A Case Study into Municipal Heat-Transition: Zoetermeer Municipality Policy-Making

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Abstract: National government has mandated heat transition to the municipality as part of the global execution of climate agreement. However, despite many guides has been offered, municipal heat-transition policy is a tricky matter that the municipal policy-makers struggle to grasp. To understand the needs and dynamics of the key stakeholders of the municipal heat transition, this paper is presented to answer the research question on "What are the current condition of the data-driven municipal heat-transition policy-making in Zoetermeer?" From this research, we found that the municipality is supporting an open, transparent, and equal municipal policy-making process. Every actor stands on an equal ground analogous to a spiders web where everyone connected equally but with interdependence that creates complexity in their relationship. However, this process still can be improved by accepting that heat transition will cost money that needs to be prepared. For the next research, bigger area of research shall be used (multi-case study) so a comparison between municipality can be done.

Keywords: Case study, heat transition, data-driven, policymaking, municipal governance

1. Introduction

Climate change is an urgent global problem. A global joint effort is made all around the world to combat climate change (Climate Focus, 2015). The Netherlands anticipated this problem with both public cooperation (e.g. climate agreement) (Climate Council, 2019; Ministry of Economic Affairs and Climate, 2016; Planning Office for the Living Environment, 2019) and policy-making (e.g. energy agenda and climate act). One of the main efforts is to not use natural gas in 2050 (Beckman & van den Beukel, 2019; Deloitte, 2013; Planning Office for the Living Environment, 2019). As part of the strategy, the Dutch government plans to phase out natural gas by utilising municipal leadership (Government of the Netherlands, 2019). Heat transition in the Netherlands is a mandate of the built environment national climate agreement (Climate Council, 2019). The national government has mandated heat transition to the municipality (blue box in **Error! Reference source not found.**) as part of the global execution of climate agreement.

However, although many guides have been offered, municipal heat-transition policy is a tricky matter that the municipal policy-makers struggle to grasp. They are puzzled on how can they make a voluntary investment by heat-users. They are currently in a tough scenario where they have been mandated as the director of heat-transition without legal power to make user shit their heat source. Moving people free will is a tricky business in the social factors that these policy-makers wish to cover.

Moreover, literature that covers heat-transition social influencing factors in the energy-transition is scarce. The literature discusses heat-transition technical influencing factors than the social ones (e.g. El Geneidy & Howard (2020) on consumer behavioural change, or effect on policy to people behaviour). However, knowledge about how to incorporate heat-transition influencing factors either social, technical, or economical in a municipal policy-making process is limited.

To understand the needs and dynamics of the key stakeholders of the municipal heat transition, this paper is presented to find out about the answer a research question on "How are the dynamics in the data-driven municipal heat-transition policy-making?" The method is described in section 2 and data collection in Section 3. Then actor analysis is presented in section 4. Influencing factor analysis in Section 5 and the conclusion is presented in Section 6.

2. Method

This study is done using a case study adapted from Yin (2018). Yin (2018) provides general guidelines for conducting a case study. This guidance defines that a case study is generally conducted in six phases: 1) planning, 2) design, 3) preparing, 4) collecting, 5) analysis and 6) sharing. These phases are adapted into three case study phases in this research: 1) planning and design phase, 2) preparation and data collection phase, and 3) analysis and report phase (see **Error! Reference source not found.** 1).

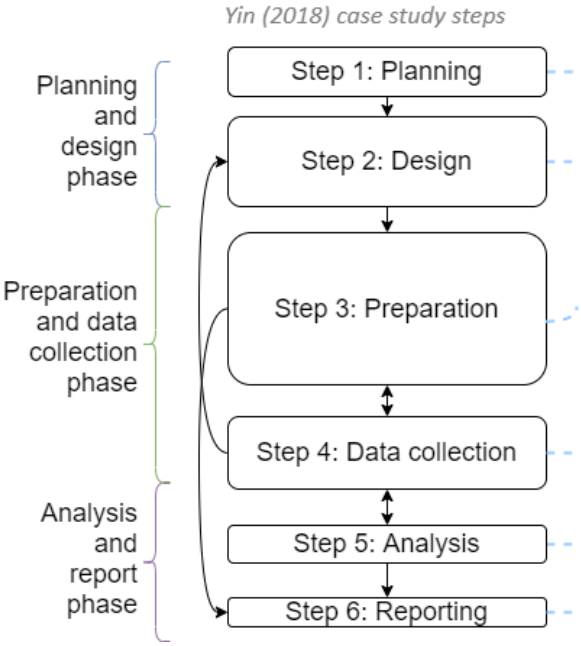

Figure 1 Study approach adapted from Yin (2018)

The case study is focusing on the heat-transition policy-making process of Zoetermeer municipality. To scale down the focus of this study, more boundary should be set. The case study is bounded by three categories as described as follow. First is the geographical area of the study is set to Zoetermeer municipality. The second boundary comes from the component of the required focus that will be used in this case. This case will focus on two dimensions of information, 1) actor analysis and 2) heat-transition influencing factors. The influencing factors have been researched beforehand using an SLR as shown in the Appendix.

In the third step, the qualitative analysis was executed. In this qualitative analysis, the middle ground coding was used. The middle theory is executed by having the initial code list informed by theory and code list then inductively evolve the code during analysis. This approach is more relax than grounded theory (Glaser et al., 1967) but more flexible than a tight approach (the predefined code list). This predefined code list comes from the SLR that was done previously. These three steps were used in this analysis, 1) data preparation, 2) coding cycle and 3) derived analysis (see Figure 2).

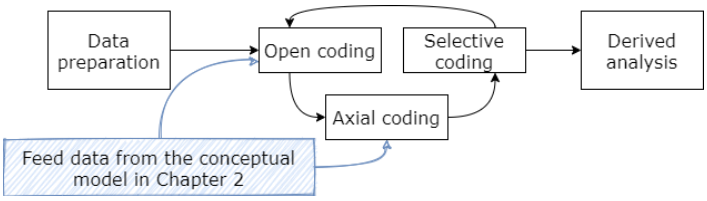

Figure 2 Case study qualitative analysis scheme adapted from Kuckartz (2019) and Williams & Moser (2019)

Four main groups of code that were taken from the literature review. These four main groups consist of 1) perspectives, 2) Actors, 3) policy-making process, and 4) influencing factors to support policy-making. The perspectives are using the concept from Head (2008). The lesson then also divided into good ones marked as an opportunity and bad ones marked as barriers. Then the policy-making process was sub-categorised as with 1) policy cycle phase and 2) process and strategy. Lastly, the influencing factors were subcategorised with the economy, social, and technical. However, due to the vast range of economical category in this topic, subcategories of legal, financial, and politics were made.

After the case study was finished, an artificial ex-ante evaluation was done in an expert interview. Ex-ante evaluation indicates the evaluation was done based on the possible result (ex-prediction) (Peffers et al., 2007; Pries-Heje & Baskerville, 2008). Artificial evaluation indicates that the evaluation does not explore the performance of a solution in its real environment (Nunamaker Jr et al., 1990; Venable, 2006). On the other hand, naturalistic evaluation or observation is performed in a real environment.

To execute this evaluation, a semi-structured expert workshop was done with three experts in public administration, Policy lab, data and evidence-based policy-making, and multi-actor management and framing. This workshop covers three activities: 1) questionnaire, 2) presentation, and 3) discussion for the HeTPoM DSS framework and 4) discussion for the Zoetermeer municipality heat transition policy-making activities.

3. Data Collection

Primary data collection was done with either Skype or Microsoft Teams online meeting rather than face to face interview due to the COVID-19 measures that started in mid-March. Fourteen sources were interviewed in thirteen different interviews between 60 to 110 minutes. Eleven of them were done using Microsoft Teams and two were done using Skype for Desktop (free edition). The interview started on May 12th, 2020 and finished on June 8th, 2020. Interviews were all done in a form of semi-structured conversation in English except for one interview with PO03 and PO04 where all questions were spoken in English but the answer can be either spoken in English or written via Microsoft Teams text messages in Dutch.

Interviews were made to be taken from Head (2008) three lenses of knowledge and evidence, 1) policy, 2) research, and 3) practice. The interview from the policy comes from the municipality. The municipality consists of two departments. The sustainability department that has its direct contact with heat-transition policy (ID=PO01 and PO02) and the social department (PO03, PO04, and PO05) that is collaborating with the sustainability department in this heat-transition project. PO03 and PO04 have their speciality in the district approach while PO05 has a bigger area concern, Zoetermeer municipality.

PO01 is also different from PO02. PO02 have more hand-on experience with scenarios development as they are contracted by the municipality, using a company named Endule, to take care of the socio-economic influencing factors of heat-transition. On the other hand, PO01 have a more holistic view where he works not only in heat-transition, but the whole sustainability matter in the municipality of Zoetermeer.

The practitioner (or policy-target) interviews comes from four organisations, 1) DEZo, 2) Netverder, 3) Stedin, and 4) Vestia. This arrangement is done based on the main stakeholders that are found in Chapter 2, the literature study. DEZo and Vestia are meant to shows the perspective of the policy target. Vestia as a company and DEZo as citizen initiatives. The uniqueness of these two parties comes from how DEZO as citizen initiatives have not joined the force of policy-making with the municipality yet. On the other hand, Vestia as a company is heavily connected with the current policy-making with the municipality of Zoetermeer.

On the other hand, Netverder and Stedin are meant to shows the perspective of the network operator. Stedin is responsible for the electricity and natural gas network development and operation. Complementary, Netverder provides development and operation of other types of energy such as biomass, steam, or heat. While Stedin has been involved with the current policy-making process, Netverder has not been part of this process yet.

The role of research was filled not based by the research institution, but based on their previous and present research in the topic of Zoetermeer heat-transition policy-making. TNO was the source for their involvement in the previous heat-transition policy-making in Palenstein, Zoetermeer. TNO is also part of the new heat-transition project by the municipality of Zoetermeer. But the interview was talking about more into the previous project. TU Delft, although they don't have any project at the present, their master student researched the heat-transition policy-making acceptance in one small neighbourhood in Zoetermeer. As an addition, RE03 is also part of the HVC district approach heat transition advisor. So her interview can be taken from her time in HVC or her research in Zoetermeer. CE Delft was interviewed for their knowledge in their project to evaluate the sustainable Zoetermeer, including heat transition in 2019. Lastly, RE02 from The Hague University was interviewed for a running project of data-driven policy-making for heat-transition in the Zoetermeer area.

4. Actors dynamics in Zoetermeer heat-transition policy-making

There are forty-three actors mentioned in the interview as shown in Appendix 1. Based on their roles e can see that these actors can be seen as part of bigger actors. For example, citizen "A" is owning a house in Zoetermeer and part of citizen initiatives DEZo. Thus, in this case, citizen "A" can be seen as a citizen, house owner, or as DEZo. Citizen is one very big part that consists of both tenants and building owners. The same case happens with the housing corporations. Housing cooperation is part of the Green Deals team who made the heat-transition planning. They are chosen as one of the main actors in the policy-making is because they are the building owners of social housing that are rented for people.

In this section, firstly, the main actors were analysed. To find out the main actors in the heat-transition policy-

making, firstly, we see them from the number of interviewees who mentioned them in the interview. The logic is, the more important you are, the more you will be remembered by the other actors. This definition of importance fit with Newman (2008) who imply that the more important a node is, the more connection they have. In this case, all of the perspectives and mentioned actors are treated as nodes and the edge is whether one node mentioning the other or not. In that case, we can conclude that the most important actor here in the heat-transition that should be included in the municipal policy-making Zoetermeer can be ranked from the table in Appendix 1.

The most important actor who are connected (have edges) to all of these perspectives is the citizen. Followed by the municipality, social housing corporations, Stedin, national government, and private houses. However, this centrality measures does not always measure node importance (Golbeck, 2013; Hansen et al., 2011). Although it makes senses to use this now, it is better to check this result with qualitative data from the interview that confirm these actors importance. RE02 stated that the most important actor in the heat-transition is the municipality although the municipality does not have the same opinion. This is because although a heat-transition policy mandate has been given to the municipality, no form of enforcement can be given. This statement was given as a dilemma by most of the interviewee. But also that reinforcement is not the way the municipality wants to do it.

Because we don't have any special power to force anything. I don't even think we would want to do it even if we have it. (PO01, 2020)

From the municipality, when they were asked their opinion about this, they mostly go with the building owners. The municipality thinks like that since the real decision-maker, in this case, are the building owners. On the other hand, the important role of the municipality as the director of the municipal heat-transition is a fact that is also supported by practitioners and researchers.

And to be more direct, the social housing real estate owners. They are indeed the most important partner. (PO01, 2020)

From the perspective of the citizen initiatives, they see themselves as one of the most important actors in this heat transition with the municipality and network operator (Stedin). However, the municipality government think that these initiatives are a very small group of early adaptors who are inspiring but cannot represent the whole population. On the other hand, their involvement in the heat-transition can be seen from their green project with the municipality such as "Palenstein Energy Neutral" (DEZo, 2020). Their importance is existing and based on their vision, will keep on growing in this heat-transition. Thus, energy initiatives are included in the main actor in the heat-transition due to their unique position as both target and motor of the energy transition as well as policy-target in the heat-transition.

The municipality first, I think, the network operators, cooperations like ours. Those are the most important. (PR01, 2020)

However, two main stakeholders that are essential right now is still the municipality and the social housing corporations. On the other hand, the national government can also be a really important actor in this case because they are creating laws that persuade citizen behaviour (heat law).

There's a municipal administration, mayor, municipal council, steering the whole process of saying or enables the stakeholders, so they are one of the most important stakeholders. In this case, I must say that there's one other very big stakeholder, and that's the national government. (PR03, 2020)

Contradicting with popular opinion, some practitioner also said that we should also try to find an opportunity to expand the interest to the new players in the energy system. That is because they might have a big opportunity to create a solution. Mostly energy incumbent party who also still own a lot of capital in the existing energy system. However, since the heat-transition has not come too far, we will not include these players in the analysis yet.

5. Influencing factors dynamics in Zoetermeer heat-transition policymaking

Influencing factors are divided into three big groups, economic, social, and technical factors. This classification was adapted from Ho, (2014). Economic factor (that include legal and political factor) is defined as anything that defined as 1) macroeconomic condition, 2) microeconomic condition, and 3) government intervention and lobbying. Then social factor relates to individual (and community)

factors that influence heat-transition. This social factor includes both 1) social, cultural, and demographic measure, and 2) behaviour and attitude. The technical factor includes 1) technology-related activities, 2) physical related material, and 3) new technology advancements.

Twenty-eight municipal heat transition influencing factors are derived from this study. These numbers of groups are reduced into 1) eleven social influencing factors, 2) nine economic influencing factors, and 3) nine technical influencing factors. These factors are described in the following subsection.

There are ten social municipal heat-transition influencing factors derived from this study. These social factors 1) Behaviour, 2) Attitude, 3) Capability, 4 Social cohesion, 5) Stakeholder engagement, 6) Demographic profile, 7) Stakeholders profile,8) Fairness, 9) Uncertain behaviour, and lastly, 10) Motivation. Some differences from the SLR result was listed in Table 1.

Table 1 Social heat transition influencing factors derived from the case study vs ones derived from the SLR (see Appendix)

Social heat transition influencing factors from the case study	Social heat transition influencing factors from the SLR
Behaviour	Behaviour (participation)
Attitude	Attitude (acceptance), individual knowledge
Capability	Household economic power, individual empowerment
Social cohesion	Established social network
Stakeholder engagement	-
Demographic profile	-
Stakeholders profile	-
Fairness	Fairness
Uncertain behaviour	-
Motivation	Individual perception

Behaviour can be seen as a manifestation from intention and resources to realise the mentioned intention c In this scenario, as can be read from subsection 3.4.1.1.1., these behaviour are classified as the intention of the citizen to move from the previous state of their journey toward heat-transition to the next one. Thus, behaviour factor, in this case, is subcategorised into 1) willingness to be aware, 2) willingness to analyse heat transition options, 3) willingness to act on heat-transition and 4) willingness to adapt on the new system.

Behaviour can also be seen as a response based on a certain set of input (Elizabeth & Lynn, 2014). And one of this input is the **attitude** toward the behaviour (Ajzen & Fishbein, 2011). Attitude is a construct that characterises an entity (Perloff, 2010). In this case, attitude is especially meant on how people perceive the problem. For example, is their attitude toward the last flag, willingness to adapt. They have already spent money to renovate their house because another 70% of the house already they agree to this. But being in the side where it was not their choice to change, they have a negative attitude toward this change. And that makes them hard to adapt (behaviour). Or on the other hand, citizen with a good attitude toward this adaptation process might not feel burdened wit consequences that they might encounter in the adaptation process as to how one citizen said.

In this case, attitude also covers the perception of personal benefit. Personal benefit has something to do with the proximity of the problem. That means, the more apparent the benefit of heat-transition, the better the attitude of the citizen. For example, some people might not think that the risk of using gas in the future is something imminent. But maybe the heat-wave that will come in summer is a more imminent problem that can drive them to do something.

The capability has something to do with if the user feels like they are powerful enough to make a change (Ajzen & Fishbein, 2011). This has something to do with citizen empowerment. In this heat-transition case, five subcategories were made for this category, 1) capability to be aware, 2) capability to be reached, 3) capability to change, 4) capability to handle the construction and 5) education of renewable energy system.

And part of it is training people and helping. We're training people to do a scan in the home of people. So, we can write a report and give suggestions on what they can do in their house to improve sustainability. (PR01, 2020)

Demographic profile means analysis on how people are living their lives in their neighbourhood. This factor includes their health, their environment safety, their jobs, their diversity in the neighbourhood, their environmental condition within the neighbourhood, poverty number in the neighbourhood, or youth problems. The municipality also called them the neighbourhood analysis. At this moment, the component of this demographic profile is still in the design and experimentation phase.

Fairness is about whether the decision is just and reasonable. This is one factor that the municipality needs to consider with talking wth the citizen because fairness can come in various ways. For example, should everyone pay the same amount of money for heat-transition? But what about the less fortunate ones? Aren't they can only afford less than the more fortunate ones? The policy-maker think that this is important and need to think about. But the fairness that they see is that everyone needs to find heat-transition affordable and realistic.

More about fairness also comes from the freedom to choose. Although it is fair for everyone to have freedom of choice, some balance is needed. As the policy-maker said that full freedom is just too expensive. However, some citizen enjoy their freedom to choose something, they want it and they will not be happy if they need to let go of their right to choose their heating system.

I think total freedom is very expensive because you have to find the balance between the cost for society will be (common cost) and the private cost. So if everyone has total freedom then the common price will be very high. (PO01, 2020)

On the other hand, this can also be confusing for some people, mostly because the role of infrastructure is about collectivity. And collectivity is not on the same page as freedom of choice. So, this can be a difficult subject to think about.

And what I mentioned earlier, you still have the freedom of choice for citizens. So you can't come up with just only one solution. And in decision making In what you can do, is partly come up with solutions. Those were meant where people could choose between. (PR01, 2020)

Then the most important social factors that policy-makers need to see is citizen motivation. It is about their priority, their interest, their complaint, their demands, and their perception of comfort (heat comfort). This factor means that the municipality needs to be aware of why (or why not) the citizen wants to join this energy transition. It is also connected to demographic profile factors. For example, what can be the motivation of the elders to join heat-transition when the change is not about their people, but more for future generations. Does it matter to them? Or do they need more trigger for these changes?

Then there is social cohesion. Social cohesion means the closeness of people within the neighbourhood. This cohesion can be seen on how often they talk to each other or how often they meet. Social cohesion holds an important aspect I heat transition because they can grow because of heat-transition. And as feedback, they can also accelerate heat transition. This positive feedback relation is something that the municipality needs to consider in the process.

Stakeholder engagement factor includes the point of contact with the people, the number of contacts they can make, and how engaging the contact that is made with the stakeholders. This is a really important thing to consider because this will determine the strategy that the municipality can do in the implementation of the policy as well as how they gather the social data that they need from the people.

There are nine economic municipal heat-transition influencing factors derived from this study. These economic factors are 1) Society cost, 2) Path dependency, 3) Financial feasibility, 4) Market proposition, 5) National regulation, 6) Responsibility and power to make a decision, 7) Organisational affair, 8) Data gathering and utilisation regulation, 9) Conflict of interest. Some differences from the SLR result was listed in Table 2.

Table 2 Economic heat transition influencing factors derived from the case study vs ones derived from the SLR (see Appendix)

Economic heat transition influencing factors from the case study	Economic heat transition influencing factors from the SLR
Society cost	-
Path dependency	Path dependency
Financial feasibility	Profitability
Market proposition	Energy demands
National regulation	Energy regulation
Responsibility and power to make a decision	Ownership
Organisational affair	Organisational motivation
Data gathering and utilisation regulation	Data regulation
Conflict of interest	Negotiation

Society cost consists can be society cost that is paid by the government or individual cost that paid directly by the municipality. Currently, this is the main indicator to choose a solution for heat-transition. They are also part of models

that the municipality often use, CEGOIA, Openingsbod, and Vesta Mais.

The second economic factors are also really important, path dependency. The policy-makers have said that their strategy is to make sure that this transition can happen also in the natural moment of investment. Although sometimes, this might create a conflicting agenda between one party and the other, which is part of the conflict of interest topic.

The most important part of our strategy. We use the natural moment of investment to make a combination with improving the energy performance of the building and to make an energy transition. So that you will have as little as much investment or lost values of former investment. (PO01, 2020)

Then financial feasibility of the citizen to pay for the transition is also part of the planning. This financial feasibility planning includes the financial status of the citizen, the rational payback period for them, the business model that they have, the financial options that users can take, an investment plan that they have, investment price they need to pay, and maybe also subsidy that they can have.

Market proposition talks about the number of the proposition that the market has also their stability. The case is that there is the economy of scale where buying more will cost you cheaper. Then the proposition is different for one house or 10 houses. That means the price for individuals will be higher than ones for the cooperations.

The other problem is the uncertainty of market price. Prices might change between seasons and that makes it hard for the municipality to advise the users on how much it is cost. The price just keeps on changing and this might reduce the willingness to act from the users' side.

National governments law also provide a really important environment that the municipality needs to think about and keep on giving feedback to. The municipality has talked about how national law is essential and need to be updated to stimulate the process. The national law will create an environment that enables or disable a certain route in the process and reduce uncertainty.

Then comes to the who can decide and who should decide, the responsibility and power to make a decision. As previously mentioned, this responsibility also connected to the ownership or tenants of a house as well as the purpose of the buildings. It is also about the power of the municipality to direct this transition. In this process, the municipality need to keep on asking the questions, who are responsible for this? And in the implementation of the policy, the people who are going to be responsible to operate and to gain profit from this energy business also need to be decided.

Some organisational affairs need to be taken care of as well. This includes the core mission of a certain organisation and how to contact certain stakeholders. In a housing corporation, for example, at least 70% of tenants need to agree on a decision before changes can be made. And that can be quite an effort. For that, some organisational affairs need to be arranged. Furthermore, the same thing needs to be done also in private houses. In private homeowners, organising these people might be even more challenging.

However, it is very challenging for private homeowners to organise their needs. I cannot organise 200 of my neighbour to make a statement. Those kinds of things need to be organised at the municipal level. (PO02, 2020)

Lastly, there are also factors from data regulation on gathering, sharing, and utilisation. The municipality needs to be responsible to handle their data and data sharing between partners in this heat-transition. Some data can be sensitive and problematic. And some data can also be generalised in a certain area that ensures privacy. This privacy is also the reason why the municipality is trying to make aggregated data to be used for their analysis purposes.

There are eight technical municipal heat-transition influencing factors derived from this study. These technical factors are 1) Building criteria, 2) Data digitalisation and utilisation, 3) Technical operation, 4) Technology maturity, 5) Heat source plan, 6) Maintenance and path dependency, 7) Neighbourhood density and 8) Future uncertainty. Some differences from the SLR result was listed in Table 23.

Table 3 Technical heat transition influencing factors derived from the case study vs ones derived from the SLR (see Appendix)

Technical heat transition influencing factors from the case study	Technical heat transition influencing factors from the SLR

Building criteria and existing connection	Consumers
Data digitalisation and utilisation	Data related service
Technical operation	Consumers, production
Technology maturity	Production
Heat source plan	Production
Maintenance and path dependency	Transportation physical device and energy transmission service
Neighbourhood density	Consumers
Future uncertainty	-

The first technical factors that are important for heat-transition is the building criteria. This factor is a really important factor that is connected to various data about the house. These data consist of the existence of collective heat source, floor plan, existing heat producer, the age of the house, insulation criteria, space, and types of building.

Then there is also a case of path dependency about the distribution infrastructure capacity or the flexibility (to change) of the system that also need to be considered. The good thing about technical factors is that they are pretty straightforward. But they are also connected strictly to both social and economic factors of heat-transition influencing factors. Like this path dependency problem will influence the attitude of the people to choose a technology. Or the part where maintenance needs to happen technically affect the path dependency of economic influencing factors to be more feasible to be executed (investment natural moment is equal to maintenance natural moment).

Although it is straightforward, these factors also give hope to people about technology maturity. Although there are not that many options today, some policy-makers also put their hope in the uncertainty of technology advancement to get this technology matured and cheaper.

6. *Zoetermeer municipality* policy-making process

In the expert workshop that was done, HeTPoM DSS framework was done to also evaluate the current policy-making that is used in the municipality of Zoetermeer. Using HeTPoM DSS framework, two critics and recommendations were made as follow.

The first critic comes in the minimum involvement of the citizen initiatives in the Zoetermeer municipality heat transition program. Although an open and equal process that was done in the municipality of Zoetermeer is a good approach, the municipality of Zoetermeer is still seen to be lacking in the involvement of the citizen subjects. We see that this shortcoming needs to be evaluated to support a successful policy-making process. Evaluators are confident that the municipal heat-transition policy-making can be better with more citizen inclusion. This statement is also corroborated by Hoppe (2012) who investigates local government support and citizen initiatives. We discussed that in parallel with the municipality of Zoetermeer plan to base their policy on the social data, collaboration with citizen initiatives is essential for a successful municipal heat transition. Thus, municipal policy needs to include them as well.

The second critic comes from the absence of the exit strategy activity in the Zoetermeer municipality policy-making. An exit strategy can be seen as the mean to mitigate failure or the mean to leave the investment (Hawkey, 2002; Phillips, 2006). We discussed that without an exit strategy, citizens support might be hard to gather as they are scared to be trapped with their choices. Although this the exit strategy might not be plentiful, an exit strategy needs to be discussed with the citizen. Also, this exit strategy needs to be negotiated as the outset of the heat transition project (Grigoras, n.d.). That way, citizens trust and support can be gained more sustainably.

7. Conclusion

From this analysis, we found that the municipality is supporting an open, transparent, and equal municipal policy-making process. First, it came from the disability of the municipality to enforce the matter of “what” and “when” heat-transition should be happening to the key actors (Brus, 2018). Thus, every actor stands on an equal ground analogous to a spiders web where everyone connected equally but with interdependence that creates complexity in their relationship.

This has created a complex co-design between key actors on an equal basis in the way these heat-transition policies were made. In their previous project, the heat-transition team from the municipality of Zoetermeer were doing this co-design with social housing corporation (Vestia, Vidomas, and De Goede Woning), and Stedin. Then presently, they are trying to add new players with the social department of the municipal office, private house real estate, citizen, and citizen initiatives.

From this analysis, we found that the municipality is supporting an open, transparent, and equal municipal policy-making process. First, it came from the disability of the municipality to enforce the matter of "what" and "when" heat-transition should be happening to the key actors (Brus, 2018). Thus, every actor stands on an equal ground analogous to a spiders web where everyone connected equally but with interdependence that creates complexity in their relationship.

Since the municipality is not the sole decision-making in this process, for the policy-makers, all of their policy required the usage of transparent influencing factors. We found ten social influencing factors that required to be included in the municipal heat-transition policy-making, 1) Behaviour, 2) Attitude, 3) Capability, 4 Social cohesion, 5) Stakeholder engagement, 6) Demographic profile, 7) Stakeholders profile,8) Fairness, 9) Uncertain behaviour, and lastly, 10) Motivation. We found nine economic heat-transition influencing factors in the municipality of Zoetermeer, 1) Society cost, 2) Path dependency, 3) Financial feasibility, 4) Market proposition, 5) National regulation, 6) Responsibility and power to make a decision, 7) Organisational affair, 8) Data gathering and utilisation regulation, 9) Conflict of interest. And lastly, we found eight technical municipal heat-transition influencing factors, 1) Building criteria, 2) Data digitalisation and utilisation, 3) Technical operation, 4) Technology maturity, 5) Heat source plan, 6) Maintenance and path dependency, 7) Neighbourhood density and 8) Future uncertainty

For the next research, bigger area of research shall be used (multi-case study). The purpose of expanding the area bigger is so that comparison between municipality can be done and then further generalisation can be verified.

8. Further research recommendation

As a single case study allow more focusing resources on a specific subject which allows a deeper understanding of the specific case. This limitation is the reason for this single case study choice. However, a single case study is also limited to their capability to use several cases to explore either comparative or generalisation of the derived theory (Yin & Davis, 2007). A single case study is limited in its ability to be replicated.

Moreover, the municipalities of the Netherlands are quite diverse. Therefore, the theory that is derived (on the needs of the municipal heat transition policy-making DSS framework) is not proven to be valid for other municipalities than Zoetermeer municipality. To answer this limitation, replicated research for a multiple-case study is recommended. Therefore, generalisation and replication of the theory can be evaluated.

Furthermore, this case study has only used qualitative analysis method to derive the conclusion. This case study analysis was deemed sufficient as this thesis was done without the perspective of the citizen in general. Perspectives from the heat-transition policy-makers and companies are more uniform than ones from citizens. However, this qualitative analysis might not be proper to address the view of the citizen who lives in the municipalities that are quite diverse. Therefore, to improve the reliability of the case study, quantitative (or mixed) method to gather citizen perspectives might be necessary

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Appendix

Table 4. Previous research SLR heat transition influencing factors

Category	Factors identified	References
Social	Attitude (acceptance)	Artur et al. (2020); Büttner & Ring (2019); Paiho & Saastamoinen (2018); Seidl et al. (2019); Upham et al. (2018); Perloff (2010); Aberilla et al. (2020); Gorroño-Albizu (2020); Seidl et al. (2019); Von Wirth et al. (2018); Lygnerud (2018)
	Individual knowledge	Darby, 2017; Paiho & Saastamoinen, 2018; Sernhed et al., 2018), Seidl et al. (2019)
	Individual perception	El Geneidy & Howard (2020); Fabiani et al. (2019); Long et al. (2016); Paiho & Saastamoinen (2018); Bush & Bale (2019), Aberilla et al. (2020); Von Wirth et al. (2018); Seidl et al. (2019), Lauridsen & Jensen (2013); Lygnerud (2018)
	Behaviour (participation)	El Geneidy & Howard (2020); Paiho & Saastamoinen (2018); Seidl et al. (2019)
	Household economic power	Artur et al. (2020); Darby (2017); Bush & Bale (2019); Kerimray et al. (2018).
	Individual empowerment	Paiho & Saastamoinen (2018)
	Established social network	Dyaram & Kamalanabhan (2005); Lygnerud (2018); Seidl et al. (2019).
	Fairness	Späth & Rohracher (2015)
Economic	Organisational motivation	Lygnerud (2018); Paiho & Saastamoinen (2018)
	Path dependency	Rissman et al. (2020); Späth & Rohracher (2015); Finck et al. (2018); Gorroño-Albizu (2020); Paiho & Saastamoinen (2018); Heinisch et al. (2019); Knobloch et al. (2019)
	Profitability	Kerimray et al., (2018); Paiho & Saastamoinen (2018); Astudillo et al. (2017); El Geneidy & Howard (2020); Heinisch et al. (2019); Knobloch et al. (2019); Li et al. (2015); Qu et al. (2020); Späth & Rohracher (2015); Wijesuriya et al. (2018), Li et al., (2015);
	Energy demands	Artur et al. (2020); Bloemendal et al. (2018); Bush & Bale (2019); Chwieduk (2016); Darby (2017); El Geneidy & Howard (2020); Fabiani et al. (2019); Finck et al. (2018); Han et al. (2018); Kerimray et al. (2018); Lee et al. (2015); Long et al. (2016); Paiho & Saastamoinen (2018); Sager-Klauß (2016); Späth & Rohracher (2015); Stropnik et al. (2019); Von Wirth et al. (2018); Von Wirth et al. (2018); Astudillo et al. (2017); Qu et al. (2020); Wijesuriya et al. (2018)
	Negotiation	Jensen (2016); Paiho & Saastamoinen (2018); Sager-Klauß (2016); Späth & Rohracher (2015)
	Ownership	Paiho & Saastamoinen (2018)
	Energy regulation	El Geneidy & Howard (2020); Paiho & Saastamoinen (2018); Rissman et al. (2020); Rissman et al. (2020); Aberilla et al. (2020); Gorroño-Albizu (2020); Von Wirth et al. (2018)
	Data regulation	Diran et al. (2020); Paiho & Saastamoinen (2018)
Technical	Consumers	Artur et al. (2020); (Qu et al. (2020); Fabiani et al. (2019); Kerimray et al. (2018); El Geneidy & Howard (2020); Zdankus et al. (2016);e.g. Astudillo et al. (2017); Chwieduk (2016); Darby (2017); Lee et al. (2015); Long et al. (2016); Paiho & Saastamoinen (2018); Qu et al. (2020); Aberilla et al. (2020)
	Producers	Artur et al., 2020; Darby, 2017; Gan & Xiang, 2020; Han et al., 2018; Heinisch et al., 2019; Knobloch et al., 2019; Long et al., 2016; Wijesuriya et al., 2018; El Geneidy & Howard, 2020; Zdankus et al., 2016;

		Abdurafikov et al., 2017; Artur et al., 2020; Astudillo et al., 2017; Han et al., 2018; Heinisch et al., 2019; Knobloch et al., 2019; Leurent et al., 2017; Paiho & Reda, 2016; Paiho & Saastamoinen, 2018; Wahlroos et al., 2017; Zdankus et al., 2016; Bloemendal et al., 2018; Finck et al., 2018; Han et al., 2018; Heinisch et al., 2019; Stropnik et al., 2019
	Physical transport device	Abdurafikov et al. (2017); Knobloch et al. (2019); Han et al. (2018); Paiho & Reda (2016); Paiho & Saastamoinen (2018); Upham et al. (2018); Gorroño-Albizu (2020); Heinisch et al. (2019)
	Energy services	Heinisch et al. (2019); Finck et al. (2018); Paiho & Saastamoinen (2018);
	Data services	Diran et al. (2020); Paiho & Saastamoinen (2018);