


# The implementation of a district heating system

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To which degree can Paddepoel-Noord learn from Katendrecht, regarding the implementation of a district heating system



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## **Abstract**

This research aims to find the best way regarding the implementation of a district heating system. With climate change causing all kinds of problems, we need certain alternatives regarding our current heating system. District heating is one of these alternatives. The strength and weaknesses from the district heating project within Katendrecht and Paddepoel-Noord are analysed using qualitative research methods. Strengths from the Katendrecht project, which is already implemented, could be transferred to the Paddepoel-Noord project, which is still in construction phase. Regarding the transition management theory both project are pioneers. The projects create theory from practice, creating pathways towards new policies. These results show not all strengths were applicable to other projects because they were highly case specific. The strengths that could be implemented within the Paddepoel-Noord, transferred from the Katendrecht project, are open communication concerning shared risk and profit margins. In addition, the use of a strong transition manager could be beneficial concerning the project. These two lessons could be implemented In the Paddepoel-Noord district heating project. Which should lead to a diverse transition arena which leads to up-scaling of innovation and breakthrough of innovations.

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# 1 Introduction

## 1.1 Problem indication

The world we live in has many challenges such as climate change, energy uncertainty and depletion of fossil fuels. All these challenges have a connection with our current energy system. We have been highly dependent on the use of fossil fuels since the 1860's. The International Panel of Climate Change has also acknowledged climate change is accelerated by humans (IPCC, 2017). Mankind has to make a transition preventing further acceleration regarding climate change.

The use of fossil fuels is regarded as one of the biggest contributors to climate change. Fossil fuels are mainly used regarding transportation, creating electricity, heating buildings and many more. When diminishing the use of fossil fuels we need new alternatives.

One alternative and a way of facing these challenges is changing our current energy system. Such a transition does not happen overnight and the processes and policy changes needed are not always clear (Kern and Smith, 2008). One of the alternative ways regarding the current energy system could be district heating. District heating is an alternative way to heat our houses and other buildings in contradiction to our current way of using fossil fuels. Within the Dutch context, gas is still the main source of heating. With district heating, water is heated at an external location and transferred via pipes, which are connected to buildings. The heating process can and is done in several ways. Sources such as burning residual waste, solar power, wind energy, IT heat, geothermal heat and if necessary even fossil fuels could be used.

The system of district heating has great potential to facilitate as a heat source due to its flexibility to use a variety of sources, as mentioned above. In addition, when using low emission sources such as solar power and wind energy the carbon footprint of district heating is extremely small (Lund et al, 2010). Furthermore, countries become more energy secure and are not dependent on importation of fossil fuels from other countries (Lund et al. 2010). With the current way of building and our existing buildings, we are still in need of an external heating/energy source. This will most likely not change very quickly due to the existing bulk of building and a slow moving real estate cycle.

This research aims to discover the best approach regarding the implementation of these district heating projects. To specify, there will not be a technological analyse on how to implement the system but rather an analysis of how it is implemented. The implementation will be analysed regarding its strengths and weaknesses concerning the implementation process and stakeholder collaboration.

### Dutch district heating projects

All over the Netherlands there are different district heating projects. The Rotterdam district heating projects are the most advanced. AVR Rotterdam is a waste processing centre which generates heat mostly through burning residual waste. The heat created due to this process is used for district heating. Last year they supplied 157.000 households with energy and saved up to 608 kton of CO2 emission (AVR annual report, 2018). Two projects will be researched and compared, the first being the Katendrecht district heating project and the second is Paddepoel-Noord district heating project. Katendrecht is a neighbourhood within the city of Rotterdam with a total of 4760 inhabitants. The Katendrecht project uses the pipes already constructed by Warmtebedrijf Rotterdam. However, it does not have the AVR as their heat source but Shell Pernis. Shell Pernis is a big oil refinery in Rotterdam. Shell Pernis will distribute their residual heat and facilitate energy towards Katendrecht. Shell Pernis is

currently capable of supplying heat to 16.000 households. Secondly, we will look at the implementation of the Paddepoel-Noord district heating project. Paddepoel-Noord is a neighbourhood in Groningen, which has 5255 inhabitants. The extension of the district heating project will deliver energy towards 672 student homes and five more apartment complexes at the Planetenlaan. This second project is not completed yet, therefore we will also try to compute a 'lessons learned' advice for the latter.

### **Scientific relevance**

District heating systems are researched heavily on technical and societal facets within academic literature. Also comparisons between different projects worldwide have been studied, although the process of implementation and collaboration of different stakeholders is less emphasised. Within this thesis the strengths and weaknesses regarding the implementation of these two project are analysed. Not only regarding the literature (theoretical) but also within two ongoing Dutch projects. The lack of literature regarding the implementation process and stakeholder collaboration makes this research scientifically relevant.

## **1.2 Problem statement**

Problem:

Climate change is accelerated by humankind (IPCC, 2017), mainly due to the extensive use of fossil fuels. We need alternatives to face the challenges that lay ahead. An energy transition from fossil fuels towards a district heating energy system could be one of these alternatives. A energy transition is not only a technical change but also a societal one (Geels, 2004; Kern and Smith, 2008). Therefore it is important that the implementation process is done right, also concerning society. This thesis will analyse two projects and through them analyse the implementation process. It will determine important strengths and weaknesses regarding the process and stakeholder collaboration.

Goal:

Gain insight on different district heating implementation processes and derive lessons learned from Katendrecht which could be transferred into the Paddepoel-Noord District heating process.

Main question:

"To which degree can Paddepoel-Noord learn from Katendrecht, regarding the implementation of a district heating system within their neighbourhood?"

Sub questions:

1. What were the strengths and weaknesses from the implementation of the Rotterdam district heating project?
2. Which lessons can be transferred from the implementation of district heating in Katendrecht regarding the Paddepoel-Noord district heating project?

### 1.3 Thesis Outline

In chapter 2, the theoretical framework, niche development is discussed and used the concepts are defined. In addition, emphasis is put on desirable transition management aspects. In chapter 3, Methodology, the methodology of the thesis is described: the forms of data collection are explained and accounted for. In chapter 4, the gathered data are analysed, compared with existing literature and the sub-questions are answered accordingly. The data are analysed regarding the process of both projects and their collaboration with other stakeholder. In addition, a lessons learned is computed concerning the results within the analysis. In chapter 5, Conclusion and Discussion, an answer is given to the main question of the research and the results will be discussed. Furthermore, a recommendation regarding future research is given.

## 2 Theoretical Framework.

Following the main objective of this research, we will first need to define certain processes within sustainable energy transition, using literature. At first, the theory regarding development of sustainable energy projects is explained. Followed by, explanation of the stakeholder involvement and their relations towards the transition management theory.

### 2.1 Energy transition

#### *Socio-technical landscape and regime*

The energy transition towards a sustainable energy system is labelled a socio-technical change (Geels, 2004; Kern and Smith, 2008). Meaning, such a change does not only concern new technologies but also influences changes within markets, user practices, policy and cultural meaning (Geels, 2004). Transitions like the energy transition are a social transformation process, socio-technical systems change structurally over an extended period of time (Rotmans et al., 2001). A socio-technical system is a system which links elements necessary to fulfill societal functions (Geels, 2004). Meaning, the system is not just providing what it is designed for, but it is also, integrated within our society, within our culture, within our day-to-day lives. The energy system, providing heat, light and power, is regarded as such a system.

Transitions in such a system could be understood using a multi-level perspective, arguing, development comes through three levels: Landscape, regime and niches (Geels, 2004). Within figure 1 all three levels and interaction between them are displayed. The (socio technical) landscape refers to a wider societal level at a macro level, containing things like political culture, societal values, worldviews (Loorbach and Rotmans, 2010). Processes at a macro level are referred to as 'regimes'. Kemp and Loorbach (2006) argue that these processes are dominant actor networks and institutions that guide decision-making processes. In addition, they argue that these processes provide stability and stimulate reproduction of practice and therefore block new initiatives to protect original regime. Thus, transitions do not occur easily due to the regimes characteristics as lock-in and strict path dependence (Geels, 2010). With the landscape and regime layers providing stability on a macro level, transition has to occur through another level. Transition has to occur through niche development, displayed within figure 1.

### *Niche development*

With the concept of transition thinking and multi-level perspective, transition starts through 'niches'. On this niche level, new technological, practices and innovations can occur and will, over time, compete with the already established and dominant regime. The multi-level transition theory argues that, "transition is a result of the interaction between changes and innovations at these different levels; slowly changing trends lead to a new way of thinking (paradigms) that lead to innovation and vice versa." This lens of socio-technical multi-level perspective is used in several papers to analyse the Dutch energy transition policies. Which makes it arguably a strong concept to use within our context. Figure 1 shows how these different levels interact. The niche development and how it interacts with the regime is somewhat divided within the literature. As shown in figure 1 both the landscape and the regime level are noted as external influences on niches. Some argue that these external influences on niche development could be seen as a top down approach. Moreover, regarding the literature, niches should be developed this way. Others point out that niches should originate from a bottom up approach, develop on their own, and later on interact with the existing regimes.

#### Multilevel transition model

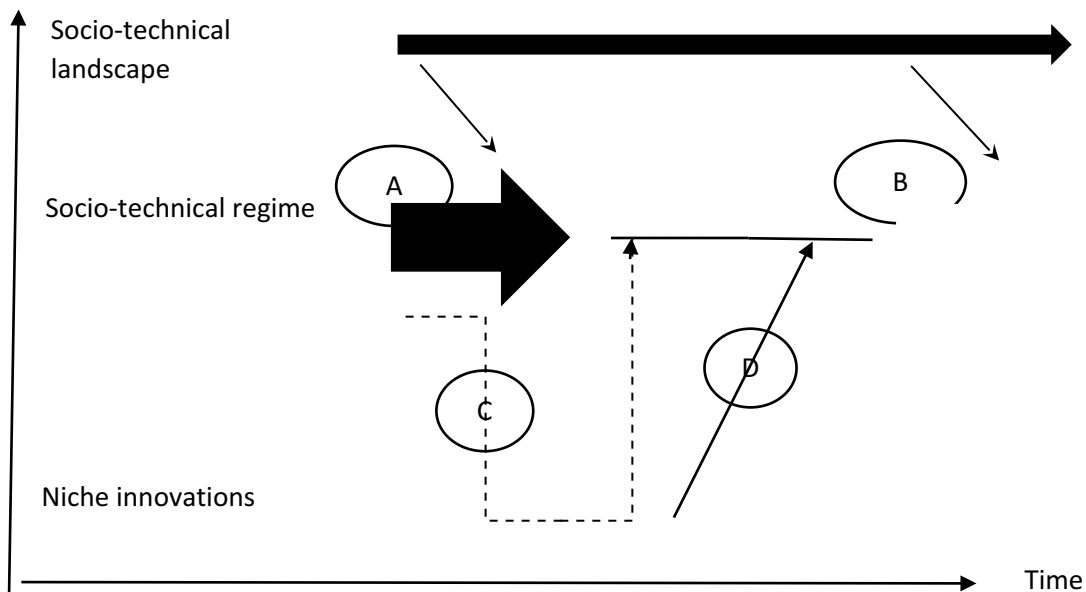


Figure 1. Regime changes through niche development

To place this multilevel transition thinking in the energy transition concept we could argue that the existing regimes are the dominant fossil fuel companies and renewable energy could be a developing niche. In the spirit of transition thinking, the niche should develop and over time compete with the existing regime. This interaction with the existing regime is displayed within figure 1. the niche developing lines are displayed by C and D. These lines interact with existing regime A and through this interaction change the existing regime to a new regime at B. Figure 1 is a simplified edition of the multiple levels as a nested hierarchy by Geels (2002). It only mentioned the important interactions concerning this thesis.

Not all energy transition projects turned out to be successful regarding this niche-developing method. For example, wind energy in the 1970's had trouble developing mainly due to high



initial costs. In addition, photovoltaic (PV) in the 1990's was a project that had broad societal support and was embraced by policy makers in the Netherlands (MEZ, 1996). Despite technological innovations decreasing its original high initial costs the PV energy transition was re-evaluated in 1995 and scored on both cost sufficiency and reduction of greenhouse gases poorly (Verborg and Geels, 2006). This due to the technical problems being bigger than expected and implementations within the system being not easily established. Also the nature of the niche-dynamics were highly influenced by existing regimes and landscape, oil prices, environmental concerns, economic recession, climate change and liberalisation (Verborg and Geels 2006).

## 2.2 Transition management theory

Different implementation strategies have been discussed above. However, how should these changes/transitions be managed? Transition management is built on the idea and framework of multi-level system innovation. Transition management could be seen as a strategy/framework, which could guide policy makers regarding global environmental change (Loorbach and Rotmans, 2007). The key principle regarding the transition management theory is the search to widen participation by taking a multi-actor approach to include wide societal values and beliefs. It has both long term (between 1 and 3 generations) and short-term objectives. In addition, it focuses on the development of the niche and to create pathways through them. The transition management theory emphasises on learning by doing. Meaning, developing theory from practice also referred to as transition experiments (Loorbach and Rotmans, 2007). Within this same theory the role of the government is discussed. Regarding the transition management theory the role of the national government should not be the enforcer of change. It should be stimulating the transition process by encouraging others stakeholders to take place and think along. "These new insights may lead to a change in actor's way of thinking and to joint actions that aim to contribute to inducing the specific transition" (Kerkhof and Wieczorek, 2005).

The transition management theory does have some uncertainties. Firstly, the theory is based on expectations and results from the past. Therefore no one knows the ingredients regarding a successful transition remained the same (Kerkhof and Wieczorek, 2005). Also, neoclassical economist would argue that the role of the government is not to intervene within the market but only to correct its imperfections (Goodland and Ledec, 1987).

We are aware that a change within the energy system is regarded a socio-technical change. In the past we had other socio-technical changes, therefore we are able to look into these transitions to guide this current one. In addition, the problem (the need for alternative energy system) is quite integrated within our society, this will allow for uncomplicated linkage between numerous stakeholders regarding a successful transition (Kerkhof and Wieczorek, 2005). The strength regarding the transition management theory is a strategy which presents itself useful accelerating and guiding social innovation processes (Loorbach and Rotmans, 2010).

### *Transition arena*

Within the transition management theory there is a so called theoretical transition arena. Within a perfect situation there should be a mix of heterogeneity and homogeneity actors. Meaning, a mix between people with different backgrounds, opinions and thinking style but also people with sufficient communication skills and willingness to invest time and energy and to integrate aspects of sustainability in their own organisation (kerkhof and Wieczorek, 2005). Rotmans (2003) describes this same transition arena as: "A place for shaping evolutionary process and including a variety of actors from different segments of society,

such as governments, business, societal organisations, intermediary organisations and knowledge institutions."Such a strong and diverse transition arena will improve the process through their debate, thinking and experimenting and conditions are created for up-scaling of innovation and breakthrough of innovations (Loorbach and Rotmans, 2010). In practice this co-production of different actors will lead to new insights which will be implemented and reflected upon in a continuing way (Loorbach and Rotmans, 2010). This process should be ongoing which will result in a continuing improvement of the process.

### *Transition manager*

The transition arena, as described above, is an arena with a selection of actors. The arena and its set of actors is put together by a transition manager. Within the literature there is debate regarding whom should fulfil this role of the transition manager. Rotmans (2003) argues that government was designed to gather the important parties, but they did not have a gatekeeper role. Loorbach and Rotmans (2007) revise this government role and propose there should be a different transition manager, although they do not make clear which organisation or actor this should be. Regarding Kerkhof and Wieczorek (2005), a self-organising transition arena could lead to an insufficient selection of actors. In addition, the ideas and views of the dominant actors could in the absence of a transition manager be even more dominant.

### *Expectations*

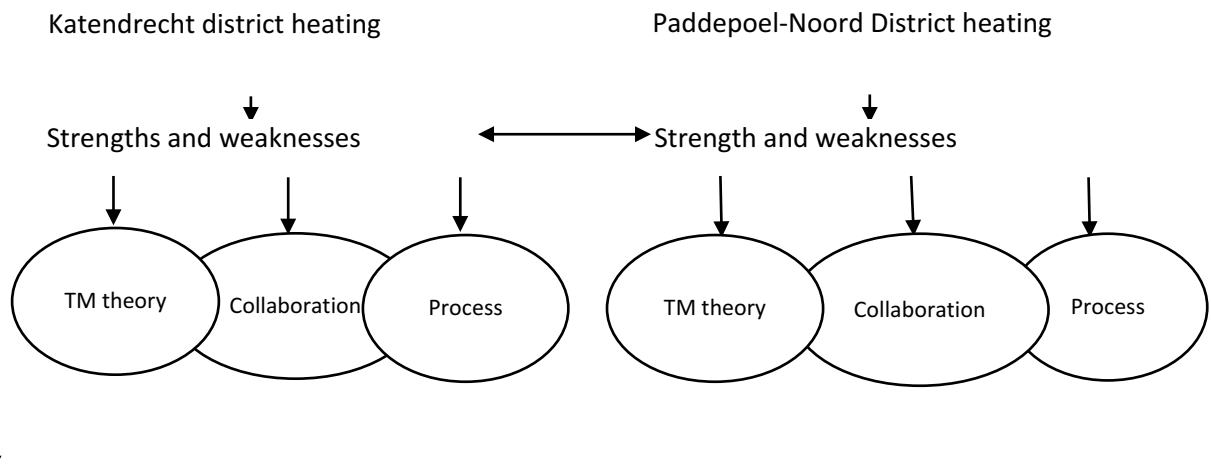
It is expected that a strong development process of a niche project like district heating has a pioneer role regarding transition. In addition, the innovative character and success of the project should be altered by the strength of the transition manager and the diversity of actors within the transition arena.

**2.4 Conceptual model.**

**Problem**

Implementation of district heating system

**Strengths and weaknesses** -----



**Lessons learned** -----

Katendrecht district heating project → Paddepoel-Noord district heating

Figure 2. Conceptual Model

The energy transition towards new heating sources such as district heating is a new movement. The way it is shaped could determine the success other similar projects. As visualised in figure 2, the two projects, Katendrecht and Paddepoel-Noord, are analysed concerning their strengths and weaknesses. These strengths and weaknesses will be analysed regarding the transition management theory (TM theory), their collaboration with other stakeholder and their (development) process. If feasible, certain strengths of the Katendrecht district heating projects will be projected onto Paddepoel-Noord via a lessons learned paragraph.

### 3 Methodology

#### 3.1 Used methods

This thesis aims to find certain strengths and weaknesses regarding the approach, opinion and interpretations of people whom are actively working on the implementation of a district heating system and try to get their view and value on this process. To gather this data a qualitative research design is preferable. Qualitative research is used to gain understanding of underlying motivations opinions and reasons (Clifford et al., 2016), and is therefore most fit to gather the desired data. Also as stated by Jones (1985), an interview is one of the most powerful ways to understand others. Next to qualitative research is quantitative research, which statistically analyses numeric data. Opinions and interpretations are hard to put into numbers and statistically analysed, therefore this thesis uses a qualitative research design.

The one-on-one in-depth interview consists of a couple of core questions with follow up probing questions. Thus, the interview will be semi-structured. A semi-structured interview provides flexibility in the way issues are addressed by the respondent, while retaining some sort of predetermined order and is highly dependent on dynamics between interviewee and interviewer (Clifford et al, 2016). The interview will be held in Dutch when the interviewee is Dutch. Otherwise information might be lost due to the language barrier and or meaning given to certain words (Punch, 2014; Clifford et al. 2016)

#### *Analysis*

The in-depth interviews were transcribed and coded using qualitative data analysis software, Atlas.ti, applying deductive coding. Deductive coding is a method wherein a code scheme is created beforehand using existing literature (theoretical framework). The code scheme will guide the researcher through the coding process (Clifford et al. 2016). We created the code scheme with use of a thematic framework. Through analysing the different in-depth interviews, codes were generated. From these generated codes a set of themes is formulated. Within this thesis “process” and “collaboration” are the two main themes.

#### 3.2 Research ethics

At the start of the interview the researcher explained the interview procedure and spoke about informed consent which was signed after the interview. Furthermore, the interviewee was asked for permission to record the interviewee using a smartphone. One respondent did not want to be recorded, this data was written down as good as possible. The audio files and transcribed interviews were stored on a secured online location, protected by a password. Respondents names and other information that could compromise the identity of the interviewee were changed to ensure anonymity. Also the location of the interview was chosen by the interviewee. This way the interviewed might feel most relaxed and therefore provide more honest answers (Oltmann, 2016).

Within qualitative research, validity and reliability cannot be justified using certain statistical tests. Therefore, qualitative researchers try to design a methodological strategy to remain valid and reliable within their findings (Noble and Smith, 2015). The following strategies were adopted concerning credibility: The establishing of a comparison case, seeking out

differences and similarities. This strategy ensures multiple perspectives are represented (Noble and Smith, 2015). Also within the literature review, we engaged with other researchers to reduce researcher bias. In addition, within some cases, we applied respondent validation, meaning, inviting respondents to comment on the transcript whether the written down processes are correctly noted and understood. With these precautions in place, I expect to achieve credibility regarding our study findings

### 3.2 Respondents

#### *Katendrecht*

Within the Katendrecht district heating project the most important stakeholders are Warmtebedrijf Rotterdam, the municipality of Rotterdam and Shell Pernis. All these stakeholders were contacted concerning an interview. The municipality of Rotterdam and Warmtebedrijf Rotterdam were not willing to participate within the research. As an alternative Deltalinqs was interviewed, they were active initializing the initial project and have been in close contact with the municipality and Warmtebedrijf Rotterdam within these stages.

#### *Paddepoel-Noord*

Within the Paddepoel-Noord district heating project the most important stakeholders are WarmteStad the municipality of Groningen, Shell and the inhabitants of Paddepoel-Noord represented by the neighbourhood cooperation's. An overview of the interviewed respondents can be found in table 1.

#### Respondents

Respondents:	Gender:	Organisation:	Function:
Respondent A	Male	Shell Pernis	Project manager
Respondent B	Male	Deltalinqs	Project manager
Respondent C	Male	WarmteStad	Team coordinator
Respondent D	Female	Energie werkplaats	Communication and stakeholder management

Table 1. characteristics of respondents.



Figure 3 Katendrecht district heating system

### 3.4 Paddepoel-Noord

Paddepoel-Noord is a neighbourhood in the city of Groningen, which is part of the district Noord West. The neighbourhood is located at the North side of the city and close to the Zernike Campus which houses both the Rijksuniversiteit Groningen and Hanzehoogeschool Groningen. Some characteristics of the neighbourhood are displayed in table 2. WarmteStad is the company which will deliver heat towards the Paddepoel-Noord neighbourhood. The municipal company WarmteStad claims to be a local, sustainable and affordable social organisation with the mission to contribute to the energy transition from fossil to sustainable heat source within the city of Groningen ( WarmteStad, 2020) Neighbourhood cooperation Paddepoel Energiek is a non-profit foundation founded in 2016 with the desired result of reaching an energy neutral Paddepoel in 2035 (Paddepoel Energiek, 2018). Within figure 4 the location of Paddepoel-Noord is displayed. Also the pipes and heat source are shown, to indicate the already made constructions.

Paddepoel-Noord district heating system

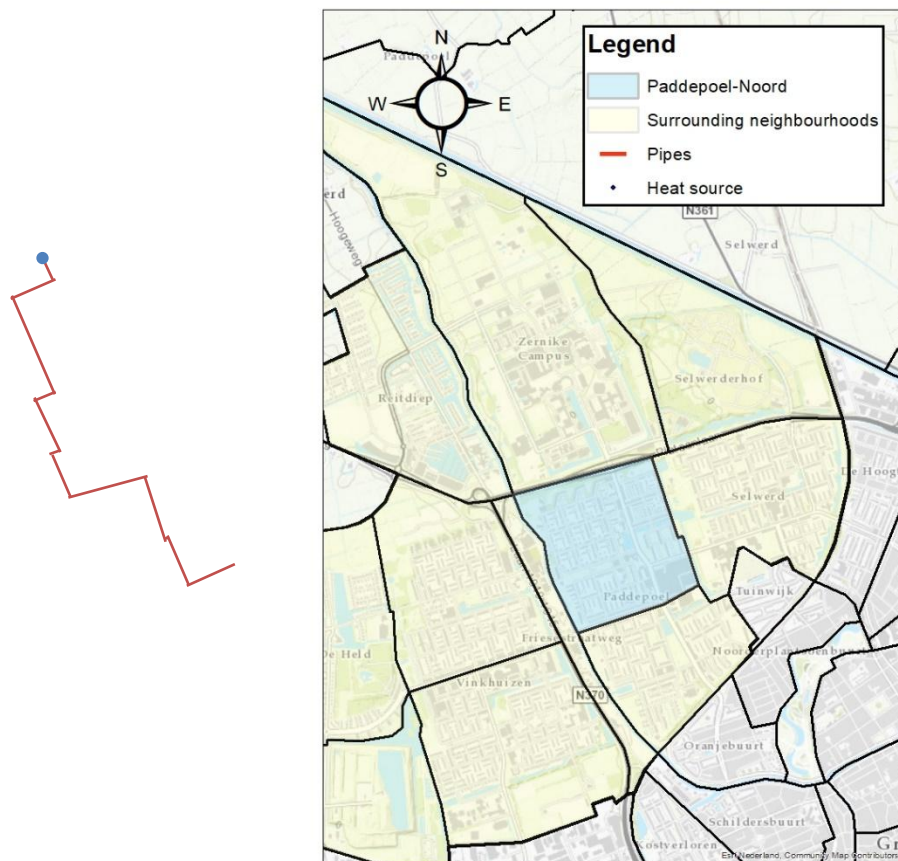


Figure 4. District heating system Paddepoel-Noord

Some characteristics of the neighbourhoods Katendrecht and Paddepoel-Noord are displayed in table 1. Both average gross and total inhabitants are somewhat equal which makes these neighbourhoods better suited regarding comparison. When comparing things you want to eliminate as many other variables as you can. Another important characteristic is their high percentage concerning residents owned by housing cooperation's. Because this is the reason both these neighbourhoods have a district heating system.

### Characteristics of the neighbourhoods

Characteristic:	Katendrecht (2019)	Paddepoel-Noord (2019)
Average gross income:	22.100€	19.400€
Percentage home owners:	35%	25%
Percentage housing cooperation:	51%	53%
Percentage other rent:	14%	22%
Average property value:	192.000€	135.000€
Total inhabitants:	4860	5590
Annual population growth:	8%	14%

Table 2. Characteristics of Katendrecht and Paddepoel-Noord ([allecijfers](#), 2019).

## 4 results



## 4.1 Katendrecht

This section aims to reveal the strengths and weaknesses from the implementation of the Katendrecht district heating project. The process of the project and their collaboration with other stakeholders will be analysed. These results are all gathered through the interviews and will be compared with the existing literature. Collaboration and (development) process are the main themes which the results will be analysed on.

### *Process*

The interviewees described the founding history of the Katendrecht district heating project as a joint stakeholder venture. The set of stakeholders contained: The VNPI (vereniging Nederlandse petroleum industrie) members, Warmtebedrijf Rotterdam and the RVO (rijksdienst voor ondernemend Nederland). The VNPI is the national organisation for petroleum industries. Warmtebedrijf Rotterdam is the district heating distributor of Rotterdam, a municipal company, and the RVO is the Dutch national organisation regarding stimulation and strengthening of sustainable projects. The stakeholders went on a business trip to a district heating system in Karelse, (Germany), to gain knowledge on potential implementation.

This founding process of Katendrecht district heating process can be registered as a strength regarding Kerkhof and Wiczorek (2005). They stated the role of the government regarding a successful niche developing process. The government should not be the enforcer of change. They should encourage other stakeholder to take place within this phase. This government role should lead to a change in actor way of thinking and joint actions that aim to induce the specific transition.

As the interviewee continues, the most important lessons we learned from this trip was the open communication between the stakeholder on shared risks regarding investment costs and shared profit margins. When there are only small profits to begin with, open communication concerning these profits with one another made the project feasible. All different stakeholders (displayed in figure 3) need to make some profit along the process. As Respondent A argues:

“The project only succeeded because both parties were willing to share/carry the risks together and communicated openly regarding investment costs and profit margins”

The interviewee also stated that there were some other case specific strengths which made the project feasible. First, the location of the extraction point of the residual heat was relatively easy accessible within the refinery. Second, there were already existing pipelines concerning transporting of the heat towards Katendrecht and the city of Rotterdam. Furthermore, the attitude of Shell Pernis was not to make initial high profits if they would only earn it back within a reasonable period. At that time they also had favourable management regarding residual heat projects.

Next to these strengths the interviewee stated that this project not only contributes positively towards the environment but also towards the energy transition. Respondent A says:

“The examples set by us can really be beneficial when the larger national energy transition is going to happen, not only regarding district heating but also towards others projects, such as hydrogen energy”

He continues, the government has seen the light and now are aware that certain financial aid is crucial in these expensive project, such as district heating. There is even a new law (SD++) which provides financial aid regarding residual heat projects. A pioneer project is a

way to create theory from practice. Loorbach and Rotmans (2007) refer to such a project as a transition experiment. A transition experiment can identify how strong different pathways might be.

### *Collaboration*

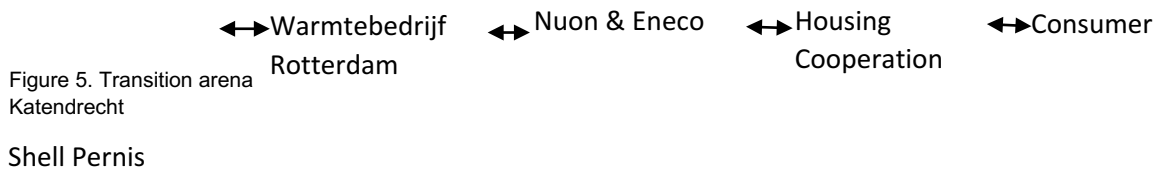
Regarding the interviewees the set of active stakeholder consist of Shell Pernis, Warmtebedrijf Rotterdam, Nuon and Eneco (heat distributors) and the housing corporations. They are all displayed within figure 5.

In addition, they state that after the initial phase of the project their relation went to a more business like relation. As stated by respondent A:

“We do not intervene on the demand side of project, we sell our residual heat to Warmtebedrijf Rotterdam and that is where the involvement ends.”

With the data provided by the interviewees, figure 5 is conducted. It illustrated the current collaboration between the active stakeholders. The stakeholder tends to only collaborate with their “neighbouring” partners.

### Transition arena Katendrecht



This set of active stakeholders is a mix of government and business, which by far does not include all the stakeholders regarding Rotmans (2003). This including of only somewhat more dominant stakeholders in the initial phases may lead toward predefining the transition theme (Kerkhof and Wiczorek, 2005). This structure of dominant stakeholder may leave other stakeholder unheard. This could be beneficial for the existing regimes and prevent strong niche development regarding and creation of a new regime (Geels, 2002).

In addition, the transition arena seems not be shaped as an arena but more like linear string. Strong and transition arena's create up-scaling of innovation and breakthrough of innovations due to their continues co-production, implementing and reflection upon each other (Loorbach and Romand, 2010). With limited stakeholder diversity and interaction as shown in figure 5, the advantages of a strong transition arena cannot be enjoyed. Another weakness regarding such a relation is when one of the shackles is eliminated; the entire project will not be operational.

### *Transition manager*

When asking the organisation Deltaling on their strengths they immediately argued their expertise on their relation founding. We initiate relations which otherwise would not have

happened. Through certain energy mix studies they link industrial companies to energy demanding parties. As Respondent B stated:

*“We attempt to bring different parties together to make their collaboration more viable”*

Furthermore, Deltalinqs claims to be unbiased regarding other stakeholders. When asked if they thought they were being heard enough, respondent B answered:

*“Honestly, I think we do not really care. Our only concern is helping the overall energy transition”*

This position regarding bringing different parties together relates a lot towards the role of a transition manager within the transition management theory. When a transition arena is created, the transition manager includes different parties within the arena. A strong transition manager could alter the success of the transition arena and therefore of the transition itself (Kerkhof and Wciezorek, 2005).

To conclude, some of the strengths of the project are to case specific to apply on other situations, such as easy accessible residual heating extraction point, the presence of a district heating network and favourable management. Other strengths like open communication regarding profit and shared risks could be implemented elsewhere. Regarding the transition management theory the project seemed efficient as a pioneer. Creating theory from practise showing new policies could be even more beneficial regarding new development. The transition arena was rather one sided which may have left certain parties excluded from the process and therefore might pre-defined the transition theme. In addition, the design of the transition arena might prove inefficient as well. On the other hand the transition manager embodied by Deltalinqs is specialised in creating relations and is unbiased regarding stakeholders, their only focus is strengthening the energy transition.

## **4.2 Project Paddepoel-Noord**

To answer the question on which lessons could be transferred from the Katendrecht district heating project to the Paddepoel-Noord district heating project an analysis of the Paddepoel-Noord district heating project is needed. We have to take into consideration that the strengths and weaknesses of the Paddepoel-Noord are preliminary due to the fact the project is not completed and fully implemented yet.

### *The process*

The interviewee described WarmteStad as a pioneer regarding district heating, mainly within Groningen. They argue that there are not many sustainable energy projects regarding district heating, only some smaller simple thermal energy storage systems (WKO-systems). They want to approach the situation in a more collective manner. The following was said by Respondent C regarding their pioneer role:

*“The way we have done it, within our pioneer role, we noticed we got a lot of attention. We did create some knowledge of our own, which might prove valuable within the future. But we also need subsidies and at the moment there aren’t any. The instruments are not yet provided, we are running ahead, but it is a nice challenge.”*

This statement relates highly towards the transition management theory. As stated in the literature the transition management theory emphasis on learning by doing. Creating pathways and theory from practice due to a transition experiments (Loorbach and Rotmans, 2007). The gained knowledge could lead to policies concerning future projects. On the other

hand, policies are late regarding this project, which might provide difficulties. These flaws of a transition experiment are also at display, the pioneers cannot use any governmental support because it is not yet realised within policies.

As the interviewee continues, one of our major strengths is our competitiveness and focus on remaining affordable for our customers. As respondent C argues:

“The energy bill is for some people already a heavy burden, therefore district heating cannot be more expensive than their current heat source. Also because we want to grow and become ‘the’ biggest energy supplier of Groningen.”

The process described above refers to figure 1 concerning the niche development process. The niche should develop towards a level where it is able to compete with the existing regime (Geels, 2002). This niche of district heating is aiming to become the biggest energy supplier within Groningen. To achieve this goal they have to compete with the already existing socio-technical regime and therefore their prices need to be competitive.

The backlash towards this competitive strategy is also displayed when the interviewed is asked about their focus on individual households or privately owned housing. Respondent C argues:

“ Looking into individual cases proves to be too expensive within the current state of the process.”

#### *Neighbourhood cooperation's*

Within the neighbourhood of Paddepoel-Noord there are individuals whom were interested in the district heating project and also wanted to participate. These inhabitants are represented within several neighbourhood cooperations. It is also important to organise and inform the private rent and privately owned sector within the neighbourhood because this is the only way to include them. As respondent D argues:

“due to the lack of an existing coercive regarding implementing towards the district heating system, there is only one way to include the masses of privately owned, and that's enthusiasm!”

The neighbourhood cooperation's Paddepoel Energiek strongly believe in a bottom-up niche development regarding the district heating system. A bottom-up approach regarding the district heating system has been successful within Germany (Rotgen, 2003). These projects contributed greatly towards the energy sufficiency of the Germanys energy market (Rotgen, 2003). A bottom up niche development is displayed within figure 1. Arrow D originates from the niche level and is connecting with the regime level without the support of the regime or socio-technical landscape (no arrows downwards at initial phase of the project).

#### *Collaboration*

When analysing the collaboration of the Paddepoel-Noord we should first identify the field of stakeholders. This data is gathered within the different interviews with the respondents. The different stakeholders can be somewhat split into two groups, this is shown within figure 6. Both section A and section B do collaborate with the municipality of Groningen.

Stakeholders transition arena's

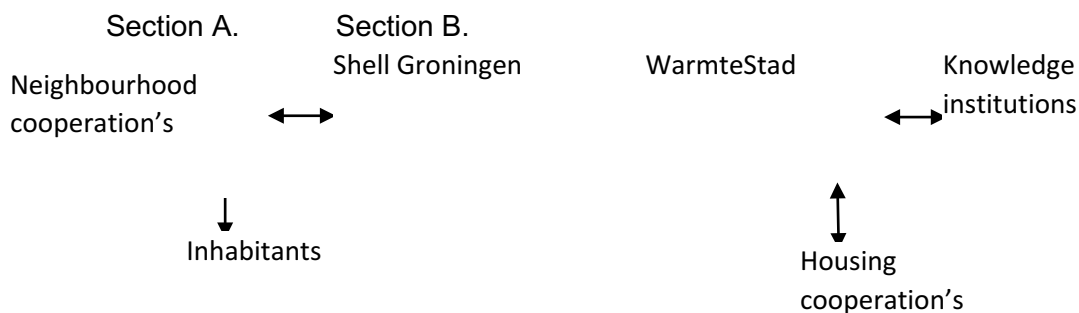


Figure 6. Stakeholder's transition arena's

Figure 6 Section A shows us the current stakeholders that are actively working together implementing a district heating system within Paddepoel-Noord. The nature of their collaboration is through supply and demand. Respondent C on their relation with the housing corporations:

“When making a certain project successful, you will need commitment. This commitment is created due to years of collaboration”

They argue their success is linked to their commitment in combination with their interdependence. Also respondent C argues that through the years they experienced each other's expertise within their fields of work.

Figure 6 Section B shows collaboration between the other stakeholders. These parties are looking into connecting individuals to the district heating system. The collaboration between the neighbourhood cooperatives and both Shell and the municipality of Groningen is mostly financial aid. Their financial aid helped the Paddepoel Energiek and their spinoff Energie Werkplaats to come up with a conceptual plan regarding the implementation of the private housing sector.

As shown in figure 6 a variety of stakeholders is active regarding the implementation of the district heating system. But not all stakeholders are operating with one another. Regarding the literature a diverse transition arena with both homogeneity and heterogeneity actors will benefit the transition (Kerkhof and Wieczorek, 2005). This diverse transition arena will lead to up-scaling of innovation and breakthrough of innovations (Loorbach and Rotmans, 2010). Or as Rotman (2003) puts it, different segments of society such as government, business, societal organisations, intermediate organisations and knowledge institutions. Within the Paddepoel-Noord project there is a high potential regarding a strong transition arena if the different stakeholder within figure 6 section A and B could be brought together.

### 4.3. Lessons learned

To answer the second sub-question there has been an analyses of both the strengths and weaknesses of the projects. This paragraph will provide an answer regarding transferable strength from Katendrecht to Paddepoel-Noord

Regarding the interviewees, both projects are pioneers. Therefore a knowledge transfer on pioneer role is not relevant. The analyses of the Paddepoel-Noord project showed a high number of stakeholder from different segments of society. However the stakeholder were divided within two different transition arenas. Although respondent C and D both confirmed there was no collaboration between them, Respondent C did say:

“Looking at individual cases is expensive, but if they come with a suggestion we are willing to listen. We even would stimulate a discussion of ideas.”

The two lesson which will benefit Paddepoel-Noord the most are: Open communication regarding expenses made to initialize the project. Meaning, open communication concerning, investment costs, marginal profits and splitting the risks. Furthermore, the implementation of a strong transition manager should be beneficial. A transition manger, such as Deltalinqs, is specialized regarding the founding of relations.

If the different stakeholders are included within one transition arena the innovations process will be enlightened. As Loorbach and Rotmans (2010) already stated, a diverse and strong transition arena will lead to extra up-scaling of innovation and breakthrough of innovations.

## 5 Conclusion and discussion

To answer the main research question ,to which degree can Paddepoel-Noord learn from Katendrecht, regarding the implementation of a district heating system within their neighbourhood, the following conclusion was made. The strengths of Rotterdam district heating system were divided within transferable strengths and not transferable strengths. The not transferable strengths were, “an easily accessible residual heat extraction point, existing heating district system and favourable management.” The transferable strengths were open communication concerning divided risks and profit between initial stakeholders. In addition, an unbiased and experienced transition manager like Deltalinqs can alter the success of the project regarding their design of the transition arena (Kerkhof and Wciezorek, 2005). The weakness of the project lays within its transition arena design, the absence of stakeholder from different segments of society might have whit-held the project from achieving extra up-scaling of innovation and breakthrough of innovations (Loorbach and Rotmans, 2010). When analysing the Paddepoel-Noord district heating project the high variety of the involvement of different stakeholder was noted. The high potential of a diverse transition arena could be achieved if the stakeholder could be brought together. Within the Katendrecht project stakeholders were brought together by the transition manager Deltalinqs and the open communication between the different stakeholder on shared risks and shared profits made the project feasible for all stakeholder. Both this open communication and the introduction of a transition manager could bring the different actors together. This should lead to up-scaling of innovation and breakthrough innovations.

The conclusions made on transferable lessons should be put into perspective. The set of (other) variables which alter the success of a project are endless. In addition, the “successful” variables within one project do not necessary alter the success of another project. Furthermore this research is done within a qualitative research design, meaning generalisations are very hard, if not impossible to make.

On the other hand this research has provided some lessons learned regarding the implementation of a district heating system, transferable from Katendrecht to Paddepoel-Noord. Further research is needed to determine if these lessons are successful and can be adopted within other district heating cases as well. This will further contribute to the theoretical/practical design of a district heating project. The need for a sufficient energy transition is present, therefore the need for these pioneer projects. Their processes and collaborations should be designed properly, because the success of these projects might alter the success of the energy transition.

## 6 Reflection

When I started with this bachelor thesis the goal was to conduct interviews with a wide variety of stakeholder from both Katendrecht and Paddepoel-Noord. This turned-out to be a very time consuming process and not all stakeholders were willing to participate. This was something I did not foresee and underestimated slightly. I did not put a lot of thought in this scenario and did not have an immediate backup plan. In addition, I had some problems regarding my health within the data gathering period which also did not help. More interviews and a diverse set of interviewees had made the conclusion of this thesis stronger.

The in-depth interviews were very important regarding my research because they provided the primary data. I believe the interviews went well, a thing that I should improve is my role as an interviewer. I always began with my interview guide but lost it a bit during the way. And wanted to participate to much during the interview with findings or opinions of my own. The interviewer should not intervene to much within the interview this might lead to certain channelling of answers.

Within a next research I will put more energy regarding the expected results. I believe this will decline the mismatch regarding secondary and primary data.

Despite these difficulties along the way I did learn so many new things regarding performing independent research. When you perform such a project on your own there are a lot of ups and downs but you learn so much from these. Learning curve.



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## **Interview guide**

### **Openingsvragen**

- A. vertelt u alstublieft iets over uzelf, wie bent u, wat is uw functie binnen de Gemeente Groningen?
- B. Wat is/was u rol binnen het project stadswarmte Groningen (Paddepoel-Noord)

### **Hoofdvragen**

- C. Hoe zijn jullie betrokken geraakt bij het project?
- D. Is jullie rol tijdens het project ook veranderd?
- E. Met welke andere organisaties (Stakeholder) werkt u samen?
- F. Wat waren de voor en nadelen van deze manier van samenwerken?
- G. Worden jullie als organisatie genoeg gehoord?

*Heeft u zelf nog iets toe te voegen aan eerder gegeven antwoorden ?*

*Heeft u zelf nog wat toe te voegen?*

*Heeft u nog vragen voor mij of over het onderzoek*