MASTER THESIS

APPLYING HYBRID GOVERNANCE APPROACHES TO ACHIEVE INTEGRATION ACROSS SUSTAINABLE TRANSITIONS

Considering applications of governance mixes for the integration of climate adaptation and the heat transition

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Applying Hybrid Governance Approaches to Achieve Integration Across Sustainable Transitions

Considering applications of governance mixes for the integration of climate adaptation and the heat transition

by

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Executive Summary

The Netherlands must be natural gas-free by 2050. This means that neighbourhoods throughout the Netherlands will have to be overhauled for the construction of heat networks. In addition, we are increasingly faced with the effects of climate change, such as flooding and increasing heat. Both tasks require physical changes in the built environment and demand space in the built environment. An integrated approach to both the heat transition and climate adaptation has benefits, as it can lead to a more efficient use of resources and reduces conflicts between the two tasks. It is worthwhile to coordinate the plans for the two because the space in the subsoil and topsoil is scarce. Support for the construction of a heat network may even increase when it is linked to a new, greener, climate-adaptive design of the public space. Despite these advantages of linking sustainable tasks in the public space, tasks are often still tackled individually.

The problem of not being able to integrate mitigation and climate adaptation measures appears to be not technical but organizational in nature. New governance approaches will be needed that can realize integration of the heat transition and climate adaptation. However, there is little knowledge of how different governance approaches perform to realise this goal. This research tries to fill the gap by researching how different governance approaches are applied in cases and how they perform in realising an integrated approach to the heat transition and climate adaptation. The aim of this research is to find out how different hybrid governance approaches are applied and what effect they have on achieving an integrated approach for the heat transition and climate adaptation. The research question that will be answered in this report is:

"How do hybrid governance approaches perform in realising integration between the implementation of heat transition and climate adaptation measures?"

To answer this research question, first an in-depth understanding of hybrid governance approaches was formed. A hybrid governance approach is an approach that is constructed from elements of the different extreme modes of governance: hierarchy, market, network and self-organization. These hybrid governance approaches can emerge unconsciously, but can also deliberately be influenced to accelerate change. To alter an existing governance approach to achieve a particular goal, a number of steps can be taken. First the current governance environment should be mapped. To map the current governance environment cases are selected and studied in which existing neighbourhoods undergo a transition to a natural gas-free heating system and consider climate adaptation to a greater or lesser extent. The following characteristics are considered for each case: motive of the subordinate actor, initiating and implementing actors, the role of the government, the direction of authority, power, the dominant actor type, knowledge, choice of actors, policy instruments/ steering, actions and conflict resolution. Interviews are conducted to determine the interpretation of these characteristics in the projects and these are then linked to one of the four extreme governance modes to form an idea about the governance mix of the case. All four cases appear to consist of different governance mixes and have a different dominant governance mode. It seems that the governance environment of these kind of projects can vary greatly.

After mapping the governance, the current governance approach was evaluated. The successive events in a project that influenced whether or not an integrated approach was achieved were listed. The practices that could prevent integration from happening are called avoidance practices. The three most important avoidance practices for integration during projects are: giving a party a sectoral assignment, time pressure for one of the two assignments and no available budget for an integrated project. These three were recognized as most important by experts during a focus group. These avoidance practices along with the other avoidance practices are caused by events or processes that preceded them. Avoidance practices occurring in the multi-actor interaction process context (context were project manager gets involved) can be caused by events or processes that happened or choices that were made in the specific context (context in which objectives are made and information is gathered) and in the policy context (context in which budgets, policies and guidelines are created). Avoidance practices can be alleviated by a wide range of alleviation practices or already

anticipated for by anticipatory practices. These alleviation practices and anticipatory practices can be hierarchical, market, network or self-organizational in nature. The avoidance practices can help to identify weaknesses in a project's governance approach, while alleviation practices and anticipatory practices can demonstrate strengths of a governance approach.

Integration in projects is now often initiated by someone who sees the opportunity and acts on it. Integration of assignments is not considered by default and assignments are not integrally defined. This makes it harder to integrate different sustainable transitions during the project. At the start of a project for the construction of a heat network, the project is under a certain time pressure. If climate adaptation measures were to be linked to this project, a plan would already have to be in place and a budget would have to be made available. Taking climate adaptation actions has to be seen as urgent and must be found worth it by the parties.

There are different hybrid governance approaches that lead to integration of transition. There is not one standard governance framework that will work best for integration. However, it does seem that a Network approach with some elements of Hierarchy works well for integrated projects. Network and hierarchical actions could be taken to realize integration, like sharing knowledge and creating awareness for integrated projects and the municipality could take control over the subsoil by coordinating it more. The next step is then improving coordination and collaboration to find opportunities for integration. A network structure needs to be created where parties work together in shared spaces and have regular meetings combined with hierarchical forms of regulation like permits, frameworks and rules for sharing plans.

Consciously looking at the performance of current governance approaches can be helpful in adapting them appropriately to address complex societal issues. Above evaluation helps to make deliberate choices for altering the current governance approach to realize integration of heat transition and climate adaptation tasks. These alterations will differ per case, because there will be no one-size fits all governance approach.

Preface

During my study I developed a great interest in the energy transition, climate adaptation and sustainable urban development. I am glad that I could focus on all these subjects in this research. Both the energy transition and climate adaptation are important topics now and will stay very important in the future.

While writing this thesis, I received support from a group of people whom I would like to thank by writing this preface. First of all Martijn Leijten for his advice and support during the whole process of writing this thesis. I am especially grateful for the prompt responses to my emails and for always being able to make time to provide feedback. In addition, I would like to thank Daan Schraven for his critical questions that made me realize the missing pieces or pieces that needed further elaboration of this research. Third, I want to thank Paul Chan for making sure I didn't lose sight of the bigger picture and helping me to separate the side issues from the main issues.

I also want to thank the people working at APPM, who I could always turn to for questions. I especially want to thank Hidde van Ooststroom, Gijs Eikmans and Nora Prins, who were always open to discuss aspects of this research and helped me to structure my thoughts when needed. I really enjoyed my time graduating at the company.

Next to this I want to thank Joanne Vinke-de Kruijf for letting me participate with sessions with other students graduating on this subject. And lastly, I want to thank my parents and friends for their encouragement throughout my graduation.

I am pleased to have been able to carry out this relevant and current research and I hope that with this research I can contribute to the realization of sustainable and liveable cities in the future.

Mirthe Meijer
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Research Introduction

1.1. Introduction

An increasing proportion of the population moves to the city and now more than 50 percent of the world population lives in urban areas (Sharifi, 2020). Cities are major contributors to greenhouse gas emissions (Grafakos, Trigg, Landauer, Chelleri & Dhakal, 2019). Around two-thirds of global primary energy demand is attributed to urban areas, and they cause 71 percent of global direct energy-related greenhouse gas emissions (Mauree et al., 2019). These greenhouse gases cause climate change, a shift in climate patterns leading to the rise of extreme weather. In 2018 the world encountered 315 cases of natural disasters, mainly climate related (Fawzy, Osman, Doran & Rooney, 2020). The Netherlands experiences more heavy rain falls and heat waves and there is a bigger chance of floods (Milieu Centraal, 2021). Cities will have to lower their contribution to greenhouse gas emissions and at the same time they will have to adapt to these extreme weather events and deal with environmental problems such as the Urban Heat Island Effect, flooding, and drought. There is an urgent need for the implementation of environmental solutions to prepare cities for the future and keep them liveable.

To control the effects of climate change, there is an urgent need to decrease greenhouse gas emissions and additionally, cities need to adapt to face the challenges related to climate change (Mauree et al., 2019). To decrease greenhouse gas emissions, cities will have to make interventions to reduce the sources or enhance the sinks of greenhouse gases (Sharifi, 2021). Cities will need to make a transition to renewable and sustainable heating and energy systems. This necessary structural change in the energy system to lower greenhouse gases is called the energy transition. Energy should be generated by renewable energy sources, energy-use should be lowered, and houses should be heated in a sustainable way. The Dutch government wants all homes to be natural-gas free in 2050. Next to this, Dutch cities must implement measures to deal with increasing number of floods, drought and extreme heat caused by climate change. Measures to deal with these are for example trees and greenery. This process of adjusting to actual or expected climate change and it effects is called climate adaptation (Sharifi, 2021). The Delta Plan on Spatial Adaptation (Deltaplan Ruimtelijke Adaptatie) states that the Netherlands should be designed to be water-resilient and climate-proof by 2050 (Snep et al., 2020).

The energy transition and climate adaptation are examples of transitions that are now being set in motion. Changes to the systems at neighbourhood level and city level that will be necessary for these transitions, such as the construction of parks, changes to the sewerage system, changes to the electricity infrastructure and the construction of a heat network, can be very radical and take a long time. Entire neighbourhoods, housing blocks and individual houses will have to be overhauled. Management of public spaces in existing neighbourhoods is important in the complex approach to the various transitions that are now taking place (Esmail, Takx, Brinkhuijsen, Hartmann, Hesselmanss & Oosterhoff, 2020). Municipalities play a major role in the adjustments and renewing of public spaces, because they are responsible for maintaining and replacing systems such (electrical) infrastructure and green space (Esmail et al., 2020). All these transitions require physical changes in the built environment and for both these major changes must be implemented in the upcoming years. There is now an opportunity to see whether these measures can be tackled integrally. According to Hamers et al. (2021) it can take decades before the opportunity for a big change arises again, so it is wise to invest now in opportunities for integration of the different sustainable transitions.

An integrated approach to various sustainable transitions means that these transitions are considered together, in order to take into account the various tasks in the built environment and to arrive at a simultaneous approach. The integration of the heat transition and climate adaptation therefore means a joint approach for

these two tasks. Integration of different transitions, so a joint approach, can happen on process level, when processes of measures are combined in time or space; and on a substantive level, which is a more technical integration of measures (Snep et al., 2020). Substantive integration is for example the integration of a green roof with solar panels. Green roofs not only work as insulation to reduce energy, but also enhance efficiency of solar panels through their cooling effects (Sharifi, 2021). This report will focus on integration on process level. Integration on process level means that the process (planning, investments, contracts) is coordinated with each other. There is a big opportunity for integration on process level. A joint approach to mitigation (reducing sources of greenhouse gas emissions) and climate adaptation (adjusting to climate and it effects) can bring benefits such as better awareness about possible interactions in space and time (Sharifi, 2021), and hereby limiting potential conflict and maximizing the impact of the limited resources; and they may even become mutually reinforcing (Grafakos et al., 2019). It is valuable to coordinate the plans for the heat transition and climate adaptation, because the space in the subsurface and in the topsoil are limited. Both transitions take up a lot of space in the subsoil (heat network and tree roots for example). If the transitions were considered separately, it could potentially lead to conflicts in space later. There could also be benefits when integrating plans. The construction of the heat network (for which neighbourhoods have to be overhauled and roads have to be demolished) is, for example, a good moment to improve public space and apply climate-adaptation measures such as the creation of green surface or water-permeable roads. It prevents that the road must be demolished multiple times for different transitions, because multiple transitions are considered at once. Due to the joint approach, efficiency can be improved (Dignum et al., 2021) and time and money can be saved. Linking climate adaptation measures with sustainable heating plans will save time in the total execution, leading to the minimization of nuisances and inconveniencies for the people living in the neighbourhood (Dignum et al., 2021; Snep et al., 2020). Also support for a heat network can increase, when invisible heat transition measures are combined with an addition of more green space to improve the quality of a neighbourhood (Dignum, 2021).

Despite the many advantages, sustainable transitions often appear to be approached individually from each other. This research will consider the application of hybrid governance approaches and their ability to realize integrated projects.

1.2. Problem Statement

Municipalities are developing plans for adaptation to and mitigation of climate change, however these plans are now often only focused on one of them (Sharifi, 2020). Hurlimann, Moosavi & Browne (2021) found that limited integration of climate mitigation and adaptation was evident. Treating these two issues in isolation could lead to inefficiencies in urban planning, conflicting policy objectives and lost opportunities for synergistic actions (Grafakos, Trigg, Landauer, Chelleri & Dhakal, 2019). There is limited action to integrate the two (Rosenzweig et al., 2018). Examples of integrated sustainability projects exist, but it remains limited.

To ensure that multiple issues are tackled simultaneously in sustainability projects, an integrated approach must be adopted that involves structural cooperation within governments and with external stakeholders (Snep, et al., 2020). Realizing an integrated approach to climate adaptation and mitigation is complicated because it involves multiple stakeholders, who work in different sectors, with many uncertainties and there are various challenges to overcome. Now there seems to be limited governance capacity of current climate governance systems to implement integrated low-carbon and resilient solutions (Hölscher, Frantzeskaki & Loorbach, 2018).

1.3. Knowledge Gap

Past studies have concluded that benefits exist when mitigation (for example sustainable heating) and climate adaptation measures are considered integrally (Sharifi 2020, 2021; Grafakos et al., 2019; Snep et al., 2020; Dignum et al., 2021), however past studies also found that the extent of integration of mitigation and adaptation in climate action plans appears to be low (Sharifi, 2020; Grafakos et al., 2019; Hurlimann et al., 2021; Reckien et al., 2018; Rosenzweig et al., 2018). Past research has been focusing on the integration of climate mitigation and adaptation measures, mainly focuses on measuring the degree of integration of these two measures in government climate action plans. For example, the paper of Grafakos et al. (2019) introduces a framework that can be used to evaluate the level of climate mitigation and adaptation integration in cities' climate change action plans and the paper of Hurlimann, Moosavi & Browne (2021) researches the extent to which the need to mitigate and adapt to climate changes is addressed in urban planning policy.

The problem of not being able to integrate mitigation and climate adaptation measures appears to be

not technical, but organizational in nature. A new governance approach will be needed that has the capacity to direct and coordinate networks to make integrated long-term sustainable change in society feasible (Loorbach, 2010). These governance approaches can be mixes of different governance modes and are then called hybrid governance approaches. Pahl-Wostl (2019) notices that the formation of hybrid governance approaches is more a product of chance and politics rather than of purposeful design and deliberation among the stakeholders involved. To design governance approaches, performance information is needed on the performance of different governance arrangements. There is, however, only little knowledge on the performance of different governance arrangements and to which extent hybrid governance systems have a higher performance (Pahl-Wostl, 2019). This report tries to fill this gap by researching how different governance arrangements are applied in reality and their performance for an integrated approach to sustainable heating and climate adaptation.

1.4. Research Objective

This research wants to fill the knowledge gap of how governance arrangements can be applied to contribute to the realization of an integrated implementation of climate adaptation and sustainable heating measures in existing neighbourhoods. For this research, cases are studied that are working on the heat transitions and that have and have not succeeded in combining this with taking climate adaptation measures. The aim of this research is to find out how different hybrid governance approaches are applied and how these perform in realizing integration.

1.5. Research Questions

The research question that will be answered in this report is:

"How do hybrid governance approaches perform in realizing integration between the implementation of heat transition and climate adaptation measures?"

To answer this research question, first some sub questions need to be answered:

1. *"How to consider the application of governance approaches in sustainable transition projects?"*

This research question will be answered by looking at literature about governance modes, hybrid governance forms and meta-governance to form a roadmap that could help with establishing the application and performance of governance approaches in sustainable projects.

2. *''What governance approaches are applied in heat transition projects in the Netherlands?"*

After establishing how to consider governance of projects, the current governance approach of the cases should be established. This can be established by looking at characteristics and processes of the case and linking these characteristics to modes of governance.

3. *''What are the most important avoidance, alleviation and anticipatory practices for integration?"*

The next step is to study the cases and find out the reasons why integration between the heat transition and climate adaptation was established in some cases or what prevented it from happening. By looking at what people in the project encountered for integration and how they solved it, an idea can be formed about the success of the governance mix for realizing integration of projects. Events and processes that prevented integration are avoidance practices and how parties have tried to cope with these are alleviation practices. Anticipatory practices are practices that anticipate avoidance practices before they can occur. Avoidance practices show the weaknesses of the governance approach and alleviation and anticipatory practices show the strengths of the governance approach of the project.

4. *''What is the underlying problem (problem setting) and what are possible governance options to address them?"*

The last research question is answered by critically looking at the avoidance practices and discussing them in a focus group to find out what the most important avoidance practices are and to establish why integration is not being realized in some cases. This forms the problem setting. Governance solutions are formed by speaking to the interviewees and discussing them again in the focus group.

1.6. Thesis Outline

In the following chapter, Chapter 2, the theoretical background of this research can be found. The third chapter describes the method that is used in this research. In Chapter 4 the cases are described and the governance of the cases are described. Chapter 5 contains a deeper-analysis of the avoidance, alleviation and anticipatory practices and the governance they are related to. In Chapter 6 governance options are listed that could contribute to the integration of the heat transition and climate adaptation. Chapter 7 describes the results of an expert validation session. Chapter 8 is the discussion and in Chapter 9, the conclusion, an answer is given on the research question. Chapter 10 contains practical recommendations for improving governance for the integration of the heat transition and climate adaptation. Figure 1.1 shows how the steps taken to consider the application of hybrid governance approaches relate to the chapters in this research paper.

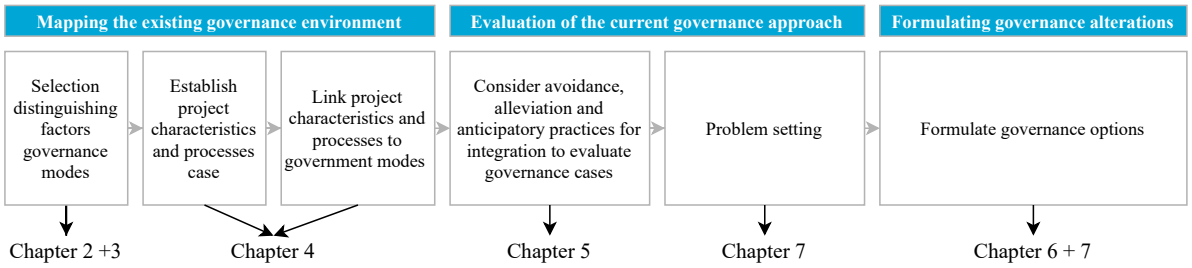

Figure 1.1: Thesis Outline

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Theoretical Background

This chapter presents the theoretical background that will form the basis for this research and answers the first sub-question presented in Chapter 1: 'How to consider the application of governance approaches in sustainable transition projects?'. First, in Section 2.1, negative and positive conditions for integration of sustainable transitions found in scientific literature and research reports are considered. Section 2.2 focuses on governance modes, hybrid governance forms and meta-governance.

2.1. Negative and positive conditions for integration of sustainable transitions

In this paragraph the barriers and opportunities for integration of sustainable transitions found in scientific literature and research reports are presented. Studying both scientific literature and research reports is important in this case, because scientific literature often reflects critically on policy and its effects and research reports (in which cases are conducted) provide the best insights from the past that are relevant for the future (Verloo & Ferier, 2021).

2.1.1. Negative Conditions

Barriers for integration seem to be mostly related to financial resources, knowledge, time, involved parties and organization. According to Grafakos et al. (2020) a capacity gap for the integrated climate change planning in Europe is a common funding body and securing finance for efficient integration. The compartmentalization of financial resources work is a negative condition for finding cohesion between different sectors (Hamers et al., 2021) and the absence of financial resources forms a barrier to the integrated approach (Albers et al., 2020; Brinkhof, 2020). Next to this, parties regularly assume that linking opportunities will involve additional costs and efforts that cannot be covered by sectorally organized budgets (Uyterlinde et al., 2019).

There also seems to be a lack of knowledge in the field of integrating different challenges in order to accelerate multiple sustainable transitions (Brinkhof, 2020). Integration and especially integral cooperation is new and complex and requires expertise that municipalities do not always have within the organization (Klösters et al., 2020). This lack of knowledge makes it difficult to integrate assignments. There is still too little systematic exchange of knowledge between experts and policy sectors and there is no structured way of recognizing opportunities for integration and translating these into projects (Uyterlinde et al., 2019).

In addition, there also seems to be a problem in the timing of various sustainable transitions. The timing must be right for various parties (Dignum et al., 2021). For example, the construction of a heat network must take place at the same time as the municipality has plans to adapt the public space. Lack of sufficient time can have a restrictive effect on combining the challenges of climate adaptation and the energy transition (Brinkhof, 2020). It can be time-consuming to align with new stakeholders who are important for realizing the integration (Dignum et al., 2020). According to Brinkhof (2020), the greater the number of parties involved with whom an agreement has to be reached, the more discussions and the longer it takes before a project can start.

Finally, the national government and municipalities are often very sector-oriented, which makes it difficult to establish connections between the sectors (Hamers et al., 2021; Uyterlinde et al., 2019). There could even be resistance to the integral approach (Hamers et al., 2021). People fear that the process will become too complex if too many assignments are linked together (Uyterlinde et al., 2019). According to Uyterlinde et al. (2019), uncertainty then arises and more parties become dependent, which can lead to procrastination. An

integrated approach will also require more coordination between parties that are currently not used to working together or have no shared goals (Dignum et al., 2021). If not all parties feel the urgency for the integrated implementation of sustainability goals, if the communication is not going well or if employees are not willing to work integrally, this can have a restrictive effect on the integration of different sustainable transitions.

2.1.2. Positive Conditions

A negative condition for the integration of sustainable transitions is a lack of money and sectorally organized budgets. An important condition for realizing the integration of sustainable transitions is the presence of financial resources (Brinkhof, 2020). According to Albers et al. (2020) a joint innovative business case will help to make the realization of integrated projects possible. Sharing concrete examples of integration opportunities and best practices, along with sharing knowledge between policy sectors and experts, could help people identify opportunities for integration. Another condition is enough time and the timing should be right. To get the timing right, a timeline can be made and it can be researched whether assignments can be accelerated or delayed (Albers et al., 2020). In this way, agendas can be aligned. In addition, according to Brinkhof (2020), employees should be given more time to clarify which tasks there are per area and to look for connections between them. They must be given this time by their management (Brinkhof, 2020). In addition, cooperation (Albers et al., 2020) and communication (Brinkhof, 2020) between the parties is important for integration. To realize integration of different issues it can be important to carry out actions like jointly working on strategy documents and organizing events where actors can interact (van Broekhoven & van Buuren, 2020). All parties must be involved early in the process of seeking opportunities for integration to reduce resistance (Hamers et al., 2021). Early detection of interfaces and linking opportunities is important to determine whether it is worth combining certain tasks (Uyterline et al., 2019). Another important factor for being able to integrate are the individual characteristics of key actors (Broekhoven & van Buuren, 2020). There must be people willing to look beyond their own expertise (Brinkhof, 2020). According to Broekhoven and van Buuren (2020), the focus of top management is also important. Top management should dedicate time and energy to an integrated projects (Broekhoven & van Buuren, 2020). Brinkhof (2020) sees that appointing someone that keep the overview of all the assignments in a neighbourhood could be helpful for integration.

Different people will need to be involved, that will fulfill different roles and will interact, take actions and use instruments to realize integration between sustainable transitions. As the problem seems to be not technical but organizational in nature, this research will go deeper into this by focusing on governance in the next part of this chapter. The following sections will explain the word governance in more detail and show what it all means.

2.2. Governance

Mitigation and climate change adaptation are challenges that are multi-sectoral and multiple actors are involved, so to implement climate change policies, cooperation between different parties of different sectors and levels is needed (Fröhlich & Knieling, 2012). For an integrated approach to climate change, new forms of government are needed that support and stimulate these collaborations and society interactions across different levels (Loorbach, 2010). The complex relationship between sectors and stakeholders can be described through the term governance (Fröhlich & Knieling, 2012). A new governance approach will be needed that has the capacity to direct and coordinate networks to make integrated long-term sustainable change in society feasible (Loorbach, 2010). Governance is the domain for the realization of societal transformation processes towards sustainable development (Lange et al., 2013).

2.2.1. Governance to Deal with Complex Problems of Society

Governance is a broad term, used in many contexts (Fröhlich & Knieling, 2012; Bednar & Henstra, 2018). It seems that the word is open to more than one interpretation. Looking at different interpretations in various papers, governance can be explained as:

'Governance stands for the interconnectedness of state and society (Fröhlich & Knieling, 2012) where a wide range of private stakeholders need to be coordinated and are included and collaborating (Fröhlich & Knieling 2012; Castán Broto, 2017) to deal with complex problems of society (Loorbach, 2010) by making use of softer forms of regulation (Fröhlich & Knieling 2012; Castán Broto, 2017).'

From this explanation, a few characteristics of governance can be observed, namely:

Why governance?	It relates to actions to deal with complex problems of society
Actors involved	Government includes private actors in problem resolution processes
Actions	Actors and societal processes need to be coordinated and these actors all need to collaborate and negotiate (relational)
Policy Instruments	It is about softer forms of regulation, such as seduction and inducement, has power in agreements

In this paper the complex problem or challenge of society is creating low carbon and at the same time resilient cities. An integrated approach to the heat transition and climate adaptation will include government and private actors and they will need to work together and be coordinated, while using different forms of regulation, to achieve certain goal. Different governance approaches can be applied to achieve an integration of sustainable projects and can stimulate and coordinate the involvement and collaboration of other actors.

2.2.2. Governance Modes

According to Fröhlich and Knieling (2012) interaction and coordination between different disciplines for the implementation of sustainable strategies will need different forms and approaches of governance. An approach or form through which governance can be realized is called a governance mode in literature (Pahl-Wostl, 2019). Three modes of governance that are named often in literature are the modes 'Hierarchy', 'Market' and 'Network' (Pahl-Wostl, 2019). Hierarchies, markets, and networks all three have different characteristics (Pahl-Wostl, 2019) and can be seen as the most extreme modes of governance. 'Hierarchy' is based on regulation, 'Market' on economic principles, 'Network' on negotiated agreements and joint goal determination (Bednar & Henstra, 2018; Molenveld, van Buuren & Ellen, 2020; Pahl-Wostl, 2019).

When looking specifically at the integration of climate adaptation and mitigation in different sectors, for example urban planning, this can be done through compulsion (hierarchy), dialogue (network) or through financial incentives (market) (Fröhlich & Knieling, 2012). Instruments used for climate adaptation and mitigation can be formal (hierarchy), like land use plans and urban planning agreements; informal (network), like networks and area management; or economic (market), like incentive systems, taxes, and climate labels (Fröhlich & Knieling, 2012). Each of the three primary modes represent alternative ways to organize society (Keast, Mandell & Brown, 2006).

The governance mode 'Hierarchy' is based on regulation. This mode is characterized by a clear responsibility for a government, which is to regulate society, and the government clearly lays down the obligations for others (Molenveld, van Buuren & Ellen, 2020). The government can steer through legal obligations, standards, and sanctions. Relationships between actors are regulated (Keast et al., 2006). A drawback of the mode 'Hierarchy' is that it sometimes can be rigid, knows institutional and service fragmentation and can be more exclusive rather than inclusive (Keast et al., 2006). This makes this mode sometimes inappropriate for delivering public services. The governance mode 'Market' assumes actors are ruled by price and negotiation (Pahl-Wostl, 2019). In this mode coordination can be realized through for example positive and negative incentives (Molenveld et al., 2020). It assumes that incentives like subsidies will change people's behaviour. Subsidies are given by governments, and therefore it also could be seen as a policy instrument that also falls under the mode 'Hierarchy'. However, because receiving subsidies is not an obligation and it assumes that people will change their behaviour because of a change in costs and benefits, in literature it is attributed to 'Market'. A drawback of the mode 'Market' is that it is based on the idea of a competitive market, which does not always consider the interest of the public (Keast et al., 2006). Especially when external costs are not internalized. In the governance mode 'Network' a wide range of actors are partners (including governments) working alongside each other, which requires negotiation processes to synchronize (competing) goals and agendas (Keast et al., 2006). The 'Network' mode works best if the right parties can find each other and join forces (Molenveld et al., 2020). According to Keast et al. (2006) the interactions of a diverse group of people with different perspectives can lead to new more responsive solutions to social problems. The drawback of the 'Network' mode is that networks can be difficult to steer, it is not always clear who is in charge, coming to agreements can be hard and accountability can become a problem (Keast, 2006). It is difficult to hold actors into account for things that are realized in collaboration (Meuleman & Niestroy, 2015).

In the paper of Bednar and Henstra (2018) a typology of governance modes is proposed, where a fourth mode of governance is added: 'Community'. The governance mode 'Community' is based on self-regulation (Bednar & Henstra, 2018). Typical instruments that belong to this mode are open public deliberation, education campaigns and direct democracy (Bednar & Henstra, 2018). In the paper of Molenveld, van Buuren

and Ellen (2020) a distinction is made between five modes of governance: 'Hierarchy', 'Market', 'Network', 'Self-organization' and ''Communicative'. In the governance mode 'Self-organization' the government is not actively involved, and private actors can create order by spontaneous (bottom-up) actions due to their self-organizing capacity (Molenveld, van Buuren & Ellen, 2020). Government has a limited facilitative role and need to create room and remove barriers for actors to act (Molenveld, van Buuren & Ellen, 2020). Actors are aware of the problem society is facing and they try to solve it themselves by adjusting their behaviour or by taking measures. This mode of governance shows similarities with the 'Community' mode of governance earlier mentioned, because they are both based on the self-regulation of private actors, that decide and take actions with a bottom-up approach. This mode of governance assumes that actors feel a sense of urgency to act. However, sometimes it can be a long process for people to act, which is a drawback of this mode. The fifth mode of governance that Molenveld, van Buuren and Ellen (2020) propose is called 'Communicative'. Actors share information and knowledge, and actors use this knowledge to act (Molenveld et al., 2020). These actors can be external experts or people that were involved in successful projects that can be seen as best practices. Providing best practices is seen as an important basis for steering (Molenveld et al., 2020). According to Molenveld et al. (2020) this mode assumes that by sharing examples and experiences, people will be motivated to follow this example. Sharing information on industry best practices could also be related to the 'Network' mode according to Bednar and Henstra (2018). The difference between the 'Network' mode and the 'Communicative' mode is that the 'Network' mode is mainly about collaboration of parties to achieve something and the 'Communicative' mode is mainly about inciting other parties to action by setting good examples. However, knowledge sharing and involving experts is also a big aspect of governance mode 'Network' and a lot of the characteristics of the governance mode 'Communicative' named by Molenveld et al. (2020) on could also be attributed to the governance mode 'Network'. 'Communicative' also has some similarities with the mode 'Self-organization' as both assume that the government has a coordinating role and that people start acting themselves because of either awareness of the urgency of a situation (in the case of 'Self-organization') or the motivation to follow good examples (in the case of 'Communicative').

2.2.3. Hybrid Forms

The fact that a distinction is made between different governance modes in Section 2.2.2, does not mean that one of there should be chosen for dealing with complex environmental challenges. Rather, different characteristics of different governance modes will have to be combined to arrive at a good governance approach. A governance approach where different modes are combined is called a hybrid governance style. According to Pahl-Wostl (2019) a hybrid governance style is a synergistic interplay of characteristics of different modes of governance, that is needed to deal with complex governance challenges. An effective combination of different governance modes is important for the creation of successful hybrid governance and the distinction between hierarchies, networks and markets has proven to be very useful for analysing hybrid governance settings (Pahl-Wostl, 2019). Meuleman and Niestroy (2015) call a hybrid governance approach a governance framework that is the totality of instruments, procedures, processes and role division among actors designed to tackle a group of societal problems.

2.2.4. Meta-governance

The activity of finding the right (hybrid) governance approach is called meta-governance. Meta-governance is a reflection process on the formulation and evaluation of governance approaches (Pahl-Wostl, 2019) and therefore in general terms meta-governance is often called the governance-of-governance. According to Pahl-Wostl (2019) meta-governance, as the formulation of governance approaches, has a purpose of addressing complex societal challenges. Abbott (2017) describes Meta-governance as the activity of a higher-level authority, structuring and managing interaction between lower-level organizations. Actors interact to influence the activities of other actors (Gjaltema, Biesbroek & Termee, 2019), in this way meta-governance can help to coordinate and stimulate cooperation of actors from multiple domains. This coordination can for example help to reduce overlap (Gjaltema, Biesbroek & Termeer, 2019). Meta-governance is mainly about the reflection on the formation of governance approaches and the coordination of actors.

According to Gjaltema, Biesbroek and Termee (2019) meta-governance could be seen as an umbrella concept, as it covers and connects to part of the literatures on network management, orchestration, and collibration. Collibration relates to the reflection on the formation of governance approaches. Collibration is the process of mixing different governance modes, discussed in section 2.2.3, with their accompanying instruments and balancing them, to achieve a governance mode that can deal with complex governance challenges. One or more modes of governance are coordinated, by using different instruments, methods, and strategies

to overcome governance failures (Gjaltema, Biesbroek & Termee, 2019). The weight of individual modes of governance are altered depending on the situation, so that the resulting governance approach can properly deal with the complex problem it is made to deal with. While collibration is about combining instruments and characteristics of the governance modes 'Hierarchy', 'Market' and 'Network', orchestration and network management are more focused on coordinating actors in a multi-actor system and network. The latter focus mostly on the governance mode 'Network'.

According to Lange et al. (2013) one of the most important questions in the search for suitable governance for sustainable development is which mix of modes of governance is best suited to promote sustainable development. For an integrated approach to transitions the right mix of modes of governance should be established and a new governance approach should be designed. To design a governance approach by mixing different governance modes, the different governance modes should be understood and distinguished. Lange et al. (2013) form a meta-framework as a conceptual basis to understand the governance modes. The different meta-framework contains three different dimensions of governance, namely political processes (politics), institutional structures (polity) and policy content (policy) (Lange et al., 2013). The politics dimension refers to the actors that are involved and interaction processes between actors, the polity dimensions refers to institutions (rules of the game) and norms and policy dimensions to political steering possibilities and to instruments (Pahl-Wostl, 2015). These three dimensions can be used as point of departure to develop a broad framework to understand and distinguish the modes of governance. The three dimensions of governance should be considered when distinguishing the governance modes and to come up with distinguishing factors to differentiate governance modes. For the stimulation of integration of the heat transition and climate adaptation mainly the dimension politics and policy are considered. Whereat polity is the institutional architecture in which politics and policy-making take place (2013). A focus will be on the actors and their interactions and on their steering possibilities and instruments. The modes hierarchy, market and network are distinguished in the paper of Pahl-Wostl (2019) through: motive of sub-ordinate actors (politics), roles of government (politics), choice of actors (policy), power (politics), steering (policy), roles of knowledge (politics) and dominant actor type (politics) (Table 2.1).

Table 2.1: Governance modes Pahl-Wostl (2019)

	Hierarchy	**Market**	**Network**
Motive of sub-ordinate actor	Fear of punishment	Material benefit	Belonging to group
Roles of govermment	Government rules society	Government delivers services to society	Government is partner in a network society
Choice of actors	Controlled by written rules	Ruled by price and negotiation	Ruled by trust and reciprocity
Power	Position in formal hierarchy	Degree of wealth, market share	Centrality of role in network
Steering	Authority	Price, economic incentives	Trust
Roles of knowledge	Expertise for effectiveness of ruling	Knowledge for competitive advantage	Knowledge as shared good
Dominant actor type	Government	Companies	Civil society organizations
Knowledge Generation	Technocratic focus; only technical experts involved	Knowledge serves to increase competitive advantage	Knowledge generation as part of group building process; different types of knowledge acknowledged
Conflict resolution	Legal procedures	Survival of the fittest;compensation payments	Mediation; Aim for concensus
Monitoring and evaluation	Compliance with regulation and quantifiable standards	Cost-benefit calculations	Reflection on agreed goals; change negotiated
Representativeness	Elected representatives	Access for all market players	Openness of process

In the typology of Bednar and Henstra (2018), the modes hierarchy, market, network and community are distinguished based on actor roles (politics), direction of authority (politics), instrument selection (policy) and actions that can be taken (policy) (Bednar & Henstra, 2018). Every mode of governance has their own characteristics, for example the direction of authority in the governance mode 'Hierarchy' is top-down and that of 'Community' is bottom-up, shown in Table 2.2.

Table 2.2: Governance modes Bednar and Henstra (2018)

	Hierarchy	**Market**	**Network**	**Community**
Direction of authority	Top-down	Circular (supply and demand)	Horizontal	Bottom-up
Initiating and implementing actors	Governments	Governments and market actors	Government, private sector, experts	Citizens, Community groups, neighbourhood associations
Dominant Policy Instruments	Legislation and regulation	Supply and demand	Negotiated agreements, codes of practice, voluntary programs	Self-regulation, voluntary participation
Action	Mandated	User free	Partnership building and voluntary best practices	Volunteers program and neighbourhood awareness

Molenveld, van Buuren and Ellen (2020) describe the five modes of governance based on the way actors can steer other actors as shown in Table 2.3 .

Table 2.3: Governance modes Molenveld, van Buuren and Ellen (2020)

	Hierarchy	**Market**	**Network**	**Communicative**	**Self-governance**
Steering	Mandatory rules and regulation	Joint goal determination	Economic Incentives	Giving information, sharing good examples;	Self-steering capacity of actors

In the book of Meuleman (2008) an extensive overview of the differences between the three ideal types of governance (hierarchy, network and market) is presented. According to Meuleman and Niestroy (2015) the three governance styles (hierarchy, network and market) differ across more than 35 distinguishing factors. For each of the distinguishing factors, there are three options, the network option, the hierarchy option or the market option (Meuleman & Niestroy, 2015). For this research the distinguishing factors in the papers of Pahl-Wostl (2019), Bednar and Henstra (2018) and Molenveld, van Buuren and Ellen (2020) are considered, because of their focus on sustainability and climate change adaptation and their publishing date.

Table 2.4 presents an overview of the different governance modes that will be considered in this research together with the distinguishing factors. In this table the mode 'Community' discussed in the paper of Bednar and Henstra (2018) and the governance mode 'Self-organization' discussed in the article of Molenveld et al. (2020) are combined and named 'Self-organization', because of their similarities. Some of the characteristics of the governance mode 'Communicative' are assigned to the 'Network' mode, because providing and sharing knowledge (by experts) is also an activity that belongs to a network. Other characteristics of 'Communicative are assigned to the mode 'Self-regulation', because in both there is a coordinating role for the government and self-regulation is important. Section 2.2.2 extensively explains why these governance modes can be combined.

Table 2.4 can be used as a tool to determine what kind of governance mix characterizes these types of projects and also forms the basis for designing a new governance mix.

Table 2.4: The governance modes and belonging distinguishing factors to be considered in this research (based on Pahl-Wostl, 2019; Bednar and Henstra, 2018; Molenveld, van Buuren and Ellen, 2020

Politics/ Policy/ Polity	**Distinguishing factors governance modes**	**Hierarchy**	**Market**	**Network**	**Self-organization**
Politics	*Motive of subordinate actor*	Fear of punishment	Material benefit	Belonging to a group, provide knowledge	Improve community
Politics	*Initiating and implementing actors*	Government	Government and market actors	Government, private sector, experts and intermediaries	Citizens, community groups, neighbourhood associations
Politics	*Role of government*	Government rules society	Government delivers services to society	Government is partner in a network society	Government can coordinate and connects
Politics	*Direction of authority*	Top-down	Circular (supply and demand)	Horizontal	Bottom-up
Politics	*Power*	Position in formal hierarchy	Degree of wealth, market share	Centrality of role in network	Esteem of other residents
Politics	*Dominant actor type*	Government	Companies	Society organizations	Citizens
Politics	*Knowledge*	Expertise for effective ruling, technocratic focus	Knowledge for competitive advantage	Knowledge as shared good	Knowledge as shared good
Policy	*Choice of actors*	Controlled by written rules	Ruled by price and negotiation	Ruled by trust and reciprocity	Ruled by own will
Policy	*Policy Instruments/steering*	Mandatory rules and regulations	Economic incentives	Negotiated agreements and joint goal determination, providing information and knowledge	Self-steering capacity of actors, voluntary participation
Policy	*Actions*	Providing mandatory standards	Creating subsidies, insurances, and funding	Coordinated actions, partnership building, standards	Actors look for solutions to social problems, neighbourhood awareness creation
Polity	*Conflict Resolution*	Legal procedures	Compensation payments and survival of the fittest	Mediation	Aim for consensus

2.2.5. Transition Management as Meta-governance

According to Loorbach and Rotmans (2010) transition management is meta-governance, because it is a process of deliberately influencing governance activities to accelerate a change. Laes, Gorissen and Nevens (2014) describe transition management as an intentional governance design aimed to steer systems in a more sustainable direction. Concepts that stand out for both explanations are ''deliberately" and ''intentional". Transition management is about actively influencing and transforming a governance system. It could be rather explorative and experiments with different forms of policy and management and different instruments (Rotmans & Loorbach, 2008). Transition management means learning by doing and can be uncertain at times, however it focuses on achieving a radical and irreversible change (Rotmans & Loorbach, 2008).

Laes et al. (2014) describe transition processes as a sequence of four phases, namely the pre-development phase, the take-off phase, the acceleration phase and the stabilization phase. In the pre-development phase small-scale initiatives arise that explore solutions for a certain problem (Laes et al., 2014). These initiatives are still isolated and fragmented and not enough developed to compete with the existing 'regime' (Brugge & Rotmans, 2006). In the Netherlands you now see some projects where an integrated approach is applied for the heat transition and climate adaptation. People realize that integration does have some benefits because of improved efficiency and almost becomes necessary to make all the transitions fit in the soil and subsoil. However, these projects are still rare and in an experimenting phase. People working on these projects learn while doing. The public space management world still knows a large fragmentation of the different sectors. In the take-off phase a change process is set in motion and in the acceleration phase structural changes occur and become mainstream practices (Laes et al., 2014). In the stabilization phase a new system is established and less change is visible (Laes et al., 2014).

Transition management focusses on the transition (process of fundamental change) in one domain (subsystem), however in the case of this research meta-governance is used to accelerate change directed at integration of multiple sustainable transitions. This is why in this research is focused on the term meta-governance. To accelerate change directed at an integrated sustainability approach, it should be explored what governance design is most suitable to do this.

2.2.6. Designing a Hybrid Governance Approach

Pahl-Wostl (2015) sees that opinions diverge if interactions can be influenced by purposeful design of governance and if any kind of design can be derived. Pahl-Wostl (2019) notes that meta-governance can be both about purposeful designing and about self-organization and Meuleman (2008) writes in his article that meta-governance can be defined as consciously designing and managing situationally optimal mixtures of governance styles. Meuleman and Niestroy (2015) write that the idea of meta-governance is that it is possible to develop combinations of styles of governance into a new governance framework. Designing and evaluating a governance approach is a major challenge for science and policy (Pahl-Wostl, 2019). Little attention has been giving to analysing how hybrid governance approaches evolve and to which extent hybrid governance systems have a higher performance (Pahl-Wostl, 2019). Literature is lacking on how to decide on the right hybrid governance approach for certain complex problems in society.

In the paper of Pahl-Wostl (2019) water governance approaches in different countries are compared, by looking at their governance characteristics. Quotations from legal documents and implementation plans from different countries were linked to the governance modes hierarchy, network and market. The allocation of a quote to a governance mode was based on the established characteristics for the three governance modes. Figure 2.1 shows the first three steps Pahl-Wostl (2019) took to say something about the governance approaches found in legal documents and water implementation plans of countries.

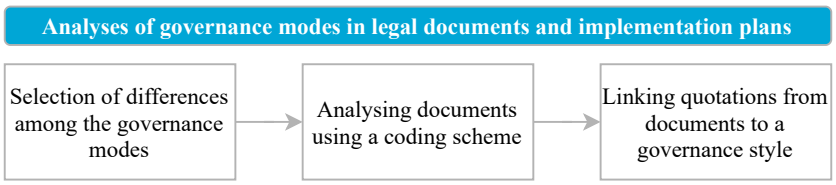

Figure 2.1: Analyses of governance modes, Pahl-Wostl (2019)

These results are then analysed using qualitative content analysis. This gives an idea about the present and past hybrid governance approaches being used and about synergies and conflict between different governance approaches. The approach of Pahl-Wostl (2019) could be a good basis for designing a new hybrid governance approach to deal with a certain complex problem of society. Pahl-Wostl (2019) notes that: ''There is a need for meta-governance as a reflexive process of societal learning to develop, evaluate and adapt governance approaches with the purpose of addressing complex societal challenge."

Meuleman and Niestroy (2015) describe in their paper a step by step approach to form and implement a new adjusted governance framework for meta-governors. It starts by looking at the current governance environment (actors and roles, constitutional, legal and political settings), than evaluating the existing governance framework, looking at the challenges to be addressed, formulating goals and policy options, designing a governance framework and then managing and reviewing this framework (Meuleman & Niestroy, 2015). A SWOT is used to evaluate the current governance approach. A SWOT analysis is a situation analysis technique

that is used to evaluate the strengths, weaknesses, opportunities and threats involved in an organization, a plan, a project, a person or a business activity (Gürel, 2017), or in this case a governance approach. Figure 2.2 is an overview of the steps Meuleman and Niestroy (2015) take to implement a new governance framework. A governance framework is called a hybrid governance approach in this paper.

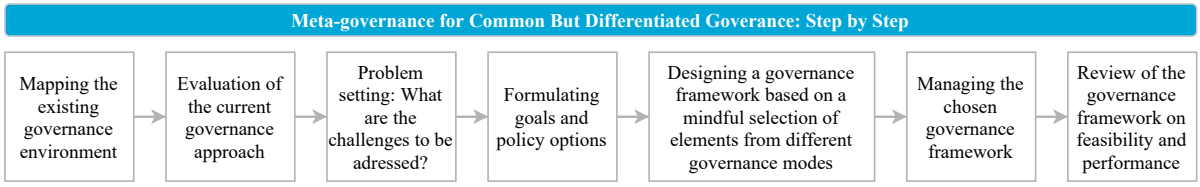

Figure 2.2: Meta-governance for Common But Differentiated Governance, Meuleman and Niestroy (2015)

Linking quotes from real life governance situations to the different governance modes, as done in the paper of Pahl-Wostl (2019), is a good way to gain insight into the current mix of governance modes that characterize a particular situation. This mix should then be evaluated to see how this mix is working for achieving goals. Evaluating the current mix of governance modes is a good start for developing a new optimised mix or for making alterations to the existing mix. Combining the approaches used in the paper of Pahl-Wostl (2019) and Meuleman and Niestroy (2015) a new roadmap can be developed to purposeful design a hybrid governance approach by mixing different governance characteristics. Figure 2.3 shows how the approaches in the two papers are combined to form the new roadmap. This roadmap could be used by meta-governors.

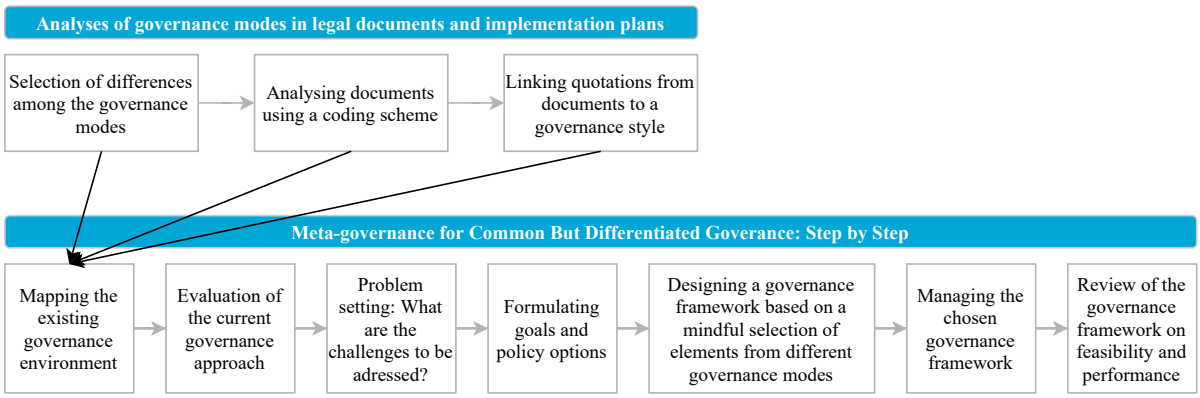

Figure 2.3: Purposefully designing governance

To design a hybrid governance approach, first the meta-governor must have a clear idea of the characteristics of the governance modes that can be mixed and which distinguishing factors are going to be considered.

According to Lange, Bornemann and Burger (2019) a governance approach is a good approach if it at least contains some characteristics of the hierarchical governance. According to Fröhlich and Knieling (2012) climate change-related measures includes the cooperation of different institutions and actors in addition to hierarchical forms of regulation and self-organising structures. According to Castán Broto (2017) the implementation of climate change and mitigation strategies can be promoted through forms of collaboration and self-organization. This paper will research which characteristics a hybrid governance approach should contain to stimulate an integrated approach to the challenges of the heat transition and climate adaptation.

2.2.7. Governance and Project Stages

As said earlier, the distinguishing factors of the governance modes can be placed in three dimensions, namely politics (actors and interaction processes), polity (institutions), and the policy (instruments and political steering). Different distinguishing factors can be relevant in different processes of a project. Just as governance characteristics can be divided into different dimensions, the process of projects can also be divided into different dimensions or contexts. On a higher level municipalities decides on their budgets, create policies and provide guidelines and tools. After this, objectives are made for a specific project and information is gathered. Awareness and commitment play an important role here. Lastly, the project starts. This is when a

project manager gets involved. In the master thesis of Kapousouz (2019) these contexts are called the policy context, the specific context and the multi-actor interaction process context. In her thesis the multi-actor interaction process context is then divided into the stages preparation phase, design phase, implementation phase and in-use phase. The contexts that Kapousouz (2019) uses in the master thesis are important to consider when looking at the governance and for the evaluation of the governance approach.

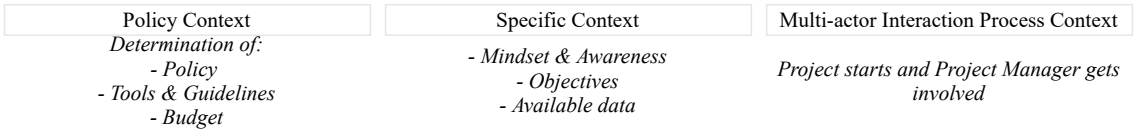

Figure 2.4: Three Contexts

3

Research Method

To answer the research question, the researcher should step into the skin of the meta-governor, to consider hybrid governance approaches. This chapter explains the followed method for this research. In Section 3.1 the research design is presented. For this research, a qualitative research method is conducted to give an answer on the research question. Cases are studied (Section 3.2) and semi-structured interviews are conducted to gather the needed data together with document analyses (Section 3.3). Section 3.4 describes how the gathered data is analysed and Section 3.5 describes how the data is validated in a focus group.

3.1. Research Design

For this research an alternative version of the roadmap in (Figure 2.3) in Section 2.2.6 is used. This roadmap is based on the theories of Pahl-Wostl (2019) and Meuleman and Niestroy (2015). The following step-by-step approach is followed for this research (Figure 3.1):

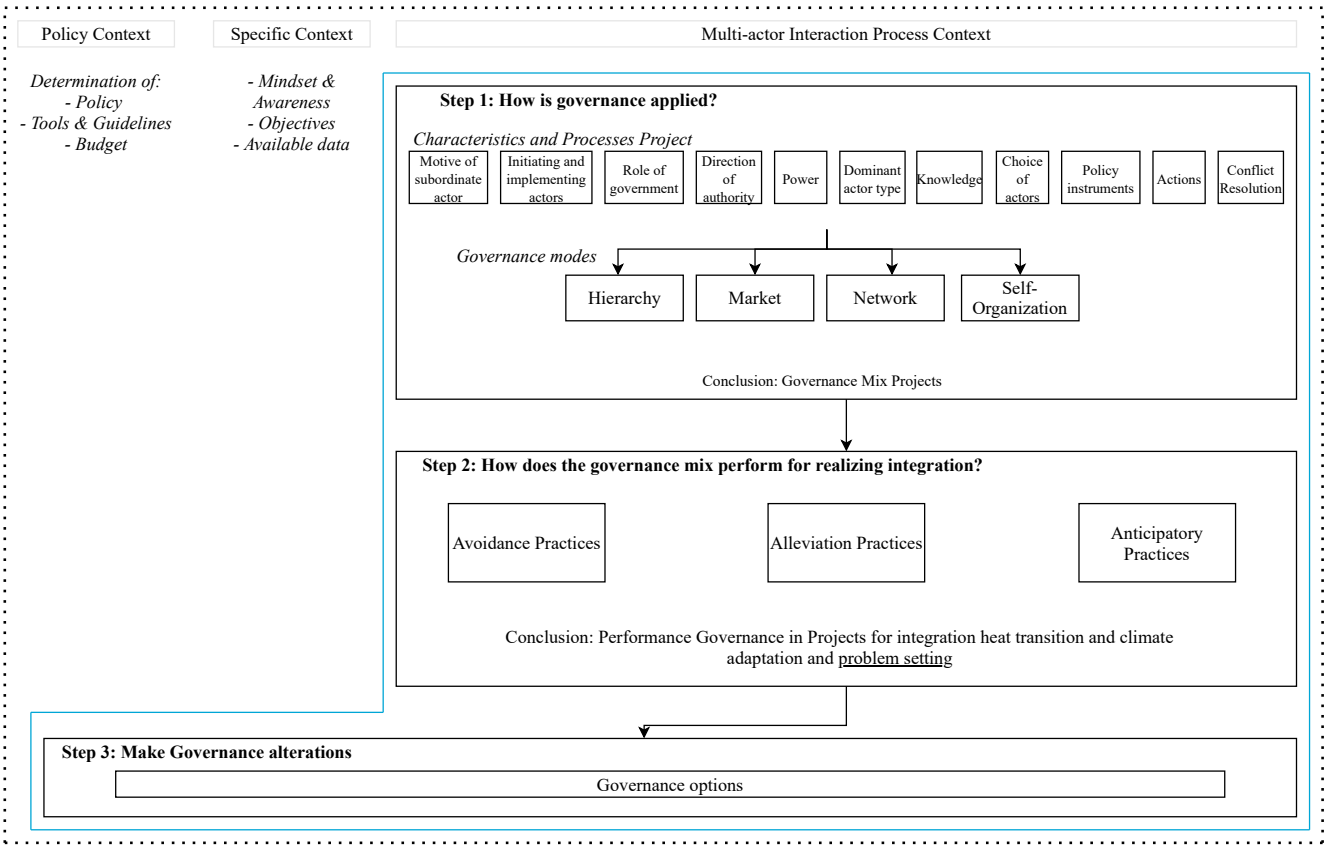

Figure 3.1: Research Design

The three steps in the figure refer to the first four steps of the roadmap of Meuleman and Niestroy (2015) in

Figure 2.2. The first step is mapping the existening environment. The second step refers to their step of evaluating the current governance approach and problem setting. The last step refers to their step formulating goals and policy options. This last step is translated for this research into formulating governance options, because the word governance covers more than the word policy. The last steps of the roadmap of Meuleman and Niestroy (2015) in Figure 2.2, implementing the changes and reviewing the changes fall outside the scope of this research. Instead, outcomes are validated by proposing them to an expert focus group.

For a successful alteration of the hybrid governance approaches the meta-governor needs input from real life situations. This is why, for this research, a case study will be done. Why a case study was chosen as the research method is discussed in detail in the next section.

3.2. The Case Study

Cases have been selected for this research where neighbourhoods undergo a transition to a natural gas-free heating system and consider climate adaptation to a greater or lesser extent. Section 3.2.2 will elaborate on this. This method is selected to learn from these cases how to organize an integrated climate approach.

3.2.1. The Case Study Method

A case study method allows to explore a complex issue in depth in the real-life setting of this issue (Crowe et al., 2011). In this way, a case study will help to explain the complexities of the real situation (Zainal, 2007). Because, as Flyvbjerg (2006) writes, in the study of human affairs there is only context-dependent knowledge. According to Crowe et al. (2011) the case study approach is well recognised in the field of policy. A limitation of this method is, as only a few cases are considered, it is hard to provide a scientific generalizing conclusion (Zainal, 2007). So, it will maybe be difficult to prove something or formally generalize, 'but this does not mean it cannot enter into the collective process of knowledge accumulation in a field' (Flyvbjerg, 2006). Every neighbourhood is unique, but neighbourhoods are organized in a similar way. This makes it possible to make generic statements about transitions in a neighbourhood (Ten Hoeve et al., 2020). The focus of this research is to gather knowledge from the competent knower, so people who have experience working on this kind of projects in the complexity and context-dependence of the real situation and have learned lessons from this. The knowledge that could be acquired by looking at an example should not be underestimated (Flyvbjerg, 2006). This kind of knowledge cannot be collected with a quantitative research method, like a questionnaire. Flyvbjerg (2006) quotes Beveridge (1951) in his article: 'more discoveries have arisen from intense observation than from statistics applied to a large groups', This of course depends on the research and the kind of knowledge the researcher wants to acquire. The aim of this research is to develop an in-depth understanding of integrated projects, the barriers to integration and what hybrid governacne mix will contribute to integration of transitions in time and space. This in-depth knowledge can only be acquired by having deep conversations and a pre-prepared questionnaire could hinder acquiring in-depth knowledge. The results of the case study will help to add to knowledge about integrated approaches and this will be used to form generalized advice about a governance structure that stimulates an integrated approach in the Netherlands. The research does not focus on specific opportunities for integration, as these will differ per municipality.

3.2.2. Case Selection

Municipalities slowly begin to realize the importance of integration of multiple assignments in the public space. To accelerate the heat transition, heat transition visions (transitievisie warmte) are now being drawn up that must be completed by the end of the year 2021. In these visions, the municipalities outline how the various existing neighbourhoods will switch to a heat source other than natural gas. The importance of climate adaptation is becoming increasingly clear with increasing flooding and heat stress in cities. Municipalities are taking steps to implement climate adaptation measures. However, an integrated approach to transitions in the Netherlands is still in its infancy. Cases are selected for this research in which existing neighbourhoods undergo a transition to a natural gas-free heating system and consider climate adaptation to a greater or lesser extent. The cases are projects all over the Netherlands in existing neighbourhoods located in bigger municipalities. There are not many advanced projects that have combined renewable heating with climate adaptation measures, so the projects are in different phases and of different scale. This makes them less suitable to compare, however several cases are studied to accumulate knowledge gained from these cases. All cases will give new insights that can be used for this research and are chosen based on expectation about their information content. Flyvbjerg (2006) calls this information-oriented selection of cases. In every

case, multiple people are interviewed to create a more complete picture. An overview of the interviewees can be found in Table 3.2. Table 3.1 gives an overview of some characteristics of the considered cases.

Table 3.1: Case information

Case 1. Paddepoel	
City:	Groningen
Stage:	In-use phase
Initiating party:	Municipality of Groningen
What:	Construction of a heat network combined with climate adaptation measures
Case 2: Kruidenbuurt	
City:	Tilburg
Stage:	Implementation phase
Initiating party:	Housing associations initiate heat network and Municipality of Tilburg climate adaptation
What:	The construction of a heat network, redevelopment public space and improving social environment
Case 3: Huiswaard	
City:	Alkmaar
Stage:	Preparation phase
Initiating party:	Housing association
What:	The construction of a heat network
Case 4: Vruchtenbuurt	
City:	The Hague
Stage:	Preparation phase
Initiating party:	Residents
What:	The construction of a heat network

3.2.3. Short Case Description

In Paddepoel, the moment of installing the heat network has been tackled in order to immediately take climate-adaptive measures. The road has been replaced with a water-permeable road with sewer infiltration and is made more narrow. Because the road is made smaller there was more space for greenery. This project knows a large integration between the heat transition and climate adaptation, because plans are aligned, both in time and space. In the Kruidenbuurt the municipality works together with the parties installing the heat network and adjust their plans to the heat network. In some spaces, the municipality is planning to combine the construction with a redesign for the public space to make it more climate resilient. In Huiswaard the heat network will be installed, then everything will be returned to its original state. After this, the ground level will be considered and it will be examined whether climate-adaptive measures will be taken. Climate adaptation is considered, but no actual plans are made at this point. In the Vruchtenbuurt climate adaptation is not considered. The parties fully focus on installing the heat network.

PADDEPOEL

In Paddepoel the construction of a heat network is combined with the construction of measures for climate adaptation, which makes this case unique in its kind. The municipality gave the assignment to WarmteStad to build a heat network and realized that this was a good opportunity to implement solutions for the heat and flooding problem in this area. For all involved parties this was the first time that they worked on a project where issues were integrated in this way. This project has been completed and this makes this project very suitable to draw lessons from.

KRUIDENBUURT

There is a lot going on in the Kruidenbuurt and in the upcoming ten years a lot of changes will be made in this area. The municipality is working with a lot of people to improve the live-ability of this neighbourhood, which makes it a very interesting case. The housing associations are now constructing the heat network to their houses. At a later moment in time the municipality will start adapting and redeveloping the public space, taking into account climate adaptation. The design for the public space is finished and is now being presented to the residents that gave the input for this design. The municipality hopes to combine some of the work with the construction of the heat network.

HUISWAARD

In Huiswaard the housing associations initiated the development of a heat network. The municipality got involved in this project at a later stage. The municipality works with an external party called Stadswerk072 that is focused on the public space in Alkmaar. In a later stage, this party will consider if there is still space for climate adaptation measures in this area.

VRUCHTENBUURT
What is unique about this case is that the residents themselves initiated and direct the construction of the heat network here. The residents have an active residents' associations called Coörporatie Duurzaam Vruchtenbuurt. Other parties involved are Dunea, the drinking water company, Net Verder, the network operator and the municipality of The Hague. This project has received a European subsidy called ELENA to do research on the heat network.

3.3. Data Gathering

In this Section it is explained how data will be gathered for this research. To gather the data that is needed, interviews are conducted and documents are collected and analysed. Interviewees will include people working at the municipality and other organizations involved in the energy transition and climate adaptation. All these people are connected to or engaged with the implementation of sustainable energy, new forms heating and climate adaptation in cities. Interviews are held online via teams and recorded so more complete transcripts can be made. One interview is held face to face. The recordings of the interviews will be transcribed, and the information will be used to answer the research questions. To find the right people to interview, a sampling strategy named snowball sampling is used. This means that people interviewed for this research will provide referrals for new subjects. For example, when someone from the municipality is interviewed, the interviewer will ask for a contact at the involved utility company to interview as well. Table 3.2 shows the interviewees per case. The last column, 'Name in thesis', are the names that will be used in the remainder of this thesis. The interviews are semi-structured interviews. Every interview was different and the interviews were meant to establish the characteristics of the project and gain an understanding of the course of the project. Examples of questions that will be asked are:

1. How were you involved in the project?
2. How did the project go?
3. What did you encounter during the project?
4. What are you most proud of?
5. What do you think contributes most to integration?

Table 3.2: Interviewees cases

Name of Organization	Function of Interviewee	Name in thesis
Case 1. Paddepoel		
Municipality of Groningen	Project Leader	Project Leader Municipality
Municipality of Groningen	Sustainable Designer	Sustainable Designer Municipality
WarmteStad	Director WarmteStad	Director Heat Company
Case 2: Kruidenbuurt		
Municipality of Tilburg	Project Leader	Project Leader Municipality
TBV Wonen	Consultant Beheer	Consultant Management Housing Association
Ennatuurlijk	Project Developer/ Advisor	Project Advisor Heat Company
Case 3: Huiswaard		
Municipality of Alkmaar	Coordinator Soil and Subsoil	Coordinator Soil and Subsoil Municipality
Stadswerk072	Project Leader Intergral Projects	Project Leader City Management
Stadswerk072	Senior Advisor City Water and Climate Adaptation	Senior Advisor City Management
Case 4: Vruchtenbuurt		
Municipality of The Hague	Project Manager Energy Transition	Project Manager Municipality
Dunea	Developer Sustainable Heat and Cold	Developer Water Company
NetVerder	Project Developer Heat	Project Developer Network Operator
Coöperatie Duurzaam Vruchtenbuurt	Board Member	Board Member Residents' Association

Documents that will be considered for this research will be for example articles, press releases about the project, mail exchanges between interviewer and interviewee, documents about collaborations or about strategies and neighbourhood magazines.

3.3.1. The Semi-structured Interviews Method

To gather data of the cases, the method in-depth interviews is used. Conducting semi-structured interviews will be helpful to get a broader understanding of the characteristics of the cases and the experiences of people involved. Semi-structured means that the interviewer has a set of questions to ask and knows what topics to cover, however the conversation is free to vary between participants (Fylan, 2005). So, there is no specific order of questions to follow, like with a structured interview. Semi-structured interviews can be used to find out from the interviewee what is important and why and this way semi-structured interviews can be used to explore and develop a much deeper understanding of a more complicated research questions (Fylan, 2005). A possible drawback of this method is the possibility that an interviewee could be presenting inaccurate information (maybe not even intentional) (Morris, 2015). Therefore, multiple people will be interviewed for this research, so false information can be filtered out.

3.3.2. Qualitative Document Analysis Method

To develop a more broad and reliable understanding of the project, different data methods will be considered. The use of multiple data sources is called triangulation (Carter et al., 2014). According to Carter et al. (2014) it can be seen as a qualitative research strategy to test the validity of the information because the information comes from different sources. This is why, next to interviewing multiple people per project, documents will be considered. The method qualitative document analysis is often used alongside interviews in case study research (Wood, Sebar Vecchio, 2020). In this research, the information from documents will be used to supplement the information from the interviews and for general background information for the cases.

Document analysis is the process of locating and analysing any type of existing document to gather facts or trends about the topic of research (Pershing, 2007). According to Pershing (2007) in the process of analysing a document the researcher can look for problems, outcomes and accomplishments of for example projects and this information can be used to create an understanding about the performance of the project.

3.4. Data Analysis

It is not the intention to summarize the results of the interviews. The example of Flyvbjerg (2006) will be followed, who tells the stories for his research in its diversity, to allow the reader to experience the multifaceted and complex stories of the interviewees. Every interview is recorded and transcripted with the software Amberscript. These transcripts are analysed carefully by the researchers to form an image of the governance approach that is in place in the projects researched. Quotes are extracted from the interview transcripts and documents that say something about certain governance characteristics and processes. All interviews were analysed using the coding scheme in table 3.3. For example, quotes about involved actors or instruments used by the parties during the project are extracted. These quotes about governance characteristics or processes are then linked to one of the governance modes (hierarchy, market, network and self-organization) based on table 2.4. By linking these quotes to one of the governance modes, an idea can be formed about the certain logic or form of the governance characteristics and processes. The governance characteristics and processes together form the governance mix.

Table 3.3: Coding Scheme for Analyses

Coding Scheme for analyses	
Actors	Reason for involvement actors
	Actors who have an implementing role during the project
	Actors who are in charge of control
	Actors that initiate the project
	The basis of choices that actors make during the project
Government	Role, responsibility of government
Knowledge	Kind of knowledge
	Sharing of knowledge
Policy Instruments/ steering	Ways of steering of actors
	Rules and regulations encountered or used during project
Actions	Kind of activities that are undertaken during the project
Conflict Resolution	Ways of resolving conflicts by actors

For the evaluation of the performance of the governance mix for realizing integration between the heat transition and climate adaptation, the interviews and the documents are analysed to see what contributes or does not contribute to integration of the heat transition and climate adaptation. Interviews will be used to identify actions and events that have hindered integration or made integration possible. The results of the data analysis can be found in chapter 4, chapter 5 and chapter 6.

3.5. Expert Validation Session (Focus Group)

The result of the data analysis described in Section 3.4 are validated by organising a focus group. The focus group exists of seven people working at universities, municipalities or consultancy companies in the area of energy transition, climate adaptation and governance. The participants are chosen on the basis of their experience to the research topic and these people could be seen as experts because of their experience and knowledge on the topic of sustainable transitions. They will give their thoughts on the avoidance practices and governance suggestions found in this research. The focus group will be held online via Teams and the researcher will first give an overview of the research and then takes the participants through in the results of this research. After this the participants can react on the outcomes.

The perks of focus groups are that multiple people are interviewed at once and discussion between the interviewees are stimulated. A lively conversation with people from different kind of departments or organizations with experience in transitions is a good way to validate the insights obtained from the interviews and documents. Interaction between the different experts in the focus group is an important characteristic of this research method and this is also the biggest difference between a focus group and the interviews (Cameron, 2005). According to Cameron (2005) a focus group requires careful planning beforehand, but the interaction and discussion of the participants will lead to interesting insights on the topic of research.

4

Governance Cases

In this chapter an answer will be given to the second research question: 'What governance approaches are applied in heat transition projects in the Netherlands?'. It gives a description of the consecutive events per case and explains the governance characteristics of the case. It also gives an overview of what went right and wrong per case.

4.1. Case 1. Paddepoel – Groningen

This paragraph describes the Paddepoel case in Groningen. Section 4.1.1 describes the case and explains the successive events in this project. By analysing information from documents and interviews, the governance approach is identified in this project and can be found in Section 4.1.2.

4.1.1. Description Case

Paddepoel is a neighbourhood in Groningen that was built in the sixties and seventies (Kennisportaal Klimaatadaptatie, n.d.). The gas extraction in Groningen has resulted in earthquakes here. Because the consequences of using natural gas to heat a house are felt immediately in Groningen, people here are more motivated to make the switch to natural gas-free heating. The municipality of Groningen wants all neighbourhoods to be natural gas-free in 2035 (Kennisportaal Klimaatadaptatie, n.d.). Paddepoel is a pilot neighbourhood of the Natural Gas Free Neighbourhoods Program (PAW) and has therefore been made natural gas-free (Team Stadszaken.nl, 2019). WarmteStad was commissioned to install the district heating network in Paddepoel (Snep et al., 2020). WarmteStad is a company founded by the municipality of Groningen and the water company of the province of Groningen. The houses to which the heat network is connected, were to become customers of WarmteStad. WarmteStad wanted to install the heat network as quickly and as effectively as possible to keep their customers happy. They would open the street, install the heat network, and restore the street to its original state.

At the same time, a stress test carried out showed that Paddepoel suffered from flooding and heat (Steenbreek, 2021). The municipality saw the construction of the heat network as an opportunity to tackle these climate problems. For the construction of the heat network, the streets in Paddepoel are being overhauled to a greater or lesser extent and this could be an opportunity for the municipality to redevelop the public space (Team Stadszaken.nl, 2019). An individual policy officer at the climate adaptation department raised this integration opportunity and boosted the integration of the projects. By the time the municipality mentioned climate adaptation as a problem that could be tackled together with the heating network, WamteStad was already well advanced with their plans for the construction of the heat network (Platform 31 Nyenrode, n.d.). They also already had a tight schedule and did not have the resources to realize climate adaptive measures. WarmteStad had initially been given a defined and sectoral assignment from the municipality. The assignment that the municipality had given to WarmteStad was very one-sided and mainly concerned the instalment of the heat network and the location of the heat network. Considering climate adaptation in this point of the project meant large delay and extra costs. But since the municipality is a 50 percent shareholder in WarmteStad, the municipality is an important player for them. The Paddepoel district alderman also supported the plans of the Climate Adaptation Department, which contributed to the continuation of the integrated project. To solve the shortage of money for climate adaptation, the municipality applied for a subsidy from the Ministry of Infrastructure Water Board. Together they drew up a new project proposal, to claim a government subsidy for climate adaptation. This ultimately resulted in obtaining the subsidy for climate adaptation. This meant that WarmteStad, in combination with the construction of the heat network

in the street the Plutolaan in Paddepoel, would also include climate-adaptive measures. WarmteStad would stay in the lead for this project because they were already very far in the process.

As expected, they suffered a lot of delay because of this change of project scope. Unlike WarmteStad, the municipality had not yet worked out their plans for climate adaptation. So, this had to be done before WarmteStad could proceed with the installation of the heat network. This has led to discussions. There have also been some discussions about the feasibility of the various constructions. A special climate-adaptive (water-permeable road with sewer infiltration) had to be made available (Steenbreek, 2021) and WarmteStad did not want to be liable for this installation since they normally do not perform this kind of construction. In the end, even the designated contractor indicated that he would no longer continue in the Plutolaan in Paddepoel, and a new contractor had to be found. This became the responsibility of the municipality. Agreements have been made and the municipality now bears full responsibility for the work in Plutolaan. In this project in Paddepoel there were two separate budgets, WarmteStad had a budget for the heat network and the municipality had the subsidy for climate adaptation. An integral project team had been formed. WarmteStad had formally the directing role, but the responsibility was shared with the municipality. The climate part was also fully supervised by the municipality. The entire project took much longer, also causing more nuisance for the residents. That has also caused complaints, but the support for the project has not been affected in the end. What contributed to the support and what kept the resident positive is that they became very involved in the process. They were allowed to help determine how their street would be redesigned. More greenery, trees selected by the residents and parking spaces have been added to the neighbourhood. The municipality and WarmteStad worked together with Co Creatie Paddepoel to communicate to the residents (Steenbreek, 2021). This organization worked between the municipality and the residents, and this setup seemed to work really well. It was important for the residents to be able to think along with the plans for re-organization of the street. The fact that they were heard, was an incentive to participate in the process and this ensures a lot of acceptance.

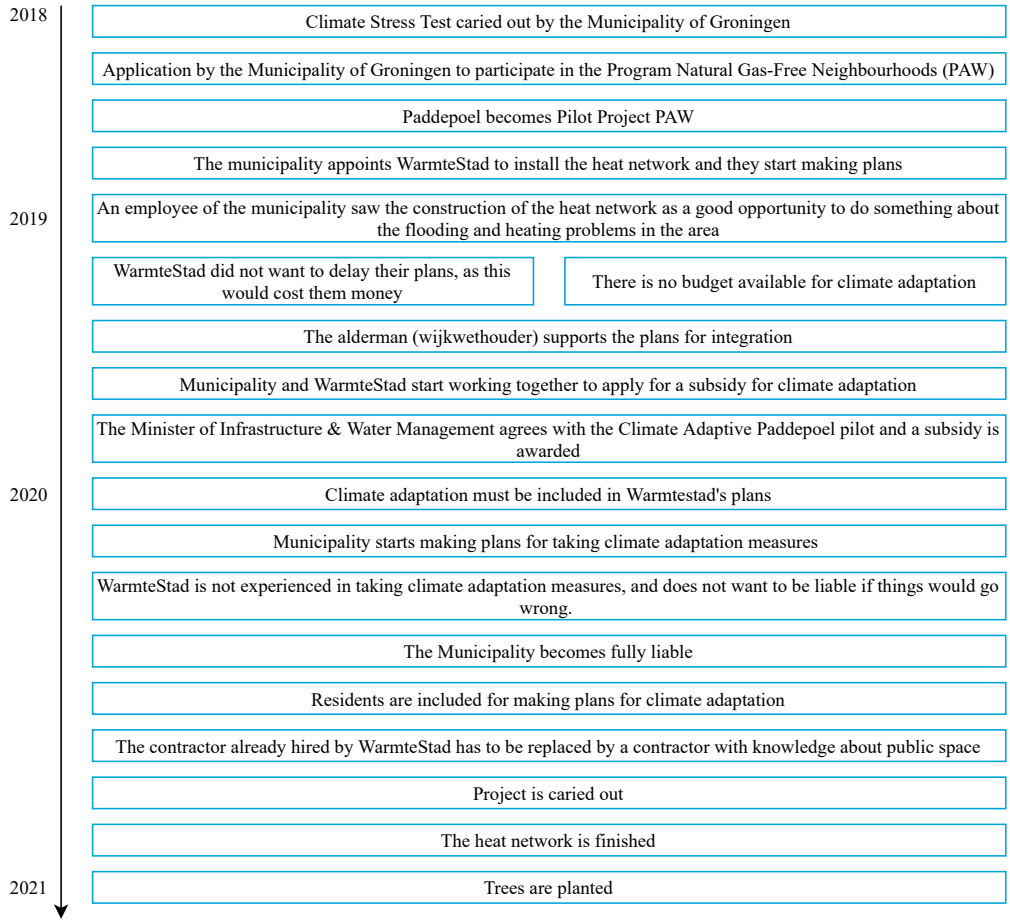

Figure 4.1: Timeline Case Paddepoel

The residents saw that the delayed construction work also resulted in a visible improvement for the street, what made them more positive towards the project. In 2020 the heat network in the street Plutolaan in Paddepoel was finished and later that year the last trees were planted (Kennisportaal Klimaatadaptatie, n.d.). Because of the integrated approach, costs could be saved (Steenbreek, 2021). Figure 4.1 shows the timeline of the integrated project in Paddepoel. This timeline starts with the conducted climate stress test by the municipality and ends at the end of 2021 when the last trees will be planted.

4.1.2. Governance Mix Case

The conducted interviews for the case Paddepoel were analysed using the coding scheme in Section 3.4, table 3.3. These governance characteristics or processes were linked to one of the governance modes based on Table 2.4 in Section 2.2.4. Figure 4.2 shows an overview of the governance processes and characteristics in Paddepoel and the belonging governance modes. This together forms the governance mix of Paddepoel.

The project in Paddepoel knows two main phases, one before climate adaptation was added to the scope and one after. Since the governance mix changes a lot after this addition, in Figure 4.2 the ovals that contain governance modes before climate adaptation have received the colour grey and after the colour blue. The dominant mode in the first phase seems to be hierarchy. The Municipality gave the assignment to the Heat Network Company to build a Heat Network and they became in charge of this project. The knowledge used for this project had a technocratic focus: the construction of a heat network. The Company has to work efficient, because it wants to keep their price as low as possible for their customers, a market governance characteristic. As the Heat Network Company is forced to keep their prices as low as possible, this could also be seen as a hierarchic governance characteristic. Partly because of the attitude of the alderman (wijkwethouder) towards the project, climate adaptation measures were added to the scope. This is a hierarchical element. The company works together with the municipality and the residents' association, a collaboration with network characteristics, to install the heat network and the climate adaptation measures. With the addition of climate adaptation measures to the case, the case changed (unintentionally) from a mostly hierarchical approach to a more network approach. It was decided that the market party that was assigned the project for the construction of the heat network kept the directing role, due to the advanced stage of the project. However, they did not have the knowledge to organize the addition of climate adaptation to the project. The municipality directed this part of the project. The sectoral assignment the municipality had given the Heat Network Company top-down, now changed in a collaboration network assignment where the municipality and the Heat Network Company had to work together. This directed the project to a more network approach in order to make integration possible. This shift to a network structure was necessary to be able to integrate both assignments in this case. The project changed to a more socio-technocratic focus, with a new goal of changing the liveability of the neighbourhood. The Heat Network Company still wants to keep their prices for the customers as low as possible, but have accepted the delays that the project will have because of the addition of climate adaptation. The project in this phase still keeps some hierarchical characteristics. For example, the Municipality is fully responsible when things go wrong during this project. In this second phase the dominant governance mode is network.

Governance Characteristics	Quotes Interviewees	Governance Mode
Motive of subordinate actor	WarmteStad is forced to keep its prices as low as possible, so the company has to keep investments as low as possible and we can do this by integrating different projects (Director Heat Company)	Hierarchy
	The heat company wants to install the heat network within a certain time and connect it to its customers, because that means income for them. (Project Leader Municipality)	Market
	You have to organize it on a project basis and focus more on liveability, because that is why you do the project in the end. This gives you the chance to increase liveability of the neighbourhood (Project Leader Municipality).	Self-organization
	The municipality is of course an important player for us as a shareholder, but also a partner in the implementation and they came up with the idea to include climate adaptation in this project. That meant that a new project proposal had to be made (Director Heat Company).	Network
Initiating and implementing actors	The Municipality has awarded WarmteStad the contract for the construction of the heat network in Paddepoel (Sustainable Designer Municipality)	Hierarchy
	The residents' association was able to get the neighbourhood organized (Project Leader Municipality). A person of the residents' association coordinated the process with the residents (Sustainable Designer Municipality). The face that the residents are heard is an incentive to participate in the process and this ensures a lot of acceptatnce (Director Heat Company)	Self-organization
Role of government	The municipality of Groningen has awarded WarmteStad the contract for the construction of the heat network in Paddepoel (Sustainable Designer Municipality)	Hierarchy
	So then WarmteStad made a project plan together with the municipality and the residents in the neighbourhood (Director WarmteStad). We eventually formed a kind of integral project team (Director Heat Company)	Network
Direction of authority	The municipality of Groningen has awarded WarmteStad the contract for the construction of the heat network in Paddepoel (Sustainable Designer Municipality)	Hierarchy
	WarmteStad had the directing role, but behind the scenes it was an integral project. From a formal point of view, WarmteStad was therefore the contractor's client. But the climate part is supervised by the municipality. (Director Heat Company).	Network
Power	The Alderman (wijkwethouder) has to make these kinds of smart combinations. So we quickly found him by our side. So he just gave the order. But there are many municipalities that still work quite sectorally and these kinds of things only work if there really is an administrative assignment (Project Leader Municipality).	Hierarchy
Dominant actor type	WarmteStad has agreed with the municipality that they would retain control of the netire process, because WarmteStad was already very far in the tender proces (Director Heat Company)	Market
	WarmteStad had the directing role, but behind the scenes it was an integral project (Director Heat Company).	Network
Knowledge	The assignment that the municipality has given WarmteStad is very one-sided, it concerns the construction of the heat network and the location of the network. Installing the heat network and then repairing the pavement again (Director Heat Company).	Hierarchy
	We now give the assignment to a contractor with knowledge about the design of the public space and this contractor hires a contractor with knowledge about the heat network. (Project Leader Municipality)	Network
Choice of actors	WarmteStad is forced to keep its prices as low as possible, so the company has to keep investments as low as possible and we can do this by integrating different projects (Director Heat Company)	Market
	The municipality is of course an important player for us as a shareholder, but also a partner in the implementation and they came up with the idea to include climate adaptation in this project. That meant that a new project proposal had to be made (Director Heat Company).	Network
Policy instruments/ steering	WarmteStad is forced to keep its prices as low as possible (Director Heat Company).	Hierarchy
	We were also able to get a subsidy. Especially since this was the first time, it made it a bit easier for us to realize (Project Leader Municipality).	Market
	We have already made a climate stress test with the Climate Adaptation Department at the Municipality of Groningen, in 2018 for the entire Municipality of Groningen and the results were already available. The stress test showed that there are still some problems to be solved in this neighbourhood (Sustainable Designer Municipality).	Network
Actions	A heat network takes up a lot of space and is not a straight pipe, if you also want to lay waste water or a rainwater sewer system, and there is not much space in most streets, then the technician has to see how it all fits (Project Leader Municipality).	Hierarchy
	This means that we have to work much closer with the municipality. That is what the project teams are for, which include people from the municipality and people from WarmteStad. We have working groups, project groups and steering groups (Director Heat Company).	Network
	Representatives of all departments from the municipality sat together in a project team. The communication between the different departments was therefore also quite good. (Sustainable Designer Municipality).	Network
	The municipality and WarmteStad are in the process of drawing up a collaboration agreement about how this will all be organised (Project Leader Municipality).	Network
Conflict Resolution	You will always get some conflict, but you have to be able to go back to a level above it (Director Heat Company).	Hierarchy
	We at WarmteStad are not familiar with this and we also do not want to be held liable for the consequences if things go wrong with the road (e.g. cracks) (Director Heat Company). The municipality therefore also bears the responsibility for this part (Director Heat Company).	Hierarchy
	Some things went wrong with the contractor who installed the heat network and there is now also a small case pending in court (Project Leader Municipality). WarmteStad is now also in a legal dispute with the contractor and the financial settlement thereof, so the story is not over yet. (Director Heat Company).	Hierarchy

Figure 4.2: Governance Mix Paddepoel

4.2. Case 2. Kruidenbuurt – Tilburg

This paragraph describes the Kruidenbuurt case in Tilburg. Section 4.2.1 describes the case and explains the successive events in this project. By analysing information from documents and interviews, the governance approach is identified in this project and can be found in Section 4.2.2.

4.2.1. Description Case

In the Kruidenbuurt, 85 percent of the houses is social housing and is owned by three housing associations. These housing associations are making their housing stock more sustainable by insulating, installing solar panels and by installing a heat network that is going to be connected to 440 houses (van Uden, e-mail, 2021). They have decided to join forces for the construction of the heat network. The municipality is also actively involved in the improvement and redevelopment of the public space in this neighbourhood (van Uden, e-mail, 2021). To reduce heat stress more greenery is added to the neighbourhood. The approach in the Kruidenbuurt is called triple sustainability (driedubbele duurzaamheid) (Gemeente Tilburg, 2020). In addition to making the homes more sustainable energetically and making the public space more sustainable, the municipality is also working on social sustainability. This neighbourhood is a deprived area and improving the quality of life by tackling public space is combined with improving quality of life in the social field.

Houses are connected to the heat network and this is combined with a climate-adaptive redesign of public space (Gemeente Tilburg, 2020). The three housing associations and the municipality are going to collaborate, because they all have work to do in the Kruidenbuurt. To make this collaboration official, a collaboration agreement has been made up and signed by the parties. The municipality and the three housing associations now meet every three months to inform each other and coordinate each other's plans. By signing the cooperation agreement, the housing associations will have more freedom and some barriers that the municipality could impose are removed. As a result of this collaboration, they can apply for permits to close a road for construction work more quickly. The three housing associations coordinate with each other when they will work on which road, and they can communicate this directly with the licensing authority. This means that a few steps in this process can be skipped. As a result, the municipality no longer needs to carry out inspections, the neighbourhood remains easily accessible, and the process is now much faster for the housing associations. A joint damage-pot has also been set up with the three housing associations, with financial contributions from all three organizations. If damage occurs during the work and it is not clear which housing association is to blame, it will be paid from the damage-pot. At the end, each party gets back the money that is left. The municipality has a less important role for the construction of the heat network because the housing associations have been given more space. The housing associations are in the lead for the construction of the heat network.

Because the municipality had already started to collaborate with the housing associations from the beginning, the municipality knew at an early stage where the heat network would be located. This enabled the municipality to coordinate its plans at an early stage with the plans for the location of the heat network. For example, their plans now include parking spaces above the heat network, so that there is room for trees on the other side of the street. For the redevelopment of the public space, the municipality considers the wishes of the residents. Initially, the municipality had difficulty reaching the residents. The municipality is now actively promoting the participation of residents and the communication is getting better now. The residents have indicated that some people are breaking the speed limits and they would desire more greenery. The municipality itself also wants this. There is also a parking shortage, and the municipality wishes to have less paved roads and places. A heat stress study carried out in the Kruidenbuurt shows that the area is heating up. A road will therefore be completely removed and replaced by a park and some streets will become one-way traffic, so that there is more space for parking and greenery. Some parking spaces are designed to be climate-proof, by using tiles that are permeable to water. The municipality also wants to see if they can possibly take over land from the housing associations to build even more park. They also want to encourage residents to green and get rid of some tiles in their garden. For example, if people go door-to-door to inform people about the heat network, the municipality also immediately tells what they plan to do in the neighbourhood and what the residents can do themselves. They also receive an explanation about solar panels and the necessary new insulation and installations in their homes. At the primary school here, the children also receive guest lectures on climate adaptation, and they can participate in decision-making about the design of the new parks.

In this neighbourhood, links are not only made between climate adaptation and the energy transition, but the social aspect is also included (Gemeente Tilburg, 2020). This neighbourhood is a deprived area where many people live below the poverty line. Many people are unemployed and have a language deficiency. When

the municipality goes door-to-door, they will explain to the residents all the activities at once and it will be checked whether the residents have a job, any debts and whether there is domestic violence. A neighbourhood supporter will contact people in the neighbourhood and programs will be set up to help people get a job. For example, several residents are now employed by the contractor who is going to work in the neighbourhood. In this way, links are not only made in the physical space, but this moment is also tackled to make the neighbourhood more liveable socially.

Figure 4.3 presents the timeline of the project in the Kruidenbuurt. A climate stress test was carried out in 2014. In the years between 2021 and 2023 the heat network will be installed and the Municipality will work on the public space in the Kruidenbuurt making it more climate adaptive.

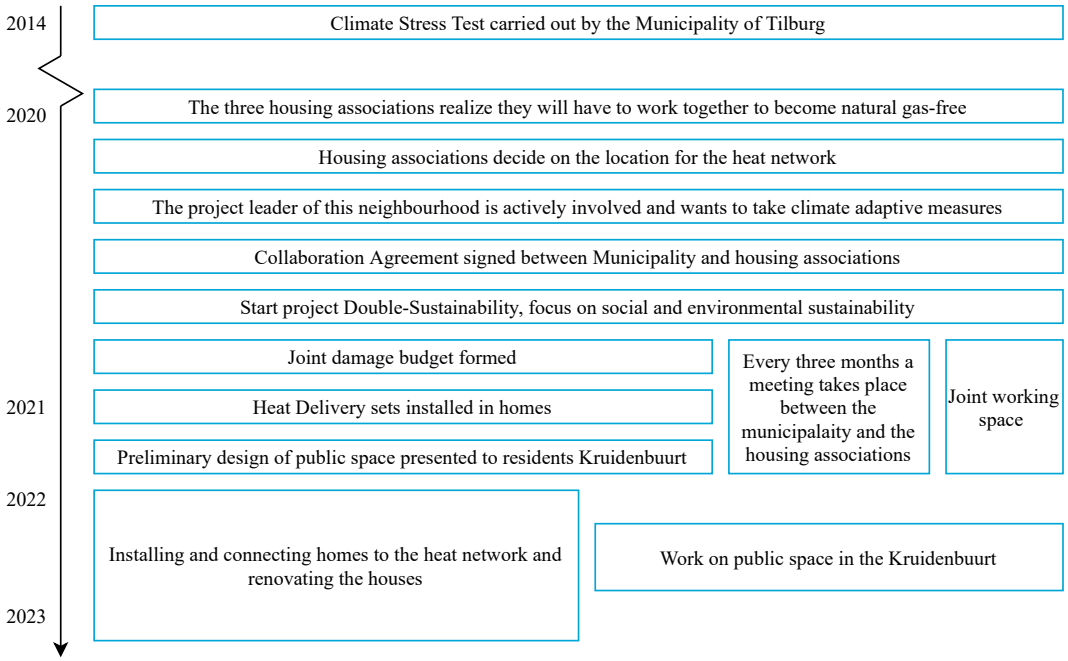

Figure 4.3: Timeline Case Kruidenbuurt

4.2.2. Governance Mix Case

The governance characteristics or processes (table 3.3) of the case Kruidenbuurt were linked to one of the governance modes based on Table 2.4 in Section 2.2.4. Figure 4.4 shows an overview of the governance processes and characteristics in Kruidenbuurt and the belonging governance modes. This together forms the governance mix of Kruidenbuurt.

The governance of this project contains characteristics of the governance mode network. The housing associations, the municipality and the other parties involved in this neighbourhood work together to improve the live-ability and the community here. The municipality tries to involve the residents as much as possible in the decisions they make. This project does not seem to contain characteristics of the market mode, as the parties installing the heat network and improving the public space main goal is improving the live-ability in this neighbourhood by collaborating. Although a lot of processes and characteristics of this project can be attributed to the governance mode network, the project still contains some hierarchical elements. The project leader of the municipality is in charge for the redevelopment of the public space and connects multiple parties and projects in the neighbourhood.

Governance Characteristics	Quotes Interviewees	Governance Mode
Motive of subordinate actor	During the residents' evenings, the residents have indicated that they are driving too fast and have indicated that they want more greenery. The municipality also wants this (Project Leader Municipality)	Self-organization
	The intention is to do it together as much as possible and to work together towards a shared goal (Consultant Management Housing Association).	Network
Initiating and implementing actors	We are going to coordinate the entire project in certain places in the neighbourhood and implement it together with the housing associations (Project Leader Municipality)	Network
	Soon there will be a plan of 3 housing associations + municipality + the process of the residents. That will be the joint plan for the next ten years (Project Leader Municipality)	
	We determine the location of the heat network together. That is an important part of the collaboration. So we worked very closely with the housing corporation there. (Project Advisor Heat Company)	
Role of government	The municipality has therefore been given a less important role for the construction of the heat network, because the cooperation agreement has given the housing associations more space (Project Leader Municipality).	Network
	But the municipality itself comes up with its plan for the public space and its green implementation (Consultant Management Housing Association).	Hierarchy
Direction of authority	So the decision was made to work together even more intensively. Both the three corporations, the municipality and all other parties around it (Consultant Management Housing Association).	Network
Power	As a project leader you actually have a much broader role. Actually, I'm more of a neighbourhood program manager. All assignments in a neighbourhood are considered and you have to coordinate them all. (Project Leader Municipality)	Network
Dominant actor type	As a project leader you actually have a much broader role. Actually, I'm more of a neighbourhood program manager. All assignments in a neighbourhood are considered and you have to coordinate them all (Project Leader Municipality).	Hierarchy
	As a municipality, you are often the initiator of the heat network. But that is not always convenient. Now the housing associations have taken over (Project Leader Municipality).	Network
Knowledge	So a heat network is constructed, a new design for the public space is made an we also focus on the social aspect. The social aspect is difficult, but we want to integrate this in this project. (Project Leader Municipality).	Network
	Together we looked at the plans of the various involved parties. (Project Leader Municipality).	
Choice of actors	Then it helps if you have a common plan with a common goal and that everything you do should contribute to that goal (Consultant Management Housing Association).	Network
Policy instruments/ steering	I will use a different contract form for the contractor. There is a good chance that something will change in the middle of the process. Another form of contract gives me the freedom to look more closely at the planning with the contractor. (Project Leader Municipality).	Hierarchy
	In 2014 a Heat stress map was made in Tilburg, which shows that Tilburg is heating up. (Project Leader Municipality).	Network
Actions	Once every three months, the housing associations and people from the municipality have a meeting (Project Leader Municipality).	Network
	The municipality has approached the housing associations and signed a collaboration agreement (Project Leader Municipality).	Network
	And afterwards if there is damage to, for example, a road, it is difficult to find out who is ultimately to blame. In the collaboration agreement, instead of everyone having their own risk budget, a joined risk budget, a joint damage pot, is made. If there is damage that we cannot appoint to a party, it will be paid from that damage pot. And at the end, each party gets back the money that is left (Project Leader Municipality).	Network
	This is new, because normally every housing association has its own plans. This year, for the first time, we tried to make joint plans for the neighbourhood (Consultant Management Housing Association).	Network
	A work café is also organized once a month, where all parties involved work together (Consultant Management Housing Association)	Network
	We did that in a number of sessions with about ten persons sitting at the table and looking at where the heat network should be (Project Advisor Heat Company).	Network
Conflict Resolution	You just need to have a number of documents in which you record the collaboration. Including agreements on what to do if someone deviates from agreements. And this doesn't have to be a legal document, but more of a plan with how you work together that everyone can adhere to (Project Advisor Heat Company).	Network

Figure 4.4: Governance Mix Kruidenbuurt

4.3. Case 3. Huiswaard - Alkmaar

This paragraph describes the Huiswaard case in Alkmaar. Section 4.3.1 describes the case and explains the successive events in this project. By analysing information from documents and interviews, the governance approach is identified in this project and can be found in Section 4.3.2.

4.3.1. Description Case

The initiative for the construction of the heat network in Huiswaard came from the housing corporation Woonwaard in Huiswaard. They wanted their homes to be depleted of natural gas and have called in the waste processing company HVC that is now also specializing in installing heat networks. HVC started the process when it had ensured that it would have enough customers to connect to. The municipality stays in the background. In this project climate adaptation is not yet considered, but they are planning on considering this in a later moment in time in this project. The municipality has an external party called Stadswerk072 that is focused on the public space in Alkmaar. The municipality is partly a shareholder of this organization. Stadswerk072 is working on heat network projects, and they are responsible for the management and maintenance of public green spaces in the municipality of Alkmaar. Stadswerk072 is seen by the municipality and HVC, as the party that is responsible for climate adaptation and should pay for climate adaptation.

Stadswerk072 is also involved with the heat network that is going to be installed in Huiswaard and is project leader over the whole project. Stadswerk072 only heard about HVC's plans later in the process of implementing the heat network. Usually Stadswerk072 is involved from the beginning. The specific plans of HVC were only later communicated to the municipality and Stadswerk072. Communication between these parties is not structurally coordinated, making it harder to align plans. However, talking to each other does seem to help to connect assignments in this area. Stadswerk072 is going to replace the sewerage system and HVC takes the lead for the determination of the exact location of the heat network and the construction. When the sewerage has been replaced and the street has been closed again, HVC will start opening the street again and instal the heat network. Stadswerk072 collects information and communicates with all parties involved in this project. Woonwaard and HVC Groep are coordinating things with each other, and a number of consultancy firms are also involved.

This project does not yet focus on climate adaptation. Part of the reason is that Woonwaard was already well advanced in its plans for the heat network when Stadswerk072 got involved. Stadswerk072 also has no budget to include climate adaptation in Huiswaard as a task. When HVC starts installing the heat network, Stadswerk072 will investigate whether extra green can be added to Huiswaard. It is a requirement of the municipality to take into consideration climate adaptation, so this will be considered in a later stage of this project. First Stadswerk072 will ensure that the pipes for the heat network fit into the ground and then later it will consider trees and greenery. Stadswerk072 tries to add as much green as possible, however this can be very difficult due to lack of space. The biggest barrier to creating greenery in a neighbourhood are the cables and pipes that are all buried in the ground. Trees cannot be installed above cables or pipes. They are looking at the possibility of sacrificing parking space in order to create more green, or to add green facades, little gardens in front of people's houses or planters. A timeline for the case Huiswaard is presented in Figure 4.5.

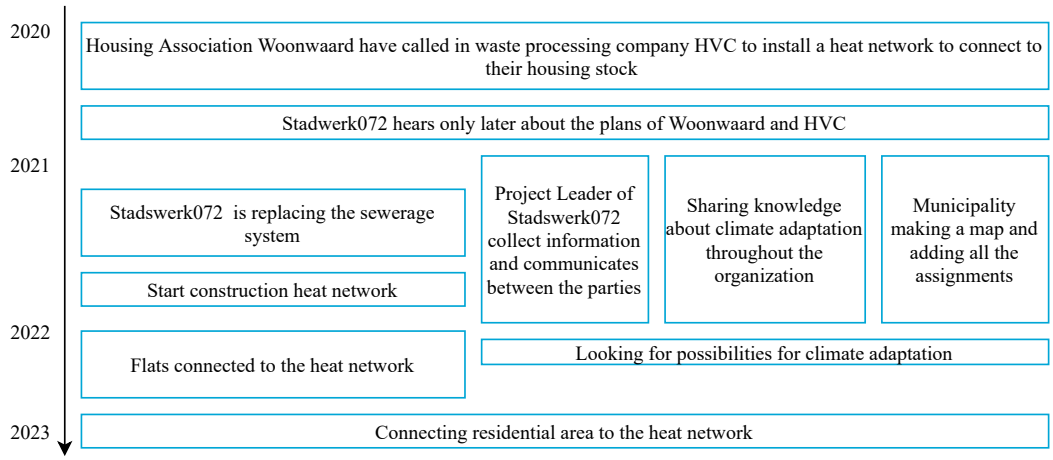

Figure 4.5: Timeline Case Huiswaard

4.3.2. Governance Mix Case

The governance characteristics or processes (table 3.3) of the case Huiswaard were linked to one of the governance modes based on Table 2.4 in Section 2.2.4. Figure 4.6 shows an overview of the governance processes and characteristics in Huiswaard and the belonging governance modes. This together forms the governance mix of Huiswaard. The governance of this project contains characteristics of the governance mode market. Woonwaard hired the company HVC to install the heat network to connect to the houses of the housing association.

Governance Characteristics	Quotes Interviewees	Governance Mode
Motive of subordinate actor	A plan has been made of where HVC can lay their pipes, but they must be sure they will have enough clients (Senior Advisor City Management).	Market
Initiating and implementing actors	In Huiswaard, the housing association Woonwaard, HVC and Stadswerk072 are working together. (Coordinator Soil and Subsoil Municipality)	Network
	The housing corporation Woonwaard in Huiswaard wanted its homes to be switched off from gas and connected to the heat network. For this they went to HVC Groep, a heat pipeline company. They have started making plans for the construction of a heat network. Then this later came to the attention of Stadwerk072 and now they are also involved (Project Leader City Management)	
Role of government	Someone from the municipality from the Transitie Visie Warmte is involved, but otherwise the municipality remains more in the background (Coordinator Soil and Subsoil Municipality).	Market
Direction of authority	A plan has been made of where HVC can lay their pipes, but they must be sure they will have enough clients (Senior Advisor City Management).	Market
Power	HVC is in charge of the heat network and ultimately determines the exact location of the heat network. This is of course done in consultation, because there must be room for it in the underground (Senior Advisor City Management).	Market
Dominant actor type	The municipality is of course not a business party. HVC is not quite that either, because it also all has shareholders from governments (Senior Advisor City Managment).	Network
	Stadswerk is the project leader in Huiswaard. Someone from the municipality from the Transition Vision Warmte is involved, but the municipality remains more in the background. Stadswerk072 receives a budget from a municipality. They are then in the lead of the project, but when the budget runs out, it is gone. Because money plays a major role, mitigation seems to go faster than adaptation (Coordinator Soil & Subsoil Municipality).	
	The project leader from Stadswerk collects all information and communicates with all parties involved in this project (Project Leader Municipality).	
Knowledge	We do have the climate maps for flooding and heat stress, so there is sufficient information (Senior Advisor City Management).	Network
	That is something we are also working on with the region, to ensure that more people in the municipal organizations have knowledge of climate adaptation (Senior Advisor City Management).	
Choice of actors	Climate adaptation has not yet been included here, because Stadswerk072 does not have a budget to include climate adaptation in Huiswaard as a task (Coordinator Soil & Subsoil Municipality).	Market
	Climate adaptation is in the public interest and must come from the municipality, since commercial companies will not go green so quickly on their own. Climate adaptation is less tangible than, for example, a business case for a heat network. They are then in the lead of the project, but when the budget runs out, it's gone. Because money plays a major role, mitigation seems to go faster than adaptation (Coordinator Soil & Subsoil Municipality).	Market
Policy instruments/ steering	I wanted to know if we could still apply for a subsidy. There is a subsidy from the government and I actually wanted to see if we could apply for it for Huiswaard (Senior Advisor City Management).	Market
Actions	So I have also consulted with someone from the municipality who is working on the energy transition or with the heat vision for Alkmaar. The people from the energy transition department know where to find me and we also know where to find the people from the energy transition (Senior Advisor City Management).	Network
	There is consultation with all parties that carry out tasks in the subsurface. So HVC, housing associations and Leander. I'm there sometimes too (Senior Advisor City Management).	Network
Conflict Resolution	Then I heard one party say that they weren't going to do something, and the other party wasn't among them. Or I wasn't there at that meeting. At one point I informed Stadswerk about this and said that we should start talking to each other better. Then the project leader of Stadswerk and his manager talked to HVC and they came out fine. So the solutions are ultimately to sit down with each other and think about what the problem is and what the different parties want (Senior Advisor City Management).	Network

Figure 4.6: Governance Mix Huiswaard

HVC installs the heat network if it has enough customers to connect to. HVC decides where the heat network will be installed and when. Stadswerk072 is implementing climate adaptation measures if it has enough budget to do this. This makes that this project contains a lot of characteristics of the governance mode market. However, Stadswerk072 and HVC both have governments as shareholders of their company and keep each other updated through meetings. When there are conflicts, the parties resolve them by talking to each other. Making that this project also has characteristics of the governance mode network.

4.4. Case 4. Vruchtenbuurt - The Hague

This paragraph describes the Vruchtenburt case in The Hague. Section 4.4.1 describes the case and explains the successive events in this project. By analysing information from documents and interviews, the governance approach is identified in this project and can be found in section 4.4.2.

4.4.1. Description Case

The Vruchtenbuurt is different from other projects as the residents' cooperation is in the lead. The initiative for the heat network came from a group of residents in the neighbourhood. They are responsible for communicating with their fellow residents. Financially, this project has been given a boost by the ELENA fund, a European subsidy that has been applied for by the Province South Holland and this is being used to hire consultants and to do research for the heat network. Thanks to the ELENA fund the residents' corporation is better able to stay in the lead for the construction of the heat network, because they can hire these external advisory companies that will advise and support the corporation.

The heat network will be realized by the drinking water company Dunea and the network operator NetVerder. The residents' association has approached Dunea and NetVerder itself. A letter of intent (intentieovereenkomst) has been signed for the Vruchtenbuurt by the municipality, Dunea, the residents' cooperative Cooperatie Duurzaam Vruchtenbuurt and NetVerder. This means that the collaboration for the construction of the heat network in the Vruchtenbuurt has now been formalised. The municipality has been affiliated with the Vruchtenbuurt for two years now and has a supporting role. The municipality has hired an engineering company called IF Technology, to look into net heating possibilities in the Vruchtenbuurt.

The fact that the municipality is more in the background in this project does not mean that their role in the subsurface is changing. The role in the subsurface is the same for them as that of a project where the municipality does have a leading role. This is because the municipality has to issue permits for the subsoil. The municipality stays in charge and can reserve space in the subsoil by issuing permits.

The drinking water company Dunea is involved in the project because they saw opportunities to make better use of the energy from their drinking water pipes. The network operator NetVerder is part of the Stedin Group that focuses on heating. NetVerder, together with municipalities, looks for partners who can supply heat to districts. The municipality is also a shareholder in NetVerder and is therefore an important provider of money to the company. NetVerder is of the opinion that a heat network should be public property. It is a non-profit organization and they believe that a heat network should work with a public model. In the Vruchtenbuurt, together with Dunea, they are responsible for the construction of the heat network and they will look together at how they will technically install the heat network. Dunea's water pipes will be the source for the heat network and NetVerder is responsible for transporting the heat to the houses in the neighbourhood.

The various parties communicate with each other during project meetings. The steering party in this project is the residents' association Coorperatie Duurzaam Vruchtenbuurt. A project leader has even been appointed from the cooperative. The municipality is the supporting party in this project and focuses on participation and communication. The parties have been working together for some time and this makes communication easier.

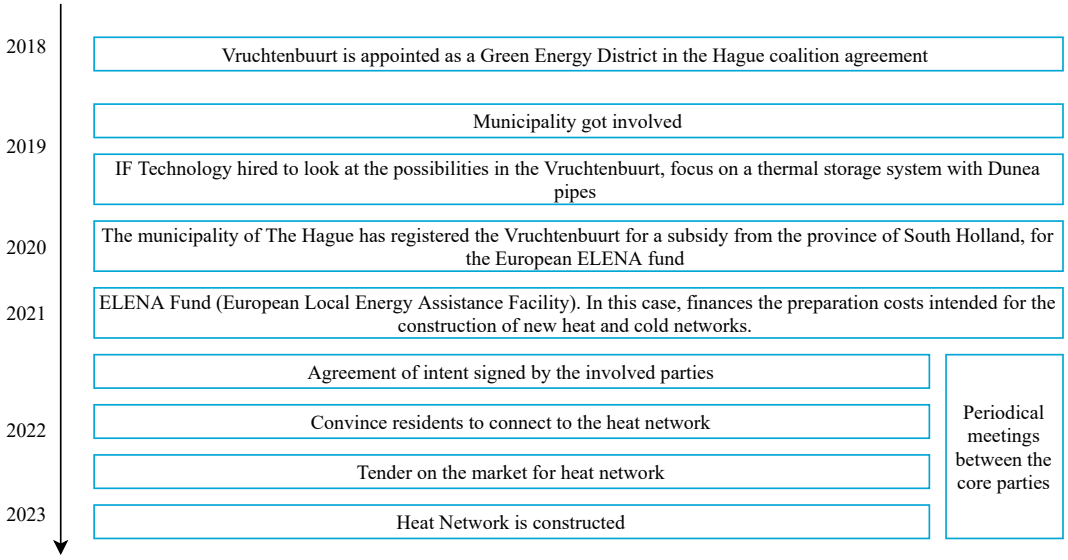

Figure 4.7: Timeline Case Vruchtenbuurt

What is going to be difficult in the project is the participation plan. There are many private homes in this district and all these residents must separately agree to switch off natural gas. It will therefore be important to know what can convince these residents to switch to the heat network. They should discover what will stimulate them cooperate. But this will be looked at later on in the project and we will have to wait and see what input the residents give. This project is fully focused on the installation of the heat network and the parties probably will integrate other issues if it helps to stimulate the residents to cooperate. Figure 4.7 shows the timeline of the case Vruchtenbuurt.

4.4.2. Governance Mix Case

The governance characteristics or processes (Table 3.3) of the case Vruchtenbuurt were linked to one of the governance modes based on Table 2.4 in Section 2.2.4. Figure 4.8 shows an overview of the governance processes and characteristics in the Vruchtenbuurt and the belonging governance modes. This together forms the governance mix of the Vruchtenbuurt.

This project knows a lot of characteristics of self-organization. The residents initiated this project and are in the lead. The resident's association of the Vruchtenbuurt wants to make their neighbourhood more sustainable. The municipality has a facilitating role and stays more in the background in this project. Dunea and NetVerder are also involved and signed a collaboration agreement together with the resident's association and the municipality. They have been working with each other for a long time and have meeting in which they discuss whose getting which task for this project. An engineering firm was hired to look for the best option for heating the houses in a more sustainable way. The instruments used for this project are a subsidy (market mode) and permits (hierarchy mode). The project received a subsidy to do research on the heat network and to hire advisory companies. Even though the municipality is not in charge in this project, it can still steer through permits.

Governance Characteristics	Quotes Interviewees	Governance Mode
Motive of subordinate actor	The residents' cooperative has a sustainability ambition. They do a lot with shared cars, greenery, climate adaptation and also many things in the field of electricity (Project Manager Municipality)	→ Self-organization
	NetVerder is not for profit, they want to play an independent role (Project Developer Network Operator)	
Initiating and implementing actors	The municipality has been affiliated with the Vruchtenbuurt for two years now (Project Manager Municipality).	→ Self-organization
	NetVerder is involved in the Vruchtenbuurt in The Hague and, together with Dunea, will ensure the construction of the heat network there. Dunea handles the source (WKO) and NetVerder provides the connection to the houses (Project Developer Network Operator).	
	IF technology [engineering firm] is hired by us. (Project Manager Municipality)	
Role of government	The municipality supports this neighborhood initiative. We as a municipality provide support where necessary, for example financially and sometimes legally (Project Manager Energy Transition Municipality). The municipality is consciously restrained because it is nice that an initiative comes from the residents (Project Developer Network Operator).	→ Self-organization
Direction of authority	The Vruchtenbuurt is slightly different from other projects. Here the residents' association is in the lead. The initiative came from the residents (Project Developer Network Operator).	→ Self-organization
Power	The residents' cooperative does a lot and receives support from about ten projects from the residents of the neighbourhood. This is a high percentage. It is by no means all the people in the neighbourhood, but ten percent of the people contribute in some way (Project Manager Municipality).	→ Self-organization
Dominant actor type	The steering party is the residents' association. There is also a project leader from the corporation (Developer Water Company).	→ Self-organization
Knowledge	IF Technology that hired by us. As a municipality, we designated certain areas in The Hague as the focus areas three or four years ago, where we looked at what was really possible in the field of sustainable heat. And we wanted to do that, partly through technical studies where we sketch a scenario. And it turned out that a heat network is the best option here... In addition, we have also done some studies on the lack of space in the subsoil, because it is fairly busy in the subsoil of The Hague (Project Manager Municipality).	→ Hierarchy
Choice of actors	Then there must be resources for that, because that money has to come from somewhere. If we don't have the resources for climate adaptation, then the road will be placed back exactly as it was before (Project Manager Municipality)	→ Market
	Together, we have been working on this project for some time now (Developer Water Company).	
	NetVerder is not for profit, they want to play an independent role... We do this in collaboration with municipalities. The municipality is also a shareholder in NetVerder. The municipality is therefore an important provider of funds and that is why we take what the municipality wants into account (Project Developer Network Operator).	→ Network
Policy instruments/ steering	So we applied for and received a ELENA subsidy, together with the province, and that subsidy means that in a three-year period we will have 300000 euros for the preparation costs. So to do studies, to have the meetings, to motivate people. Everything you have to do in the preparation phase. And from there we can also hire people, We have now hired a communication and participation agency (Project Manager Municipality).	→ Market
	The role of the municipality in the underground will not change. The role in the subsurface for me now is the same as I would pull the whole project. This is because we as a municipality have to issue permits for the subsurface. So if you are talking about how you can reserve space in the underground, there are several ways to do it (Project Manager Municipality).	→ Hierarchy
Actions	Project consultations are held at least once a month with Dunea, NetVerder, the municipality and the residents' association (Board Member Residents' Associations). We have a structural meetings with all partners of the project, where we also agree on which party will take on what task (Project Manager Municipality).	→ Network
	To formalise the collaboration, a collaboration agreement is signed by the municipality and the other parties (Project Manager Municipality).	→ Network
	The most difficult part of this project is to get people involved voluntarily for the construction of the heat network. In doing so, you have to assess how the residents feel and what they need from us to make the consideration. You should ask that question to as many residents as possible. At the beginning of next year, we want to have 500 residents together who agree to be connected to the heat network. For that we have to inform people on the streets and inform people at residents' evenings... In the Vruchtenbuurt there is a lot of private house ownership and without the resident's association it is difficult for the municipality to get residents to participate. You cannot just get a resident to do things to their house and this is necessary for the energy transition to succeed. You have to let the residents have their say (Board Member Residents' Association).	→ Self-organization
Conflict Resolution	We have a work plan together in which we record tasks. During such a meeting, something is always discussed, but so far everyone has dealt with it very easily (Projet Manager Municipality).	→ Network

Figure 4.8: Governance Mix Vruchtenbuurt

4.5. Summary Governance Cases

In the first case the governance mode Hierarchy is the dominant governance mode. After adding climate adaptation to the scope of this heat transition project, the dominant mode of governance shifted to Network. In the second case Network is the dominant mode of governance. In this case measures were taken to improve the network structure, like using an independent process coordinator and having a space to meet all the parties (network). The dominant governance mode of the third case was Market. The market parties are controlled by price and negotiations. They are especially dependent on their business case. The dominant governance mode of the last case is Self-organization. The residents are in the lead for the construction of the heat network and the municipality has a facilitating role in this case. The residents received money from a subsidy to keep being able to be in charge. The municipality maintained control of the subsoil by granting permits (hierarchy).

5

Evaluation Performance Cases

In Chapter 4 the governance characteristics and processes of the cases are considered. It appears that all four cases have a different governance mix. In this chapter, the cases will be analysed by looking at their avoidance, alleviation and anticipatory practices. Avoidance practices are actions that prevented the integration of heat transition and climate adaptation measures. To mitigate avoidance practices, alleviation practices were taken in the cases. To prevent avoidance practices from happening, anticipatory practices were apparent in some cases. The first section, Section 5.1, lists these practices. In the second section, Section 5.2 the avoidance, alleviation and anticipatory practices are related to the governance of the cases.

5.1. Avoidance, Alleviation and Anticipatory Practices

The first part, Section 5.1.1, sums up the avoidance practices found in the cases of this research, Section 5.1.2 the alleviation practices and Section 5.1.3 the anticipatory practices.

5.1.1. Avoidance Practices

Using documents and quotes from the interviewees, so-called avoidance practices can be identified. These avoidance practices are things that prevented the integration of heat transitions and climate adaptation. In the cases, several things made it difficult to enable integration.

The negative conditions described in Section 2.1 seem to be mostly related to financial resources, knowledge, time, involved parties and organization. Therefore, the avoidance practices in Figure 5.1 are also divided into the same groups. In Figure 5.1 from the left column to the right, first the groups are noted, then the avoidance practices, then the quotes of interviewees about avoidance practices, then the belonging case together with the dominant governance mode of that cases.

Subject	Avoidance Practice	Quotes Interviewees	Case	Dominant governance mode
Financial Resources	No budget	The subsidy was necessary to make the project happen (Sustainable Designer Municipality). We just did not have the resources at the time (Director Heat Company)	Paddepoel	Hierarchy/ Network
		Climate adaptation is not yet included here, because Stadswerk072 does not have a budget to include climate adaptation in Huiswaard as a task (Coordinator Soil and Subsoil Municipality)	Huiswaard	Market
		The municipalities would have to pay for that, we do not have the financial resources (Board Member Residents' Association)	Vruchtenbuurt	Self-organization
	No integration of budgets	One of the biggest barriers to an integrated approach is money. We are not able to bring different budgets together in a creative way (Project Leader Municipality).	Paddepoel	Hierarchy/ Network
		What you notice in such a process, is that if you both have your own budget and also both have your own project leader, that they sometimes disagree about what falls within what budget. For example, if there are setbacks or surpluses, what budget does that fall into (Director Heat Company)?	Paddepoel	Hierarchy/ Network
Knowledge	Big role organization specialised in only one transition	The contractor with an understanding of pipelines now got the responsibility for the public space (Project Leader Municipality). They did not have the expertise to implement all these climate adaptive measurs (Director Heat Company).	Paddepoel	Hierarchy/ Network
Time	Precedence in transition	This is a field of tension, in which the various tasks at hand must be taken into account at the front end of the design of a neighborhood. Climate adaptation is sometimes forgotten. Often mitigation comes before adaptation. So first we look at how the heat network will be integrated and only then whether there is still room for climate adaptation (Coordinator Soil and Subsoil Municipality).	Huiswaard	Market
	Fear of delaying other parties	I'm not going to slow them down, I'm not going to make everyone stand still because I have to stand still. For example, I may be weather dependent with my work and they may not (Project Leader Municipality).	Kruidenbuurt	Network
		We don't want to cause delays in the Vruchtenbuurt. I sometimes try to slow down the integral approach to projects in the Vruchtenbuurt. This project needs to be accelerated and should not be delayed due to the deadline of the ELENA subsidy (Project Manager Municipality).	Vruchtenbuurt	Self-organization
	High project schedule drive one transition	Warmtestad was not happy with this, this expansion of the assignment. It would entail extra costs and they had to continue with their planning as well (Sustainable Designer Municipality). The municipality had no specifications yet and had not yet worked out their plans. There was some tension in the sense that WarmteStad has to speed up and has a certain schedule. WarmteStad also has obligations to their clients, we have to supply buildings and we cannot afford to take too long to do this (Director Heat Company).	Paddepoel	Hierarchy/ Network
		This project should not be delayed due to the deadline of the ELENA subsidy (Project Manager Municipality).	Vruchtenbuurt	Self-organization
	Schedules cannot be aligned due to variety in lead time	The municipality could tackle the entire public space in eight months, while the installation of the entire heat network would take a few years (Project Leader Municipality)	Kruidenbuurt	Network
	Starting collaborating at a later moment in time	So looking for that commonality even more and start a little earlier with collaborating. In this project this has turned out differently, we were not that far yet. (Consultant Management Housing Association).	Kruidenbuurt	Network
		Climate adaptation is not yet included here, … Woonwaard is already further advanced in its plans in this project (Coordinator Soil and Subsoil Municipality).	Huiswaard	Market
Actors	No willingness to integate plans	People are used to doing things the way they always do and with an integrated approach you have to work a little differently than most people are used to. People find it complicated, so you encounter quite a lot of resistance if you want to do these kinds of things (Project Leader Municipality).	Paddepoel	Hierarchy/ Network
		A lot of things are already going on and it is then difficult to bring up climate adaptation as well, because these parties are not waiting for that (Coordinator Soil and Subsoil Municipality)	Huiswaard	Market
	Private parties do not feel and do not want to be responsible for the public space	We were not called upon to solve climate adaptation issues. We at WarmteStad are not familiar with that and we do not want to be held liable if things go wrong with the road (Director Heat Company).	Paddepoel	Hierarchy/ Network
		But the municipality itself comes up with its plan for the public space and its green implementation. That is really the job of the municipality (Consultant Management Housing Association).	Kruidenbuurt	Network
		If HVC gets to work, it is almost automatically assumed that Stadswerk will pay for the layout of the ground level. While, of course, the advantage of linking these tasks together is that you jointly bear the costs (Senior Advisor City Management)	Huiswaard	Market
	Dependencies on external stakeholders	But coordinating with Enexis is sometimes difficult, because that is of course another party with its own plans and ideas... Yes, my experience is that they are not that flexible and this also has to do with the capacity. They are working in many neighborhoods to make them more sustainable, so they do not have the capacity to be flexible... Because they are just very busy, it is a capacity problem. And that's why it's not possible to coordinate that completely (Consultant Management Housing Association)	Kruidenbuurt	Network
		Occasionally, a project for construction of a heat network is suddenly started somewhere that was not in the earlier plans. At that moment you actually have too little time to make good plans for climate adaptation... Huiswaard is a good example where we should have known it earlier. I knew the project was coming, but if we had known that one or two years earlier, we could have coordinated some things... When a project leader from Stadswerk hears about a project like this, it's actually already too late. (Senior Advisor City Management)	Huiswaard	Market
		For the construction of a heat network, you are subject to a certain time schedule. You don't know when you'll get it done, because the residents have to be ready to participate. That is quite difficult... We are still busy looking at how we can convince people to connect to a heat network and how we can get companies to install the heat networks. (Project Manager Municipality).	Vruchtenbuurt	Self-organization
	No party coordinating communication between parties	And I must say that there is also a communication aspect to it. I do notice that there is a lack of direction (Senior Advisor City Management).	Huiswaard	Market
	Parties not used to working with eachother	If as a party you have to do something alone, then everyone can do their own thing and then there is no problem. But if you are going to refurbish an entire neighborhood, you have to work together. Then you simply notice that the parties do not speak the same language. They have to get used to each other and that takes time. That takes time, especially in the preparation (Project Advisor Heat Company).	Kruidenbuurt	Network
Organization	Municipality gives external parties sectoral assignment	The assignment that the municipality has given WarmteStad is very one-sided, it concerns the construction of the heat network and the location of the network... Installing the heat network and then repairing the pavement again (Sustainable Designer Municipality).	Paddepoel	Hierarchy/ Network
	Liability	We at WarmteStad are not familiar with this and we also do not want to be held liable for the consequences if things go wrong with the road (e.g. cracks) (Director Heat Company).	Paddepoel	Hierarchy/ Network

Figure 5.1: Avoidance Practices

No budget
Having no budget to integrate plans is an avoidance practice that is experienced in multiple cases with different dominant governance modes. Also in the literature (Section 2.1.1) it was noted as a negative condition for integration. Albers et al. (2020) and Brinkhof (2020) noted that the absence of financial resources forms a barrier to the integrated approach. Considering the contexts introduced in Section 2.2.7, this is a problem that appears in the multi-actor interaction process context when in the policy context no budget is cleared for certain climate change plans.

Paddepoel - dominant mode Hierarchy/ Network: In Paddepoel the municipality only later in the project realized that climate adaptation should be taken along in the plans, they did not have budget for this measures.

Huiswaard - dominant mode Market: The same situation is apparent in Huiswaard. The city management company does not always have the budget to improve the design of the public space and to add climate adaptation measures. In the policy context the municipality should create budget for climate adaptation in order to make climate adaptation happen in a later context. Private parties are not always willing to invest in climate adaptation measures in the public space.

Vruchtenbuurt - dominant mode Self-organization: In the Vruchtenbuurt the municipality will have to be willing to make money available for climate adaptation when the heat network is installed to make integration possible.

Integrating budgets
Integrating budgets is an avoidance practice that was apparent in the case of Paddepoel. In the literature the separation of budgets is seen as a problem. Hamers et al. (2021) see the compartmentalization of financial resources work is a negative condition for finding cohesion between different sectors.

Paddepoel - dominant mode Hierarchy/ Network: In the case of Paddepoel, the heat network company and the municipality worked closely together during this project, however they kept both their budgets separated. The heat network company kept their budget for the heat network and the municipality used the subsidy for climate adaptation. During this project this led to some disagreements about what costs fell in what budget. During this project, the characteristics of the governance mode went from mostly hierarchical to network. The heat network company and the municipality had not jet adjusted in this project to this new close collaboration.

Big role for organization specialized in only one transition (and lack of experience with other transition)
This avoidance barrier relates to the avoidance barrier 'Municipality gives external parties sectoral assignment'. In the specific context, introduced in Section 2.2.7, the objectives of projects are established. Based on these objectives, parties are involved. If the municipality gives an external party a sectoral assignment, this works through in the multi-actor interaction process context in the involved actors and their roles. If in the policy context and in the specific context integration of transitions is not stimulated, it will get more difficult to still combine assignments in the multi-actor interaction process context.

Paddepoel - dominant mode Hierarchy/ Network: In Paddepoel, the heat network company had the directing role over the project. This company was specialised in the construction of heat networks, but did not have any knowledge about climate adaptation. The contractor was also specialised in the construction of heat networks. This contractor was already hired before it was decided that climate adaptation would become a part of the project. In the beginning the project of Paddepoel showed a lot of characteristics of the governance mode 'Hierarchy' and the project had a technical focus. This lack of knowledge of climate adaptation led to some problems of liability and a new contractor had to be hired, delaying the project.

Precedence in transitions
Precendence in transition is noticed in Huiswaard in the multi-actor interaction process context, but could be created in the policy context when one transition gets less attention in policy objectives or when no budget is created.

Huiswaard - dominant mode Market: Interviewees from the case Huiswaard see that mitigation measures like the construction of a heat network often comes before climate adaptation measures. First the location of the heat network is established and then it is decided if there is still room for climate adaptation. Knowledge about climate adaptation is not widely spread within the municipality and City Management. Climate adaptation measures like adding trees and green in the public space cannot directly generate money for market

parties. If one transition is seen as more important than the other, parties see no reason to add the other transition to their project scope. The parties fully want to focus on the transition that is seen as most important, and do not seek for opportunities for synergies.

Fear of delaying other parties
Schedules of different assignments can vary. Some schedules cannot be aligned due to the variety in lead time and some projects are more dependent on external circumstances. When there is 'Precedence in transitions', it may be that parties fear to delay the transition that is seen as more urgent or important.

Kruidenbuurt - dominant mode Network: The municipality can for example be weather dependent with their work in the public space and does not want to delay their partners, the housing associations, in the construction of the heat network. This fear of delaying other parties can be caused by the precedence in transitions. The construction of the heat network is seen as more important and cannot be delayed.

Vruchtenbuurt - dominant mode Self-organization: The construction of the heat network in the Vruchtenbuurt cannot be delayed, so the municipality does not want to add an extra task to the construction of the heat network. The market instruments the ELENA subsidy has the condition that the investment orders must be completed within three years of the granting of the subsidy. This strict deadline means that the full focus is on implementing the heat network and that there will be no experimentation with adding extra assignments.

High project schedule drive one transition
According to literature, lack of sufficient time can have a restrictive effect on combining the challenges of climate adaptation and the energy transition (Brinkhof, 2020). In the cases Paddepoel and the Vruchtenbuurt this was also noticed.

Paddepoel - dominant mode Hierarchy/ Network: The heat network company in Paddepoel wanted to install the heat network as quickly as possible. They had a high project schedule drive, because they had to connect the network in time to their future customers. Adding climate adaptation would lead to delays in this case, because the plans for climate adaptation measures were not ready. In the specific context, integrating plans for the heat transition with climate adaptation plans was not considered an objective. Adding climate adaptation to the project scope in the multi-actor interaction process context is possible, but barriers like this will be encountered. Delays would make the project more expensive. The heat network company is a market party and is expected to not make a financial loss.

Vruchtenbuurt - dominant mode Self-organization: The construction of a heat network is an expensive operation and the residents cannot pay for this themselves. They need a market instrument to continue the project. The financial support from the subsidy allows the residents' cooperative to remain in the lead. The ELENA does however gives the project a strict deadline. The construction must start after three years of receiving the subsidy, This hierarchical rule gives the residents' cooperation less space to experiment with integrating other issues. The subsidy forms a barrier for integration. There full focus is on the construction of the heat network.

Schedules cannot be aligned due to the variety in lead time
Sometimes schedules cannot be aligned due to the variety in lead time. The timing must be right for various parties (Dignum et al., 2021), as said in Section 2.1.1.

Kruidenbuurt - dominant mode Network: The municipality in the Kruidenbuurt can finish the redevelopment of the public space (adding more green, parks, parking spaces and one-way traffic) in eight months, while the installation of the entire heat network here can take a few years. It is hard to align these schedules.

Starting collaborating at a later moment in time
When starting collaborating at a later moment in time, parties may have to get accustomed and sharing plans can be to late to still adapt to each other. The avoidance barrier 'No party coordinating communication between parties' can precede this avoidance practice. If parties are not communicating opportunities for integration can be missed.

Kruidenbuurt - dominant mode Network: The Kruidenbuurt is the first neighbourhood in Tilburg where so many parties come together to make the neighbourhood more liveable and sustainable. These parties are not yet fully accustomed and attuned to each other. The heat network is already being installed here, so no large changes will be possible in their planning and in the location of the heat network. If plans are shared before the beginning of the construction phase, the parties can also get used to each other a bit and adjust better to the plans of the other parties.

Huiswaard - dominant mode Market: In the case Huiswaard, the housing association and the heat company were already making plans for the heat network and city management became involved only later. As a result, no plans were yet ready for the redesign of the public space. This makes it really hard to combine the construction of the heat network with the redesign of the public space. After constructing the heat network, the road will be placed again, without changing anything at ground level. Parties should now where to find each other to be able to share plans.

No willingness to integrate plans
If people are not willing to work integrally, this can have a restrictive effect on the integration of different sustainable transitions. According to literature people could fear that the process will become too complex if too many assignments are linked together (Uyterlinde et al., 2019).

Paddepoel - dominant mode Hierarchy/ Network and *Huiswaard - Market*: In the cases Paddepoel and Huiswaard interviewees saw that parties in general want to focus on their own project within a neighbourhood. Parties do not always agree to considering climate adaptation in projects. They have to consider a lot of parties in the subsoil and climate adaptation would then be an extra assignment to consider, making it more difficult. Sometimes even within the municipality not everyone has a positive towards the plan to combine work of multiple departments in one project.

Private parties do not feel responsible for the public space
The responsibility of the public space is seen as the task of the municipality. Companies do not specialize in this.

Paddepoel - dominant mode Hierarchy/ Network: In Paddepoel, the heat network company had the directing role over the whole project and kept this role after the addition of climate adaptation to the scope, because of the advantageous stage of the project at that moment. However the heat network company did not want to be responsible for the climate adaptation measures, as their company's main activity is the installation of the heat network. The heat network company was founded to construct heat networks and not to install climate-adaptive measures that are necessary in the neighbourhood. They have specific technical knowledge about heating houses and not about the design of public space.

Kruidenbuurt - dominant mode Network: Also in the Kruidenbuurt the housing associations priority is not climate adaptation.

Huiswaard - dominant mode Market: An employee at city management at Huiswaard noticed that other parties assume that city management pays for the ground level. No joint budget is made and city management is not seen as an equal party. The private parties are not dedicated to to achieve climate adaptation objectives.

Dependencies on external stakeholders
Because of the dependency on external stakeholders, parties cannot make reliable long-term plans and it makes them less flexible to adjust plans later in the process.

Kruidenbuurt - dominant mode Network: In the Kruidenbuurt, to combine the construction of the heat network with the construction of climate adaptation measures, the municipality and the housing associations should coordinate and align each other's plans. However, the housing associations are dependent on the heat company for the construction of the heat network. The heat company is less flexible, as they do not have the capacity to be flexible. The planning for the construction of the heat network cannot be adjusted at this moment in time. In the Kruidenbuurt a lot of parties work together in a network and are dependent.

Huiswaard - dominant mode Market: The case Huiswaard has a lot of Market governance characteristics. As noted in Section 2.2.2, a drawback of the mode 'Market' is that it is based on the idea of competitive market. The core parties in this case are dependent on their customers and business case. The heat network in Huiswaard is constructed if the heat company has enough customers to connect to, because the company must gain material benefit. When and if residents agree to a connection to the heat network is unpredictable and makes it hard to align the redesign of the public space with the planning of the heat company. They cannot make a precise planning far ahead. Because of their dependence on the customers (and business case) integration becomes more difficult.

Vruchtenbuurt - dominant mode Self-organization: In the Vruchtenbuurt most houses are privately owned. Making a planning for the construction of a heat network is even more difficult when there are a lot of private house owners. A large part of the house owners has to agree with connecting to the heat network for the

heat network to be constructed. Insecurities in the time planning makes it difficult to connect to other assignments and plan ahead. The Vruchtenbuurt is largely dependent on self-organization of the residents. Enough residents must be involved in the construction of the heat network for it to succeed and this is difficult.

No party coordinating communication between parties
To integrate plans, different parties have to communicate and share their plans.

Huiswaard - dominant mode Market: An interviewee noted that the municipality does not take sufficient control. Plans of different parties are not communicated properly. There should be a party coordinating the network and make sure the assignments align well. The core parties in this case do not form a network, as they do not perform negotiation processes to synchronize (competing) goals and agendas on a regularly basis. The municipality only later heard of the plans for the heat network, that was going to be installed in Huiswaard.

Parties not used to working with each other
When parties are not used to working with each other, they may need some time to get acquainted.

Kruidenbuurt - dominant mode Network: The parties working in the Kruidenbuurt on the heat network and working in the public space are not yet fully accustomed and attuned to each other. They have only just started working together, so this neighbourhood could be seen as a pilot project for these parties (even though it is not officially connected to the pilot project PAW or pilot projects for climate adaptation, described in Section 4.1.1, as in Paddepoel). The hybrid governance mix of the project of making the Kruidenbuurt more sustainable and climate resilient is getting more characteristics of the governance mode 'Network'. Parties have to adjust to this close collaboration with multiple parties.

Municipality gives external parties sectoral assignment
If the municipality gives an external party a sectoral assignment, the project is dependent on certain alleviation practices to still become an integrated project. If in the policy context and in the specific context integration of transitions is not stimulated, it will get more difficult to still combine assignments in the multi-actor interaction process context.

Paddepoel - dominant mode Hierarchy/ Network: The municipality gave a market party the sectoral assignment to construct a heat network. This party did not look for integration, because the municipality did not gave them the assignment to do so. In this hierarchical top-down project, if the municipality does not have an integrated focus, it cannot be expected that subordinate actors will have an integrated focus. As noted in Section 2.2.2 of this report, the governance mode hierarchy assumes that the government clearly lays down the obligations for others (Molenveld, van Buuren Ellen, 2020). The heat network company would execute the assignment of the municipality and the original plan was for the municipality and the heat network company to not work together on this.

Liability

Paddepoel - dominant mode Hierarchy/ Network: In a network environment, liability can become a problem as multiple parties are involved in the same project. In the project of Paddepoel the company has indicated that it does not want to be responsible for climate-adaptive measures. The heat network company in Paddepoel is specialized in heating houses, but does not have knowledge about climate adaptation. The climate adaptation measures that were installed in Paddepoel have not been used often before and the risks of damage are less clear. Paddepoel does not want to be liable for this project.

5.1.2. Alleviation Practices

Using documents and quotes from the interviewees, alleviation practices can be identified. Alleviation practices are actions taken to mitigate the avoidance practices.Figure 5.2 shows an overview of the alleviation practices in the cases. The alleviation practices are also divided into practices related to financial resources, knowledge, time, actors and organization. In Figure 5.2 the first column shows the group, then the avoidance practices, quotes from the interviewees with the belonging case and dominant governance modes of the cases. The alleviation practices were found in the case Paddepoel and in the case Kruidenbuurt, because in these cases a degree of integration occurs. These two cases both contain a lot of governance characteristics and processes of the mode network.

Subject	Alleviation Practice	Quotes Interviewees	Case	Dominant governance mode
Financial Resources	Receiving a subsidy	We received that subsidy and on the basis of that subsidy we have obtained resources to also implement measures for climate adaptation in the street. Without this subsidy from the ministry, this project would not have succeeded in linking climate adaptation to making this district gas-free (Sustainable Designer Municipality).	Paddepoel	Hierarchy/ Network
Knowledge	Documents showing urgency transition	We had already made a climate stress test with the Climate Adaptation Department at the Municipality of Groningen, in 2018 for the entire Municipality of Groningen and the results were already there (Sustainable Designer Municipality).	Paddepoel	Hierarchy/ Network
	Contractor with knowledge about public space	What we are going to do now in the future is turn it around. We are now awarding the contract to a contractor who is good at designing public spaces and who is looking for a contractor for the heat network (Project Leader Municipality).	Paddepoel	Hierarchy/ Network
Time	Flexibility of actors	People need to be just a little more flexible than usual... You need different people from different departments who ... need to have some flexibility in their programs and how they work. So you need passionate people who find these kinds of projects important (Project Leader Municipality).	Paddepoel	Hierarchy/ Network
		As a housing association, we could be a bit flexible with our plans, if the municipality asked. To make it fit better (Consultant Management Housing Association).	Kruidenbuurt	Network
Actors	People willing to look beyond their own expertise	In addition, you have to have people who want that. Who think it's important that it happens (Project Leader Municipality). The key to the ultimate success for integration in this project is therefore the people who see the opportunities and seize it... In fact the main reason that climate adaptation is included in the plans for the Paddepoel district is because an individual policy officer from the municipality of Groningen has fought very hard for this (Sustainable Designer Municipality).	Paddepoel	Hierarchy/ Network
		You have to look beyond your own limits, otherwise you won't get there. So you should not only look at your own organization (Project Advisor Heat Company).	Kruidenbuurt	Network
	Project leader that guarantees integration	The Project Leader PACT approach is in the lead and keeps all parties together... So the project leader ensures that cohesion remains (Consultant Management Housing Association).	Kruidenbuurt	Network
	Neutral process manager that supports collaboration	We hired a planner for the meetings on neighbourhood level. You want to have a neutral process facilitator. Someone that guides the collaboration (Project Advisor Heat Company).	Kruidenbuurt	Network
	Actors have common interests and work together to a common goal	But then you also have to make sure that everyone stays connected and you have to keep them informed. Then it helps if you have a joint plan with a common goal and that everything you do should contribute to that goal (Consultant Management Housing Association).	Kruidenbuurt	Network
	Signed collaboration agreement	The municipality is also actively involved in the improvement and redevelopment of the public space in this neighbourhood. The three housing associations and the municipality have decided to work closely together in this neighbourhood, because they all have work to do here. To make this collaboration official, a collaboration agreement has been made up and signed by the parties. The municipality and the three housing associations now meet every three months to inform each other and coordinate each other's plans... Because the municipality had already started to collaborate with the housing associations from the beginning, the municipality knew at an early stage where the heat network would be located. This enabled the municipality to coordinate its plans at an early stage with the plans for the location of the heat network (Project Leader Municipality).	Kruidenbuurt	Network
		'You just need to have a number of documents in which you record the collaboration. Including agreements on what to do if someone deviates from agreements. And this doesn't have to be a legal document, but more of a plan with how you work together that everyone can adhere to (Project Advisor Heat Company).		
Organization	Municipality takes full liability	That is why the municipality now also bears the responsibility for this piece (Director WarmteStad).	Paddepoel	Hierarchy/ Network

Figure 5.2: Alleviation Practices

Receiving a subsidy

An important condition for realizing the integration of sustainable transitions is the presence of financial resources (Brinkhof, 2020). A subsidy can help with this.

Paddepoel - dominant mode Hierarchy/ Network: Both parties did not have the budget to pay for climate adaptation without the subsidy, but luckily a subsidy was available for climate adaptation pilot projects. In Paddepoel the municipality of Groningen obtained a subsidy of 1.25 million euros to connect climate adaptation measures to the construction of the heat network (FocusGroningen, 2019). This market policy instrument made it possible for them to experiment with taking adaptation measures at the same time as the construction of the heat network.

Documents showing urgency transition

If a party can prove that a neighbourhood is indeed experiencing some problems due to climate change, they could see the importance and the urgency of taking climate adaptation measures as well as mitigation measures.

Paddepoel - dominant mode Hierarchy/ Network: The climate adaptation department of the municipality in Groningen could prove to the other departments that Paddepoel had indeed a problem with extreme heat

and flooding (Steenbreek, 2020). The stress test showed the urgency of the climate adaptation measures. For example, the Plutolaan (in this street the heat network would be constructed) is the lowest point in the area and models predicted potentially more than 15 cm of water on the street (Snep et al., 2020). By using the network action 'providing information and knowledge' to the people working at the municipality about the effects of climate change, people will become more willing to look for opportunities to connect climate adaptation measures to the construction of the heat network. This helped to alleviate the avoidance practices and support could be created for the integration of plans.

Hire contractor with knowledge about public space

Paddepoel - dominant mode Hierarchy/ Network: In Paddepoel the municipality and the heat network company realized that hiring a contractor with knowledge about the public space works better than hiring a contractor with specialised knowledge in the construction of the heat network. The contractor for the public space can find a contractor to construct the heat network. The other way around, a contractor specialised in construction of a heat network finding a party to take care of the public space, did not seem to work that well. The contractor should not only have specialised technical knowledge, but needs a broader more socio-technical knowledge for the public space.

Ability of actors to be flexible

To integrate two or multiple projects, actors should have a more flexible attitude towards each other.

Paddepoel - dominant mode Hierarchy/ Network: In the case of Paddepoel, the heat network company showed some flexibility and waited for the municipality to finish their plans for the public space. They did this because the municipality and the heat network company are partners and because the municipality is a shareholder of the company. There more than one possible ways for a party to be able to be more flexible as a party and more reasons to have a more flexible attitude towards the other parties.

Kruidenbuurt - dominant mode Network: The housing associations in the case Kruidenbuurt want to be flexible to a certain extent for the plans of the municipality. The municipality shows some flexibility by drawing up a more flexible contract with the contractor for the redesign of the public space.

People willing to look beyond their own expertise

To make integrated plans succeed, people are needed that are willing to look beyond their own expertise and want to give the extra effort for a more complex solution. In literature the individual characteristics of key actors is seen as an important condition for integration (Broekhoven and van Buuren, 2020). According to Brinkhof (2020) there must be people willing to look beyond their own expertise.

Paddepoel - dominant mode Hierarchy/ Network: The reason that climate adaptation was considered in the case Paddepoel, is because one individual person saw a chance for integration. This person had the self-organizing ability to start this process. As discussed in Section 2.2.2, the mode Self-Organization assumes that actors feel a sense of urgency to act. In the case of Paddepoel an individual from the Climate Adaptation department made this extra effort for integration. It is crucial that there is someone within the organization who can convince colleagues to link different tasks of different departments (Snep et al., 2020). Next to this the department of Climate Adaptation of the municipality of Groningen was actively looking for connections with other departments (Platform31 Nyenrode, n.d.).

Kruidenbuurt - dominant mode Network: People should be willing to look at a particular project in a different way. In the case of the Kruidenbuurt parties found each other and almost by coincidence started to work together. These parties were able to look beyond their own goals and formed a joint goal of improving the neighbourhood. Now a new network structure is emerging here.

Project leader that guarantees integration

If a project leader has an integral focus, this could be really helpful to ensure integration.

Kruidenbuurt - dominant mode Network: The housing associations priority in the Kruidenbuurt is not climate adaptation. Climate adaptation is seen by many parties as the responsibility of the municipality. The project leader of the municipality should therefore ensures here that climate adaptation is taken along in the plans for making the neighbourhood more sustainable and liveable. This project leader could also be seen as a program manager, who keeps an overview of all assignments in a neighbourhood and coordinates the network. This project leader seems to go a step further than was expected of him (self-organization) so that integration was considered.

Neutral process manager that supports collaboration
As noted in Section 2.1.2, cooperation (Albers et al., 2020) and communication (Brinkhof, 2020) between the parties is important for integration. A neutral process manager could help with facilitating cooperation and communication.

Kruidenbuurt - dominant mode Network: A drawback of the mode Network is that it can be difficult to steer and coming to agreements can be hard (Keast, 2006). In the Kruidenbuurt multiple parties have started working together in a network to improve the Kruidenbuurt. These parties are not used to working together with each other. To get acquainted, periodic meetings are organized with all involved parties. A neutral process facilitator has also been hired at some meetings, who supervises and directs the collaboration in certain areas. Now this was often someone from the municipality, but it can also be someone from outside.

Actors have common interests and work together to a common goal
Forming a common goal that every part wants to contribute can improve collaboration between parties in a network.

Kruidenbuurt - dominant mode Network: In the Kruidenbuurt the municipality and the housing associations have a common goal and everything they do is intended to contribute to that common goal; increasing the quality of life for the people living in the Kruidenbuurt. The Kruidenbuurt is a deprived area and both the municipality and the housing associations are doing their best to work together to improve the quality of life here. Creating a common goal could be seen as a partnership building activity.

Collaboration agreement
Integration is not only about constructing at the same location at the same time, but is also about taking into account each other's plans. By taking each other into account, activities can alternate smoothly.

Kruidenbuurt - dominant mode Network: Because of the collaboration agreement that the parties signed in the Kruidenbuurt, plans and agreements could be made together. Permits for opening the road could also be issued more quickly by the municipality, because parties discussed beforehand who would work where on what in this neighbourhood. The collaboration agreement can promote the improvement of the social and physical living environment for neighbourhood residents (Tilburg Municipality, 2020). The action of signing a collaboration agreement is typical for the governance mode 'Network'.

Municipality fully liable
Private parties do not have knowledge about climate adaptation and do not feel responsible for taking climate adaptation measures in the public space.

Paddepoel - dominant mode Hierarchy/ Network: In a network environment, liability can become a problem as multiple parties are involved in the same project. It is hard to point out who is responsible if something goes wrong. In the project of Paddepoel the company has indicated that it does not want to be responsible for climate-adaptive measures. The municipality decided to take full liability over this project.

5.1.3. Anticipatory Practices

To prevent avoidance practices from happening, anticipatory practices were apparent in some cases. Figure 5.3 shows an overview of the anticipatory practices in the cases. The anticipatory practices are divided into practices related knowledge, time, actors and organization.

The list of anticipatory practices is smaller than the list of avoidance and alleviation practices. This can be explained by the fact that integration was not one of the first objectives of any of the projects. Avoidance practices already took place and alleviation practices made integration possible. Integrating transitions is still fairly new and has not always been established at a higher level in for example policies. Cases in which climate adaptation and the heat transition are integrated, are linked to each other by chance or in the case of Paddepoel and the Kruidenbuurt by someone who is willing and has the power to initiate integration. It is not mainstreamed in higher contexts. In Figure 5.3 the first column shows the group, then the avoidance practices, quotes from the interviewees with the belonging case and dominant governance modes of the cases.

Subject	Anticipatory Practice	Quotes Interviewees	Case	Dominant governance mode
Knowledge	Periodic meetings with all parties	So it was decided to work together even more intensively. Both the three corporations, the municipality and all other parties around it... The intention is to do it together as much as possible and to work towards a goal together.... And once a month there is a large meeting and all parties involved work together there. Then you can see each other and catch up, about what is going on and who is working on what (Consultant Management Housing Association).	Kruidenbuurt	Network
		We have had a number of sessions with about ten men and then you start puzzling over where the heat network should be located. The municipality will therefore consider whether they need to intervene above ground. For example, that a tree has to be removed and replanted elsewhere... We have made a schedule of all projects in the neighbourhood that are directly or indirectly connected... Aware of each other's activities and how the other's activities have an impact on yours. That works well... You are then in a room with 20 parties. Then you look at how you can realize the network and all other projects at the same time (Project Advisor Heat Company).		
Time	Flexible contract forms with private partners	We will work flexibly around it and integrate where possible. We will therefore also use a more flexible contract form with the contractor, because it is a lengthy process. This gives the us more freedom to look at a schedule together with the contractor and perhaps to change things during the work (Project Leader Municipality).	Kruidenbuurt	Network
Actors	Involving residents	That you do that together with the residents. The biggest pitfall is if you already make a plan and show the residents this plan... As a municipality you can do things, but the residents also have certain wishes about how they want to improve the quality of life in their neighbourhood. In Paddepoel we made a plan together with the neighborhood. (Project Leader Municipality). The fact that they are heard is an incentive to participate in the process and this creates a lot of acceptance. So that went very well in this project. (Director Heat Company). So the key to the ultimate success for integration in this project is… the process with the residents (Sustainable Designer Municipality).	Paddepoel	Hierarchy/ Network
	Joint space to collaborate	A work café is also organized once a month, where all parties involved work together (Consultant Management Housing Association).	Kruidenbuurt	Network
Organization	Top management supporting the plans	In Paddepoel, this was successful because ... we had a manager who supported our plans, the district alderman... Administrative decisiveness, you do need top management who want this (Project Leader Municipality).	Paddepoel	Hierarchy/ Network
	The municipality is in charge	With new projects, the municipality will take on the coordinating role and we will then be part of the integrated project. The municipality simply has to be the director in these types of integrated projects, that works better (Director Heat Company). Then we will be in charge and then WarmteStad will participate in our project (Project Leader Municipality).	Paddepoel	Hierarchy/ Network
	Having a joint risk-budget	A joint damage-pot has also been set up with the three housing associations. If damage occurs during the work and it is not clear who is to blame, it will be paid from the damage-pot (Project Leader Municipality).	Kruidenbuurt	Network

Figure 5.3: Anticipatory Practices

Periodic meetings with all parties

Kruidenbuurt - dominant mode Network: Since many tasks are running simultaneously and the parties may have to close roads, it can be very beneficial to coordinate each other's plans. The parties have decided that they can no longer work independently and have formed a network. By forming the network and structurally sharing plans, there are more opportunities for integration and the parties can take each other into account. Because these meetings are scheduled by default, other parties plans can be taken into account at an early stage and parties know better what to approach which party for.

Flexible contract forms with private parties

Kruidenbuurt - dominant mode Network: In the Kruidenbuurt the construction of the heat network will take longer than the redesign of the public space. To align the plans for the heat network and the public space, the municipality should be able to work in a flexible way and being able to adjust their plans when necessary. The municipality wants to adopt a more flexible attitude by drawing up a more flexible contract with the contractor. This hierarchical instrument gives the municipality the opportunity to adjust their plans during the project.

Involving residents

Involving residents seems to have a positive effect on their attitude towards the project.

Paddepoel - dominant mode Hierarchy/ Network: The project in Paddepoel for example experienced significant delays, however the residents stayed supportive because they were involved in the new design for the public space. The construction of the heat network has no influence on the appearance of a street, while taking climate-adaptive measures can have a positive effect on the public space (greenery/trees).

Joint space where parties can work together
A positive condition named in literature (Section 2.1.2) is the organization of events where actors can interact to realize integration of different issues (van Broekhoven and van Buuren, 2020).

Kruidenbuurt - dominant mode Network: In the case the Kruidenbuurt, a space is created where the different parties involved in the neighbourhood can work together and meet to share their plans and to communicate. This helps to strengthen the network and to find opportunities for integration.

Top management supporting the plans
Top management supporting integrated plans could convince people to take an integrated approach. Also in literature the importance of top management was mentioned. According to Broekhoven and van Buuren (2020) top management should dedicate time and energy to integrated projects.

Paddepoel - dominant mode Hierarchy/ Network: What helped to stimulate the employees of the municipality to continue the integrated project in Paddepoel is the support of the top management for the plans. The Alderman (wijkwethouder) gave orders for the parties to try and make the climate adaptation measures happen. Because of his position in the formal hierarchy, people listened to him. The support of top management played a big part in convincing people to take an integrated approach.

Municipality directing role

Paddepoel - dominant mode Hierarchy/ Network: While the project first was focused on technological knowledge, the knowledge needed for this project became more broad. The directing party was specialized in heat networks and did not have knowledge about climate adaptation. This is why the municipality took the directing role over the climate adaptation part. The municipality should have a directing role in projects where multiple assignments are integrated, as they have an overview of what is needed in a neighbourhood and they are seen as responsible for the public space. In the report of Platform31 and Nyenrode (n.d.) they also conclude that the municipality should be kept in charge in this kind of projects.

Joint risk budget

Kruidenbuurt - dominant mode Network: Liability can become a problem in 'Network' governance structures. The municipality foresaw that in the Kruidenbuurt this could also become a problem, as multiple parties were going to work on the same assignment. As also mentioned in Section 2.2.2, it is difficult to hold actors into account for things that are realized in collaboration (Meuleman Niestroy, 2015). To solve this problem, the parties decided to make a joint damage budget. If damage occurs and it is not clear which party is responsible, it can be paid from this budget. For this to be able the work, parties must trust each other. A strong network is needed.

5.2. Performance Cases

As earlier noted, the dominant governance mode of all four cases differs. Paddepoel could first be described as a rather 'Hierarchical' project, but after adding climate adaptation to the scope of this project the governance mode 'Network' became the dominant governance mode. Kruidenbuurt has a lot of characteristics of the governance mode 'Network'. Huiswaard has a lot of characteristics of the governance mode 'Market' and Vruchtenbuurt mainly has characteristics of the governance mode 'Self-organization'. This paragraph relates the anticipatory, alleviation and anticipatory practices to the governance of the cases.

5.2.1. Case 1. Paddepoel – Groningen

Initially, the case of Paddepoel's dominant mode of governance was hierarchy. The municipality gave a market party the sectoral assignment to construct a heat network. This party did not look for integration, because the municipality did not give them the assignment to do so. In this hierarchical top-down project, if the municipality does not have an integrated focus, it cannot be expected that subordinate actors will have an integrated focus or could act on it. The reason that climate adaptation was considered in this project, is because one individual person saw a chance for integration. This person had the self-organizing ability to start this process. However, it can be a long process for people to act and in some projects there may not be someone who feels the urgency to make connections between transitions. The project is dependent on decisions made by individuals who need to feel an urgency for integration. For the case in Paddepoel there was such an individual, and in this hierarchical environment a self-organizing element could alleviate the avoidance practice in the specific context.

People were not willing to integrate the plans at this moment in the project. The heat network company wanted to install the heat network as soon as possible, because delays would cost them money. However, because the alderman (wijkwethouder) was behind the plans of the municipality, the parties began to consider the addition of climate adaptation to the plans. Because of this position in formal hierarchy, people listened to him. The support of top management played a big part in convincing people to take an integrated approach. Next to this, a climate stress test could prove that taking climate adaptation measures was going to be very important to keep the neighbourhood live-able. By using the network action 'providing information and knowledge' to the people working at the municipality about the effects of climate change, people will become more willing to look for opportunities to connect climate adaptation measures to the construction of the heat network. This hierarchical (support top management) and network practices (sharing information and showing urgency) made people begin to consider adding climate adaptation to the scope. The heat network company showed some flexibility and waited for the municipality to finish their plans for the public space. They did this because the municipality and the heat network company are partners in a network. Because the project was already far advanced, there was no budget available for climate adaptation. There was no money for the integrated projects A subsidy was available for climate adaptation pilot projects. This market instrument was the solution for the missing budget.

With the addition of climate adaptation measures to the case, the case changed (unintentionally) from a mostly hierarchical approach to a more network approach. It was decided that the market party that was assigned the project for the construction of the heat network kept the directing role, due to the advanced stage of the project. While the project first was focused on technological knowledge, the knowledge needed for this project became more broad. The directing party was specialized in heat networks and did not have knowledge about climate adaptation. This is why the municipality took the directing role over the climate adaptation part and now had to work closely together with the heat network company. The sectoral assignment the municipality had given the company top-down, now changed in a collaboration network assignment where the municipality and the company had to work together to be able to combine both the assignments. This directed the project to a more network approach in order to make integration possible. This shift to a network structure was necessary to be able to integrate both assignments in this case, because of the specific focus of the market party.

In a network environment, liability can become a problem as multiple parties are involved in the same project. In the project of Paddepoel the heat network company had indicated that it does not want to be responsible for climate-adaptive measures. Because in an integrated project like this it is hard to assign damage to one activity, the municipality decided to take full liability over this project. The contractor, already hired before it was decided that climate adaptation would become a part of the project, had specific knowledge about implementing heat networks and had technical knowledge. Because the project had turned into an integrated project, the project needed a contractor with knowledge about the public space as well. The municipality and the heat network company realized that hiring a contractor with knowledge about the public space works better than hiring a contractor with specialized knowledge in the construction of the heat network. The contractor should not only have specialized technical knowledge, but needs a broader more socio-technical knowledge for the public space. During the project, the heat network company kept their budget for the heat network and the municipality used the subsidy for climate adaptation. This led to some disagreements about what costs fell in what budget. Because of the switch from hierarchical to a lot of network characteristics during the project, the heat network company and the municipality had not jet adjusted in this project to this new close collaboration. For the design of the public space the heat network company and the municipality involved the residents of Paddepoel. Even though the big delays the project experience because of the addition of climate adaptation measures to the scope, the residents stayed supportive because of their involvement in the design of their neighbourhood.

Figure 5.4 vizualizes all the practices found in the case of Paddepoel. The yellow boxes are the avoidance practices, the alleviation practices are in the blue boxes and the anticipatory in the green.

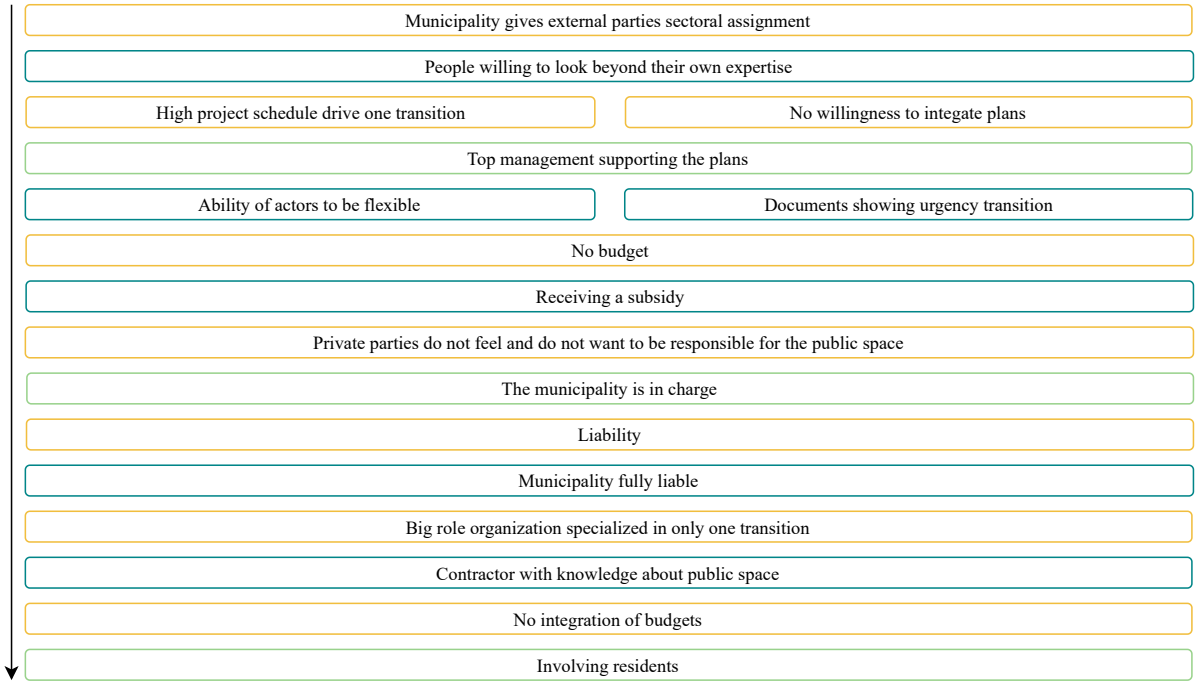

Figure 5.4: Practices Paddepoel

In this case integration was not considered at the start of the project. The reason integration was considered is because an individual saw an opportunity. Hierarchical, network and market governance elements made it possible to change the project in an integrated project in this stage of the project. It took a switch from a dominant hierarchy structure to a network approach to bring about the integration. Climate adaptation is seen as the job of the municipality and thus should be involved in this project. The company that constructs the heat network and the municipality then have to work closely together during the project to align their plans.

5.2.2. Case 2. Kruidenbuurt – Tilburg

People should be willing to look at a particular project in a different way. In the case of the Kruidenbuurt parties found each other and almost by coincidence started to work together. These parties were able to look beyond their own goals and formed a joint goal of improving the neighbourhood. Now a new network structure is emerging here. Next to this, the project leader seems to go a step further than was expected of him (self-organization) and his integrated focus on this neighbourhood makes that multiple assignments are considered and multiple parties started working together. Three housing associations own houses in the Kruidenbuurt and all three are making their housing stock more sustainable. This is why they decided to work closer together and collaborate for the construction of a heat network. To make this collaboration official the municipality and the housing associations signed a collaboration agreement and they met during periodic meetings. The municipality is planning the redesign of the public space at the same time. Since many tasks are running simultaneously, it can be very beneficial to coordinate each other's plans. The parties have decided that they can no longer work independently and have formed a network.

By forming the network and structurally sharing plans, there are more opportunities now for integration and the parties can take each other into account. The municipality foresaw that if multiple parties were going to work on the same assignment, liability could become a problem. As also mentioned in Section 2.2.2, it is difficult to hold actors into account for things that are realized in collaboration (Meuleman Niestroy, 2015). To solve this problem, the parties decided to make a joint damage budget. If damage occurs and it is not clear which party is responsible, it can be paid from this budget. For this to be able the work, parties must trust each other. A strong network is needed. The Kruidenbuurt is the first neighbourhood in Tilburg where so many parties come together to make the neighbourhood more liveable and sustainable. These parties are not yet fully accustomed and attuned to each other and the heat network is already being installed here, so no large changes will be possible in their planning and in the location of the heat network. If plans are shared

before the beginning of the construction phase, the parties can also get used to each other and adjust better to the plans of the other parties. Luckily the parties in the Kruidenbuurt share the same goal: improving the live-ability of the neighbourhood, which makes collaborating easier. There is also a neutral process manager coordinates and supports collaboration and parties can work together in a joint space.

It is hard to align the schedules, due to a variety in lead time of the two projects and dependency on external stakeholders. The construction of the heat network takes more time than the implementation of climate adaptation measures and the municipality does not want to delay the construction of the heat network. The housing associations are dependent on the heat company for the construction of the heat network. The heat company is less flexible, as they do not have the capacity to be flexible. The planning for the construction of the heat network cannot be adjusted at this moment in time. To be able to adapt more to the plans of the housing associations, the municipality now has a flexible contract with the contractor for the redesign of the public space. The municipality uses its hierarchical power to enforce flexibility. This gives it more room to adjust its plans during the project and to adapt better to the plans for the heat network.

Figure 5.5 vizualizes all the practices found in the case. The yellow boxes are the avoidance practices, the alleviation practices are in the blue boxes and the anticipatory in the green.

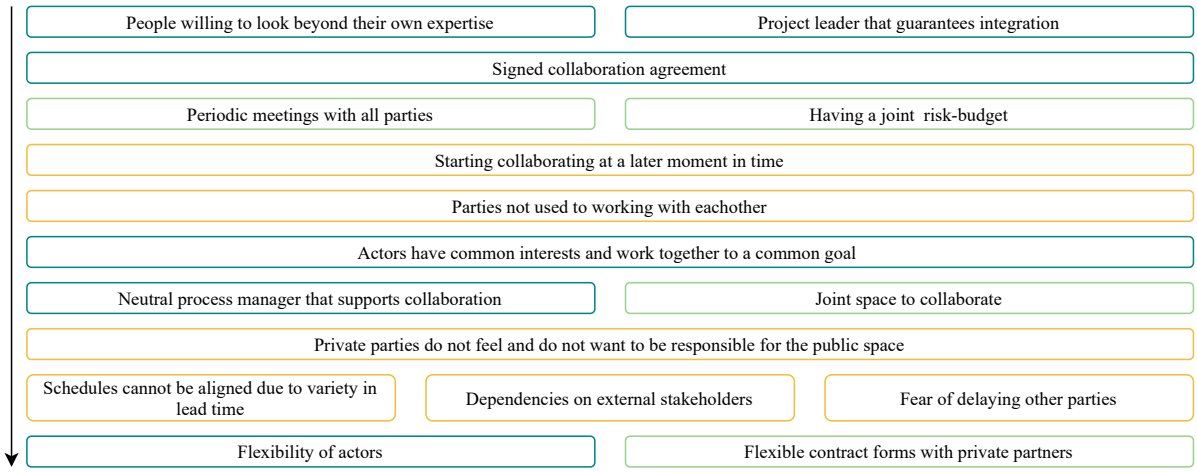

Figure 5.5: Practices Kruidenbuurt

Forming a network with all the core parties in the neighbourhood helps to integrate plans. The periodic meetings help to look for opportunities for integration early on. Measures are being taken to strengthen this network, such as providing a place where parties can work together. Both in this case and the case of Paddepoel, the municipality is responsible for taking climate adaptation measures in the public space and an individual played a big part in the realization of the integrated approach. Consciously collaborating and forming a network can help identify opportunities for integration in a more standardized way.

5.2.3. Case 3. Huiswaard – Alkmaar

The dominant governance mode of the case Huiswaard is market. The core parties in this case do not form a network, as they do not perform negotiation processes to synchronize (competing) goals and agendas on a regularly basis. Communication between the parties is not enough coordinated. The municipality only later heard of the plans for the heat network that was going to be installed in Huiswaard. As noted in Section 2.2.2, a drawback of the mode 'Market' is that it is based on the idea of a competitive market. The core parties in this case are dependent on their business case. The company that constructs the heat network will only do so when it has enough clients. They cannot make a precise planning far ahead. Because of their dependence on the business case and a lack of communication between the parties integration becomes more difficult. The municipality did not have enough time to make a plan for the public space and they had no budget to execute plans for climate adaptation.

Interviewees from the case Huiswaard see that mitigation measures like the construction of a heat network often comes before climate adaptation measures. First the location of the heat network is established and then it is decided if there is still room for climate adaptation. The parties fully want to focus on the transition that is seen as most important, and do not seek for opportunities for synergies. The heat transition has

been getting more attention and measures like a heat network can generate money. Knowledge about climate adaptation is not widely spread within the municipality and City Management and climate adaptation measures like adding trees and green in the public space cannot directly generate money for market parties. It is expected that city management and the municipality pay for climate adaptation. Figure 5.6 vizualizes all the avoidance practices found in the case. No alleviation and anticipatory practices are included, as no integration of heat transition measures and climate adaptation measures are planned yet.

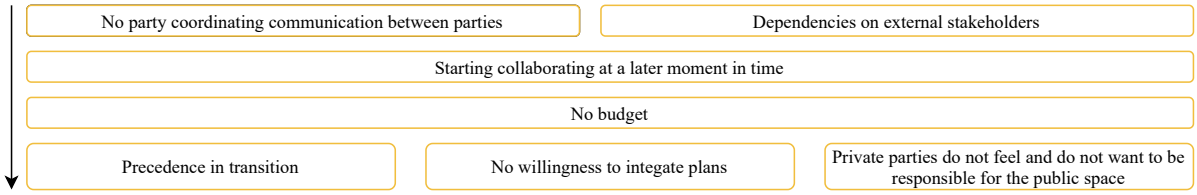

Figure 5.6: Practices Huiswaard

It seems that an integrated approach is not realized here, because of communication problems. This governance approach could need more network governance characteristics to improve collaboration between the parties for finding opportunities for integration. The network should be coordinated or the municipality could make new rules about communication of market parties about their plans. The latter would be more of a hierarchical approach in nature. City management is trying to raise more attention for climate adaptation within the municipality. This network action could improve the chance of making connections with plans of other departments.

5.2.4. Case 4. Vruchtenbuurt – Den Haag

In the Vruchtenbuurt the residents are in the lead for the construction of the heat network. In this project with a dominant governance mode self-organization, the government has a limited facilitating role. For the residents' association to be able to do research on a new form of heating for the neighbourhood, they can receive money from the municipality. This money comes from the ELENA subsidy, a subsidy obtained by the province of South Holland. The construction of a heat network is an expensive operation and the residents cannot pay for this themselves. They need a market instrument to continue the project. The financial support from the subsidy allows the residents' association to remain in the lead. The ELENA subsidy does however give the project a strict deadline. The construction must start after three years of receiving the subsidy. This hierarchical rule gives the residents' association less space to experiment with integrating other issues. The subsidy forms a barrier for integration. Their full focus is on the construction of the heat network. The construction of the heat network in the Vruchtenbuurt cannot be delayed, so the municipality does not want to add an extra task to the construction of the heat network.

In the Vruchtenbuurt most houses are privately owned. Making a planning for the construction of a heat network is even more difficult when there are a lot of private house owners. A large part of the house owners has to agree with connecting to the heat network for the heat network to be constructed. Insecurities in the time planning makes it difficult to connect to other assignments and plan ahead. The Vruchtenbuurt is largely dependent on self-organization of the residents. Enough residents must be involved in the construction of the heat network for it to succeed and this is difficult.

Because the residents do not have an overview of which tasks must fit into the subsoil in the future, this can have a negative effect on the possibility of climate adaptation due to the limited space. Although this case takes place in a self-organizing environment, it still has some hierarchical characteristics, namely the instrument permits. The municipality can steer and could take control through permits. This means that they are ultimately responsible for the location of the heat network. This location should be consciously considered by the municipality, with a view to multiple transitions. This can be done by making a map of the subsoil and use this map to create the environmental plan (omgevingsplan).

Figure 5.5 vizualizes all the avoidance practices found in the case. No alleviation and anticipatory practices are included, as there is no integration of heat transition measures and climate adaptation measures.

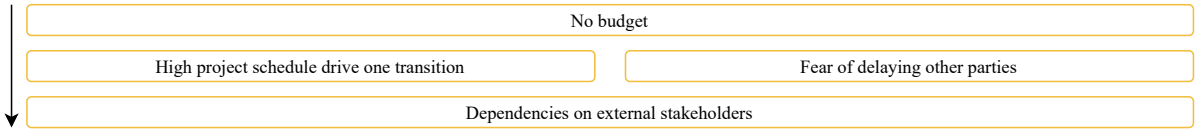

Figure 5.7: Practices Vruchtenbuurt

Flexibility is missing in this case. The project has a strict deadline and is dependent on other stakeholders, which makes it hard to align other plans. In order to take into account other projects and sustainable transition in this district, not only network elements can be used in this case as in the other cases, but hierarchical elements are also important. The municipality should keep control in the subsoil, in order to make everything fit.

5.3. Summary Evaluation Cases

Initially, the dominant mode of governance of the first case was hierarchy. The governance mode hierarchy assumes that the government clearly lays down the obligations for others and in this case the municipality gave a party the sectoral assignment to construct a heat network. This party did not look for integration, because the municipality did not give them the assignment to do so. Climate adaptation was added to the scope, because of the self-organizing capacity of one employee of the municipality. Hierarchical, market and network elements made that the project succeeded in integrating the two. The project switched from a dominant hierarchy structure to a network approach to bring about the integration. The company that constructs the heat network and the municipality had to work closely together during the project to align their plans. In the second case integration is also stimulated by one individual. The dominant mode of governance of this case is network. Periodic meetings are held where plans are shared and opportunities for integration are found. The network is strengthened by appointing a neutral process manager and creating a joint working space. A joint damage budget was made to solve the problem of liability, which often occurs in networks. Both in this case and in the first case, the municipality is responsible for taking climate adaptation measures in the public space. Consciously collaborating and forming a network can help identify opportunities for integration in a more standardized way. The dominant governance mode of the third case is Market. A drawback of this is that it is based on a competitive market and in this case this means that the parties are dependent on their business case. Because of this dependency the project of the construction of the heat network has to be finished within a certain small time frame it will be hard to integrate it with other issues. Because of a lack of coordination of the communication of the parties here, integration of projects becomes even harder. It seems that an integrated approach is not realized here, because of communication problems. This governance approach could need more network governance characteristics to improve collaboration between the parties for finding opportunities for integration. The network should be coordinated or the municipality could make new rules about communication of market parties about their plans. The latter would be more of a hierarchical approach in nature. In the last case with self-organisation as the dominant mode of governance, the residents received money from a subsidy to be able to keep matters in their own hands. This external money gives the project a time frame in which the money must be spent, preventing them from considering other transitions. This dependency on external money and their dependency on other stakeholders, makes that this project is not flexible and it is it hard to align other plans. In order to take into account other projects and sustainable transition in this district, not only network elements can be used in this case as in the other cases, but hierarchical elements are also important. The municipality should keep control in the subsoil, in order to make everything fit.

6

Formulating Governance Options

By analysing the cases in Chapter 5, the strengths and weaknesses of governance for realizing integration between the heat transition and climate adaptation could be established. The chapter described the consecutive events leading to avoidance of integration, alleviation of the avoidance practices and the practices that anticipated on avoidance practices. In the projects, avoidance practices can prevent integration from happening if there are no alleviation or anticipating practices. For future projects, the interviewees had some ideas of how integration could be stimulated. They have learned from the project they have been involved and see some opportunities.

In Section 2.2.7, the three project contexts are introduced. The policy context is where municipalities decide on their budgets, create policies and provide guidelines and tools. In the specific context objectives are made for a specific project and information is gathered. Awareness and commitment play an important role here. In the multi-actor interaction process context is the context where the project manager gets involved. Avoidance, alleviation and anticipatory practices seen in the cases happened in the multi-actor interactions process context. Governance options formulated can apply for all three contexts. Taking actions in the policy and specific context can prevent avoidance practices in the multi-actor interaction process context.

As discussed in Section 5.2, adding network elements and processes in the governance approach can help in realizing integration between transitions. In the network context the municipality should still play a big role for realizing climate adaptation measures and to coordinate the subsoil. Hierarchical elements and processes can be used to regulate collaboration and flexibility of actors and can help to control the location of the different assignments in the subsoil. The formulated governance options are hierarchical and network-related in nature.

Below a list of governance options to realize integration. These options will be validated in Chapter 7 to check how much potential they have.

- **Rules for parties to share their plans with the municipality early on:** For the municipality to be able to integrate other projects to a project, they should know early in advance about the plans of private parties. By imposing rules on private parties about the rules for communicating with the municipality, they have enough time to prepare plans for possible integration with other issues.
- **Make policy about including certain issues:** Make it a requirement to consider other transitions in a project.
- **Set frameworks to include climate adaptation in projects in public space:** The municipality could set frameworks for private parties to include climate adaptations in projects in public space. Whenever they are changing something in the public space they for example must add a certain degree of greenery. It could be set as a precondition.
- **Appoint coordinator subsoil:** Every municipality should appoint someone that will coordinate what is happening in the subsoil. This coordinator subsoil must communicate with all the parties that work in the subsoil and they have to know where to find the coordinator subsoil.
- **Municipality takes the directing role in integrated projects:** In integrated projects the municipality must take the directing role, as they have the overview of what is happening in the subsoil.
- **Tools to consider different types of possible street-layouts:** The goal of this tool is to present knowledge in order to assist project team in realizing integrated objectives. The tool gives the people working

at the municipality an idea what is possible in different kind of streets. It gives an example of the design of the ground level and the design of the subsoil.

- **Make people aware of the importance of both transitions / Share knowledge about urgency and the importance of the other transition:** By informing people within the municipality about the importance and the urgency of climate adaptation, more attention will be paid to this subject and people from other departments will maybe consider this in their project.
- **Joint kick-off with all the core parties of a project:** Organizing a kick-off with all the core parties that are going to work together, can improve collaboration in later stages of the project and all the parties now who are involved and who to turn to when there is a problem.
- **The private parties become equal partners with the municipality and form a joint budget:** The municipality and the private parties work closely together and form equal parties with the municipality. In integrated projects the private parties and the municipality form a joint budget.

In Figure 6.1, all measures are presented visually and classified according to the associated governance mode and context.

Context → Modes ↓	*Policy context*	*Specific context*	*Multi-actor interaction context*
Hierarchy	Rules for parties to share their plans with the municipality early on	Appoint coordinator subsoil	Municipality takes directing role
	Make policy about including certain issues		
	Set frameworks to include climate adaptation in projects in public space		
Market			
Network	Tools to consider different types of possible street-layouts	Creating awareness and a sense of urgency	Joint kick-off with all the core parties
			Private parties become equal parties with the municipality and form a joint budget
Self-organization			

Figure 6.1: Governance Options

7

Validation Expert Session

As indicated in Section 3.5 a focus group is held to validate the outcomes of the case analysis. In this chapter the results of this focus group will be presented. It is decided that the results of this session will be qualitative, because this adds more to the research. The focus group focused on the avoidance practices found in cases, to form an idea which avoidance barriers are most important to consider. After this the general governance suggestions made by the interviewees are presented to the experts. As these are not yet implemented ideas of people, it is important that the potential of these ideas is checked by a group of experts.

7.1. Validation of the avoidance practices

After a short explanation of the research, the avoidance practices were presented to the experts one by one. avoidance practices will be validated to see if the experts recognize the avoidance practice and if they thought the practice plays is big role in avoiding integration. The three avoidance barriers that came out highest are:

- **Municipality gives external party sectoral assignment:** This is an important avoidance practice and a reason why in a project integration does not work. This is preceded by a question: why are projects defined that way in the beginning? The experts explained that where the money flows run, projects start. If there is for example a budget for sustainable heating and no budget for climate adaptation, a sectoral project will be initiated focusing on sustainable heating.
- **High project schedule drive on transition:** According to the experts, time pressure also depends on money.
- **No budget to add an extra assignment:** This depends on the policy context. If no budget has been made available, that can indeed be a problem.

The experts' comments on the avoidance practices are detailed below:

- **No party coordinating communication between parties:** This avoidance practice can be important in integration plans.
- **Precedence in transitions:** Transitions that already have financing scheme are prioritised. Next to this, external money can also be very decisive. External money can give a time frame in which the money must be spent. (This is also apparent in the case of the Vruchtenbuurt).
- **Liability:** This can form a medium barrier for integration projects.
- **Big role for organization specialized in only one transition (and lack of experience with other transition):** This is preceded by a tender and the formation of a project team. So something is already going wrong in the organization for this. If in the specific context the project objectives are not well established and if in the multi-actor interaction process context the right people are not involved for the project. If that does not go well, this avoidance barrier arises.
- **Schedules cannot be aligned due to the variety in lead time:** A variety in lead time can be a barrier. It can be moderately important.

- **Starting collaborating at a later moment in time:** This is a medium important avoidance practice. There are also things that precede this.
- **Parties not used to working with each other:** This avoidance practice does not always have to form a barrier to an integrated project, it can also be an advantage. Sometimes parties have been working together for a long time and the relationship has cooled down. Collaborating with new parties can then provide some new energy.
- **Fear of delaying other parties:** In general, the experts find that the fear of being slowed down is greater than that of slowing down others.
- **Dependencies on external stakeholders:** Dependence on external stakeholders is a challenge in every project. The experts assume that this will not become a bigger problem when integrating multiple issues. It can even provide opportunities. For example, a new green layout of their neighbourhood can persuade residents to connect to the heat network. If, due to the dependence on other parties, the plans of a party become unpredictable, you could solve this through better cooperation or by drawing up rules that once the business case has been completed that there must be a mandatory amount of time until construction, so that the municipality plan for integration.
- **No willingness to integrate plans:** People are not against integration, but not everyone believes in its feasibility. If the project is made too large and too complex, people will drop out.
- **Private parties do not feel responsible for the public space:** Private parties would take climate adaptation into account, if this yields something for them. For example for insurance companies (damage because of climate change costs money) or investors (homes near more greenery can be sold for a higher price). There are opportunities to let companies pay for climate adaptation in public spaces. However, the Land Development Act must be taken into account. The costs that the municipality may recover are determined in the Spatial Planning Decree. This is a limited list.

The avoidance practices the experts added to this lists are the following:

- **The business case for climate adaptation is not yet been made**, making it difficult to fit it into projects. Money is very controlling in projects. This is also apparent in the municipal organisation, in how many people work per department. The business case does not only mean money, it can also be a social business case. It is important to find out how much it is worth to take climate adaptive measures.
- Another avoidance practice is related to **organizational manageability**: a project that includes large groups and multiple organizations can become unmanageable. Sometimes it can be better to keep it smaller.

An integrated approach to implementing climate adaptation and heat transition measures is not happening on a large scale in the Netherlands because projects are not defined this way in the first place. A big reason why this is not happening seems to be the lack of budget for climate adaptation. There is no business case for climate adaptation yet and often no budget is been made available. First, it has to be decided how urgent and how much it is worth to take climate adaptation measures, before people will take action to link it to other sustainable transitions that are seen as urgent and do have a budget.

Spreading knowledge about the importance of climate adaptation (network action) could be important for this. Next to this, parties should realize that there are ways to yield money from climate adaptation measures and that connecting assignments could indeed save money and resources. The positive condition mentioned in Section 2.1.2, forming a joint innovative bussines case, will help to make the realization of integrated projects possible (Albers et al., 2020). Finally, parties should realize that integration can also lead to synergies. For example, as mentioned in Section 1.1, support for a heat network can increase, when invisible heat transition measures are combined with an addition of more green space to improve the quality of a neighbourhood (Dignum, 2021). Creating awareness for climate adaptation and the benefits for integration could be the first step for an integrated approach. The next step is then improving coordination and collaboration to find opportunities for integration.

7.2. Validation of the general suggestions

As stated in Chapter 6, the interviewees also gave their own suggestions for a better governance for the integration of the heat transition and climate adaptation. Because these are thoughts by individual interviewees, it is important to validate their advice. The expert group was presented the ideas of the interviewees to react on them. They indicated whether they thought this solution would work to remove barriers for integration of issues. The suggestions they thought were really important are:

- **Appoint coordinator subsoil:** Designating a coordinator for the subsurface was considered very important by the experts. All the experts agreed on this one. The subsurface is not well established in many municipalities now. There is also not always a plan of the subsoil. This plan should be digitized. It becomes very busy in the subsoil in big cities, so something has to change now.
- **Make people aware of the importance of both transitions / Share knowledge about urgency and the importance of the other transition:** Sharing knowledge is always important.
- **Set frameworks to include climate adaptation in projects in public space:** Frameworks can be imposed on private parties that they can fill in themselves.

About the other suggestions the following comments were made:

- **Tools to consider different types of possible street-layouts:** This is a technical solution, while the problem is in the governance. The technology does not solve it, the problem is that there is no money or no responsibility is taken. It does help, but it's more nice to have.
- **Joint kick-off with all the core parties of a project:** The opinions of the experts are divided on this one. The disadvantage of a kick-off is that you then determine the parties that will be worked with in the project, while this can change during the project. In this way you define and perhaps exclude parties. Parties that may have something to contribute. Communication with residents can also be difficult. With a kick-off you indicate that you are going to carry out the project, while the residents have not yet been consulted. Residents may object or you promise things to residents that you cannot deliver.
- **Rules for parties to share their plans with the municipality early on**: This is not necessary according to the experts. A permit is always required for the construction of a heat network, so the municipality is always informed.
- **Municipality takes directing role in integrated project:** The municipality does not always have to have a coordinating role in these types of projects. There may also be a coordinator from an independent party. Climate adaptation is a social task, so the municipality gives the order and the municipality remains responsible. They will then appoint an independent party to carry out this project.
- **Make policy about including certain issues:** You do not want to impose too many rules on private parties. It would be good if someone involved in energy transition policy also pays attention to climate adaptation and vice versa. Private parties want clear laws and regulations or goals that they can adhere to, without it being completely boarded up. Obligatory cross-linking of certain challenges leads to cost increases and postponement. Policies without support and resources to make it possible lead to undesirable outcomes. Setting certain conditions is not feasible everywhere, such as how many trees must be planted by a party. You could work with bandwidths and clear frames. These frameworks must be the same for each party, but the parties must be given space within them.
- **The private parties become equal partners with the municipality and form a joint budget:** The experts do not think this is a good idea. Municipalities have a different role from private parties, so they should not be equal parties and they should not have a joint budget.

The space in the subsoil is limited and both the heat transition and climate adaptation take up a lot of space in the subsoil. If the transitions were considered separately, it could potentially lead to conflicts in space later. Still, the transitions are mostly considered separately. The experts note that appointing a coordinator for the subsoil is of great importance. Municipalities should establish the current occupation in the subsoil. For example by making a map of all the existing and future infrastructure in the subsoil. This map could then be

used at the base for giving out permits, the environmental plan (omgevingsplan) or for setting frameworks. Frameworks can be imposed on private parties, but they can fill it in themselves. Frameworks for green and trees for example when constructing a heat network. Next to this, as also mentioned in Section 7.1, sharing knowledge about the urgency of climate adaptation is very important for people to consider it.

8

Discussion

This chapter contains the interpretation and implication of the results by the researcher. The first paragraph is a reflection on the results. The second paragraph discusses the implications of the research, the desired consequences and what will happen if the results of this research is not acted upon. In the last paragraph the limitations of this research are considered, together with recommendations for future research.

8.1. Reflection on the Results

This research is focused on the current hybrid governance approach of projects, their performance in relation to integration and possible alleviation and anticipatory practices in different contexts to stimulate integration. Changing elements of the hybrid governance approach can lead to realisation of integration of the heat transition and climate adaptation. Opinions are divided in the literature on how to design and alter a governance approach and some researchers doubt whether it is even possible to intentionally design a governance approach. However, Meuleman (2008) notes that meta-governance can be defined as consciously designing and managing situationally optimal mixtures of governance styles and that this should become an essential part of public management. Meuleman and Niestroy (2015) write that the idea of meta-governance is that it is possible to develop combinations of styles of governance into a new governance framework. In the paper of Meuleman and Niestroy a roadmap with steps for meta-governance for common but differentiated governance. The first step of this roadmap is mapping the governance environment. The article by Pahl-Wostl (2019) offers guidance for mapping the governance environment. For sustainability projects, Table 2.4 and Table 3.3 can be used. In the first table information is presented about the different governance modes and the second table shows what to consider when looking at the governance of cases. By combining the information provided in the two articles a new roadmap has been developed on how to purposefully design a hybrid governance approach by mixing different governance characteristics. This combined roadmap can be used by meta-governors to establish a governance mix and an approach to implement a new hybrid governance approach. However, this research does not intend to design a new governance framework for the integration of sustainable heating and climate adaptation. It seems that there are different hybrid governance approaches that lead to integration of transitions. The approach for projects related to the heat transition and climate adaptation differ greatly between municipalities. One can wonder if there should be one standard governance framework implemented for integrated projects. This is why this research did not try to form a one-size fits all governance approach.

Four cases have been studied, in which one case has succeeded to implement an integrated approach and one is preparing an integrated approach. When the first case turned from an heating network project to an integrated project, the governance shifted from a dominant Hierarchy mode to a Network structure. The dominant governance mode of the second case is Network as well. It seems that a Network approach with some elements of Hierarchy works well for integrated projects. A Network approach includes for example periodical meetings with core parties, knowledge sharing about the integration of transitions and coordinated collaboration. With hierarchical elements for example permits are meant or rules for sharing information. A case with a lot of Market governance characteristics could be less suited for an integrated approach. This mode of governance assumes that parties want to make profit and are ruled by price and regulations, while the main goal of sustainable transitions is to reduce the sources of greenhouse gases or enhance the sinks of greenhouse gases and to make places more climate resilient. Profit that can be yielded from these actions can sometimes be more indirect. The governance mode Self-organization assumes that residents have the ability to take actions themselves. Implementing measures for the heat transition and climate adaptation in

the public space are big tasks. Residents are not always able to act or it can take long before they feel the urgency to act. In the two cases where integration is considered, this integrated approach can be traced back to one individual. This individual has the drive and the power to make integration between issues. If such a person is not present in a case, there is a small chance that integration will be considered. In the multi-actor interaction process context, integration seems to depend on the self-organisation of people. Hierarchy, Market and Network elements could stimulate integration already in the policy and specific context.

8.2. Implications

For multi-actor societal problems the technical aspect is usually not the problem, but the governance is. Governance is a broad concept and one must understand what aspects it contains to improve governance. Now a certain governance approach gradually emerges, but governance is not yet purposefully designed for taking into account the different governance modes. This research tries to add to the knowledge of meta-governance and how to purposefully design or alter a governance approach to deal with complex problems of society. It researches how governance modes are applied in real life cases. Governance modes are extensively called on in literature, however their application is less studied.

To improve the governance, the different governance modes should be considered. Hierarchy, Market, Network and Self-organisation actions and instruments can be used. Governance is also important for the consideration of who should be involved in what context and who should have what role. Considering governance can help to understand why some avoidance practices occur and provide guidance for resolving these avoidance practices.

Weaknesses of projects and processes can be explained with governance and thus consciously respond to a certain established governance approach. By establishing the current governance approach, it is possible to consciously determine the weaknesses and the actions that can be taken to strengthen it. If the established governance approach is not consciously considered, weaknesses of the current governance may not be recognized and measures may be taken that do not fit within the current governance environment. For the integration of climate adaptation and the heat transition specifically, this may mean that integration is dependent on alleviation practices, or it may even mean that opportunities for integration will be missed. If opportunities for integration are missed, this can lead to inefficiencies in urban planning or a lack of space for other tasks. Opportunities can get lost for synergistic actions.

To conclude, the desired implication of this research is that a more conscious look is taken at the governance properties of a project. By considering how different modes are applied in a project, deliberate choices can be made for improving the governance mode. For this, the different contexts must be considered, because different measures relating to different modes of governance can be taken throughout the three contexts.

Focusing specifically on the integration of the heat transition and climate adaptation, this research will help municipalities understand the playing field of the current situation of integrated projects and helps municipalities in realizing a more integrated approach.

8.3. Applicability of the Research

Below two things that have to be considered for the application of the results from the cases.

APPLICATION OF RESULTS IN DIFFERENT MUNICIPALITIES

The avoidance found may be project dependent. It can depend on the location or on the organizational structure of the municipality. This is why the avoidance practices were validated in an expert session, to see if these expert saw this avoidance barriers as well. The three avoidance barriers that received the highest rating can be expected to be visible in several cases.

APPLICATION OF RESULTS TO DIFFERENT SUSTAINABILITY ISSUES

Apart from the energy transition and climate adaptation, there are other sustainable transitions in the built environment. Municipalities are for example working on circularity, (zero emission) mobility, biodiversity and social sustainability. Integrated projects can make different kind of connections between these transitions. This research is focused on the energy transition and climate adaptation and the cases that are considered are all projects where a heat network is constructed. A lot of the avoidance, alleviation and anticipatory practices can be generalized for integration of sustainable transitions in general. However, because climate adaptation does not have a business case yet and the importance is not widely spread between all organisations (including the municipality) it makes this transition harder to connect to other transitions. Budgets for

climate adaptation and biodiversity can for example be smaller than the budgets for zero emission mobility and the energy transition. With no budget, it is hard to connect to other projects. Biodiversity and climate adaptation can improve public space visually, because more green is added to a neighbourhood. It could have a positive effect on the implementation of the other transitions. This makes that a connection that is made between the energy transition and climate adaptation is different from a connection between zero emission mobility and the energy transition.

8.4. Limitations and Recommendations for Further Research

Some limitations of this research should be considered when reading this research report. First of all, the research focuses on the heat transition and climate adaptation in the public space of existing neighbourhoods. Other sustainable transitions, like circularity, zero mission mobility and biodiversity were not considered. Section 8.3 takes a closer look at this topic. All the projects take place in big cities with bigger municipalities (Groningen, Tilburg, Alkmaar and The Hague). This can affect the avoidance, alleviation and anticipatory practices. Further research could also focus on smaller municipalities. For example, smaller municipalities could have only one employee for all sustainability challenges. This could have an effect on how integrated projects are realized.

Next to this, integrating measures for the heat transition and climate adaptation is rather new. In the Netherlands there are only a few cases were this integration is made and which are finished now. If in the future an integrated approach to transitions arises, more case studies can be considered. Then more avoidance, alleviation and anticipatory practices can be found and the researcher can see which are apparent in multiple cases. When an integrated approach becomes more standardized, new avoidance practices also come to light in the policy and specific context. Further research could focus more on for example the policy context of the integration, by taking into account the effect of policy objectives, guidelines and municipal budgets on the realization of integrated projects. Further research can also focus on the effect of national and regional decisions on achieving integration goals at municipal level. Also on national and regional level policy objectives are formed and subsidies are made available. This research could then also specifically focus on the effect of the new environment law (Omgevingswet 2022) and environmental plans.

To obtain data, interviews were held. The results of this research are partly based on how people experienced the project in the case studied. As noted in Section 3.3.1, a possible drawback of this method is the possibility that an interviewee could be presenting inaccurate information (Morris, 2015). To solve this problem, three or four people per case gave their description of how they have experienced the case.

This research has an explorative nature. It is researched how governance modes are applied in distinct cases and how these cases succeeded or may not have succeeded in integrating issues. The result of this research is not a conclusive approach to realize integrated projects. (As stated in Section 8.1 one can wonder if there should be one standard governance framework implemented for integrated projects.)

Lastly, for this research it is assumed that integration of projects is desirable. This statement is supported by literature. It will be very interesting to extensively research the perks of integration of different projects. For example, one project could delay the other project, leading to extra costs. It should be researched under what circumstances it might be worthwhile to integrate two projects. When do the cost savings, material savings or manpower savings outweigh the effort put into integrating the projects?

9

Conclusions

This research focuses on how governance arrangements can be applied to contribute to the realization of an integrated implementation of climate adaptation and sustainable heating measures in existing neighbourhoods. It studied which hybrid governance approaches can be found in particular cases and how these governance approaches performed for integration.

The research question that will be answered in this report is:

"How do hybrid governance approaches perform in realizing integration between the implementation of heat transition and climate adaptation measures?"

In order to answer this question a few steps had to be taken. Every step is one research question. First these research questions will be answered in this chapter, after which an answer on the main question, the conclusion of this research, will be presented.

1. "How to consider the application of governance approaches in sustainable transition projects?"
By combining the information provided in existing literature a new roadmap has been developed on how to purposefully alter a hybrid governance approach by mixing different governance characteristics. This combined roadmap can be used by meta-governors to consciously consider and alter governance approaches.

Sustainable transition projects can contain governance characteristics of different modes of governance. To consider the application of governance approaches in sustainable transition projects, the researcher must have an understanding of the elementary or extreme modes of governance. These modes of governance ('Hierarchy', 'Market', 'Network' and 'Self-organizations') can be distinguished from each other by looking at their specific characteristics like dominant actor and steering instruments. These characteristics should be established (using Table 3.3) in the cases that are researched and these must be linked to a governance mode (using Table 2.4). For example, a characteristic of a project could be that it is initiated by residents. A bottom-up approach is a characteristic of the governance mode 'Self-organization', so this project contains elements of the governance mode 'Self-organization.' Characteristics of governance that should be considered in sustainable transition projects are the motive of the subordinate actor, initiating and implement actors, the role of the government, the direction of authority, power, dominant actor type, knowledge, choice of actors, policy instruments/ steering, actions and conflict resolution. These characteristics are filled in differently for the different governance modes. By considering the characteristics of a project and by assigning this characteristics to a governance mode, the governance approach of a project can be established. To take it a step further, this governance approach can be evaluated. By looking at the practices that make up the project, something can be said about the performance of the various governance elements of a project. This is the basis for forming a problem setting and for forming new governance options.

2. "What hybrid governance approaches are applied in heat transition projects in the Netherlands?"
Heat transition projects in the Netherlands have different kind of hybrid governance approaches. They exist of different mixes of governance characteristics. In fact, the four cases studied for this research all have different dominant modes of governance. All the cases had elements of multiple modes of governance and can even switch from one dominant governance mode to another during the project. The cases where a degree of integration was successful had mainly hierarchical and network elements. The municipality had the directing role over the climate adaptation measures and worked together and communicated with the parties that were constructing a heat network to align their plans.

3. "What are the most important avoidance, alleviation and anticipatory practices for integration?"
The three most important avoidance practices to be considered are:

- *Giving a party a sectoral assignment:* if the municipality has given a party a sectoral assignment there is only a small chance that these parties will consider other issues that could be integrated in this project.
- *Time pressure of one assignment:* if one of the two issues to be integrated has to be finished or has to start within a certain small time frame it will be hard to integrate it with other issues.
- *No available budget for an integrated project:* if there is no budget for a certain transition it will be very hard to innclude it in another assignment.

If avoidance practices occur, they can be resolved with alleviation practices. Two alleviation practices were apparent in both cases where integration was found. This is the practice 'the presence of a person who is willing to look outside their own expertise' and 'actors that can adopt a flexible attitude'. In both cases integration was initiated by just one person with a self-organizing ability, who saw the opportunity and acted on it. After this, flexibility of other actors becomes important. Actors can be flexible due to their obligation to be flexible (Hierarchy), because of financial reasons (Market) or because they are partners (Network). The Network action creating awareness for climate adaptation and the benefits for integration, could stimulate people to look beyond their own expertise and could be an important step towards an integrated focus. The next step is then improving coordination and collaboration to find opportunities for integration.

4. "What is the underlying problem (problem setting) and what are possible governance options to address them?"
The avoidance practices can help to identify weaknesses in a project's governance approach, while alleviation practices and anticipatory practices can demonstrate strengths of a governance approach of a project. It is important to keep in mind that the avoidance practices are dependent on what happened before. There is a certain causality to be found in avoidance practices. Avoidance practices occurring in the multi-actor interaction process context can be caused by events or processes in the policy or specific context. For the avoidance practice 'Giving a party a sectoral assignment', for example, one may wonder what preceded the scope definition of this project. Integration in projects is now often initiated by someone who sees the opportunity and acts on it, but it is not considered by default and assignments are not integrally defined. This makes it harder to integrate different sustainable transitions during the project. At the start of a project for the construction of a heat network, the project is under a certain time pressure. If climate adaptation measures were to be linked to this project, a plan would already have to be in place and a budget would have to be made available. For climate adaptation no business case exists yet and a budget is not always made available. To obtain a budget for climate adaptation, it has to be decided how urgent and how much it is worth to take climate adaptation measures. The heat transition is urgent if the goals set by the government are to be met, and it is also considered as urgent. Parties feel the time pressure for this transition. This could explain the greater focus on the heat transition and the reluctance of integrating climate adaptive measures. Taking climate adaptation actions has to be seen as urgent and must be found worthwhile by the parties. Network and hierarchical actions could be taken to realize integration, like sharing knowledge and creating awareness for integrated projects and the municipality could take control over the subsoil by coordinating it more. The next step is then improving coordination and collaboration to find opportunities for integration.

The space in the subsoil is limited and both the heat transition and climate adaptation take up a lot of space there. If the transitions were considered separately, it could potentially lead to conflicts in space later. Still, this is what mainly happens. The experts note that appointing a coordinator for the subsoil is of great importance. Municipalities should establish the current infrastructure use of the subsoil. For example by making a map of all the existing and future infrastructure in the subsoil. This map could then be used as the base for giving out permits, the environmental plan (omgevingsplan) or for setting frameworks. Frameworks can be imposed on private parties, but they can fill it in themselves. Frameworks for green and trees for example when constructing a heat network.

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Final Conclusion:

"How do hybrid governance approaches perform in realizing integration between the implementation of heat transition and climate adaptation measures?"

The governance environment of projects in which existing neighbourhoods undergo a transition to a natural gas-free heating system (and consider climate adaptation to a greater or lesser extent) can vary greatly. These governance approaches are a mix of elements of the extreme modes of governance and can have different dominant modes. Some mixes of these modes will not work ideally for the integration of heat transition measures with climate adaptation measures. By consciously looking at the performance of current governance approaches they can be adapted appropriately to address complex societal issues.

There are different hybrid governance approaches that lead to integration of transition. There is not one standard governance framework that will work best for integration. However, it does seem that a Network approach with some elements of Hierarchy works well for integrated projects. A network structure needs to be created where parties work together in shared spaces and have regular meetings with in addition hierarchical forms of regulation like permits, frameworks and rules for sharing plans. By finding the right mix of governance characteristics and processes, integration of transitions can be realized.

10

Practical Recommendations

Finally, this report will provide a practical recommendation for policy makers and for core parties working on the heat transition or climate adaptation.

10.1. Process recommendation for meta-governors

This research shows that it can be beneficial to consciously look at the governance approach in order to adapt it appropriately to address complex societal issues. This means looking at a certain project through the eyes of a meta-governor. Figure 10.1 presents the steps for consciously looking at a governance approach. The steps that can be taken are the researcher's own interpretation of the step-by-step approach in the article of Meuleman and Niestroy (2015). This approach is focused on an individual project and the steps that can be taken to consider and alter governance approaches of a project with the goal of integrating sustainable issues:

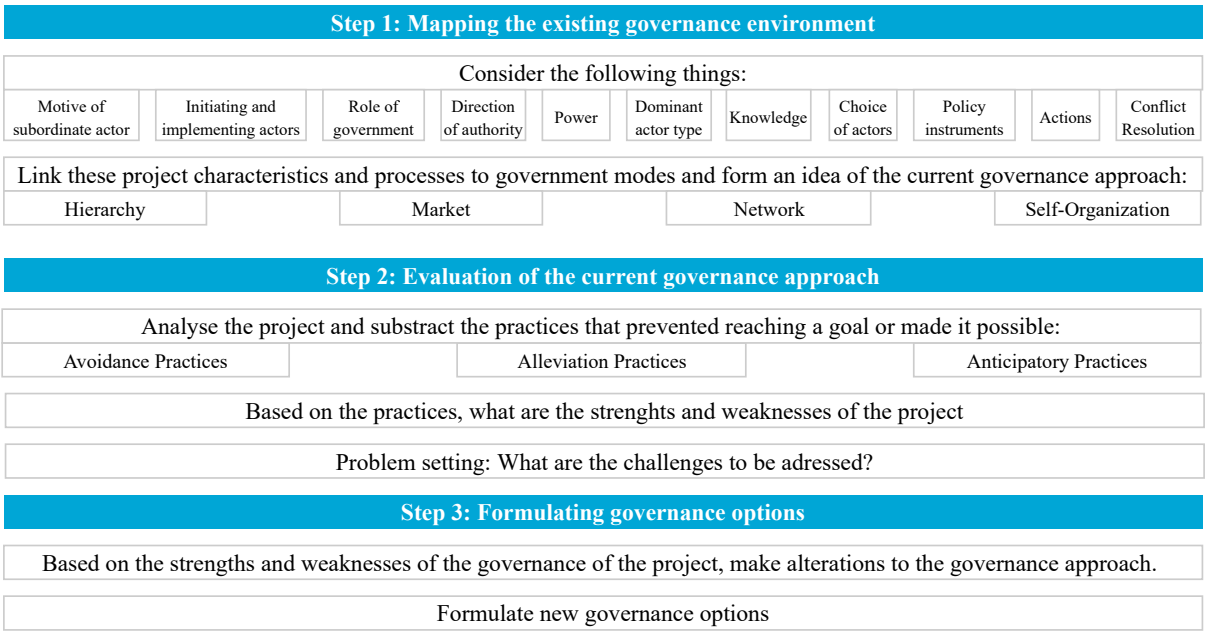

Figure 10.1: Process Recommendations

10.2. Practical recommendations for municipalities

Figure 10.2 contains practical examples of recommendations for municipalities in the different contexts, related to different dominant governance modes. These recommendations are either alleviation or avoidance practices seen in cases or governance suggestions that experts perceived as important.

Context → Modes ↓	*Policy context*	*Specific context*	*Multi-actor interaction context*
Hierarchy	Set frameworks for considering multiple issues in a project	Appoint coordinator subsoil	Get Alderman's support for scope extension
Market	Apply for subsidies for climate adaptation	Make external parties perceive benefits of investing in climate adaptation	Use flexible contract forms with contractors
Network	Use tools to consider different types of possible street-layouts	Organize periodic meetings with all core parties	Appoint neutral process manager who supports collaboration
Self-organization	Remove barriers and create room for actors to act	Create awareness and a sense of urgency for integration	Appoint a project leader who is willing to look beyond their own expertise

Figure 10.2: Practical Recommendations

To achieve the Dutch government's goals of being natural-gas free, water-resilient and climate-proof by 2050, it is important that the different transitions are considered together and that parties will collaborate to achieve synergies.

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