example, a large gas field was discovered at a crucial moment, and the government was able to create and work together with influential companies to steer the overall social and institutional landscape. Besides this, gas was a more effective, cleaner source of heat than coal. This meant that during this transition, the energy alternative was more efficient, cheaper, in abundance, cleaner and backed by very powerful actors such as the government, semi-government parties and multinationals creating a goal-oriented transition (Kemp, 2019).

The examples given above show how energy transitions *can* align with Rotmans’ model of transition theory, historically speaking. In transition theory, Kemp & Rotmans (2001) claim that a transition is a nonlinear shift from an initial equilibrium to a new equilibrium which is characterised by fast and slow developments and involves innovation in important parts of societal subsystems. Energy transitions *can* meet those conditions. For example, transitions have often been partial, and there have been no real overarching ‘fast developments’. Besides, while some parts of societal subsystems experience some degree of innovation, many others do not. It is when all developments at different layers and levels align that a transition ‘can’ occur, as could be seen from the Dutch gas example (Kemp, 2010; Kemp, 2019). Rip & Kemp (1996) identify three levels, or ‘regimes’, called a ‘multi-level perspective’ (MLP). The MLP knows three regimes: (1) *The micro level*, where novelties are created (2), *the meso level*, where novelties are further developed and counter influence on the leading energy source is exercised and (3) *the macro level*, which defines the overall landscape (Rip & Kemp, 1996). When one regime wants a transition, but there is no match with other regimes, a mismatch occurs, and a transition cannot happen. Using transition theory to steer the needed low carbon transition is of course desirable. However, both history and transition theory argue for the non-linearity and ambiguity of transitions, making transition management a real challenge. Transitions can be quick, but more often, they are extremely slow as well. Nevertheless, the vagueness and atypical behaviour of past energy transitions, combined with the topic's urgency, makes a deeper understanding of possible obstructing or enabling factors necessary.

2.1.1 Path-Dependency and institutions

An important factor that often slows desirable low-carbon energy transitions are institutions, path-dependency, and lock-ins (Andrews-Speed, 2016; Fouquet, 2016; Sovacool, 2016), in this case often called a ‘carbon lock-in’ (Unruh, 2000; Erickson et al., 2015). This institutional domain contains values, norms, laws, and other arrangements linked to governing and coordinating (Groenewegen & Koppenjan, 2005), leading to path-dependency. Salet (2018) mentions how path-dependency has three key characteristics: (1) Change in the system is not easily realised (2) The further a system has developed, the more limited the options and (3) Most institutional change is gradual (Andrews-Speed, 2016).

When looking at these characteristics, it becomes clear that energy systems are highly path-dependent, being embedded in different institutions. National energy systems are often built with large amounts of capital and labour, having high sunk costs (Steinhilber et al., 2013). Besides this, institutional legacies keep the current status quo in place through political regulations, tax codes, social and even educational institutions which all support existing energy pathways, creating stability and predictability (Goldthau & Sovacool, 2012; Unruh, 2000; Groenewegen & Koppenjan, 2005). Examples are the subsidies and (re)investments in existing coal-fired power plants or gas infrastructure. These energy sources and infrastructure have long technical life spans, low operating costs and are already paid off, creating a paradigm for energy prices and receiving strong political and institutional support (Unruh, 2000). As such, reinvesting and subsidising, thus reinforcing already existing infrastructure, or creating solutions based on contemporary paradigms and societal norms is by far the more convenient thing to do (Howe & Langdon, 2005) as opposed to working on a transition or institutional change possibly enabling this transition. However, reinforcing old energy institutions will only increase the future costs of achieving emission targets, intensifying our path-dependency (Erickson et al., 2015; Salet, 2018), making the potential long-term transition to low-carbon energy sources as Meadowcroft (2009) calls it: *'messy, conflictual and a highly disjointed process'*.

2.2 Energy Transition and use of the concept

With the energy transition being a broad concept, it is important to elaborate on how this thesis discusses the desired low-carbon energy transition, and which sector of this energy transition will be discussed. This thesis will focus on the transition from carbon-based energy fuels to renewable energy sources in the Netherlands, as is in line with goals from the European Union (EU). The reason for the distinction between the Netherlands and the EU is that not all member states share the same motivations and visions on how to realise their energy transitions (Mata Pérez et al., 2019). The EU strives to have a 32% renewable energy share in its energy mix by 2030 (Council of the EU, 2018) and to be 'almost' emission-free by 2050 (European Commission, 2012). While the Netherlands has some different sub-goals, it adheres to these targets and also strives to be almost CO₂ neutral by 2050. To be more specific: this thesis will focus on the transition from gas as the Dutch main heating source, towards a sustainable energy source suitable for heating. This phenomenon is called the 'heat transition'.

Heat transition has already been briefly discussed in the introduction and focuses on the abolishment of natural gas as our main source of heating. While heat transition is important to energy transition in all countries, especially in the Dutch context, heat transition receives high levels of attention. There seem to be two reasons for this. The *first* one is that natural gas is a polluting fossil fuel, being a carbon-intensive fuel (Lyon et al., 2021; Hmiel et al., 2020). As such, switching to renewable energy sources to replace gas is in line with reaching emission and sustainability goals. The *second* reason is more context-specific and was already briefly mentioned in 2.1. In 1959 the Dutch government discovered Europe's largest natural gas field in a Northern province of the Netherlands, Groningen. ExxonMobile and Shell, combined with the central government, quickly exploited the gas field (Gales, 2013) and integrated gas as the main energy source in Dutch society. Fast forward to 2016 and over 70% of the Dutch households use the gas from the Groninger gas field (CBS, 2018). However, there are a few downsides to the utilisation of this gas field: as with all fossil fuels, the gas source is finite. It is estimated that the reservoir is about three-quarters depleted (Ntinalexis et al., 2019). Related to this issue is that

because of the depleting reservoir, earthquakes started occurring in the area. However, even though earthquakes have occurred from 1980 onwards, a causal relation between gas extraction and earthquakes in Groningen has been systematically denied. This combination of earthquakes, caused by gas extraction of which local citizens would not reap the benefits and the authorities' ignoring concerns from citizens caused social unrest over the years (Verdoes & Boin, 2021). The tipping point came in 2018 when another earthquake hit the village of Zeerijp. At this point, the legitimacy of the state was at stake (Schmidt et al., 2018) and the minister of economic affairs decided to halt the extraction of gas to ensure the safety of the region (House of Representatives, 2017). Since then, halting our use of gas has become a high priority, and the heat transition has accelerated. However, this story elaborates clearly on the tardiness, coincidences necessary and how much effort was needed before the central government started to pursue its gas free ambitions.

2.3 Energy transition in the residential heating system

Currently, and since the last decades, residential heat in the Netherlands is often generated by extremely efficient gas-fired boilers. These boilers deliver reliable and affordable energy, with almost no energy waste and are already relatively CO₂ efficient compared to coal (CIEP, 2017). Some reasons for this affordability and reliability are the abundance of natural gas in the Netherlands, as well as the existing gas infrastructure in the Netherlands, which has already been built and paid for. Realising a heat transition in the residential areas of the Netherlands would mean that 7.2 million homes need to change their main source of heating, to a carbon-neutral energy source. Besides this change in energy source, it would also mean that the infrastructure to transport this energy has to be either overhauled or reconstructed, an expensive endeavour (CIEP, 2017).

Because these residential homes are different, different alternatives to gas heating have been created, which are often context specific. Kieft et al. (2021) discuss three main alternatives: (1) *all-electric* heat pump systems, (2) *heat networks/district heating*, and (3) *hybrid heat pump systems*. Due to the topic of this thesis, heat networks/district heating will be focused on.

2.3.1 Heat networks: an overview

Heat networks are centralised heating systems and are regarded as an important strategy for achieving energy and climate goals (Ma et al., 2020). However, while heat networks have an obvious technical design, they also have a crucial institutional design (Groenewegen en Koppenjan, 2005). Both will be briefly discussed in the following sections.

According to Werner (2017), the essence of heat networks is “*to use local fuel or heat resources that would otherwise be wasted, in order to satisfy local customer demands for heating, by using a heat distribution network of pipes*”. Based on this statement, it seems that for heat networks to succeed, the following components are necessary. (1): local (natural) heat sources, (2), local customers (buildings) in need of this heat, and (3), a network of pipes to distribute the heat; infrastructure. As such, an optimal neighbourhood to connect to heat networks would be one that is (1) nearby a (natural) heat source and (2), (3) has a high density of buildings that efficiently connects to this centralised heat source. However, while heat networks are sustainable, they also have some practical disadvantages. Cost and efficiency of the heat generation, heat losses during the distribution of the heat through the pipelines and a high

dependence on efficient isolation of buildings are key challenges (Ma et al., 2020). As such, in local clean energy planning, the geography of heat networks is crucial (Evola et al., 2016; Kelly and Pollitt, 2011).

Looking at the institutional design, both gas heating systems and heat networks are influenced and managed by private and public parties, as they are influenced by both market forces and government regulation (Groenewegen & Koppenjan, 2005). However, there is a difference in how these networks are currently operated. The new gas act, dating from 1995 liberalised the gas energy sector, creating a free market separating exploitation, generation and distribution (Correljé et al., 2004). Because of this, market parties had to compete with each other, resulting in competitive prices being handled and consumers choosing their providers. Adding on, the government enforced that a gas connection to homes becomes mandatory, to ensure that network operators will provide as many customers with heat as possible (Climate agreement, 2019). This is not the case for heat operators. Besides the construction, generation and exploitation of their heating network, they also take care of heat distribution. This means that heating companies have a natural monopoly position on their local heat network market. And, because of this, heating companies are bound by laws, such as limits on profits and prices, and minimal and maximal terms for operating heat networks (TNO, 2019). Because of these laws, becoming a heat provider is currently not really attractive for many private actors, resulting in municipalities having to jump in to create the necessary heat operators. This in turn makes DHN multi-actor systems (Groenewegen & Koppenjan, 2005): there are multiple parties involved with the boundaries between these different organisations often being transcended or vague. And since the functioning of the heat network influences both public and private interests, both sectors are highly involved.

2.4 Planning and heat networks

Spatial planning is a discipline closely linked to constructing DHN. The reason is that new pipelines have to be constructed, often in an already ‘finished’ built environment within local communities. Besides this, geography and land ownership are also crucial elements for DHN. As such, integrating the development of DHN with planning practice are important factors when trying to successfully construct DHN (Pol & Schmidt, 2016; Lichtenwoehrer et al., 2019). Therefore, this chapter will give a brief contextual overview of the planning debate over the last decades. This in turn helps to create an understanding on what the contemporary planning paradigm demands of planners when contributing to constructing a DHN, and where this paradigm originates from.

2.4.1 Spatial planning and its context

Around the 1960’s, the work of MCloughlin (1969) and Chadwick (1971) broke the long-standing tradition of planning that perceived urban planning as a design practice (Pissourios, 2014). Instead, it was argued that one should plan for urban areas based on systems theory, seeing the settlement as a complex set of parts interacting with each other. These calculated interventions were often rolled out within a coordinated top-down manner through rational planning based on predefined goals (Chadwick, 1978; Faludi, 1973). While this period lays the foundation for planning as we know it today, many aspects with regards to execution and procedures have changed over the years. This calculated, top-down approach specifically changed after the *communicative turn* (Healey, 1997; Forester, 1989) in planning, which took place between the 1980s and the 1990s. Whereas in the ’60s, planners would focus on realising certain end goals through manners which they deemed most efficient, communicative planning focuses on public

participation, bottom-up approaches, and an even distribution of influence for different parties (Thorpe, 2017; Pissourios, 2014). According to Healey (1996), the rationale behind this communicative turn is that: “*knowledge is not preformulated but is specifically created anew in our communication through exchanging perceptions and understanding and through drawing on the stock of life experience and previously consolidated cultural and moral knowledge available to participants*”. Furthermore, it is argued that communicative and participatory planning creates better plans, eases implementation through increased legislation from citizens, and can be an overall useful tool for planners when intervening in the built environment (Burby, 2003; Thorpe, 2017; Stead, 2021; Yates, 2018). To this day, participatory planning, as was instigated by the communicative turn, seems to be the go-to way to approach planning.

Even though there have been many theoretical discussions on the benefits of bottom-up approaches resulting from the communicative turn, literature has also discussed possible problems with this new planning paradigm. Pissourios (2014) argues that the efficiency of planning through a bottom-up method can become troublesome and slow when communities are too large, or when citizens have too divergent visions on certain topics. He also argues that an essential precondition for the implementation of bottom-up approaches is the existence of a ‘bottom level’, that corresponds to the existence of a community that has certain needs, problems, expectations that differ from other communities and is also motivated to participate in the planning procedures, to influence those. However, this precondition is often arguable, as there sometimes is no ‘bottom level’, or citizens from a specific community are not willing or eager to participate. Naess (2001) explicitly argues for the weakness of bottom-up approaches in sustainable development, as bottom-up approaches are only related to local interests and consequences. Objectives that go beyond local boundaries (such as energy transitions to reduce Co2 emissions) are not considered.

Current day energy planning practice in the Netherlands has already embraced the participatory, bottom-up approach. For the heat transition in the Netherlands, the Dutch government requires district-oriented approaches when implementing sustainable energy alternatives (National Climate Agreement, 2019). While this approach is a practical necessity given the geographical and contextual dependence of heat networks (Evola et al., 2016; Werner, 2017), literature also argues for this approach based on social dimensions (Kelly and Pollitt, 2011; Delmastro et al., 2016) as is in line with the thought process of Healey (1997).

It becomes clear that current-day planning systems have shifted away from the technical rationale in planning and moved towards communicative planning. Not only the government but large private companies and predefined *outputs* play an important role in constructing energy infrastructure such as heat networks. Citizens, context, and *outcomes* are also to be dealt with and of importance. However, this is also where contemporary challenges arise. Besides monetary and technical limitations (Sovacool, 2016), issues with community acceptance, NIMBYISM and low interest in the energy transition make participatory planning difficult (Lennon, 2019; Pissourios, 2014). As a result, the transition is becoming long-winded and a ‘very complex’ task. In the 1950s, when the Netherlands rapidly transitioned from coal to gas, participatory planning was non-existent. Instead, the Dutch government decided what to do and how to do it, with the backing from large corporations (Gales, 2013). While the ethics of this approach are questionable, this top-down manner contributed to the realisation of such a large transition in such a short time (Rip & Kemp, 1996).

2.4.2 Participatory planning and heat networks

Planning literature also addresses the need for participatory planning in planning for the heat transition (Kelly and Pollitt, 2011). However, as a result, the number of stakeholders in the project also increases. Mcelvaney and Foster (2014) describe stakeholders in energy planning as all the people which are affected by the planning, such as residents, local government officials, local energy cooperatives, energy companies, and so on. They also describe three levels of stakeholders: The client, the community stakeholders, and the guiding coalition. The client is the actor that initiates the planning for the intervention, while the guiding coalition consists of representatives of the different stakeholders from a location. During the process of planning for an energy transition (heat network in this case), it is important to have the client take the lead in the planning process (Kelly and Pollitt, 2011; Mcelvaney & Foster, 2014), while the other stakeholders can also intervene and partake.

However, in this 'hybrid' bottom-up/top-down approach where the municipality explores, initiates and steers, but other stakeholders can also access the discussion and decision-making process, the execution of roles and implementation become far more complex, costly, and risky (Fischer et al., 2020; Yates, 2018). This is because many different stakeholders have different perspectives and pursue different goals during the project (Hettinga et al., 2018). Besides this, the support for, and impacts of incorporating stakeholders on the quality of planning outcomes are particularly dependent on the processes related to these plans (Reed, 2008; Yates, 2018). Therefore, good stakeholder management is becoming more and more important in large planning projects, making or breaking heat planning projects (Anderson, 2013; Yates, 2018).

2.5 Stakeholder management

Because of the high plurality of stakeholders resulting from participatory planning, conflicts of interest between stakeholders often occur (Yates, 2018). As such, an understanding of stakeholder management, to ensure that the project can continue is important.

The idea of stakeholder management was introduced by Freeman (1984) in the '80s. Afterwards, Cleland (1986) introduced the concept of stakeholder management into the project management paradigm. While stakeholders are often differently defined, stakeholders' general definition is based on the notion that project stakeholders are actors who can or are affected by the project (Fraser & Zhu, 2008). Frooman (2010) defines stakeholders as 'those who have a stake in a certain issue'. Stakeholders are often categorised based on the nature of their relationship with the project, separating *internal* and *external* stakeholders. Internal stakeholders are stakeholders who are formally members of the project coalition (and usually support the project), while external stakeholders are not formal members of the project coalition, but can affect or be affected by the project (Beringer et al., 2012; Cova & Salle, 2005).

Stakeholder theory tries to identify, classify, and categorise stakeholders. The rationale behind this is that when doing so, one can understand stakeholders' motivations and possibly manage or influence the behaviour and stances of stakeholders (Aaltonen et al., 2008). Different models have been created to portray and organise stakeholders, a well-known one of those being the *salience framework* created by Mitchell et al. (1997) (see figure 1). Salience classifies stakeholders according to their legitimacy, power, and urgency, meaning that the more powerful and influential a stakeholder is, the more salient their requests are for project managers. Besides salience, project stakeholders can also be divided into different categories based on their position and interest in the project. Oftentimes, stakeholders are separated into groups according to their potential to either cooperate or threaten a certain project or organisation,

creating a categorization of *supportive, unsupportive, or swing stakeholders*. (Savage et al., 1991). Of course, there are also different visions on stakeholder management and the salience model. For example, Baba & Raufflet (2017) argue that salience thinking is too short-term and firm oriented, creating restrictive shortcomings in stakeholder thinking. However, other literature also argues in favour of the salience model, because of its applicability and useability in different situations (Aaltonen et al., 2015). Given the novelty of the case at hand, and the high flexibility and useability of the salience model from Mitchell et al. (1997), the basis of the stakeholder analysis is built upon the model.

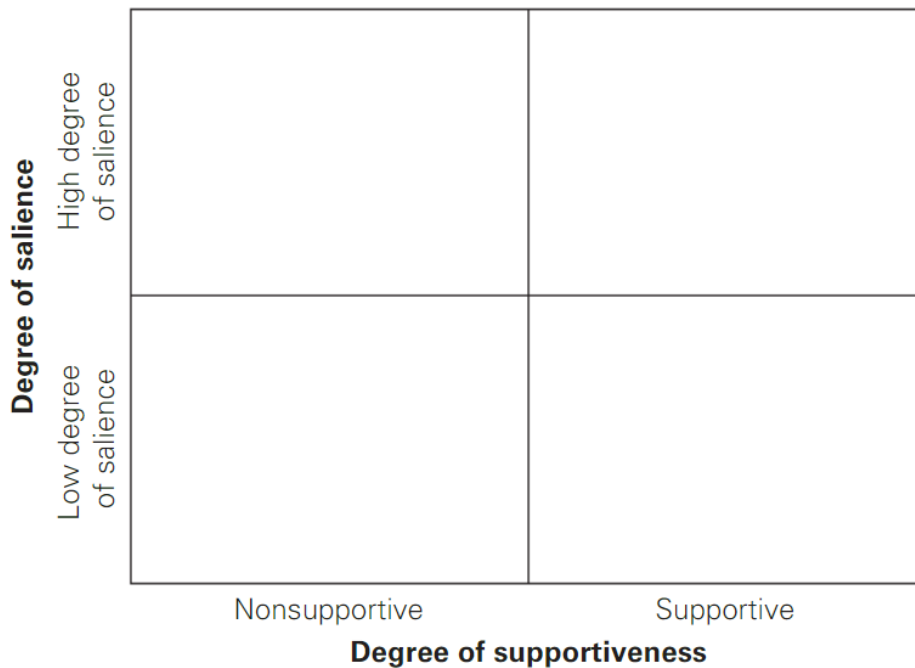


Figure 1: Supportiveness/salience matrix. Source: Mitchell (1997)

2.5.1 Stakeholder management at the front-end of a project

However, most of the existing stakeholder management research tools, frameworks, and theories provide static perspectives of the project and focus primarily on the project execution/implementation stage (Aaltonen et al., 2015). There seems to be lacking attention to understanding stakeholder dynamics, both empirically and theoretically during the early project front-end phase (Achterkamp & Vos, 2008; Brøde Jepsen, 2013; Eskerod & Vaagaasar, 2014), and how this impacts the project execution/implementation. The importance of stakeholder management and stakeholder dynamics at the front-end of projects becomes especially important when stakeholders' differing or negative attitudes can derail project progress, resulting in time and cost overruns (Aaltonen et al., 2015). The front-end stage covers all the activities from the project's idea generation to the more detailed planning phase, up until the implementation phase (Aaltonen et al., 2015) and will be addressed as the planning phase in this thesis.

There are three reasons why focusing on the front-end of stakeholder management of projects is important. First, there is a lack of theory and understanding of front-end stakeholder dynamics. However, this is the phase where stakeholders' positions are shaped, and their potential influence on the project

management's decision-making process is the highest (Miller & Olleros, 2000; Aaltonen & Kujala, 2010). Second, stakeholders' degree of supportiveness and salience are ever-changing during both the project, but also before the project during the planning phase (Aaltonen & Kujala, 2010). As such, applying efficient stakeholder influence strategies during the front-end of the project can strategically shape the positions of stakeholders and increase the likelihood that their claim will be considered during the project making process (Hendry, 2005; Aaltonen et al., 2015). Third, proactive stakeholder management consisting of early stakeholder engagement can shift stakeholders' stances into neutral or beneficial stances for the project (Aaltonen & Sivonen, 2009), possibly easing the realisation of transition projects. As such, stakeholder management strategies of collaboration, defending, monitoring, involving, and informing are recommended (Olander & Landin, 2005; Savage et al., 1991).

2.5.2 Friction between stakeholders in the planning of heat networks

Because of the contemporary bottom-up communicative planning institutional context, an increased number of influential stakeholders in the planning of heat networks are becoming involved. Not only internal stakeholders have to be managed - external stakeholders have to be managed as well to ensure that a project is realised. This is where complexity and friction arise: more stakeholders with differing views have entered the project arena, making the topic of heat networks more complex (Fischer et al., 2020, Hettinga et al., 2018). However, contemporary contextual settings emphasise the importance of having support from all local stakeholders who are involved in the execution of local energy planning (Kelly and Pollitt, 2011). To mitigate this problem, stakeholder management is often used, ensuring that the project goal will be realised despite conflicting interests being present. Literature has addressed the importance of stakeholder management on the projects' success, making stakeholder management a crucial aspect in contemporary project management (Cleland, 1986; Olander & Landin, 2005).

However, it is impossible to manage and fulfil all the stakeholders' needs. This can be troublesome, especially in the case of heat networks. Reason being the fact that the government cannot force people to use heat networks because of legal reasons, but still has to succeed with the project because of CO2 targets. As such, it is crucial to look for methods on how to optimise the process of planning for and implementing heat networks.

2.6 Governing the heat transition - Exploration, or exploitation?

The previous chapters indicate how the heat transition brings along several challenges for planners - ranging from institutional barriers to challenges surrounding participation and stakeholder management. So, how should planners, or the municipality, manage these challenges?

In 1991, James March devised a theory for organisational learning: the exploration-exploitation dilemma. March (1991) described *exploration* with terms such as searching, risk-taking, experimentation, discovery, innovation, etc. It refers to the discovery of new products and processes, resources, and opportunities. It is often associated with learning through experimentation and radical changes. *Exploitation* on the other hand is often associated with terms such as refinement, efficiency, production, selection, execution, implementation, etc. It is often associated with steady changes and learning through local search. Frequently, firms or organisations focus more on either exploration or exploitation, affecting their performance (Sinha, 2015). Combining both the exploitation of existing competencies while also

exploring new ones is a priority for many firms and is termed as ‘ambidexterity’ (Vera & Crossan, 2004; Sinha et al, 2015). Therefore, organisational ambidexterity is seen as a key capability in which organisations need to develop themselves, as companies need both exploratory and exploitative aspects (Jansen et al., 2008).

Based on the exploration-exploitation concepts, new theories were developed. One of those theories is from Duit & Galaz (2008). Their paper describes four governance styles based on the premises of exploration - exploitation capacities. These are *fragile*, *rigid* and *robust* governance styles, as are shown in figure 2. A robust governance type combines both high capacities of exploration and exploitation. Fragile governance types are at the other end of the spectrum, having both weak exploration and exploitation capacities. Flexible and rigid governance styles are in between, with flexible having a high degree of exploration but no exploitation, and rigid the other way around. Whereas organisational literature claims that an ideal organisation should be ambidextrous, in their article, Duit & Galaz (2008) address that a combination of exploration and exploitation - the robust governance style, is expected to be the ‘best’ governance style when reacting to complex situations. Exploration in the sense of experimenting, learning and discovery, exploitation in the sense of implementation, realisation, and execution. Being receptive to participation while also being strong enough to ‘get things done’. Being flexible enough to come up with new ideas and to manage possible distortions, while being rigid enough to keep processes going and to make progress. By using the governance styles of Duit & Galaz (2008), this thesis tries to understand how the municipality governed the complex challenge of implementing a DHN in Selwerd.

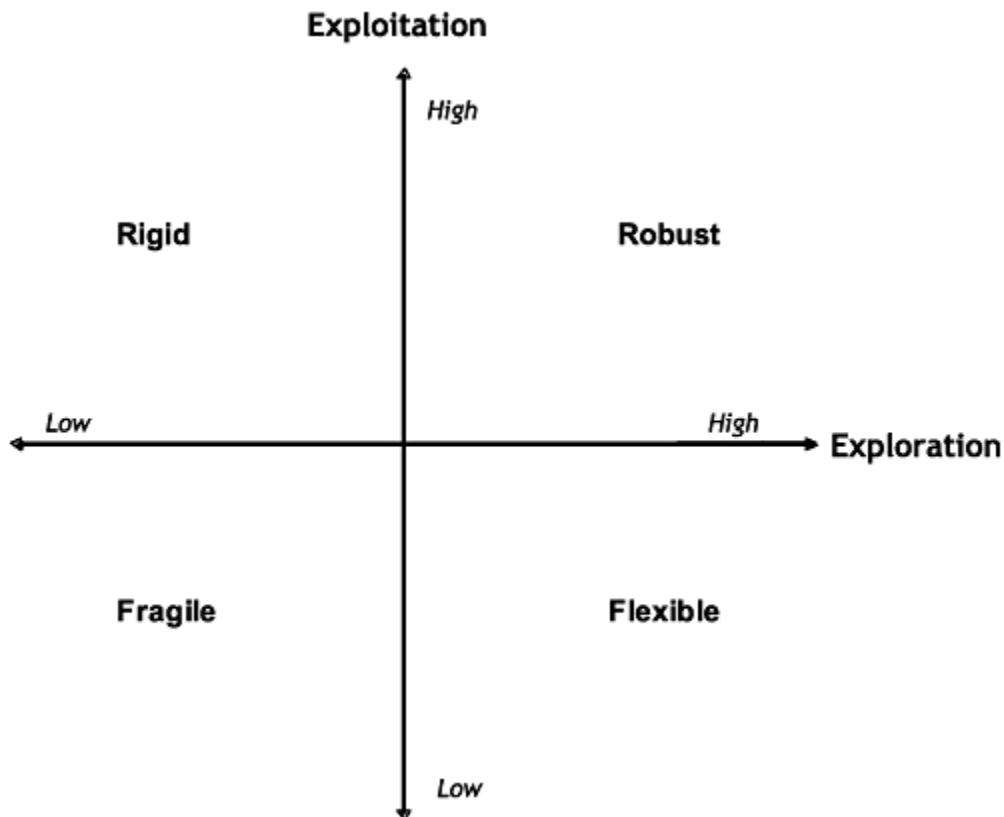


Figure 2: Four governance types from Duit & Galaz (2008)

2.7 Conceptual model

This research looks at a planning topic in its organisational context. As such, planning, public administration and management literature will be used in the thesis. The reason for this is that while the topic is on a planning issue, public administration is relevant due to the high degree of governmental involvement in planning practice and heat networks. Management theory is also important, as stakeholder management related to the implementation and realisation of projects is also important. Therefore, by not only focusing on the planning phase, but also on the execution/implementation phase, this study also addresses the planning practice - theory gap.

The concept summarises the concepts that have been reviewed.

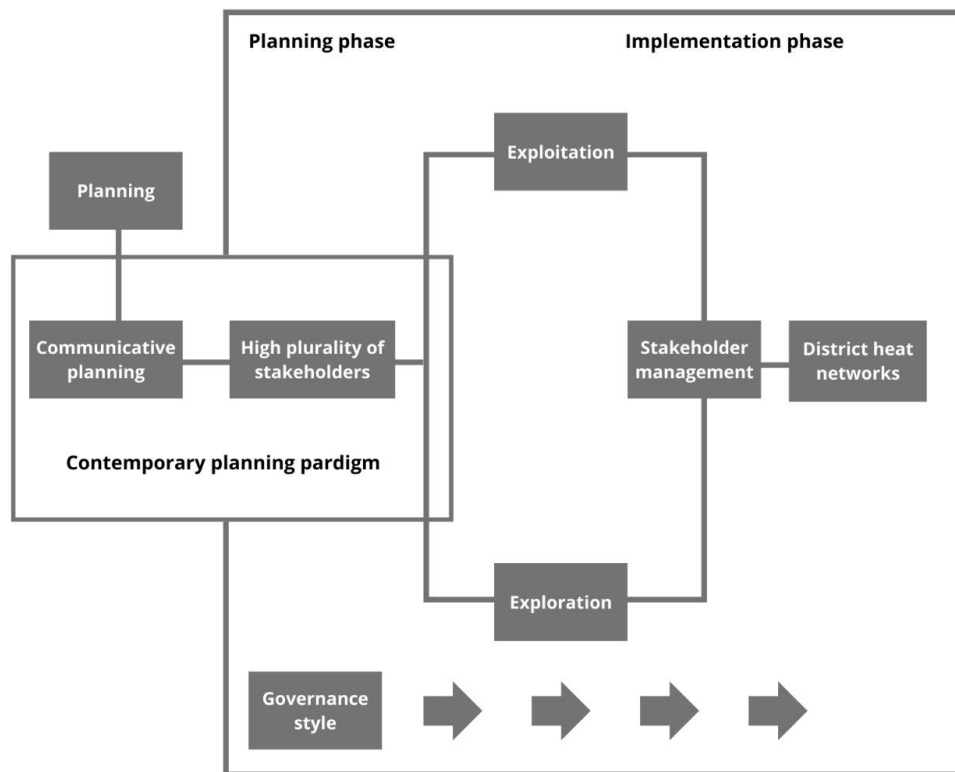


Figure 3: Conceptual Model. Source: author

The conceptual model illustrates how the communicative turn in planning grounded in the contemporary institutional setting of planning practice leads to a high plurality of external stakeholders. These stakeholders have divergent interests, which are theoretically simplified as an external organisational orientation on exploitation and exploration. It is expected that (front-end) stakeholder management can converge these interests adequately before the implementation phase, potentially leading to a smoother process of implementing heat networks. Governance style of the municipality is overarching. This study will test this hypothesis in the context of Selwerd, where a DHN is currently under construction. Chapter 3 elaborates on the case at hand.

3. Methodology

3.1 Research strategy

To answer the main and sub-research questions from the introduction, this research conducts a qualitative single case study on the Neighbourhood of Selwerd. First, semi-structured interviews are conducted and analysed to gain a broader understanding of the case at hand, necessary context and to get a clear understanding on which policy documents are relevant ‘in practice’. After this, a policy analysis is conducted. The rationale behind conducting the semi-structured interviews before the policy analyses is twofold: (1) it makes it possible for the researcher to analyse the policy documents with knowledge from the interviews in mind, also acting as a control mechanism for the results of the interviews (2) It allows the researcher to engage the interviews with a potentially less-jaded mindset, lessening the chance of steering interviews with preconceived thoughts or notions.

By comparing and analysing two data sources, the researcher gains a thorough understanding of the contextual settings regarding the DHN in Selwerd and other necessary contexts. Both with regards to the planning phase, as well as the implementation phase. This should allow for a better understanding of how the DHN project in Selwerd was initiated, how it progresses, and how these two phases are related.

3.2 Case study research

Yin (2003) defines a case study as: ‘an empirical inquiry that investigates a contemporary phenomenon within its real-life context’. Case studies are especially well-suited research methods when trying to understand complex social phenomena within their original context (Yin, 2003), or when it is used to study new topics (Eisenhardt, 1989). An important reason for this is that case studies allow the researcher to investigate the gathered data in a practical context from up close in the empiric field (Zainal, 2017), enabling the creation of new data and theories (Eisenhardt, 1989). Since this research aims to improve the understanding of the implementation of heat networks in the Netherlands, a case study method is used. The reason is that heat transition and the implementation of DHN’s is understood as a new and complex phenomenon, in which context plays a crucial role. Besides this, research within this area is limited. It is expected that DHN’s will play a major role in the energy transition, and the clock is ticking. A case study offers a research design that enables an in-depth understanding of the context of a certain case while being a suitable method for research areas on which theory seems to be lacking (Eisenhardt, 1989; Yin, 2003). All in all, case study research seems to be the most fitting for this thesis.

3.3 Case selection and Selwerd as a single case

Seawright & Gerring (2008) give several types of cases that should be considered depending on the relationship between practice and theory. According to them, important components of case study research are the fact that the case can be representative for a larger population and that the case is not

chosen at random. As such, good case selection is one of the most important aspects of case studies (Gschwend & Schimmelfennig, 2007).

This research opts for a single case study design, namely in the neighbourhood of Selwerd. There are a few reasons for this design. Firstly, it restricts the case and area of study. Heat networks, their institutional design and implementation plans are not always similar in different cases. They are case specific, and the varying influence of stakeholders differs per energy project (Kelly & Pollitt, 2011). Besides this, the stakeholder relations are in this case comparable to the situation as is explained by McElvaney & Foster (2014) where the clients and guiding coalitions are evident. Selecting a specific neighbourhood as a single case not only makes the demarcation of the case clearer but also allows the usage of certain theories to be more concise.

Secondly, as is in line with Seawright & Gerring (2008), the case is potentially representative for a larger population. The reason for this is that Selwerd is a post-war neighbourhood (Jansen, 1999). Post-war neighbourhoods are common in the Netherlands and share similar characteristics throughout the country. Reason for this is that these neighbourhoods were systematically constructed after the second world war, to solve a housing crisis quickly. As such, these neighbourhoods are standardised, resulting in them currently sharing the same technical and social features (Blom et al., 2004). Because of this, while not generalisable, results from this study can help inform municipalities or other actors when planning on constructing a DHN in a similar after-war neighbourhood.

Lastly, this research decided to pick selwerd as a single case study because of its unique characteristics and the researcher's position. Selwerd is one of the first neighbourhoods in the Netherlands undergoing such an extensive process for the Dutch heat transition, and it is expected that many more will follow. Selwerd received a special grant from the central government (Rijksoverheid, 2018), which the municipality of Groningen uses for testing and experimentation to optimise the heat transition later on. Because of this, it is essential to look at how the process of heat transition in Selwerd is progressing, and to ensure that the necessary lessons can be learned afterwards. Besides this, while the heat network in Selwerd is still in the implementation phase, parts of the backbone for the heat network have already been built. As such, much of the decision-making process has already been finalised, thus being available for examination. Also, geographic proximity to the project and relevant stakeholders gives the research better accessibility to the interviewees and also to the case area itself.

It is recognised that a multiple case study would offer a more robust and reliable outcome, given the fact that it would be possible to explore the differences between the separate cases (Yin, 1994). However, considering the novelty and uniqueness of the topic, combined with the possibilities of generalisation, this research finds that there is sufficient reason for conducting a single case study. Accordingly, this research has less of an explanatory capacity and more of an explorative potential where insights might be beneficial for later larger quantitative studies (Flyvbjerg, 2006).

3.3.1 An introduction to Selwerd

Selwerd is an 'after-war neighbourhood' known as an 'opportunity neighbourhood', located in the north of Groningen (figure 4). These after-war neighbourhoods are often problematic and in need of neighbourhood renewal. After-war neighbourhoods were built rapidly after the second world war, to provide quick and convenient housing (PBL, 2009).



Figure 4: Location of Selwerd in Groningen. Source: Lager & van Beethoven (2019)

Because of this, these neighbourhoods are often prone to being anti-adaptive neighbourhoods, which often lack adaptive capacity (Cozzolino, 2020). In Selwerd, all characteristics of an anti-adaptive neighbourhood are present: (1) *attractiveness*: when Selwerd was built, it was considered an attractive neighbourhood. However, this attractiveness seemed to have diminished over time. (2), (3) *Scale of design* and *designers*: Selwerd is the result of a single unified project designed by a team of designers. (4), (5) *Construction times* and *planning rules*: Selwerd was built rapidly from scratch, at the same time similar neighbourhoods in the Netherlands were being built. It was also built coinciding with the then established planning rules (density, height, etc.). (6) *functions*: It is a relatively mono function neighbourhood with residence (85%) being by far the dominant function. (7) *Public open spaces*: There are many public open spaces, which are managed by the municipality. (8): *ownership system*: There are many (super) condominiums present in Selwerd (Carter & Moroni, 2021; Cozzolino, 2020).

Selwerd has around 6231 inhabitants, falls in the lowest 10% income category of the Netherlands and most of the houses were built between 1950-1970 (Sunny Selwerd, 2021). Besides this, poverty, loneliness, social problems, and health problems are prevalent in the neighbourhood (Municipality of Groningen, 2019). There are currently 4152 houses in Selwerd (Sunny Selwerd, 2021). 1731 (42%) of the houses are designated to social housing and owned by housing corporations, 659 (16%) is privately owned and 1762 (42%) is rented out by a third (often private) party. Besides this, the inhabitant structure of Selwerd is very diverse: different people of all sorts of backgrounds (88 nationalities), educational levels, and ages live in the neighbourhood (Sunny Selwerd, 2021).

Because of anti-adaptive neighbourhoods' inability to self-regenerate, top-down interventions are often requested and for development in these neighbourhoods (Cozzolino, 2020). This is also the case of Selwerd, where the municipality is intervening in Selwerd through a neighbourhood renewal program, with DHN being an aspect of this programme. Figure 5 shows a bird's eye view of Selwerd, where it can be noted that it has a typical after-war neighbourhood layout.



Figure 5: Bird's eye view of Selwerd. Source: DVHN (2018)

3.4 qualitative research

As this research has an explorative nature, with the case being a pilot and highly contextual, a qualitative approach was preferred over a quantitative approach (Clifford et al., 2010). Important reasons for this are for example variables which can be of strong influence in this case but are difficult to quantify given the complexity of human interaction relevant to the case. Besides this, recognising those relevant variables becomes difficult as the case's novelty might ask for a more in-depth understanding to identify relevant variables. This research aims to create an in-depth understanding of the DHN case in selwerd and conducting a qualitative case study allows for a true 'close in' on this real-life situation. This allows the research to test and view theory directly related to phenomena as they unfold in practice (Flyvbjerg, 2006; Clifford et al., 2010). Part 3.7 elaborates on the ethical considerations linked to qualitative research and the trustworthiness.

This research acknowledges that qualitative case studies can have difficulties and limits, such as subjectivity or bias concerns and limited generalizability (Flyvbjerg, 2006). However, as is mentioned in various literature, the questions surrounding subjectivism towards certain approaches and preferred outcomes apply to all methods, with case studies often containing a greater bias towards the falsification of preconceived notions than verification (Ragin, 1987). Regarding generalizability, this is often highly dependent on the case one is speaking of and how it is chosen. Carefully chosen cases and experiences are often crucial for the progression of other theories research and can be central to scientific development via generalisation as a supplement or alternative to other methods. *“Formal generalisation is overvalued as a source of scientific development, whereas the force of example is underestimated”* (Flyvbjerg, 2006).

3.5 Data collection

It is essential that this study contains a clear and thorough dataset that elaborates on understanding the case and how all this information adds up. To connect theory and practice, two methods of data collection are used to collect essential information needed to draw conclusions related to the research questions. By combining a policy analysis and a variety of semi-structured interviews, a large share of information becomes obtainable, which can help when trying to answer the research questions. Not relying on only a single policy analysis or qualitative interviews gives a broader insight into the case, which is important as it is generally suggested to have multiple sources of data and evidence (Yin, 2003).

First, a literature review was conducted to gain a grasp on relevant literature and topics. After this, policy documents were roughly reviewed to get a broader understanding of the case study at hand. Next, semi-structured interviews based on this research were conducted. The rationale behind conducting the interviews before the final policy analyses is to gain a more comprehensive understanding of the planning phase concerning its implementation phase. This allows the researcher to better understand the policy documents, their context, and their implications for the implementation. Besides, by analysing the policy documents after the interviews, the researcher can check statements from interviewees and conduct the interviews with a relatively blank slate. The final policy review was therefore conducted after the interviews. The following sections will concretely address how these methods contribute to answering the research questions and further explain them.

3.5.1 Policy analyses

The aim of the policy review is to analyse written documents which are related to the case (Tight, 2019). Applying a document analysis for collecting data is known to have several advantages (Baarda et al., 2013) and was chosen as the main source of information for a variety of reasons. Firstly, documents can (often) be used for an unlimited amount of time, allowing for an in-depth, thorough analysis which can be conducted during all stages of the research. Besides this, the governmental agencies, including municipalities, make (almost) all relevant policy documents and records publicly available. As such, there is a large amount of documentation and information on the case and relevant topics with regards to heat transition and DHN. Especially in the case of Selwerd, which is a testing garden, a lot of policy documents can be found. Thirdly, because of the COVID-19 pandemic, organising larger focus groups or attending neighbourhood sessions was not possible during this research. Analysing documents that came from a period when these data collection methods were possible, elaborating on where the municipality is coming from becomes clearer this way.

All the documents reviewed for the case are from the Dutch government. However, the government has multiple divisions/layers. As such, these documents can originate from a different governmental body. Most documents are either from the *municipality of Groningen* or the *province of Groningen*. Reports and documents from either project developers or the heat net owner are also regarded as being from the government, as the heat net is largely owned by government agencies, and the project bureaus who are currently active in Selwerd are also mostly owned and guided by the municipality. The climate agreement from the *central government* is also regarded as an important document but has a more steering feature. Table 1 gives an overview of the used documents. For clarity and transparency reasons, the document titles are written down in Dutch. However, the titles will be translated in English for better readability from this point onwards. The four documents from the municipality and Sunny Selwerd are used to gain an understanding of the municipal plans for the heat transition and Selwerd in particular. The

province's climate agreement and heat plan are used as global guidelines within which the municipality has to act. The master plan for housing corporations is used to analyse the position and vision of housing corporations on heat transition. It shows their priorities, concerns, and key points

Table 2: Documents used for policy review

Author	Title	Publishing date
Municipality of Groningen	Groningen Aardgasloos 2035	November 2016
Municipality of Groningen	Uitvoeringsplan aardgasvrije wijken Paddepoel & Selwerd	June 2018
Municipality of Groningen	Stap voor stap naar aardgasvrije woningen: strategie en aanpak	July 2019
Municipality of Groningen	Warmtetransitieplan Groningen: Uitvoering warmtetransitie	September 2021
Province of Groningen	Warmteplan van de provincie Groningen	November 2016
Central Dutch Government	Klimaat akkoord	June 2019
KAW Architects	Masterplan corporaties Groningen CO2 neutraal en aardgasvrij	March 2019
Sunny Selwerd	Wijkvernieuwingsplan Sunny Selwerd	September 2018

3.5.2 Semi-structured interviews

Additionally, semi-structured interviews are also used as a way to gather relevant data. While documents provide a large share of general information regarding the case, they are often not very place-specific, without detailed, explicit links to the case in practice. In order to connect policy documents and data with practice, semi-structured interviews with varying parties have been conducted. These interviews can create a deeper comprehension of the analysed documents while also providing a better understanding of closely affected stakeholders' perspectives on the case (O'Leary, 2010). Besides this, interviewees can address their perceptions and notions on the case at hand in an unbiased and independent manner (Jones, 1985) and using interviews as a secondary source of information is advised in case studies in general (Yin, 2003; Assaroudi et al., 2018). Unlike unstructured or structured interviews, these semi-structured interviews can provide an in-depth understanding of the phenomena by asking structured and targeted questions based on theory or specific topics while still being open-ended (Clifford et al., 2010). An overview of the baseline questions can be found in appendix I. However, it should be kept in mind that the interviews might have diverged to some extent from these questions, depending on how the interview went. Due to the COVID-19 pandemic, most interviews were conducted digitally compared to a normal face-to-face setting. This depended on the regulations present at the date of interviewing. If interviews are conducted face to face, the consent form will still be verbally agreed upon. The interviews will be analysed through coding in Atlas.ti. Appendix II gives an overview of the inductive coding scheme used.

For this research, 12 various relevant stakeholders from different parties have been interviewed. These interviewees were found and selected through the rough policy review from the case at hand, with the interviewees being selected on their involvement and stake in the project and based on recommendations from other interviewees/experts. These interviewees needed to be from different and relevant parties, sharing their unique perspectives on the case while being able to shed some light on the

perceptions of their party on the project. Some larger parties have more interviewees, depending on the scale of their involvement. Table 2 gives an overview of the overview of the interviews conducted.

At first, a heat transition consultant from the independent consultancy firm, Sweco, was interviewed. This interview was mainly conducted to gain an insight into the theme of heat transition and to find out how ‘it really works’, as this person has already had a few years of practical experience with district oriented heat transitions and heat nets. While this conversation was very informative on the overall topic of heat transition in neighbourhoods, it was not per se to gain insight into the specific case of Selwerd. However, it did help create a clear vision on what topics and ideas would potentially be of interest in the following interviews. After this, the interviews were scheduled based on the preferences and availability of the interviewees and if possibly thereafter ordered based on the information gained from the preceding interviews.

Informative in-between interviews with a [REDACTED] from the same independent consultancy firm were also conducted during the interviews. The reason for this was to check and reflect on the information gathered during the interviews and to discuss potential ideas. His knowledge is of use when verifying claims made by on-site consultants and project managers while also sharing useful information.

Table 3: Oversight of interviewees

Function	Organisation	Date
	Sweco	
	Sunny Selwerd	
	Warmtestad	
	KAW	
	Sweco	
	KAW/ Sunny Selwerd	
	Municipality of Groningen	
	Warmtestad	
	Sweco	
	Patrimonium	
	Municipality of Groningen	
	Grunneger Power	
	Procap	
	Sweco	

It is expected that the interviews will deviate from the interview guide, as the day-to-day activities of interviewees could sometimes be different as to what was expected, or their attention was currently on a topic which was not accounted for when creating the interview guides. However, to ensure that interviews do address the relevant topics, a semi-structured interview guide is made and can be found in appendix II. All interviews have been recorded with the consent of the interviewees, and transcribed. However, to ensure the anonymity of interviewees, the interview transcriptions will be removed from the appendix after they have been reviewed by the supervisor. In the study itself, these transcriptions have been edited to only contain the relevant segments of the interview, without losing their meaning. To

ensure the edited transcription did not lose its meaning, used transcripts have been shown to the interviewees and checked by them.

3.6 Data Analysis

These edited transcripts have been analysed through conventional content analysis, where coding categories have been derived directly from the text data (Hsieh & Shannon, 2005). An important reason for this is that existing literature on the phenomenon is limited, and avoiding the use of preconceived categories might conceive new insights (Kondracki & Wellman, 2002). Using a conventional content analysis style can thus allow for a richer understanding of the phenomenon (Hsieh & Shannon, 2005). However, a vital challenge of this style of data analysis is a failure to understand the text's full context and identify critical categories (Hsieh & Shannon, 2005). This can result in findings that do not accurately represent the data collected (Lincoln & Guba, 1985). However, this research tries to harness the credibility of the analysed data through member checks and peer debriefing (Manning, 1997). An in-depth guide has been provided by Erlingsson & Brysiewicz (2017), on how to conduct a qualitative content analysis. Their article has been guiding in the content analysis of this research. Table 3 gives an overview of the steps and overview of this research, based on the guide from Assaroudi et al. (2018)

Table 4: overview of the research steps

Phase of content analyses	Subcategory	Response in present study
Preparation phase	Data collection method	The first source of data comes from policy analysis, as can be seen in table 1. For the second data source, Semi-structured interviews will be conducted (see appendix I), with codes being inductively derived from the resulting transcriptions (see appendix IV). These interviews will be recorded (if possible) to ensure that they can be carefully relistened.
	Sampling method	See actions with regards to case selection and data collection. The target characteristics and personalities were described. Sampling was done with different parties and different people. They had and have no relation with the researcher
	Selecting the unit of analyses	The transcripts of the interviews and the highlighted policy documents.
Organisation phase	Categorisation	Categories are derived from the literature review in chapter 2, in the conceptual model. Based on the interview transcripts, inductive codes have been created, which can be found in appendix II.

	Interpretation	<p>Vagueness in the transcripts was double-checked with the interviewees to ensure that there were no misunderstandings when transcribing and analysing the data. Besides this, several meetings with independent professionals were conducted to check if the interview results seemed to be in line with their experiences and to discuss the findings.</p> <p>Besides this, by repeatedly reviewing the transcripts and by constantly reviewing the coding scheme, an attempt was made to interpret the transcripts in the most relevant and adequate way.</p>
Reporting phase	Reporting results	<p>The rationale behind this research, as well as the data analyses process is described in detail in this chapter. Findings, relations and possible implications are discussed in the following chapters.</p>

3.7 Ethical considerations

During some interviews, it already emerged that the current case in Selwerd is a delicate cooperation between different parties. As such, This research understands the significance of ethical considerations. This research upholds ethical standards regarding the honest and fair acquisition and processing of data (Clifford et al., 2010). All steps in the research process have been considered carefully and the Dutch code of conduct for research integrity has been respected throughout the research. These are: independence, scrupulousness, honesty, responsibility and transparency (NWO, 2018). Besides this, there is special attention to ensure the confidentiality and anonymity of participants from the interviews (Longhurst, 2010). To ensure the anonymity and confidentiality of the interviewees, a few measures have been taken. Firstly, all interviewees were asked consent for their interviews, which explained that the interview would be recorded and transcribed and how the data would be used. Besides this, all the interviewees are made anonymous in the research, and all possibilities of tracing these interviewees have been carefully removed. Thirdly, all interviewees were allowed to withdraw interview data at any time during the research. Finally, this thesis will only be accessible to staff and students from the University of Groningen, restricting its exposure and trying to prevent unwanted consequences for the case in its current context (Clifford et al., 2010).

With all these measures in place, the anonymity and confidentiality of the interviewees is ensured. This is important as the implementation of the heat net is still ongoing in Selwerd. Any negative implications for interviewees or involved parties as a result of this research are uncalled for by not only the researcher but all other parties involved. Nevertheless, because of this high degree of confidentiality, this research has limited transparency, making it more difficult to trace every research step accurately. While a dilemma, given the fact that the described project is still ongoing and this research tries to have as little consequences on its contemporary context (Clifford et al., 2010), the claim from Moravcsik (2019)

sums up well the thought process of the research design: “*we may reasonably expect that some branches of scholarly research will simply remain less transparent because of an overriding need to protect vulnerable populations or confidential information*”.



EMPIRICAL PART

4. Policy Analyses

The following chapter analyses policy documents relevant to the DHN case in Groningen and embarks the start of the empirical part of this thesis. It pays special attention to the policy plans of the municipality with regards to Selwerd, and their planning for the project. This will be done with the help of the aforementioned policy documents in 3.5.1. Documents from the municipality have been selected as core documents since the municipality is responsible for the heat transition and also because all their policy documents are publicly available. Besides this, the municipality outlines the overall direction of heat transition in their municipality. Municipal documents from 2011-2021, relevant to realising the heat transition in Groningen and Selwerd will be studied. For this, *five* main documents will be reviewed. Table 5 gives an overview of these documents.

The documents will be reviewed and presented in chronological order, except for the PAW document for Selwerd, which will be reviewed near the end. This is because this document has a very operational and specific character. This chapter aims to create a baseline understanding of how the municipality of Groningen is approaching its heat transition while slowly making its strategy operational and zooming in on Selwerd. As such, it will zoom in on Selwerd at the end. After elaborating on these policy plans, an analysis is conducted.

Table 5: core literature

Dutch Title	English title	Abbreviation	Publishing date
Masterplan Groningen Energieneutraal	Masterplan Groningen Energy neutral	Masterplan 2011	January 2011
Groningen Aardgasloos 2035	Groningen gas free 2035	Strategic plan I	November 2016
Stap voor stap naar aardgasvrije woningen: strategie en aanpak	Gas free houses, step by step: Strategy and approach	Strategic plan II	July 2019
Warmtetransitieplan Groningen: Uitvoering warmtetransitie	Heat transition Plan Groningen: Executing heat transition	Execution plan	September 2021
Uitvoeringsplan aardgasvrije wijken Paddepoel & Selwerd	Execution plan gas free neighbourhoods Paddepoel & Selwerd	PAW Selwerd	June 2018

Besides these core documents, four subsidiary documents will also be used to get a broader understanding of the first three documents. This is because while these documents are not *directly* related to the heat transition in Groningen *or* the municipality of Groningen, they do play a role in shaping the rationale of the heat transition in Groningen. The documents are listed in table 5.

Table 6: subsidiary literature

Author	Dutch Title	English Title	Relation to this chapter
Province of Groningen	Warmteplan van de provincie Groningen	Heat plan of the Province of Groningen	Defines the role of the province and municipality in the heat transition
Central Dutch Government	Klimaat akkoord	Climate Agreement	Defines the role of the municipality and their responsibilities in the heat transition
KAW Architects	Masterplan corporaties Groningen CO2 neutraal en aardgasvrij	Masterplan corporations Groningen CO2 neutral and gas free	Informs on the roles and expectations of housing corporations in the heat transition
Sunny Selwerd	Wijkvernieuwingsplan Sunny Selwerd	Neighbourhood renewal plan Sunny Selwerd	The DHN in Selwerd is part of Sunny Selwerd.

This chapter is structured as follows:

1. The municipal policy documents are shortly introduced and elaborated on
2. All municipal documents are reviewed and summarised into comprehensive analyses
3. After the rationale and intentions of the municipality have been clarified, relevant theory from chapter 2 will be applied to this information. These are *participatory planning*, *stakeholder management* and interests, expressed in *governance style* according to Duit & Galaz (2008).

Furthermore, this chapter tries to answer research questions 2 and 3.

4.1 heat transition visions in Groningen

With the climate agreement (2019), the Dutch national government formalised a strategic framework for the energy and heat transition in the Netherlands. In this report, the Dutch national government imposed on all municipalities to have a plan for gas alternatives ready by 2021. This means that while the Dutch national government sets the standards, the municipalities can decide for themselves how they want to execute their heat transition. Not only does this give municipalities a high degree of freedom and input, it also means that they have to mostly work with their own resources to make this transition happen.

The province of Groningen is also involved to some extent but functions mainly as an intermediary between the municipalities and the national government. This role is clearly established in their '*heat plan of the province of Groningen*'. However, the province can give municipalities financial support as a boost in projects, depending on the situation (Province of Groningen, 2016). In response to this high degree of autonomy, the municipality of Groningen created five major plans which outline their heat transition visions. They will be shortly summarised below

4.1.2 Masterplan 2011

Publication date: 14 January 2011

Type of planning: Visionary, Strategic

Goal: Adjust the target of becoming CO₂ neutral in 2025 to 2035. Shift focus on topics where the municipality can have a higher impact, such as solar, wind, heat and energy savings.

Summary

In the masterplan 2011, the municipality starts by adjusting its CO₂ emissions goals. In 2006 the municipality strived to reach a zero-emissions goal by 2025. They shifted it to 2035 as this was deemed more 'realistic'. (Municipality of Groningen, 2011, p. 3). Besides this, a focus on sustainable heating, solar, wind and energy savings are also extensively addressed. However, given the focus of this thesis on DHN, these sustainable energy sources will not be addressed.

The municipality expects Groningen to have a DHN in 2025 that delivers heat to at least 40.000 houses. This will result in a 15% CO₂ reduction yearly, emphasising that besides sustainable energy, sustainable heat is a full-fledged partner in reducing CO₂ emissions (Municipality of Groningen, 2011, p. 10). The municipality acknowledges here that the construction of DHN requires large investments and is experienced as a '*chicken or the egg*' problem: investors want guaranteed returns on investments and thus be assured of customers. However, potential customers *might* only start considering connecting to a heat when one is constructed and ready to deliver heat (Municipality of Groningen, 2011, p. 10). This of course is an issue because the lack of customers might put off investors in the first place, or make potential investors go bankrupt.

According to the document, the municipality must play a crucial role in bridging these previously mentioned opposites. They want to do this by (1) constructing DHN in 'smart' ways, such as combining it with other groundwork (sewer or cable maintenance, etc.) and partly co-invest in the construction. (2) By motivating heat-deliverance through guarantees, connecting investors and customers, or enforcing construction law and policy with DHN (Municipality of Groningen, 2011, p. 11). The municipality expects that with strong, central guidance that upholds a supportive and steering role in DHN, it will be able to realise its sustainable heat targets for 2025. Figure 6 shows how the municipality envisions stimulating DHN investors

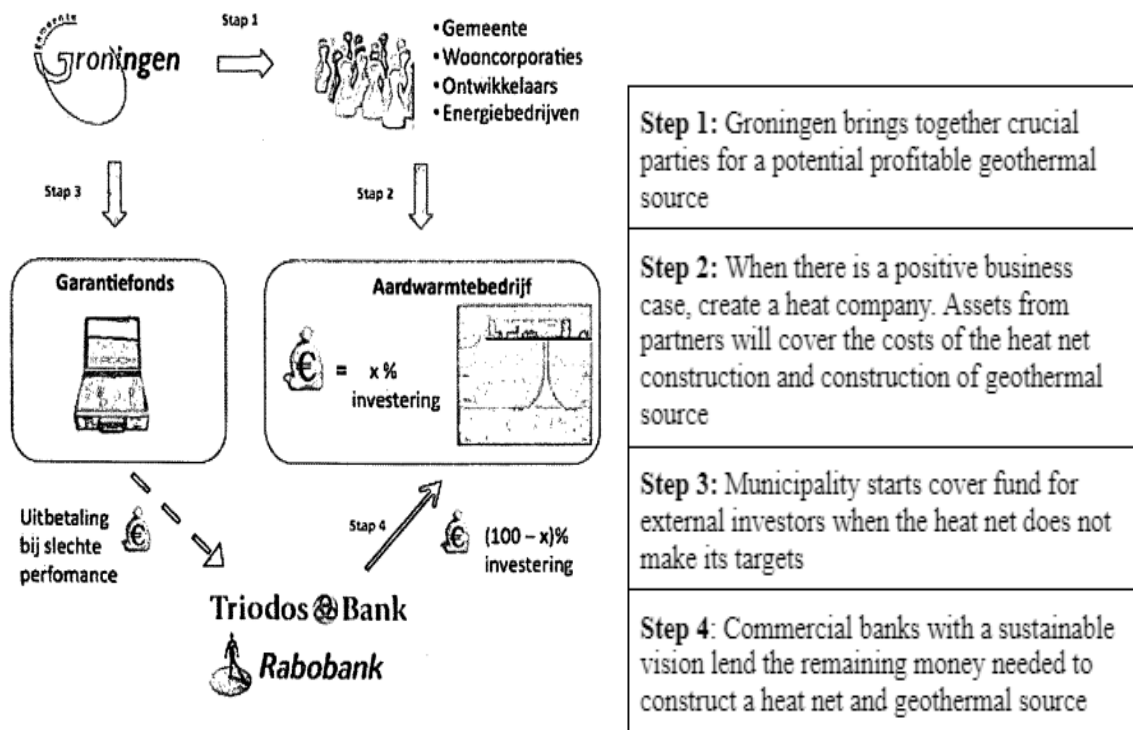


Figure 6: Finance construction for heating companies. Source: Municipality of Groningen (2011), p. 12. Edited

Concluding, the municipality underlines that they have to concentrate on a boosting (aanjagende) role. The municipality strives to create and stimulate the needed organisations to ensure their targets are met, with its limited amount of funds and personnel. The municipality wishes that most investment costs will be covered by external and private parties (Municipality of Groningen, 2011, p. 16).

4.1.3 Strategic Plan I

Publication date: 8 November 2016

Type of planning: Strategic

Goal: Focus on how to phase out natural gas as a heat source by 2035, start geothermal heat experiments in the northern part of Groningen. Lays the foundation for an area-focused approach.

Summary

In Strategic plan I, the heat transition in Groningen starts to gain its form. Where the municipality addressed the importance of developing sustainable heat alternatives in 2011, this document focuses entirely on sustainable heat and phasing out gas. WS, the heat supplier in Groningen, was founded in 2014 and has received a monopoly position on the heat market in Groningen. Besides this, thermal heat sources near the north of Groningen have been found, and are planned to be utilised from 2017 onwards by WS (Municipality of Groningen, 2016, P. 4). These experiments are regarded as leading to how the municipality will treat geothermal heat in the future.

The municipality mentions that it has to focus on three specific topics when becoming gas-free:

1. Geothermal energy and smart DHN
2. Renewable gas
3. Phasing out gas boilers

The municipality wants to reach these goals with an *integral*, neighbourhood approach. An important goal here is to carry out the message that the energy transition is intertwined with other themes and policy domains, which are all relevant for making the municipality sustainable in the long run (Municipality of Groningen, 2016, P. 6). Besides this, the municipality tries to time the implementation of sustainable heat sources with other ‘natural’ investment moments (Municipality of Groningen, 2016, P. 15), such as:

- Large-scale renovation projects from housing corporations
- (replacement) Investments in the existing energy-infrastructure
- When gas boilers need to be replaced

The municipality also acknowledges that area-specific traits are essential when creating a heat vision for neighbourhoods. This forms the basis of a neighbourhood oriented approach and will result in neighbourhoods having a tailored heating solution. Factors such as residential density, type of house (apartments or singular) and construction year are all important factors to consider (Municipality of Groningen, 2016, P. 16). Based on these characteristics, 15 types of neighbourhoods are identified, which will guide in assigning a heat alternative.

In the document, the role of citizens in the heat transition is also acknowledged. The municipality understands that they need a wide support base to execute the heat transition successfully. The role the municipality wants to play in this case, is a facilitating role. To quote the municipality: *“Releasing a support base and trust demands guarantees, a good price, broad participation and maybe even co-ownership. On one hand, this asks for a good balance between careful, supported-decision making, on the other hand, expeditious execution of the decisions made. After all, we want to make progress (‘meters maken’)”* (Municipality of Groningen, 2016, P. 17).

With the neighbourhood approach, the municipality plans on developing a neighbourhood design where residents, housing corporations, companies, energy coöperations, neighbourhood companies, net companies and other actors can develop ideas for their gas-free neighbourhood (Municipality of

Groningen, 2016, P. 18). Based on this, the steps undertaken in the neighbourhood approach according to the document are shown in table 7.

Table 7: neighbourhood approach steps according to the strategic plan I

Step 1	Neighbourhood selection based on investments corporations/net companies
Step 2	Start making a social cost/benefit analyses (MKBA)
Step 3	Technical alternatives need to be explored consistently
Step 4	Neighbourhood design teams with professional guidance need to be facilitated
Step 5	Outcome of the previous steps is a neighbourhood road map with investment program
Step 6	Implementation/execution

4.1.4 Strategic plan II

Publication date: 2 July 2019

Type of planning: Strategic, tactical

Goal: builds upon the neighbourhood-oriented approach, elaborates further on the participatory process and how to concretely scale up the heat transition to 138 neighbourhoods.

Summary

Strategic Plan II focuses mainly on tailoring the neighbourhood-oriented approach. It also focuses on the heat alternatives mentioned in chapter 2: DHNs, hybrid systems and all-electric. This summary will focus on DHN.

The document starts off by describing the process of an ‘*opening bid*’. This opening bid marks the beginning of the heat transition when using a neighbourhood approach. This neighbourhood approach now has four phases (municipality of Groningen, 2019, P. 5), unlike the six from 2016. Table 8 shows these phases.

Table 8: The four phases elaborating the process to becoming gas-free

Phase 1	Analyses and reconnaissance - to create a neighbourhood <i>vision</i>
Phase 2	Making choices - creating a <i>neighbourhood plan</i>
Phase 3	Approach - creating a <i>neighbourhood execution plan</i>
Phase 4	Execution - end

Based on these opening bids, the municipality has created a provisional map, as can be seen in figure 7, which shows what gas alternative each neighbourhood is currently assigned. This map is by no means binding or definitive, as it only shows a first impression of the possible alternatives for gas heating (Municipality of Groningen, 2019, P. 16-17).

The municipality still addresses the fact that it needs to create a solid support base among its citizens to fulfil the execution of the heat transition and describes its role as ‘there to facilitate the communication and participation surrounding the heat transition’ (Municipality of Groningen, 2019, P. 10-11). However, the municipality acknowledges the fact that not all citizens are as actively involved in the heat transition as is necessary to let citizens do all the work. As such, the municipality has designed an organisational model where the neighbourhood has a *front office* consisting of citizen representatives and a municipal project leader who leads the front office. A back office of the municipality then supports this front office. Figure 8 gives an overview of this front office/back office style (Municipality of Groningen, 2011, P. 42-43). Based on this model, decisions regarding the transition are made.

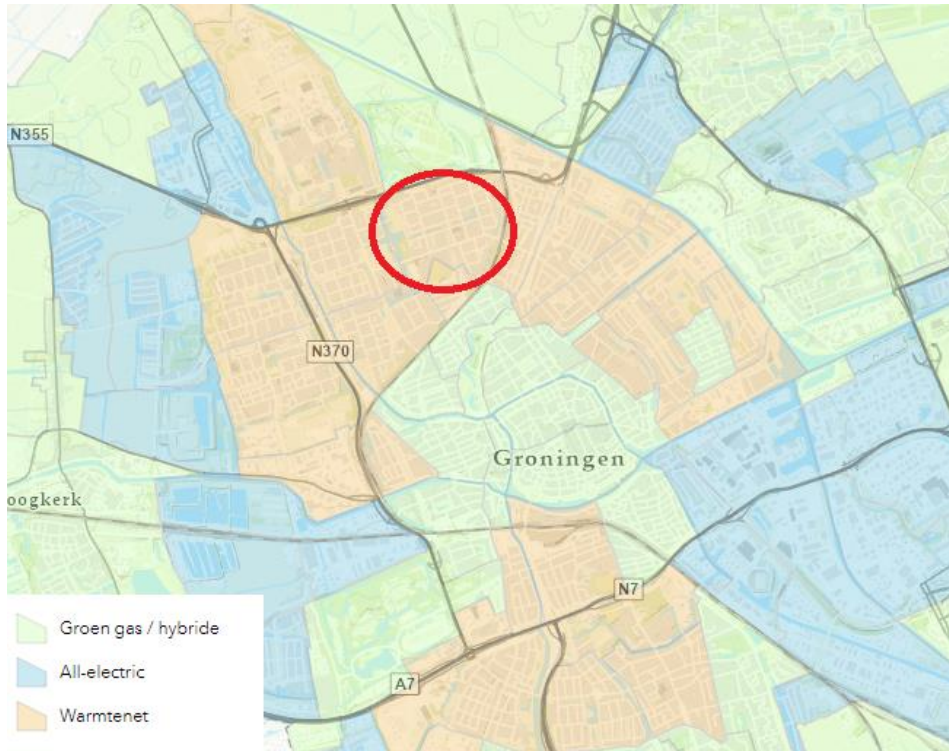


Figure 7: Map of proposed gas alternatives in Groningen. Selwerd is marked. Source: Municipality of Groningen

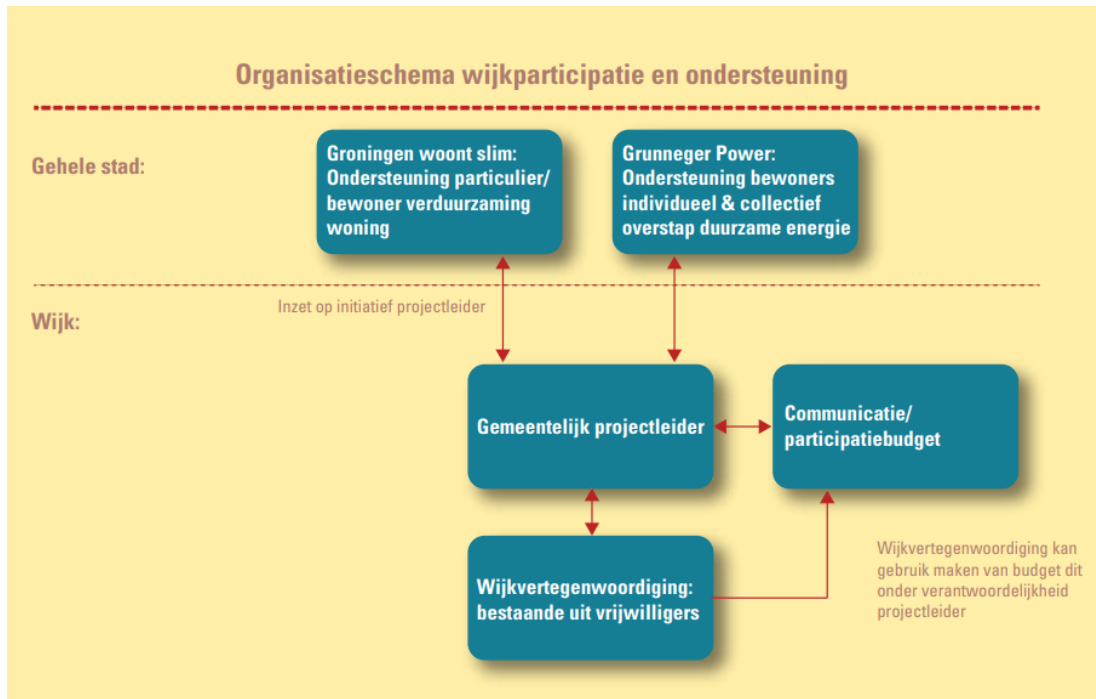


Figure 8 : A chart showing the organisational structure of neighbourhood communication. From the Strategic plan II.

4.1.5 Execution Plan

Publication date: 29 October, 2021

Type of planning: Tactical, operational

Goal: Organise the execution of heat transition in neighbourhoods. The division of two tracks: track 1, being the DHN in the north-western part of the city. Track 2 is supported through an ‘energy booth’.

Summary

In the document, the municipality sets its goal for northwest Groningen to become gas-free by 2030 (*track 1*). They expect to realise this target with the use of a DHN. WS has already started constructing its infrastructure in the area. The main reasons for using a DHN are (Municipality of Groningen, 2021, P. 18-19):

- The age of buildings
- Density of homes
- High % of apartments
- The location to a geothermal source/similar neighbourhoods
- Connection to neighbourhood initiatives, such as *neighbourhood heat*

Besides this, the municipality also elaborates more on their relationship with WS and their vision on how WS is currently operating its business model. It is recognised that WS being a monopoly might not be the ideal situation, and a PPP structure might be preferable in the future (Municipality of Groningen, 2021, P. 23-25). The municipality is currently looking into certain possibilities.

Again, the municipality addresses communication, participation and their own role in the transition. In the climate agreement (2019) that was released after Strategic Plan II, municipalities have been addressed to assess a directive role. However, the municipality stresses that it needs a larger role to speed up the process of heat transition, especially if we want to make the heat transition more affordable for citizens (Municipality of Groningen, 2021, P. 22-23).

For communicative and participatory measures, the municipality introduces the energy booth (*track 2*). This is a place where residents can inform themselves on developments with regards to sustainable housing, and also contribute with ideas and suggestions. Besides this more individual approach, the municipality will still organise neighbourhood-oriented approaches and activities. These will now be developed in collaboration with the local energy cooperation or citizens' initiative (Municipality of Groningen, 2021, P. 32-33).

Agreements with housing corporations are also addressed in the document. For this, the municipality refers to the “Masterplan corporations Groningen CO2 neutral and gas-free” document (KAW, 2019). This as housing corporations own a large share of houses in Groningen, especially in the north-western parts, such as in Selwerd. The agreement with housing corporations is that in 17 years, 35.500 corporation houses have to become gas-free. This also has to be realised through participatory and communicative measurements with residents.

4.1.6 PAW Selwerd

Publication date: June 2018

Type of planning: Operational.

Goal: Create an execution plan to connect Paddepoel & Selwerd to a DHN, to become eligible for testing garden subsidies.

Summary

On 19 February 2018, Minister Ollongren promised the municipality of Groningen subsidies to experiment with making some neighbourhoods gas-free. The municipality created two neighbourhood approaches for two relatively similar neighbourhoods: Selwerd and Paddepoel. The municipality received around €5.000.000 in subsidies for their plans, allowing the municipality to make around 500 homes gas-free (Municipality of Groningen, 2018, P. 4-7). This summary will focus on Selwerd's execution plan.

Selwerd is addressed as a problematic neighbourhood in the document. Problems such as low incomes, unemployment, bad social standing and social issues are prevalent and as such, neighbourhood renewal processes were started in 2018 (Municipality of Groningen, 2018, P. 17). This neighbourhood renewal program is called 'Sunny Selwerd', and has four goals (Sunny Selwerd, 2018).

- Create sustainable and healthy houses
- A safe and attractive neighbourhood
- A healthy neighbourhood
- A neighbourhood with participatory residents

While executing the neighbourhood renewal program, the municipality also wants to address possible pairing opportunities with an integral approach. This aligns with the integrated approach mentioned in the strategic approach I document. Some examples are (Municipality of Groningen, 2018, P.19):

- Renovation of public space while constructing the designated DHN
- When renovating corporation housing, also make them suitable for a connection to the DHN

Besides saving money, another important idea behind this integral approach is to increase communication between the neighbourhood and the municipality during the process of neighbourhood renewal. This allows the municipality to communicate with residents about topics related to the DHN and heat transition.

The province also identifies a list of stakeholders in Selwerd, which are relevant to the construction of a DHN in the area (Municipality of Groningen, 2018, P. 40-44), shown in table 9.

Table 9: list of envisioned stakeholders in the DHN

Stakeholder	Function
WarmteStad	in charge of constructing and exploiting the DHN.
The municipality of Groningen	in charge of coordinating the neighbourhood approach.
Wijkbedrijf Selwerd en Buurtenergieteam Selwerd	A physical place in the neighbourhood for residents, where they can engage in local projects and activities for the neighbourhood.

Housing corporations	own a large share of the houses in Selwerd. Active corporations are: <i>Nijestee</i> , <i>de Huismeesters</i> and <i>Patrimonium</i> .
Buurkracht	Part of Enexis/Enpuls, focuses on cooperation with residents and supports the initiation of local projects.
Dutch heat centre	Technical division of the DHN.
Enexis/Enpuls	Current main network operator in Selwerd. Enpuls is the energy division of Enexis that focuses on DHN.
Gasunie	Involved with gas, but also with the DHN. Especially since a large part of the DHN is currently heated with gas.
Groningen woont Slim	part of the front office team. They approach residents to enthuse them for heat transition and energy topics.
Grunneger Power	local energy cooperation. Also part of the front office. Facilitates residential renewable energy sources such as solar panels and heat pumps.
Local higher education institutions	possible research and development .
Entrepreneurs	Local entrepreneurs can be involved to a larger degree with the DHN.
Province of Groningen	the province designated Selwerd as a gas-free neighbourhood.
Schools	it is difficult for local schools to take action themselves. As such, they intend to work together with other front office parties.

4.2 Analysis of the documents

Based on the previous overview of documents, a clear timeline becomes visible with regards to how the municipality has approached its heat transition. Figure 9 gives an overview of the timeline. It shows how the municipality clearly went from a visionary document to a practical execution plan. While heating was not even considered to be an important topic on becoming CO2 before 2011, the master plan from 2011 appears to have turned the tides on the municipality's stance on sustainable heating. The municipality followed through with their financial construction for a heat operator, setting up WS with Water company Groningen in 2014. Around 2017, Groningen assigned the north-western part of the city to connect to a DHN and started formalising certain ideas. Construction of the DHN officially started in 2020 (Municipality of Groningen, 2021).

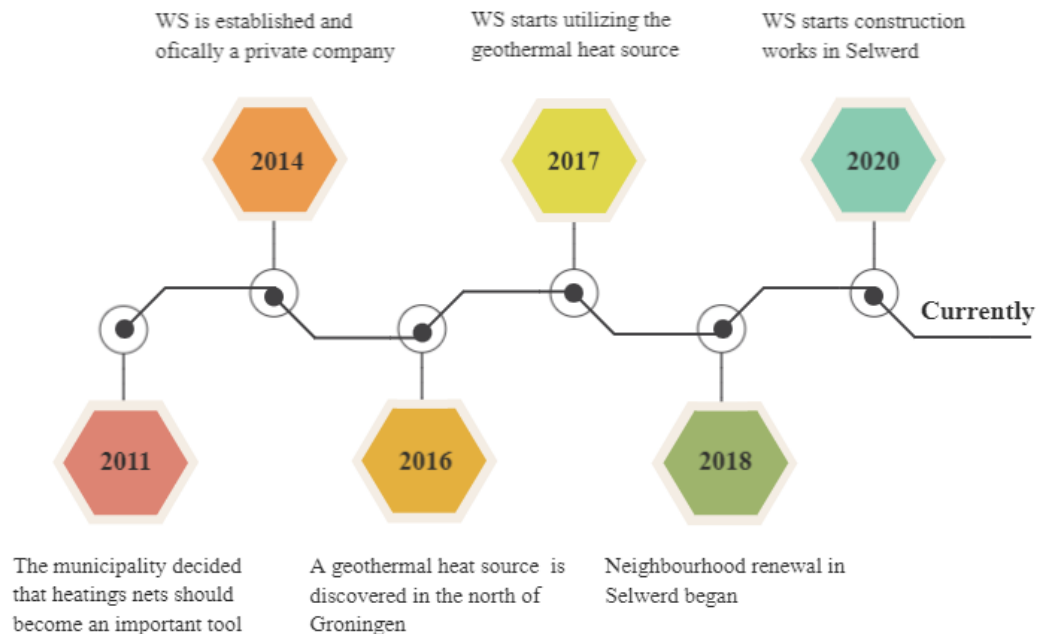


Figure 9: timetable of events related to the DHN. Source: author

4.3 A chronological review of the relevant policy documents

Starting off, this chapter will shortly analyse the reviewed policy documents, to create a comprehensive understanding of what happened during the period of 2011-2021 in Groningen and Selwerd with regards to DHN. Based on this analysis, the following research question will be answered: **“What governance style is used by the municipality during the project and what implications can be derived from this on the execution of the project?”** This research question will be answered with a perspective on communicative planning and the governance styles described by Duit & Galaz (2008).

4.3.1 WarmteStad

In 2011, the municipality already recognised one of the largest challenges to DHN: heat providers want a guaranteed number of customers, but that the municipality cannot guarantee customers to heat providers (Municipality of Groningen, 2011). As such, the municipality came up with a solution: partner up with influential stakeholders concerning energy, underground infrastructure, and housing, such as net owners, water company Groningen, and housing corporations project developers. This alliance would be enough to start initial investments in the DHN and get things off the ground. However, loans from banks were also collected to ensure that capital would still be available when more money was needed, or unforeseen events would occur. In 2014, this plan was realised and WS was created (WarmteStad, 2022).

In 2016, WS announced the presence of thermal heat sources in several areas of Groningen. One of those was located in the northern part of Groningen, and WS planned to start utilising this thermal heat source from 2017 onwards (Municipality of Groningen, 2016). For this thermal heat source, an investment of €60.000.000 was needed. The municipality, water company and province invested

€16.000.000. Banks invested the remaining €44.000.000 (RTV Noord, 2016). One of the largest challenges for a DHN; the lack of funds, was hereby resolved. However, while the logistical and economic aspects of a DHN started to fall in place, one large issue remained: to come through on its targets and goals for investors, WS still needed guaranteed customers for its DHN, of which construction would start soon.

4.3.2 Neighbourhood approach and sunny Selwerd

Besides the developments and investments regarding WS, the municipality also developed a strategy to assign certain sustainable heating alternatives: the neighbourhood approach (Municipality, 2016). This neighbourhood approach had to empower residents, energy cooperatives and other stakeholders, enabling them to voice their ideas regarding possible heating alternatives for their neighbourhood, ensuring a tailored solution for gas.

Parallel to founding WS *and* creating all these heat transition visions and strategies, the municipality was also occupied with neighbourhood renewal. In 2018, the municipality also gave the starting signal for the neighbourhood renewal program in Selwerd: ‘Sunny Selwerd’ (Sunny Selwerd, 2018). This neighbourhood renewal program was supposed to solve four key issues in the neighbourhood of Selwerd. Elaborating on this program, the municipality addressed that neighbourhood renewal for Selwerd has already been on the agenda since 2000 and was long overdue. This long delay came from the economic downturn in 2008, resulting in the neglect of neighbourhood renewal programs. It was ‘Selwerd’s’ turn’ to finally receive support (Sunny Selwerd, 2018).

One of the four key aspects of sunny Selwerd was to create ‘sustainable and healthy houses. While a broad topic, also addressing topics such as isolation and quality of housing, it also meant that the houses of Selwerd are to be connected to a sustainable source of heat. For this, the municipality decided to pick a DHN, as is elaborated in the PAW Selwerd document and the Strategic Plan II (Municipality of Groningen, 2018; Municipality of Groningen, 2019). This made the DHN in Selwerd part of the neighbourhood renewal program, and not a project on its own (Sunny Selwerd, 2018). The municipality embraced the integrated approach mentioned in previous policy documents regarding the construction of a DHN and a neighbourhood approach. And, by using this integrated approach, more enthusiasm, engagement, communication, and citizen participation could occur. Reason being the fact that Sunny Selwerd is an interactive program, where citizens are actively involved and encouraged to participate in creating new ideas on how to redesign Selwerd, and tackle relevant issues (Sunny Selwerd, 2018).

4.3.3 Participation and heat transition - a difficult situation

Going back to the heat transition: the neighbourhood approach gains a more streamlined process in Strategic Plan II, going from 6 phases in 2016 to 4 in 2019. Again, the municipality acknowledges that a solid support base among citizens, based on participation and engagement, is needed to execute the heat transition successfully. However, the municipality also addresses the fact that the citizens cannot do all the work, and that the municipality must support where necessary. Based on this idea, where participation was still important but support from the municipality was needed, the *front office/back-office* model was created. Through this model, the municipality gives guidance to residents who wish to partake in the transition in the front office transition by assigning project managers. The back office, which is also

facilitated by the municipality can support the front office where necessary, helping the citizens with realising their ideas (Municipality of Groningen 2019).

In the document from 2021, the municipality still addressed participation in the heat transition, but with a more realistic stance on participation and expectations for citizens. In the document, the municipality also argued that the directive role they have received by the central government in the climate agreement (2019) is not large enough. Besides this, the municipality also mentioned that they should have a bigger role if we wish to truly speed up the heat transition, while keeping it affordable. It almost seems that as the years passed, the municipality increasingly encountered difficulty with participation and expectations from citizen engagement. As a response, the municipality tried to create models which could still engage the citizens, but would not leave everything to them. This began with making the neighbourhood approach more convenient, slimming down the process from 6 to 4 steps. After this, by creating the front-back-office strategy in 2019, and now using two energy ‘tracks’, where one track (the DHN in north-west Groningen) is already established (Municipality of Groningen, 2016; Municipality of Groningen, 2019; Municipality of Groningen; 2021). It looks as if the municipality feels the 2035 deadline approaching and understands making this deadline is not possible if everything is left up only to the citizens.

4.4.4 Putting the process together - an integrated approach

Returning to the DHN in Selwerd. In 2017, WS, commissioned by the municipality, started constructing its DHN in the northern part of Groningen (Warmtestad, 2022). After this, at the beginning of 2018, it became clear that the municipality would receive PAW subsidies from the central government. From this point onwards, at around mid-2018, it was seemingly already decided that Selwerd would receive a DHN, partly funded by the PAW subsidy and integrated with the neighbourhood renewal approach from sunny Selwerd (Sunny Selwerd, 2018). This is remarkable, as the municipality constantly addressed the importance of participation when trying to be successful in executing its heat transition. Their neighbourhood approach, front/back-office strategy; all call for the importance of participation in the selection of a heating solution. However, in the case of Selwerd, no trace of a participatory approach can be found in the decision to pick a DHN. The idea of combining a DHN and neighbourhood renewal in Selwerd was suddenly just there, and rapidly elaborated on in the PAW document.

Technical and economic factors however *were* mentioned in justifying the choice of a DHN in North-west Groningen. These reasons are already specified in 4.1.5 (Municipality of Groningen, 2018; Municipality of Groningen, 2019; Municipality of Groningen, 2021). Besides these contextual factors, housing corporations also own large shares of houses and apartment buildings in the northwestern part of Groningen. This might be beneficial when trying to connect that area to a DHN, as many corporation apartment buildings are bound to receive large-scale maintenance (KAW, 2019), and procedures with regards to connecting large apartment blocks from housing corporations are easier (you only need a 70% acceptance rate from residents in this case).

For Selwerd, many different aspects congregated. The PAW subsidies, the contextual factors of Selwerd which make it more than suitable for a DHN, the struggles with engaging citizens and the urge to ‘get things done’ at a reasonable price (integrated with neighbourhood renewal). They all contributed to the decision of DHN in Selwerd. However, with regards to participation, it is assumed that in the planning trajectory for a DHN in Selwerd, participation amongst residents has been low, or maybe even nonexistent, in picking the option of a DHN. Instead, technical, institutional, and economic factors have been leading.

4.4 Stakeholder analyses

To answer the third research question: “Which stakeholders are involved during the planning and execution phase of the heat network in Selwerd and how do they interact with each other?”, the PAW Document is used as a starting point. In this document, the municipality outlines the relevant stakeholders in Selwerd, which are already listed in 4.1.6. A list of 14 stakeholders becomes clear. However, do all these stakeholders have the same impact on the project, and how do they influence it?

During the planning

Based on the documents and concluding from chapter 4.3, it becomes clear that during the planning for the DHN in Selwerd (up until 2020), three main stakeholders were involved. These are the municipality, WS and housing corporations. There seemed to be no participation of external parties such as GP, residents, Sunny selwerd or other stakeholders which were mentioned in the PAW document. All three parties agreed on constructing a DHN in Selwerd. As such, only internal stakeholders based on the definition of Beringer et al. (2012) have participated, and were relevant in the planning process. Based on the information from the documents, I placed the stakeholder in the salience matrix from Mitchell et al. (1997).

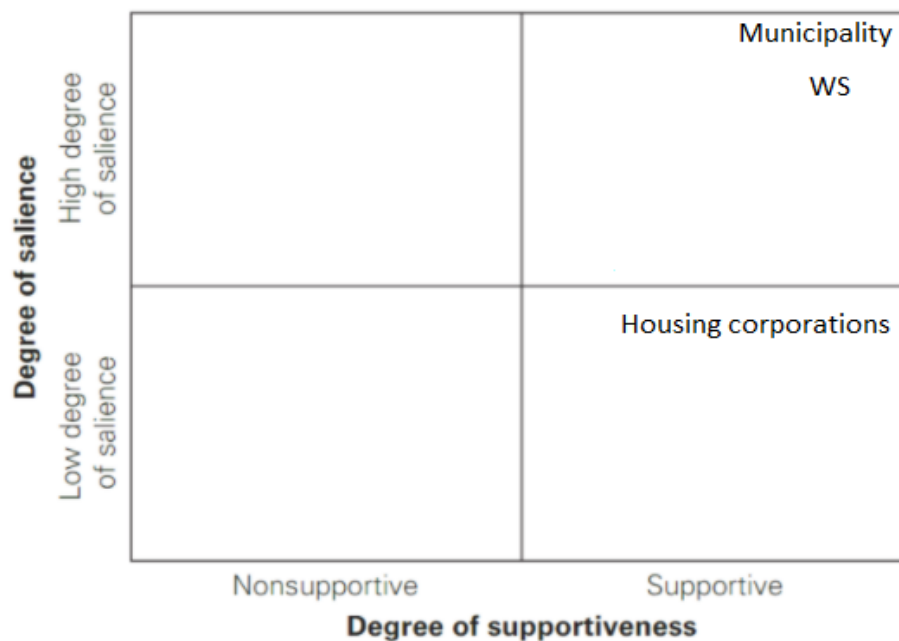


Figure 10: Salience matrix during the planning phase of the DHN in Selwerd, before 2020.

Observing from the policy documents, it becomes clear that all three parties have a high degree of *supportiveness* for the project. This is logical, given the objectives of all parties: exploration of heating alternatives and reaching the goal of becoming carbon neutral in 2035. When looking at the salience, the municipality is by far the most salient stakeholder. The reason for this is that the municipality initiated and created WS and has, to a large extent, binding influence on housing corporations. The municipality has both legal and financial influence, not only on the stakeholders but also on the project environment, given that the municipality owns many parts of the neighbourhood. WS is also regarded as a party with a high degree of salience, as they are the one responsible for all practical aspects related to the DHN. As

such, they must agree with the potential business case of a DHN in the northern part of Groningen and are the ones devising the plan for it (see figure 10). Housing corporations have a lower degree of salience. Reason is that while housing corporations are officially independent, they are still bound by many municipal decisions. For example, housing corporations adhere to the deadline of the municipality for being gas-free and are indirectly forced into the acceptance of a DHN in Selwerd. Housing corporations do have a voice in the process (See the Masterplan corporations document) but have to work *with* the plans which are already in place.

4.5 Involved stakeholders, exploration, exploitation, and governance style

4.5.1 The municipality

The municipality of Groningen (referred to as the municipality) is a large organisation, with many different subunits focusing on different topics and policy domains. Figure 11 gives an overview of the organisational structure of the municipality. The municipality functions as the representative level of the Dutch government responsible for a heating transition on a local (neighbourhood) scale. Of course, not all municipality departments are directly involved or responsible for the heat transition. However, for clarity reasons, this study uses the general concept of the municipality to address these different relevant departments concerned with the implementation of a DHN.



Figure 11: Organogram of the municipality. Source: Municipality of Groningen (2015)

Concluding from the documents of the municipality, the political units (Raad, College of B&W), the real estate, energy and engineering units were involved in the executive decisions regarding the planning phase of the DHN. The task at hand for these actors - developing a DHN in the northern part of Selwerd is

heavily exploration focused. This can be derived from the fact that Selwerd is literally a ‘testing garden’, where all challenges and aspects surrounding the implementation of a DHN are tested and experimented with (Municipality of Groningen, 2018). Neighbourhoods like Selwerd are supposed to be used for exploration. Besides this, other objectives aligning with exploration, such as experimentation, learning, building capabilities, and trial- and error, are also frequently mentioned in the policy documents. Examples are the neighbourhood-oriented approach, the front/back office organisational structure, or the combination of neighbourhood renewal with the construction of a DHN to increase participation (Municipality of Groningen, 2016; Municipality of Groningen, 2019; Sunny Selwerd, 2018).

4.5.2 WarmteStad

WS was created by the municipality and water company Groningen in 2014 to help the municipality realise their zero CO₂ goal in 2035. This has to do with the issue of finding a heat provider, as was mentioned in the 2011 document. However, WS is currently the sole DHN owner in Groningen and functions as a natural monopoly because of this structure. Besides the investments from the municipality and Water company Groningen, WS has received most of its remaining investments (€35.000.000) from the ‘Nederlandse Waterschapsbank’ (NWB bank) (WarmteStad, 2019; NWB Bank, 2019). Unlike private banks such as Rabobank or ING Bank, the NWB Bank is a unique bank that mainly services public agencies, such as provinces, municipalities, or water Authorities (NWB Bank, 2021).

The primary mission of WS is to produce, construct and exploit its DHN and the necessary infrastructure (WarmteStad, 2022b). In Selwerd, WS has already made several arrangements with housing corporations and real estate developers to connect their apartments to their DHN (Focus Groningen, 2016). Figure 12 shows how WS envisions the DHN in Selwerd.



Figure 12: map showing how WS envisions their DHN in Selwerd. Source: WarmteStad (2019)

4.5.3 Housing corporations

Housing corporations, besides the municipality and WS also play a major role in the heat transition, particularly in Selwerd. Historically, housing corporations have had close ties with the government and still own 37% of the Dutch residential portfolio (CBS, 2022). Especially in a neighbourhood such as Selwerd, this number is representative. However, because housing corporations are in between governmental and non-governmental, it is sometimes difficult for corporations to understand their role and obligations in this transition clearly. Because of this, the corporation masterplan shares perspectives from corporations, as well as making clear what standards they must adhere to. In this case, they must ensure that they also become CO₂ neutral in 2035, while also ensuring that their housing offers a sufficient quality of life to its tenants (KAW, 2019). Relevant housing corporations in Selwerd are Patrimonium, Nijestee, De Huismeesters and Lefier. While these housing corporations are different organisations, they are categorised as one stakeholder. Reason for this is that these corporations also work together as one actor to voice their interests and settle on arrangements, as can be seen in the corporation masterplan.

4.5.4 Governance style

Based on the policy review, it becomes clear that during the planning phase of the DHN in Selwerd, the intentions and rationale behind the project were explorative of nature. The plan is devised to get closer to the goal of becoming CO₂ neutral by 2035. Experimentation with a new heat alternative, potential (pairing) opportunities and the opportunity to gain knowledge through this experiment are all features that align with March's (1991) idea of exploration. There are no absolute gains to be gotten with this plan - the DHN will be less efficient and (in the short term) more expensive than using gas.

Another key aspect that becomes clear from the policy review is how the municipality plans on using multiple actors to create a network, which will work towards the goal of becoming CO₂ neutral by 2035. The municipality created WS to construct the DHN, used loans from the NWB Bank and created binding arrangements with housing corporations which enforce municipal ambitions. Besides this, the municipality also plans on using the integrated approach with Sunny Selwerd, utilising this neighbourhood renewal program to gather several projects under its umbrella, including heat transition.

Applying the theory from Duit & Galaz (2008) to this policy review, two observations can be made. (1) Based on the explorative focus of the project, as well as the network governance approach by the municipality, the governance style of the municipality aligns with a *Flexible* governance style, or flexible Network-Based Governance (NBG). This flexible governance system resembles the 'Governance without government style', where exploration is nondirected, nonhierarchical and carried out by multiple different actors. Coordination in NBG is based on voluntary commitment and conflicts are solved with negotiation and mutual concessions. (Pierre & Peters, 2005; Börzel & Risse 2009). (2) Because of this flexible NBG approach, the municipality appears to dissipate towards the background the more the DHN project progresses, and their network becomes more independent. To elaborate, the municipality was actively involved in the project during the planning phase. It set up several actors and created certain guidelines for the DHN and heat transition. However, by creating this network and integrating the DHN project with Sunny Selwerd, the municipality delegated its coordinating role to Sunny Selwerd and the other network actors it set up during the implementation. As a result, the municipality is expected not to govern anymore during the implementation, and the flexible NBG style from Duit & Galaz (2008) might not directly apply anymore during the implementation phase. Instead, the actors the municipality set up during the planning phase are now in charge, pursuing the goals they were assigned with.

5 Analysis of semi-structured interviews

Following up on the first empirical aspect of the policy analyses, this chapter will focus on and discuss how the *implementation* of the DHN in Selwerd is progressing, as is experienced by the aforementioned stakeholders. This will be done by analysing the conducted semi-structured interviews and serves as the second main source of data. This chapter focuses on the second and third research questions by emphasising on the implementation phase of the project. Combining the findings from chapter 4 with the observations made in this chapter will give an extensive answer to the two research questions, and can open up a discussion with regards to the main research question, which is: **“During which project phase do different stakeholders have to get involved to ensure a smooth implementation of the district heating net in Selwerd, and how should these stakeholders be governed?”**

5.1 Participation, implementation, and the district heat net

From the literature review in chapter 2 and the policy review in chapter 4, it becomes clear that the institutional background regarding planning makes participation necessary (see conceptual model, figure 1). The policy review also showed how the municipality seemingly went far with creating a participation plan for the project, already before the implementation phase started (Municipality of Groningen 2016; Municipality of Groningen, 2018; Municipality of Groningen 2019). Besides the municipality clearly devising strategies for adequate participation, the province and central government also addressed the importance of participation and engagement (Province of Groningen, 2016; Climate agreement, 2019). To create a more effective, but also participatory and engaging solution, the municipality came up with the integrated neighbourhood approach. This approach takes the contextual factors in the neighbourhood into account to ensure that an effective, tailored heat alternative would be implemented while also engaging the residents (Municipality of Groningen, 2016). Selwerd received such an integrated approach, being part of the neighbourhood renewal program called ‘Sunny Selwerd’ (Sunny Selwerd, 2018). For this project, the municipality received a PAW grant to experiment with the DHN.

However, from the policy review, it also became clear that while the municipality has ambitious participatory ideas when picking a heat alternative, the decision of heat in Selwerd was not based on those described participatory trajectories. The idea of combining a DHN with the neighbourhood renewal in Selwerd was suddenly there, and the participatory motivation on which this plan was founded cannot be found online. It seemed that in fact, DHN in Selwerd was chosen because of geographical and technical context. Besides this, only internal stakeholders seemed to be relevant during the planning phase.

5.1.2 Location, location, location

After analysing the interview transcripts, the idea of a DHN in Selwerd being based on technical aspects was confirmed. Quotes which are shown in table 11 give examples on how the internal stakeholders planned for the DHN. The following categories were often mentioned during the interviews with regards to why Selwerd would receive a DHN

Table 10: categories mentioned during the interviews

Geography	Technical	Economic	Institutional
located in the northern part of Groningen, nearby a geothermal heat source. Besides this, the backbone coming from this heat source would enter Groningen through Selwerd, allowing WS to supply heat to (more) inner-city areas.	Connecting houses to a DHN is expensive and a thorough process. As such, having a high density of houses where you can easily attach multiple houses at once makes the business case of a DHN more attractive. Since Selwerd has a high quantity of flats and condominiums, it would be more efficient to use a DHN	the municipality is often lacking funds for neighbourhood renewal. Combining neighbourhood renewal with the construction of a DHN, and with subsidiary money from different divisions and governments made it possible to roll out such an extensive program. This is also heavily related to the timing of the project (PAW subsidies).	housing corporations own a significant portion of the houses in Selwerd. This makes communication with this actor more convenient. Besides this, to connect apartment blocks from corporations to a DHN, only 70% of the inhabitants must agree. This also means that it's easier to connect these corporation houses to a DHN, as not all inhabitants have to agree with it.

Table 11: Quotes from interviews, elaborating on the choice of a DHN in Selwerd

The interviews indicate that for the choice of location, theoretical aspects from chapter 2.4 apply. The municipality used the district-oriented approach, as is prescribed in the climate agreement (2019). The municipality then explored neighbourhood-tailored heat alternatives and steered towards DHN with its internal stakeholders. This makes sense given the contextual and geographical dependence of and of DHN, as is mentioned by Evola et al. (2016) and Werner (2017). After identifying this fit between Selwerd and a DHN, the municipality initiated the intervention of a DHN. It took the lead for the planning process ahead, a strategy that is also described in literature from Kelly & Pollitt (2011) and McElvaney & Foster (2014). However, integrating external stakeholders during the planning process, an important step in participatory planning, did not happen. This makes it especially interesting to look at how the stakeholder dynamics proceeded after the implementation phase.

5.2 Implementing a heat network and stakeholders

This chapter builds on the research question: “**Which stakeholders are involved during the planning and implementation of the heat network in Selwerd and how do they interact with each other?**”. It supplements the policy review, trying to answer the implementation part explicitly. By answering this RQ, a clear oversight of the relevant stakeholders becomes clear, which is necessary to answer the main research question.

From both the policy reviews and after analysing the interviews, it becomes clear that during the planning phase, a hybrid top-down/bottom-up approach was instigated in Selwerd, with the municipality and other internal stakeholders initiating and steering their proposed ideal heat solution. As such, the decision to construct a DHN in Selwerd resulted from a top-down process with only internal stakeholders being involved during the planning phase. However, during the implementation of the DHN, a shift in stakeholder dynamics occurred. This as the DHN became part of Sunny Selwerd from 2020 onwards when construction officially started. Besides this, both the municipality and housing corporations need permission from residents and tenants to connect their houses to a DHN (70% approval from corporation tenants). This meant that both Sunny Selwerd and residents would also become stakeholders during the project's implementation phase.

As such, starting with implementing the DHN meant that the internal stakeholders had to take the new stakeholders into account who, given their legal and social position in the Sunny Selwerd program, would also occupy a relatively salient position. Besides this, GP also became a stakeholder because this party represents and works together closely with residents, primarily private homeowners. Suddenly, four external stakeholders entered the playing field: Sunny Selwerd, GP, (private) homeowners and (corporation) tenants. Besides these new stakeholders having a relatively high degree of salience, existing salience dynamics between internal stakeholders also shifted due to their presence. There are two main reasons for this shift in internal stakeholder salience.

First off, WS, who was a salient actor during the planning phase, became dependent on sunny Selwerd and residents, thereby losing salience. The reason for this is that the DHN project became *part of* Sunny Selwerd and neighbourhood renewal. The DHN was no longer a standalone project but was categorised in one of the four values from Sunny Selwerd (Sustainable living). This meant that Sunny Selwerd gained a relatively high degree of salience in the DHN project, and WS lost salience. However, sunny Selwerd is also dependent on the pace of external stakeholders such as tenants, homeowners, and civil organisations, as the core idea of sunny Selwerd is to *engage* residents in renewing the neighbourhood (Sunny Selwerd, 2018). This means that Sunny Selwerd is mainly dependent on residents for participation, but that WS is now dependent on residents in a twofold way: (1): residents have to explicitly agree on connecting to the DHN (approval) and (2): WS has to wait on outcomes of participatory programs from Sunny Selwerd, before it can start construction works. As such, WS loses even more salience, and because of this, residents also gain a relatively high degree of salience.

Secondly, because of the flexible NBG style, the municipality pulled back even further in the implementation phase, only fulfilling necessary directives and facilitative roles during this phase. The municipality as an overarching stakeholder, loses salience by adopting this role as it delegates a large share of responsibilities and influence to Sunny Selwerd and the other actors. Nevertheless, given that the municipality is still the actor funding most of the program (both the DHN and Sunny Selwerd), it preserves a relatively high degree of salience. This as all the aforementioned parties are (financially)

supported by subunits from figure 11 in chapter 4.5. However, unlike the planning phase of the DHN, new municipal units (e.g. social services, public services, labour, etc.) are now involved in the project, given the fact that these units are important in achieving several Sunny Selwerd goals. This means that while the municipality might still be involved in the background, it is involved to a broad degree, supporting all (new) actors in some manner. It, therefore, does not ‘only’ support the DHN or housing corporations, not having the high degree of salience it had on actors it had during the planning phase. Figure 13 gives an overview of the new stakeholder salience matrix during the implementation of the DHN in Selwerd.

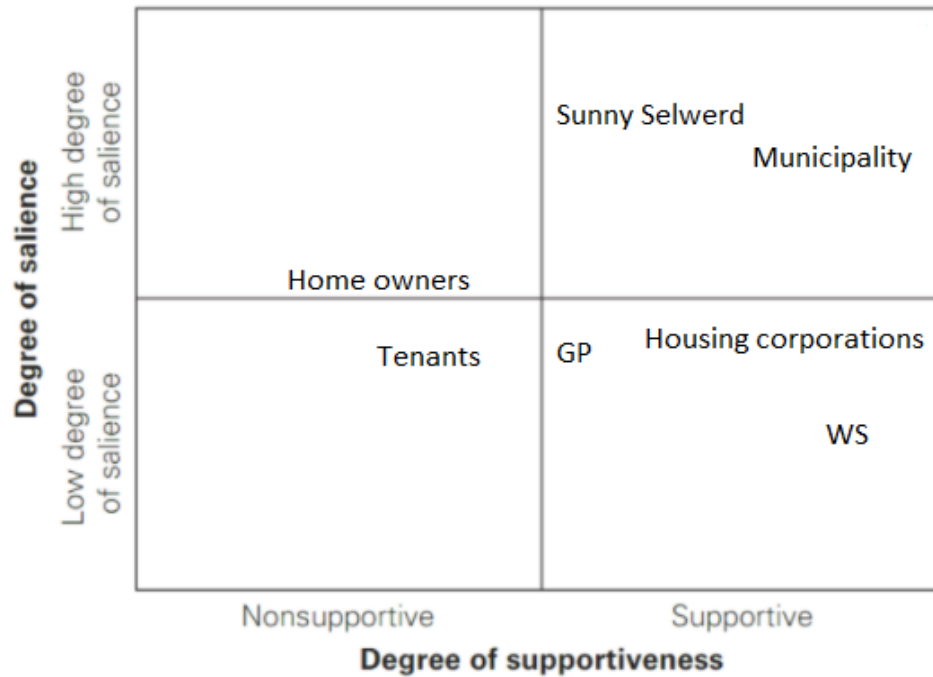


Figure 13: Salience matrix during the implementation phase of the DHN, after 2020

With new stakeholders becoming relevant during the implementation phase, existing stakeholder dynamics changed. Plans that the three internal stakeholders previously devised were suddenly dependent on the plans of new external stakeholders. For the initial plan of the DHN to succeed and be done by 2021, both tenants and Sunny Selwerd would have to follow the same pace as proposed by WS in their plans for Selwerd. However, is this a realistic expectation?

5.2.1 Interaction between the different stakeholders during the implementation

Based on the findings from the policy review, and after analysing the interviews, two observations can be made. (1) during the planning phase of the DHN in Selwerd, only the three internal stakeholders were involved. These were WarmteStad, the Municipality & Housing corporations. The internal stakeholders were both supportive and had high salience on each other's plans. They created subsidiary policy documents and shared the vision of making Selwerd Co2 neutral as quickly as possible through a DHN. The municipality initiated all these plans and ensured that WS and housing corporations would follow their ambitions by creating shared executive plans and shared agreements on specific topics such as

targets, subsidies, visions, etc. (See table 1; Figure1 (chapter 5)). Because of this, the planning phase of the DHN elapsed smoothly and in an organised manner, with the municipality setting up the necessary actors and steering them in their envisioned direction.

(2) External stakeholders also became involved in the DHN project during the implementation phase. The DHN in Selwerd was no longer a standalone project but got integrated with the neighbourhood renewal program Sunny Selwerd. As a result, the DHN became *part of* Sunny Selwerd, forcing WS to adjust its pace to the pace of Sunny Selwerd. This caused internal stakeholders to become dependent on external stakeholders and external stakeholders to gain a large degree of salience on the DHN project. Besides this, to connect houses to their DHN, WS also had to receive approval from residents. This meant that WS was directly dependent on residents for their own project and indirectly through the participatory dimension of Sunny Selwerd. This meant that WS would not only lose a large degree of autonomy to Sunny Selwerd, but also to residents.

Concluding from these two findings, an answer to the second RQ becomes clear: During the planning phase, only internal stakeholders were involved. They treated the DHN in Selwerd as a singular project they were all in favour of. The main goal of this plan was to construct a DHN as quickly and efficiently as possible. However, during the implementation phase, the DHN was integrated into the larger project environment of Sunny Selwerd. New external stakeholders became relevant to the project, changing stakeholders' dynamics. Besides this, it also changed the focus of the project. Sunny Selwerd focuses on four goals, with sustainable living being one of those goals. The DHN project is one of the several sustainable living projects, meaning that this DHN project is far from being the number 1 priority of Sunny Selwerd. As a result, the goal of WS to construct a DHN in Selwerd as efficiently and quickly as possible was not per se shared by Sunny Selwerd, since Sunny Selwerd strives to pursue all four of its key targets in an order most suitable to them. This caused a certain degree of friction between WS and Sunny Selwerd, something that also became clear during the interviews. Table 12 gives some interview quotes elaborating on the friction between Sunny Selwerd and WS and how this affected the implementation of the DHN project. Not only Sunny Selwerd addressed this friction, but different stakeholders such as the municipality and housing corporations as well.

Table 12: conflicts between WS and Sunny Selwerd

5.3 Governing the DHN project

This chapter provides an answer to the third research question: **“What governance style is used by the municipality during the project and what implications can be derived from this on the implementation of the project.”** Whereas RQ2 gives an overview of the relevant stakeholders during the DHN project, this RQ strives to provide more insights into the stakeholder dynamics by elaborating on the relevant contextual factors with regards to governance.

Based on the policy review, it becomes clear that the municipality had a flexible governance approach during the planning for the DHN project in Selwerd. Flexible governance, or flexible NBG in literature, refers to the process of network managers, often public authorities, funding, steering, and governing networks following specific procedures, with the final aim of delivering public services. (Sørsen & Tofing, 2009; Dal Molin & Masella, 2015). In the case of Selwerd, this means that the municipality set up a network consisting of private, public-private, and public actors, which was supposed to take care of the DHN, while the municipality steered and governed said network. The network in Selwerd consisted of several actors, such as WS, housing corporations, Sunny Selwerd and GP.

During the implementation phase, the role of the municipality shifts. In 4.5 and 5.2, it was already mentioned that the municipality was dissipating towards the background. It integrated the DHN project with Sunny Selwerd, delegating most of its governing functions to Sunny Selwerd. However, the interviews made clear that the municipality did not just ‘disappear’ as soon as the Sunny Selwerd program started. Instead, the municipality changed its role. Instead of an overarching governance style used to coordinate the program, it used its different subunits to support the different domains grouped under the four domains of Sunny Selwerd. To elaborate: ‘The municipality’ as an overarching stakeholder like it was in the DHN project did indeed pull out, resulting in the absence of a global governance style in the Sunny Selwerd program. However, while there is no more overarching municipality with a strategic governance style during the implementation, the different network actors were still supported by the municipality, but on an operational level, primarily by their domain unit (see figure 11 for the different municipal domains/units). Table 13 shows how the different actors perceive the role of the municipality during the implementation. The quotes indicate how the municipality does not act as one homogenous organisation and strives to achieve all four goals set in the Sunny Selwerd program. There seems to be no overarching governance style present. And, during the implementation, the municipality's role seems to be focused on assigning project leaders, funding projects and organisations and outlining the overall visions.

Table 13: The role of the municipality during the implementation

After analysing the interview transcripts, it became clear how the municipality is still involved in the project of the DHN and Sunny Selwerd, but on a more operational level. The municipality is not involved with an overarching governance style and the governance styles from Duit & Galaz (2008) are not applicable anymore during the implementation phase. Nevertheless, if we take one step backwards from the *governance styles* based on exploitation - exploration by Duit & Galaz (2008), which are derived from the *organisational* dimension of exploitation - exploration, as is mentioned in literature from March (1991), more contextual insights with regards to relevant factors on stakeholder dynamics during the implementation phase can be found. To elaborate: from an organisational perspective, the municipality, as the main organisation, is trying to achieve two contradictory goals in the same project environment: a DHN, which is a rigid project, and neighbourhood renewal, which is a flexible project. To achieve these results simultaneously, the municipality created two organisations to pursue the aforementioned goals. WS to construct underground DHN infrastructure in the most (cost) efficient way, Sunny Selwerd to ensure that all residents enjoy the neighbourhood renewal program's final result (which has many different goals). Because these parties are set up with preconceived goals and targets by the municipality, they do not have a 'complex' governance style. Instead, using the exploration-exploitation dimension from March (1991) is a simpler way to understand the characteristics and styles of WS and Sunny Selwerd.

WS is a result-oriented company, managing short-term targets focusing on execution; possessing organisational traits that align with *exploitation*. Sunny Selwerd on the other hand, focuses on accumulating knowledge about the community's environment, flexibility, and loose processes: values that align with *exploration* (Sinha, 2015; Duit & Galaz, 2008). These diverging interests and company structures seem to be relevant factors in the DHN's context, and in turn, understanding these can help with getting a better grasp of stakeholder dynamics in the project.

5.3.1 Exploration - exploitation. Sunny Selwerd - WarmteStad

It becomes clear that only internal stakeholders were involved in the planning phase. External stakeholders also got involved during the implementation phase, resulting in (existing) salience positions shifting quite abruptly. Besides this, the municipality decided to integrate the DHN project into a neighbourhood renewal program and did not enforce an overarching governance style during the Sunny Selwerd project. As a result of this, the project environment changed in which two stakeholders with different interests and timetables (WS and Sunny Selwerd) had to work together to realise their goals, while there was no larger party deciding what hierarchy of projects would be most important in Sunny Selwerd. Yes, the municipality was still there to fund and facilitate the network actors on an operational level, but it did not steer on a more strategic level.

In a situation like this, the network actors must coordinate based on voluntary commitment, and mutual concessions. However, this becomes difficult when these actors have different interests. WS wanted to quickly construct a DHN in Selwerd, as was in line with their planning and business plan. Sunny Selwerd on the other hand wanted to deliver the best neighbourhood renewal program as possible - with implementation, execution and deadlines not being as important (see table 12). Of course, the final goal of making Selwerd a more pleasant, CO2 neutral neighbourhood was shared - but the how, and underlying processes were completely different among these two actors. Just as exploitation and exploration are organisational opposites, so were WS and Sunny Selwerd in the integrated neighbourhood renewal program.

Some examples of conflicting interests were that Sunny Selwerd only wanted to start construction after a participatory process in which the residents could co-decide on how to redesign their neighbourhood. This process took much longer than anticipated by WS (maybe because of the Covid-19 pandemic, complicating participation events), resulting in contracts and agreements made by WS, investors and housing corporations not being fulfilled, resulting in fines and financial issues. Another example is Sunny Selwerd putting construction works on hold, to ensure that the construction of infrastructure and interior projects would be parallel with each other. This ensured that the end project would be realised at once, reducing nuisance and increasing the possibility that all citizens would be completely satisfied with the end product. However, this also meant that WS had to wait for Sunny Selwerd to give the green light to continue construction - sometimes interrupting construction. In the end, WS had to pay multiple fines to housing corporations, as they could not deliver their heat targets in time. Besides this, WS also had to hire subcontractors for a longer period, as work did not progress as quickly as envisioned.

Answering RQ3, three key points become apparent with regards to the governance style of the municipality and its implications. (1) Through its flexible NBG style, the municipality delegates the main responsibilities concerning the DHN to the network actors. These actors are responsible for the successful implementation of the project. During the planning phase, the municipality was more involved in this network, as it had to set up the necessary parties (WS) and form guidelines, such as the corporation masterplan, or the heat transition visions. (2) During the implementation phase, the municipality integrated the DHN project with Sunny Selwerd (see 5.2). While the municipality was still involved after this, it was in a different manner. Instead of steering and guiding the project(s) with a more holistic view, it focused on more operational aspects of the Sunny Selwerd program. By doing so, the municipality delegated most of its remaining governance roles to the project leaders in the Sunny Selwerd program. The 'governance without government' situation becomes a reality during the implementation, resulting in all individual network actors trying to maximise their individual utilities. However, no overarching actor

was deciding a strategic, hierarchical order in which projects had to be completed. (3) WS and Sunny Selwerd are two completely different organisations, with WS being the embodiment of exploitation, while Sunny Selwerd being that of exploration. WS is rigid, has a short-term horizon, focuses on execution, and has a clear end goal. Sunny Selwerd on the other hand, is flexible, has a long-term horizon, focuses on the process, and has no clear end goal. The municipality not having an overarching governance style during the implementation phase left WS and Sunny Selwerd to their own devices, resulting in these parties having to coordinate their projects with each other on a voluntary basis. This of course meant that Sunny Selwerd would push their agenda, while WS would push their agenda. The friction between these two actors as shown in 5.2 and table 12 ensured.

5.4 Space and place

During the interviews, another influential factor came up, reinforcing the friction between WS and Sunny Selwerd. This is the fact that Selwerd is a problematic neighbourhood. Besides this, given the legal requirements, one cannot skip over the participatory part of implementing a DHN.

Implementing a DHN is an intensive, large-scale process. Not only does it place a lot of strain on the current residents of the neighbourhood, the DHN operator is also dependent on the citizens, as citizens must be *willing* to connect themselves to a DHN. Besides tenants for housing corporations (where a 70% acceptance rule is binding), homeowners cannot be forced to connect to the DHN. Besides, while realising this DHN is an extensive task by itself, the municipality also decided to integrate its construction with neighbourhood renewal. Meaning that WarmteStad was only allowed to start constructing its DHN when the spatial interventions for the specific area were decided upon by Sunny Selwerd and the residents, as is important to their participatory approach.

This means that besides the other mentioned contextual factors in 5.1, the following factors were also successful for the DHN implementation:

1. Homeowners and 70% of corporation tenants must be willing to connect to a DHN
2. On-time acceptance for spatial interventions combined with the construction of the DHN is essential to ensure proper lead time for other core stakeholders

Adding on to the point that the construction process of DHN is intensive and places a lot of strain on the neighbourhood, the idea of a DHN in Selwerd was received with a lot of scepticism from residents. The fact that WarmteStad is a monopoly, unlike concurrence from the liberalised gas sector (see 2.3.2) turned out to be problematic to many people. Besides this, questions with regards to efficiency, optimisation and potential costs were prevalent in Selwerd.

Not only was there scepticism towards the concept and idea of a DHN, the neighbourhood also had an expectant posture in general, making it often difficult to engage citizens in creating plans for redesigning the neighbourhood. This is also mentioned in theory, where it is often argued that a bottom-up process becomes difficult to initiate when the community is not truly willing to participate, and when objectives that go beyond local boundaries (such as energy transition) are the leading cause (Pissourios, 2014; Naess, 2001). It seems that both WS and Sunny Selwerd have issues with convincing residents to partake in the neighbourhood renewal program and connect to their DHN. This caused delays on both ends, amplifying the delays that came up due to organisational differences. Some examples of how the interviewed stakeholders perceived the participatory nature of Selwerd and how this intertwines with delays in the DHN projects, are shown in table 14.

6. Discussion and Reflection

This chapter presents the conclusion, the discussion and a reflection. It starts by elaborating on the sub-questions, which in turn will help with answering the main research question. By answering the main research question, this research sets out to help contribute to the heat transition by elaborating on DHN implementation strategies. Not by creating a generalizable answer or solution, or by specifically ‘solving’ the issues in Selwerd, but by providing and reflecting on potential lessons learnt from a DHN project in a common type of neighbourhood in the Netherlands.

6.1 Discussion

From this part onwards, the research has answered the three sub questions. The theoretical framework gives an overview of the contemporary planning paradigm, while chapter 4 and 5 address stakeholder management and governance styles. As such, this research can now discuss the main research question: *During which project phase do different stakeholders have to get involved to ensure a smooth implementation of the district heating net in Selwerd, and how should these stakeholders be governed?* In the case of Selwerd, friction started to arise during the implementation phase when external stakeholders got involved in the project and the project environment changed. Deriving from the analyses and literature review, this resulted from conflicting interests between executive stakeholders during the implementation phase, a flexible governance approach and participatory issues related to the neighbourhood. The empirical analysis indicates that a shift in stakeholders and stakeholder salience occurred during the project: from only internal stakeholders during the planning phase, to including external stakeholders in the implementation phase. These external stakeholders had conflicting interests with the primary internal stakeholders, especially WS and Sunny Selwerd having a conflict of interests. WS focused on the outputs of their project, Sunny Selwerd on the outcomes. The governance style of the municipality, being a flexible, NBG style, amplified the friction between these two stakeholders. Both the policy analyses and interviews indicated how the rationale of a DHN in Groningen was with explorative, flexible, intent. The municipality was involved during the planning process, and set up a program with different parties which would in turn be responsible for the project during the implementation phase. This is also where the municipality took a step back and let all remaining stakeholders deal with the project, only acting as a funding and supplementary party when needed. However, because the municipality withdrew during the implementation phase, the two executive parties, WS and Sunny Selwerd had to work together and make compromises to get both their projects done. There would be no overarching actor deciding a hierarchy in which projects had to be completed. As a result, both parties clashed, trying to pursue their goals in a manner they saw fit. Another issue that increased the friction even more, was the character of the neighbourhood Selwerd. Residents were not really engaged, and the challenges facing the contemporary planning paradigm were seemingly all present in the neighbourhood. As such, processes related to participation and engagement took even longer, delaying both WS and Sunny Selwerd. Both these findings are in line with existing literature on the usefulness of stakeholder management at the front-end of projects, and the integration of different organisations/units to reduce friction when trying to reach conflicting goals in the same environment (Aaltonen et al., 2015; Jansen et al., 2008). Contemporary planning literature also supports this more participatory approach in plan creation, possibly improving their quality (Yates, 2018; Thorpe, 2017). Besides this, the downsides of a flexible governance approach (Duit & Galaz, 2008) also became apparent, with the individual actors striving to reach their goals

without an overarching governance strategy (nonhierarchical) coordinating the relevant stakeholders in a certain direction. The governance without government situation becomes applicable (Pierre & Peters, 2005)

Therefore, based on the findings, this study has three key pieces of advice for policymakers, project managers, the municipality or other actors concerned with realising a DHN. (1) Ensure that stakeholders who will be relevant during the implementation phase are also engaged in the planning phase, integrating their visions with the initial project plan. This can prevent possible friction or division during the implementation, but can also enable the creation of new ideas during the planning. Of course, this process might delay the initial planning phase, resulting in higher costs during this period. However, these costs might be earned back during the implementation phase as theory indicates that there will be less friction as a result. This tradeoff between costs and benefits when integrating external stakeholders in an earlier project phase is also an interesting topic for future research. (2) The municipality of Groningen in particular is a large municipality, with many different domain units. As such, the notion that ‘the municipality does not exist’ persists. While this might be true (for other municipalities as well), we also have to accept the fact that large scale projects like the combination of a DHN and neighbourhood renewal in post-war neighbourhoods will become more common in the future. This study has shown that in the case of Selwerd, executive parties are left to their own devices and will primarily try to pursue their priorities. This can make the implementation of such large projects disordered. To avoid this from happening, the municipality should try to uphold a relatively overarching and robust, strategic position during the implementation phase. This can ensure that different interests by different actors are pursued more hierarchically, as can be seen fit by the municipality. A central, overarching program/multi-project management unit with non-interim municipal employees might be most suitable for this role, as continuity of this unit is important. (3) It is acknowledged that the municipality has limited capacity and budget. Combining the DHN with neighbourhood renewal might also be done out of necessity, given the limited amount of capacity and budget and for the PAW funding. Yet, the municipality of Groningen is relatively resourceful, and if they are already struggling with this project, the task might be nearly impossible for other, less resourceful municipalities. Besides this, there are many similar neighbourhoods like Selwerd present in the Netherlands, which eventually have to become gas-free, but share a low intrinsic drive from its citizens. Because of this, projects like the DHN are expensive and intensive, but still expected to be necessary if we plan on becoming CO₂ neutral in the future. As such, not only the municipality, but also other governmental agencies, such as the central government and provinces should look into ways in which these DHN, and other gas alternatives can be supported. Breaking out of the path-dependency surrounding gas and fossil fuels will be extremely difficult if the central government does not thoroughly intervene, and when looking back at the Dutch gas transition of the last century, the central government played a major role in this transition. This is also an interesting avenue for future research: focus on how the central government and provinces can provide more support to municipalities in reaching their CO₂ targets, even on a more local level. For example, by potentially changing energy laws, or by giving provinces a higher degree of autonomy and responsibility, centralising some degree of authority.

Related to the aforementioned points of advice is also where this research contributes to theory; it advances (practical) knowledge related to the front-end of project management. It builds upon the requests to expand research on the front-end of project environments (See chapter 2.6.1). Specifically, it gives a more detailed picture of the relevant factors (governance style and planning paradigm) in the project’s context, which may contribute to stakeholder dynamics. Besides this, it gives a comparison of

stakeholder dynamics during the different phases (implementation) of a project. For planning practice, this study has shown how participatory planning makes the implementation of the necessary large scale energy transition projects more challenging. Realising expensive, large-scale energy infrastructure in an open, bottom-up manner is hard when uncertainty, nuisances and misunderstandings are persistent. It makes DHN projects messy and unclear, worsening the state of the project further. While participation in planning might deliver better results in some projects, it has its drawbacks in others. This is also where the research contributes to planning theory: the contemporary planning paradigm bounded by openness, democracy, plurality and participation seems to be struggling with cases like Selwerd. As such, the need for planning theory to accept and look into the distinction between necessary top-down planning, and useful bottom-up planning might be crucial if we want to realise successful implementation of similar projects achieving our goals of becoming CO2 neutral. However, to what degree participation actually hindered the DHN in Selwerd is not specifically researched. As such, whether and to what extent participation can contribute to the (non)implementation of DHN in a generalisable manner remains open for future research and debate.

6.2 Reflection

To conclude, this chapter reflects on the conducted research. Firstly, the policy review is based on policy documents, which are made public by the municipality. While these policy documents offer a large degree of insight into the rationale behind certain decisions, they do not always reflect all decisions being made, especially with how these decisions have been discussed behind the scenes. For example, how the lobbying behind the PAW negotiations went between the municipality and the Dutch central government is something that cannot be deduced from the documents. The same goes for the integration of the DHN with Sunny Selwerd; it is mentioned how this aligns with certain visions and goals of the municipality, but how the decision was made behind the scenes is not really traceable. As such, it would have been useful to be present at the meetings where these decisions were made. Or to be able to access recordings/minutes of these meetings. This would have been especially useful with regard to the governance style of the municipality during the planning phase.

Secondly, qualitative interviews can be influenced by certain conditions which can affect their outcomes. Examples of these conditions are the interviewer steering the answers in a certain direction based on how the questions were asked, or by interviewees feeling the need to give socially acceptable answers during the interviews (Salazar, 1990). Even though open questions were supposed to prevent this, it should still be acknowledged that personal factors could have influenced certain interview results, given the semi-structured nature of the interviews.

Third, it turned out that the governance styles from Duit & Galaz (2008) were especially useful in analysing the municipality's role during the planning phase, but not particularly during the implementation phase. However, starting the analyses with this framework still drove the researcher towards an exploration/exploitation point of view during the analyses. It is important to keep in mind that these decisions and theories picked at the beginning have a lasting impact on the final result of the research, without the researcher fully realising this. The same goes for the scope of the project, or interviewees selected. While the rationale behind these choices has been elaborated on extensively, they still cause some degree of path-dependency and thus impact the results.

Fourth, while useful for visualisation and conceptualisation, it is acknowledged that the governance style model from Duit & Galaz (2008), as well as the salience/supportive framework from

Mitchell (1997), are simplifications with regards to both the actual governance style and the dynamics of stakeholders. For example, the governance styles might have been more dynamic during certain project phases, as well as the salience and position of stakeholders. Besides this, the project's vulnerability to stakeholder conflicts is also not explicitly expanded upon with these models. Therefore, further research can look into developing more elaborate models with regards to conceptualising and measuring certain dynamics or positions, giving a more thorough oversight of the stakeholder landscape.

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